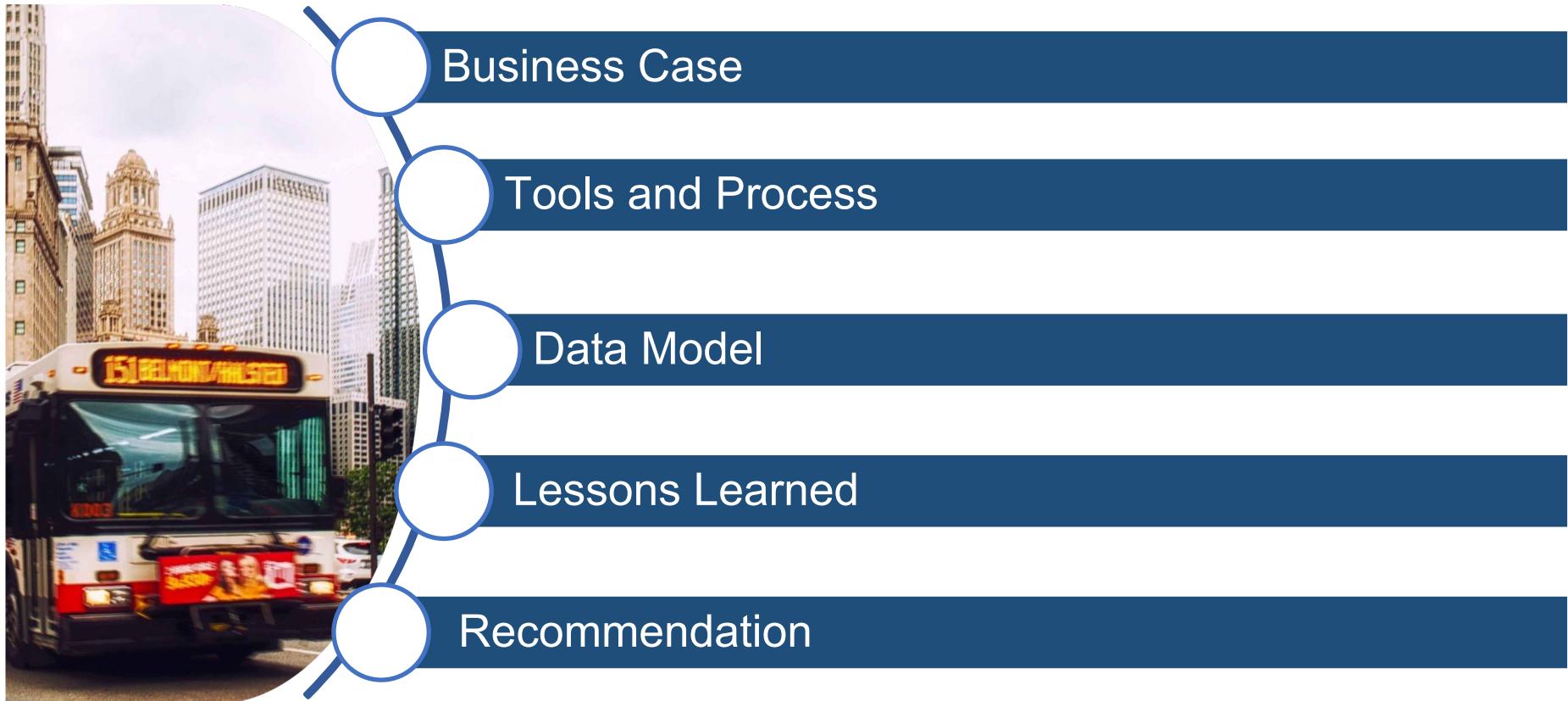


# US Public Transportation Analysis

## Financial, Operational, Environmental Aspects

*A team project conducted by three members including Azizha Zeinita*

## PROJECT OVERVIEW



# DOCUMENT SUMMARY

Document	Filename
1. Overview Documentation	<ul style="list-style-type: none"><li>• [README] Project Overview.pptx</li></ul>
2. Tableau Workbook (connected to data sources)	<ul style="list-style-type: none"><li>• Tableau APTA.twbx Password for MySQL connection: rootroot</li></ul>
