The Metropolitan Transportation Authority

MTA PROJECT

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AGENDA

01 Overview	02 Goal	03 Data Processing Pipeline
04 Steps	05 Key Insights	06 Power BI

OVERVIEW

About The Project

Public transportation is the backbone of urban mobility, but what happens when a global crisis forces a dramatic shift in commuter behavior? This study uncovers how travel patterns transformed before and after the pandemic, revealing insights that could reshape the future of public transit.

The question "What happens when a global crisis forces a dramatic shift in commuter behavior?" led us to a deeper question...

Why does it matter to understand the answer?

Because knowing how people changed their travel habits helps us:

- Improve future public transportation planning
- Prepare for future crises
- Design safer, more flexible transport systems

And this was...

The Goal of Our Project

Understanding the past helps us build a better future.

Data Processing Pipeline

- CSV file were imported into Power BI to begin the analysis.

Dataset

Cleaning

- Removed null values and duplicate entries.
- Standardized datetime formats.
- Transform data.

- Created relationships between tables..

Data Modeling

DAX

- Used DAX functions for calculated columns and measures

- Summarized the most critical findings from the analysis, highlighting trends, patterns, and key takeaways for decision-making.

visuals

Reports

- Designed interactive visuals to highlight trends. Added slicers for better filtering.

- Designed an executive-level dashboard presenting core analytical insights through curated visualizations.

Dashboard

STEPS

01 Data Cleaning (Before Transformation):

Date	Subways: Total Estimated Ridership	Subways: % of Comparable Pre-Pandemic Day	Buses: Total Estimated Ridership	Buses: % of Comparable Pre-Pandemic Day	LIRR: Total Estimated Ridership	LIRR: % of Comparable Pre-Pandemic Day	Metro-North: Total Estimated Ridership	Metro-North: % of Comparable Pre-Pandemic Day
يناير 19 2022	2642129	51	1286788	63	121249	40	96281	35
فبراير 11 2022	3015472	56	1348189	63	131028	43	110674	41
فبراير 28 2022	2915786	54	1362855	63	134902	45	118572	44
مارس 11 2022	3195956	57	1419371	63	158985	51	135371	49
مارس 14 2022	3006800	54	1406578	63	159962	51	134093	49
مارس 18 2022	3275433	59	1402805	63	163169	52	137528	50
مارس 20 2022	1656673	72	628693	63	67551	78	63818	68
مارس 21 2022	3034759	55	1418900	63	165487	53	134182	49
مارس 27 2022	1534056	67	628313	63	64950	75	58044	62
أبريل 07 2022	3307076	59	1379678	63	161276	52	140249	49
أبريل 23 2022	2109188	67	844145	63	79426	70	86804	60
مايو 09 2022	3114506	54	1428758	63	163741	51	140940	49
مايو 19 2022	3467327	61	1426027	63	172517	54	149985	52
مايو 21 2022	2324245	72	883795	63	94322	80	92552	61

Access-A-Ride: Total Scheduled Trips	Access-A-Ride: % of Comparable Pre-Pandemic Day	Bridges and Tunnels: Total Traffic	Bridges and Tunnels: % of Comparable Pre-Pandemic Day	Staten Island Railway: Total Estimated Ridership	Staten Island Railway: % of Comparable Pre-Pandemic Day
21111	75	829778	95	5598	34
22608	77	939270	106	5570	34
21929	75	859177	97	6170	38
23736	80	986555	107	6150	39
22480	76	879699	95	6416	40
24019	81	978491	106	6288	39
12736	72	879711	109	1722	55
22229	75	880846	96	6367	40
11809	67	830360	103	1602	51
24107	83	901454	96	6636	41
13459	81	907580	99	59	1
22008	75	917036	95	6564	38
24271	83	983011	102	6790	39

STEPS

01 Data Cleaning (Process):

Data was extracted for each transportation mode before COVID-19 by custom column.