3. Codes (MySQL Scripts for DDL and DML) and EER Diagram	<ul style="list-style-type: none"><li>• APTA-DDL.sql</li><li>• APTA-data-DML.sql</li><li>• APTA.mwb</li></ul>
4. Data Files	<ul style="list-style-type: none"><li>• Main Data Sources (Cleaned).zip</li></ul>

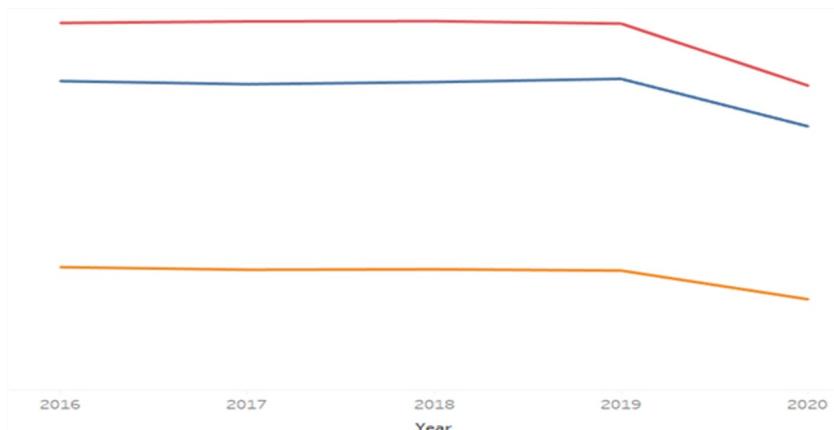
# BUSINESS CASE: APTA

## APTA Overview



- **Founded:** 1882
- **Geography:** North America
- **Headquarters:** Washington, DC

APTA is a nonprofit international association of more than 1,500 public and private sector member organizations representing all modes of public transportation in the U.S.