Custom column formula

```
= ([#"Staten Island Railway: Total Estimated Ridership"] / (
  [#"Staten Island Railway: % of Comparable Pre-Pandemic
  Day"] / 100))
```

An **UNPIVOT** operation was performed to was applied to merge pre- and post-COVID ridership data into a single column.

Three classifications were added:

- **Pre- and Post-COVID periods.**
- **Seasonal classification.**
- **Weekday vs. Weekend classification.**

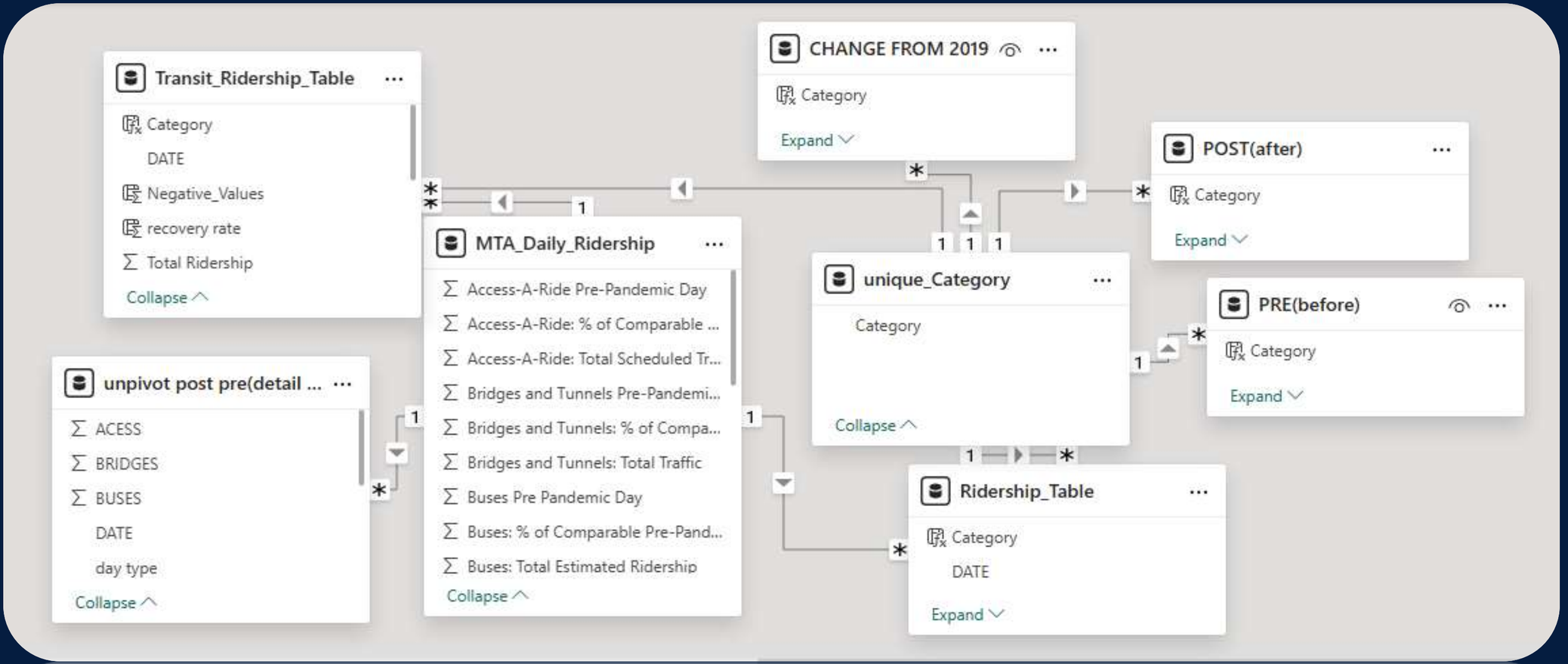
STEPS

01 Data Cleaning (After Transformation):

Transit Mode	DATE	period	season	day type	Category	Total Ridership
Subways	11/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5606940
Subways	14/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5571852
Subways	18/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5551581
Subways	21/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5517744
Subways	07/04/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5605214
Subways	09/05/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5767604
Subways	19/05/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5684143
Subways	23/05/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5762509
Subways	31/05/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5671623
Subways	03/03/2023 12:00:00 ص	pre	Spring	Weekday	Rail	5526714
Subways	10/03/2023 12:00:00 ص	pre	Spring	Weekday	Rail	5559268
Subways	17/03/2023 12:00:00 ص	pre	Spring	Weekday	Rail	5547756
Subways	24/03/2023 12:00:00 ص	pre	Spring	Weekday	Rail	5610000
Subways	12/05/2023 12:00:00 ص	pre	Spring	Weekday	Rail	5727988
Subways	15/05/2023 12:00:00 ص	pre	Spring	Weekday	Rail	5731360
Subways	19/05/2023 12:00:00 ص	pre	Spring	Weekday	Rail	5742317
Subways	30/05/2023 12:00:00 ص	pre	Spring	Weekday	Rail	5715175
Subways	09/04/2024 12:00:00 ص	pre	Spring	Weekday	Rail	5614825
Subways	16/04/2024 12:00:00 ص	pre	Spring	Weekday	Rail	5602103
Subways	01/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5603895