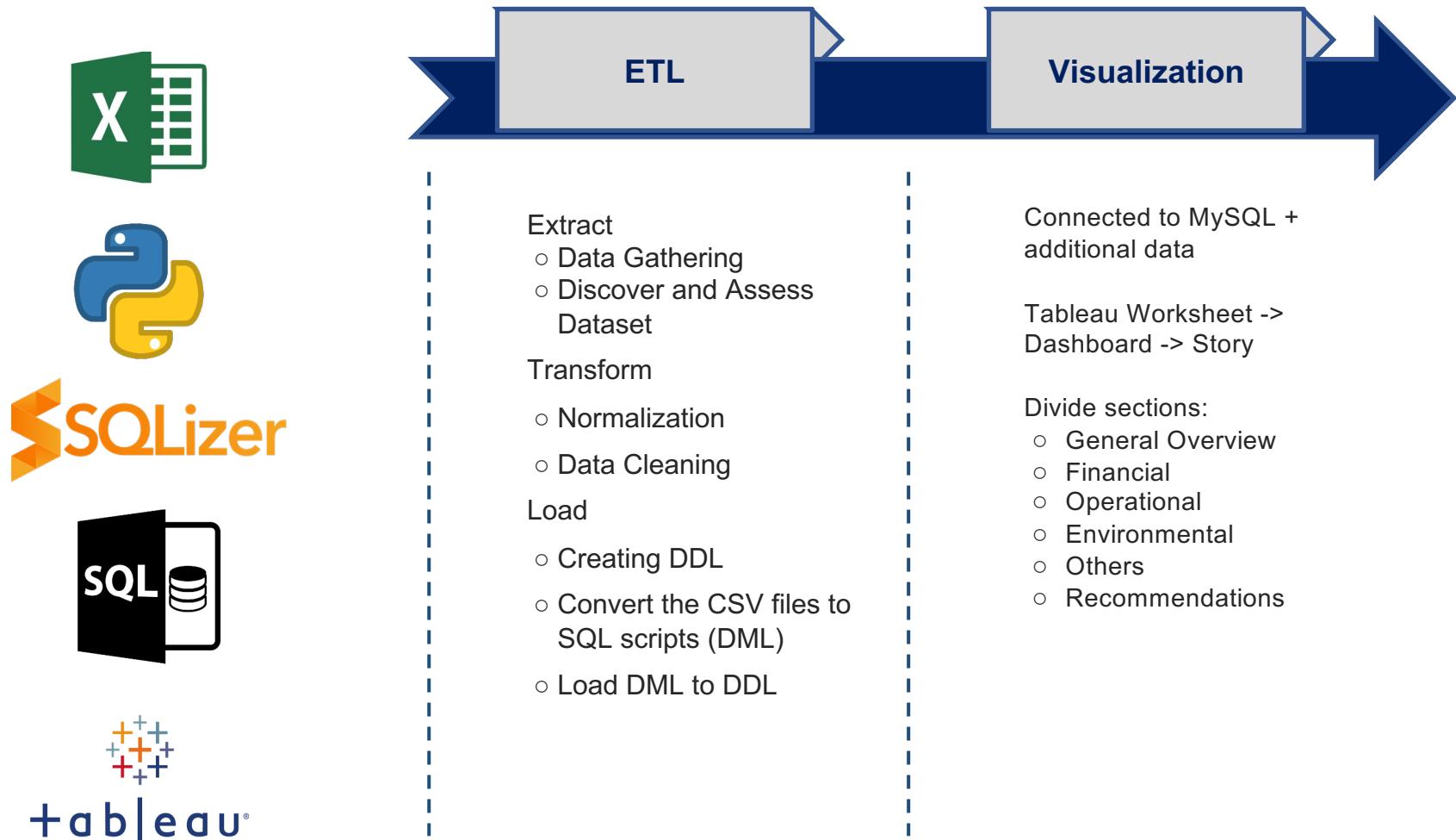


## Business Case

- APTA is facing significant pressure to adjust to the rapidly changing environment of public transportation
- With rising costs, and heightened awareness of green energy and health and safety due to the entrance of COVID-19, APTA is undertaking a grand effort to identify key cost drivers
- New opportunities must be identified to adjust the public transportation system to be more effective and efficient

**Use provided data source and analyze trends in capital and operating expenditures, revenue & funding sources, as well as energy consumption details, to provide potential solutions and methods to alleviate current pressures**

# TOOLS & HIGH-LEVEL PROCESS



# DATA MODEL

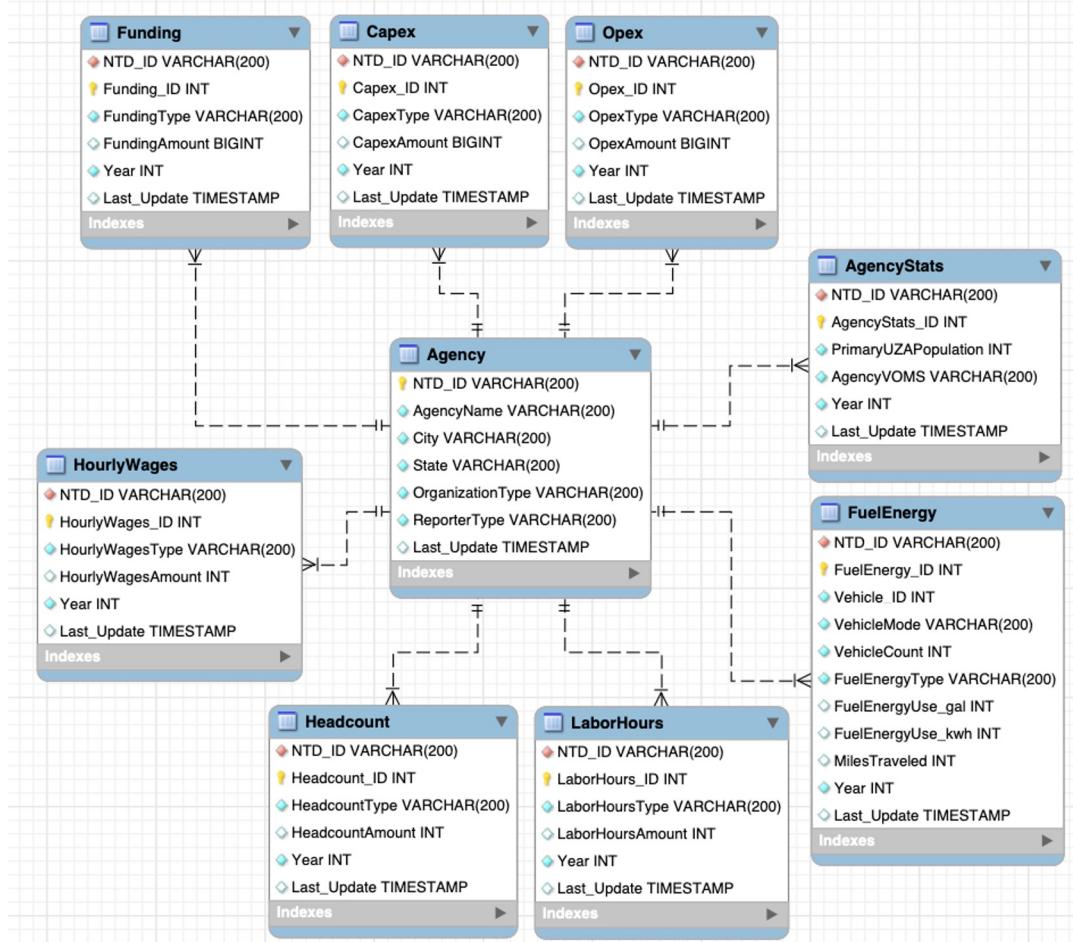
## Relational Database

### 5 Selected Data Categories (Excel to CSV)

5-year data = 5x5 = 25 files

### 9 Normalized Tables

- Agency
- AgencyStats
- Funding
- Capex
- Opex
- Headcount
- HourlyWages
- LaborHours
- FuelEnergy