Subways	02/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5531321
Subways	03/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5530164
Subways	04/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5595522
Subways	07/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5520222
Subways	08/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5593919
Subways	09/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5559927
Subways	10/03/2022 12:00:00 ص	pre	Spring	Weekday	Rail	5565605

STEPS

02 DATA MODELING:



STEPS

02 DAX:

Note: The provided DAX formulas are samples, but they have been applied consistently across different categories and transportation modes:

- The **categorization DAX** is used for all three categories.
- The **table creation DAX** is applied to all seven transportation modes.
- The **comparison DAX Measures for pre- and post-2019 periods** is also utilized across all seven transportation modes.

```
1 ACCESS CHANGE% FROM 2019 = (SUM(MTA_Daily_Ridership[Access-A-Ride: Total Scheduled Trips])-(SUM(MTA_Daily_Ridership[Access-A-Ride Pre-Pandemic Day])))/(SUM
  (MTA_Daily_Ridership[Access-A-Ride Pre-Pandemic Day]))
```

1

re | Relationships | Calculations | Calendars

```
1  Transit_Ridership_Table =
2  UNION(
3      SELECTCOLUMNS(
4          'MTA_Daily_Ridership',
5          "Transit Mode", "Subways",
6          "Total Ridership", 'MTA_Daily_Ridership'[Subways: Total Estimated Ridership],
7          "Total Ridership Pre", 'MTA_Daily_Ridership'[Subways Pre-Pandemic Day],
8          "Total Ridership %", 'MTA_Daily_Ridership'[Subways: % of Comparable Pre-Pandemic Day],
9          "DATE", 'MTA_Daily_Ridership'[Date]
10     ),
```

2

```
1  Category =
2  SWITCH(
3      'Transit_Ridership_Table'[Transit Mode],
4      "Subways", "Rail",
5      "LIRR", "Rail",
6      "Metro-North", "Rail",
7      "staten island", "Rail",
8      "Buses", "Road",
9      "Bridges and Tunnels", "Road",
10     "Access-A-Ride", "Paratransit",
11     "Unknown"
12 )
```