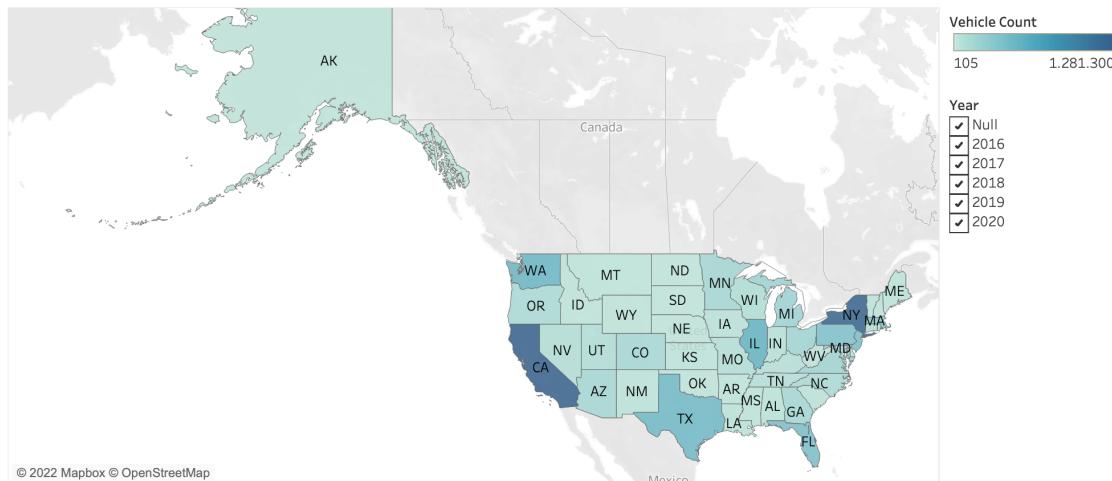


# TABLEAU VISUALIZATION

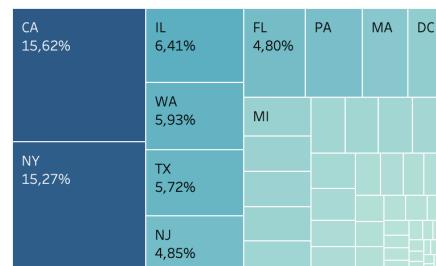
## US Public Transportation Analysis

Agenda	Introduction	General Overview	Key Metrics: Financial (Part 1 of 3)	Key Metrics: Financial (Part 2 of 3)	Key Metrics: Financial (Part 3 of 3)	Key Metrics: Operational (Part 1 of 2)
--------	--------------	------------------	--------------------------------------	--------------------------------------	--------------------------------------	--

### GENERAL OVERVIEW - Public Vehicle Count by States



CA, NY, IL make up for 37.3% of total vehicle count in the US



#### Focus on California, New York, and Illinois

1. They have the three biggest metropolitan areas (New York, Los Angeles, Chicago).
2. Top 3 states with the most public vehicles.

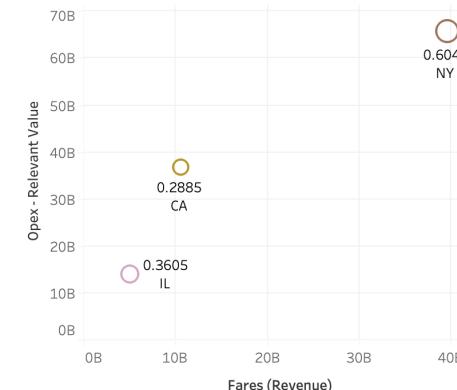
# TABLEAU VISUALIZATION

## US Public Transportation Analysis

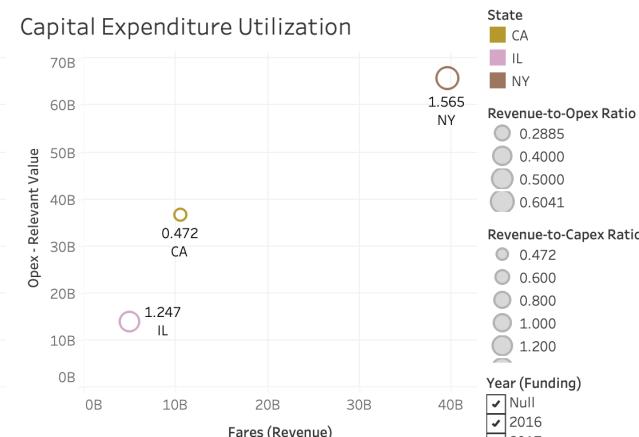
Agenda	Introduction	General Overview	Key Metrics: Financial (Part 1 of 3)	Key Metrics: Financial (Part 2 of 3)	Key Metrics: Financial (Part 3 of 3)	Key Metrics: Operational (Part 1 of 2)
--------	--------------	------------------	--------------------------------------	--------------------------------------	--------------------------------------	--

### FINANCIAL - Key Performance Indicators

Operating Expenses Utilization



Capital Expenditure Utilization



Opx vs Capex Proportion



*"New York has the best utilization, followed by Illinois. California has the lowest utilization."*

- State
  - CA
  - IL
  - NY
- Revenue-to-Opx Ratio
  - 0.2885
  - 0.4000
  - 0.5000
  - 0.6041
- Revenue-to-Capex Ratio
  - 0.472
  - 0.600
  - 0.800
  - 1.000
  - 1.200

- Year (Funding)
  - Null
  - 2016
  - 2017
  - 2018
  - 2019
  - 2020
- Year (Opx)
  - Null
  - 2016
  - 2017
  - 2018
  - 2019
  - 2020
- Year (Capex)
  - Null
  - 2016
  - 2017
  - 2018
  - 2019
  - 2020

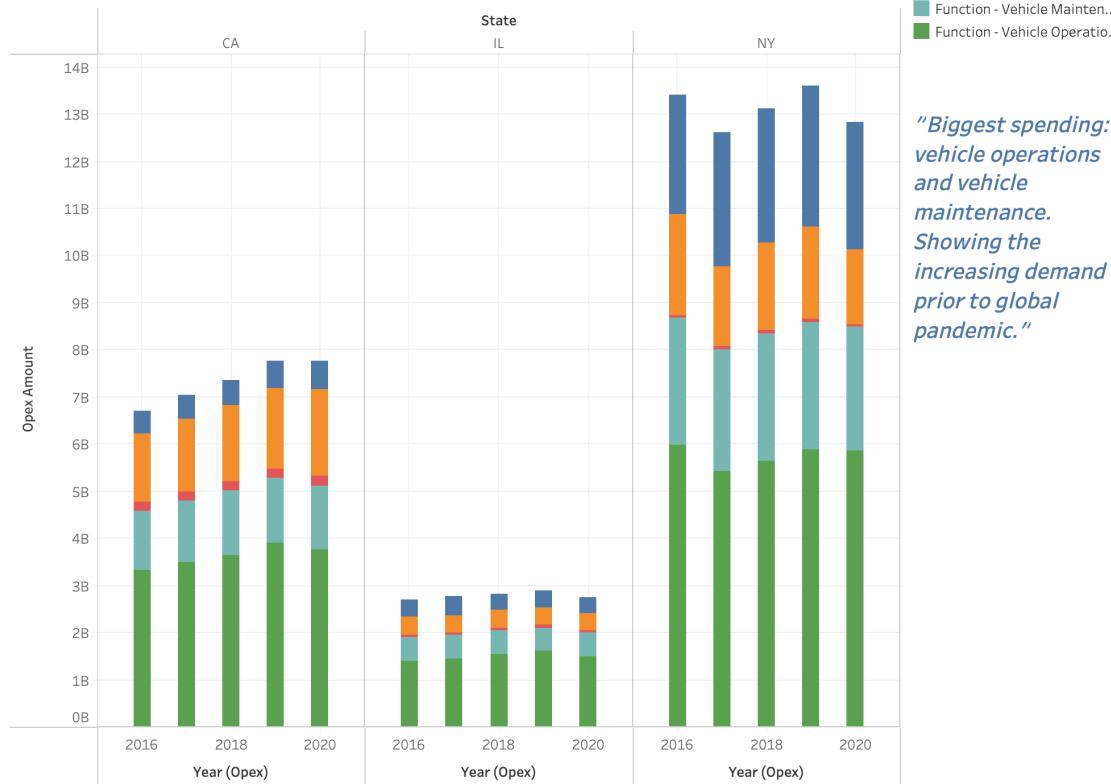
# TABLEAU VISUALIZATION

## US Public Transportation Analysis

Introduction	General Overview	Key Metrics: Financial (Part 1 of 3)	Key Metrics: Financial (Part 2 of 3)	Key Metrics: Financial (Part 3 of 3)	Key Metrics: Operational (Part 1 of 2)	Key Metrics: Operational (Part 2 of 2)
--------------	------------------	--------------------------------------	--------------------------------------	--------------------------------------	--	--