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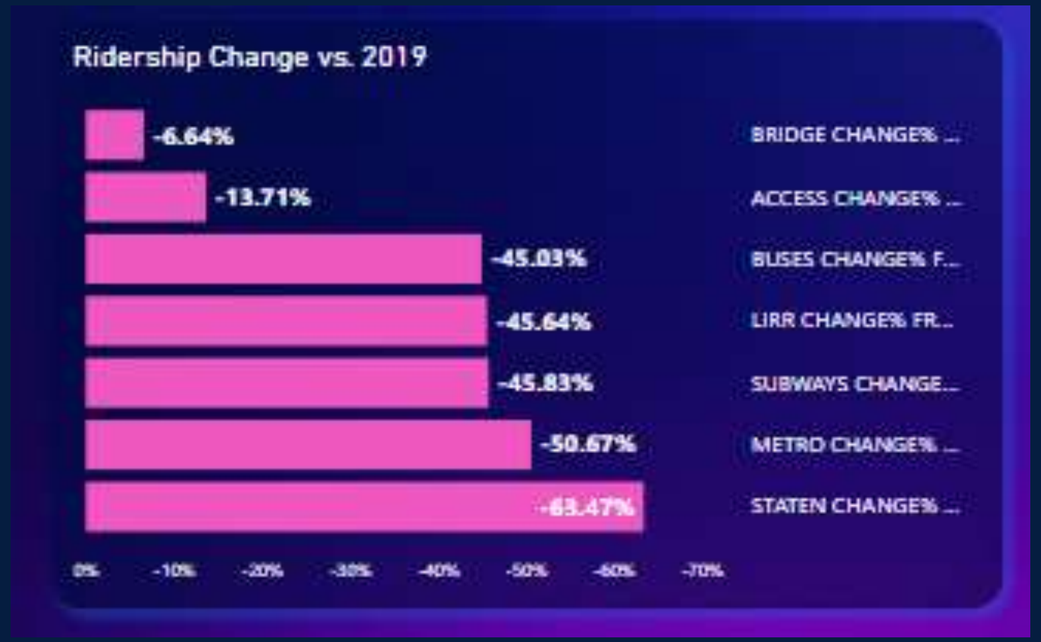
Key Insights & Visuals

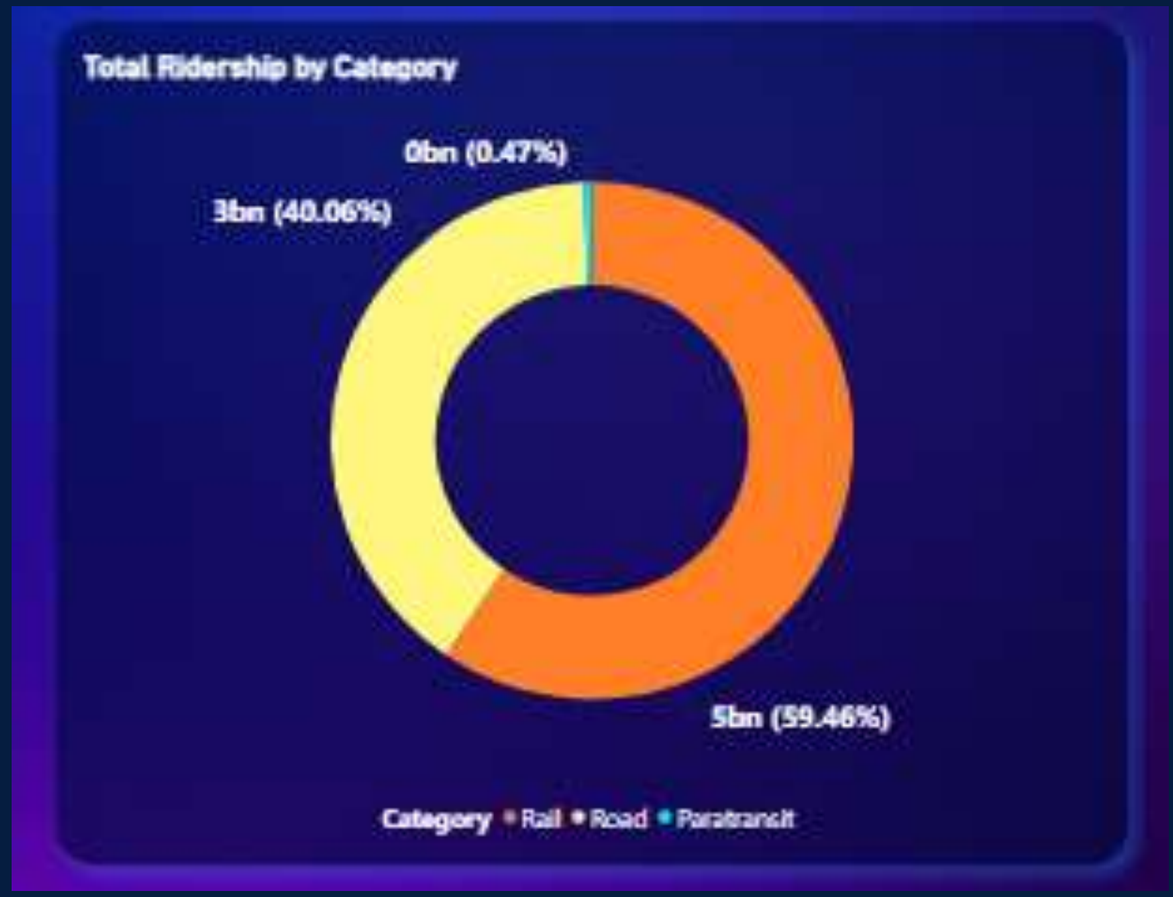
- From 2020 to 2024, subways accounted for the largest share of total transportation at 35.1%, despite experiencing a **45.83%** decline compared to 2019, with a total ridership of **4.28 billion**. Similarly, buses recorded **1.71 billion** trips, marking a **45.03%** decrease.
- On the other hand, bridges and tunnels recorded a total ridership of **1.46 billion**, but the percentage change compared to 2019 is **6.64%**. Meanwhile, **LIRR and Metro-North saw declines of 45.64% and 50.67%**, respectively.
- Staten Island Railway experienced the largest drop, **falling 63.47% below 2019 levels**. In contrast, Access-A-Ride **declined by 13.71%**, rather than showing an increase, reflecting a shift in demand for accessible transportation services.



Key Insights & Visuals

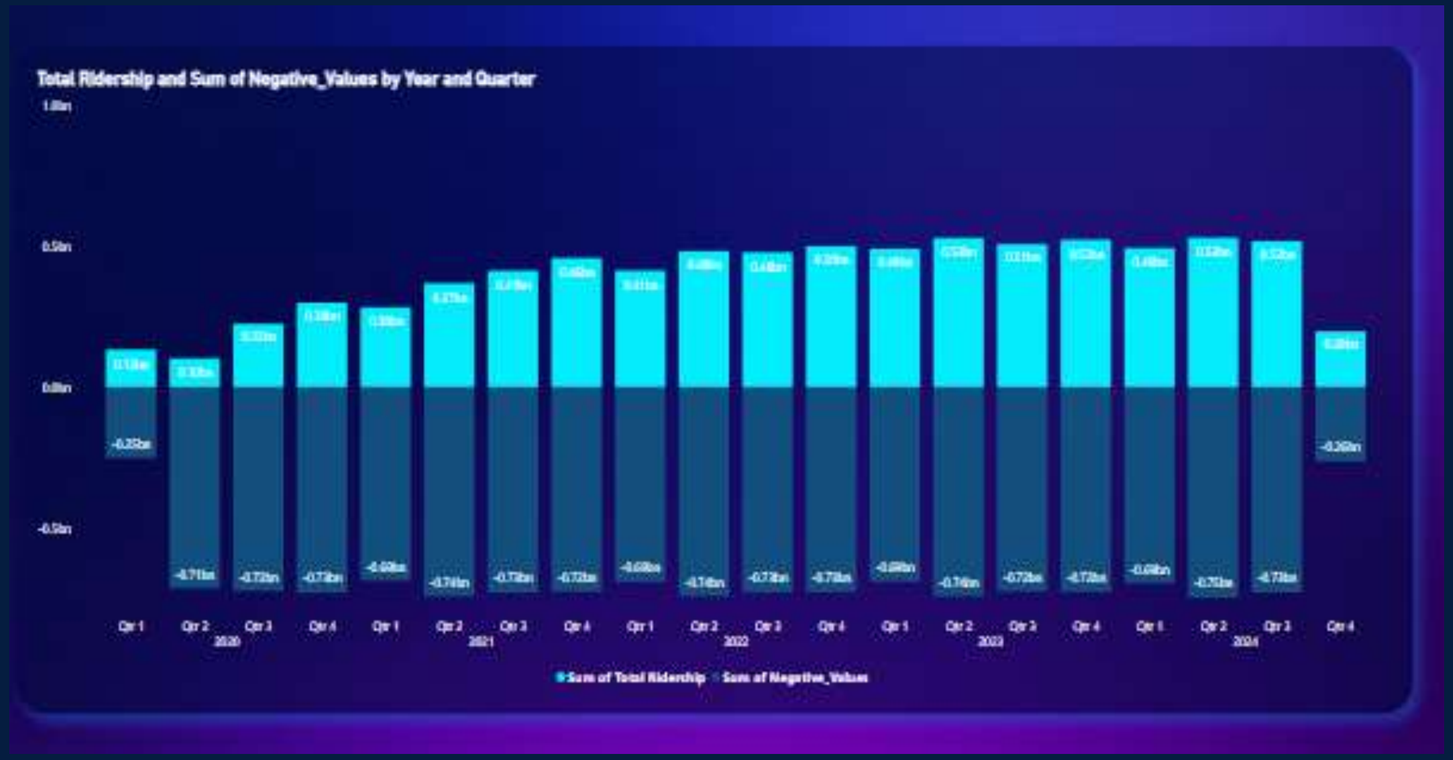
- The total ridership volume from 2020 to 2024, as of October, reached **8.43 billion**, distributed across **rail, road, and paratransit**. **Rail** accounted for the largest share at **59.46% (5 billion)**, f**ol**lowed by **road** with **40.06% (3 billion)**, while **paratransit** contributed the remaining **0.47% (0.4 billion)**.

- Understanding the distribution of ridership across these categories helps in optimizing resource allocation and improving transportation services. The dominance of rail highlights its central role in urban mobility, while road and paratransit services provide essential connectivity for different commuter needs.



Key Insights & Visuals

- The pandemic caused a **sharp decline** in transportation ridership, with **2020 experiencing the largest drop**, especially in **Q2 (-611 million)** compared to 2019.
- From **2021 to 2023**, ridership **gradually recovered**, reducing the deficit to **-200 million by 2023**.
- By **Q4 2024**, the gap further narrowed to **-263 million below 2019 levels**, reflecting a **strong rebound** as demand approached pre-pandemic levels.



Microsoft Power BI

conclusion

During the Pandemic :

- Significant drop in ridership.
- Imbalance in passenger distribution across transportation modes
  Despite the overall decrease in ridership, certain modes such as buses, subways, and bridges experienced noticeable overcrowding

After the Pandemic :

- Gradual recovery in ridership
  However, numbers did not fully return to pre-pandemic levels.
- Ongoing preference for the same modes of transportation.

which led to:

- Resource exhaustion in these modes.
- Underutilization of other transportation modes.
- Difficulty in covering operational costs for the less-used modes due to decreased revenue.

solutions

Improving services of less-used transportation modes.

Surveys to understand passenger behavior.

Incentive-based pricing system (Dynamic Pricing & Rewards)
Smart Nudging.

Passenger movement heatmaps.

MTA App :

رواد مصر الرقمية

وزارة الاتصالات وتكنولوجيا المعلومات

MTA *The Metropolitan Transportation Authority*

Thanks' For Watching