### FINANCIAL - Operating Expenses

Operating Expenses by Type, State, Year



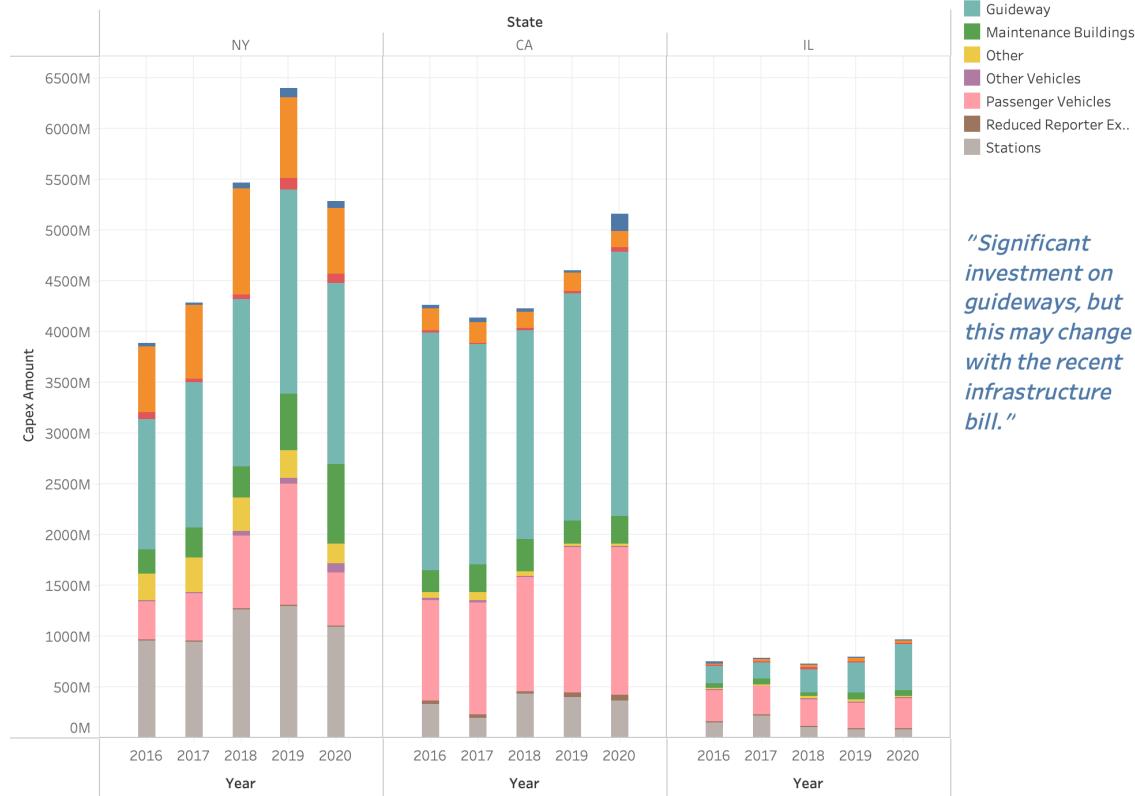
# TABLEAU VISUALIZATION

## US Public Transportation Analysis

General Overview	Key Metrics: Financial (Part 1 of 3)	Key Metrics: Financial (Part 2 of 3)	Key Metrics: Financial (Part 3 of 3)	Key Metrics: Operational (Part 1 of 2)	Key Metrics: Operational (Part 2 of 2)	Key Metrics: Environmental (Part 1 of 2)
------------------	--------------------------------------	--------------------------------------	--------------------------------------	--	--	--

### FINANCIAL - Capital Expenditure

Capital Expenditure by Type, State, Year



# TABLEAU VISUALIZATION

## US Public Transportation Analysis

Key Metrics:  
Financial (Part 1  
of 3)

Key Metrics: Financial  
(Part 2 of 3)

Key Metrics: Financial  
(Part 3 of 3)

Key Metrics:  
Operational (Part 1 of  
2)

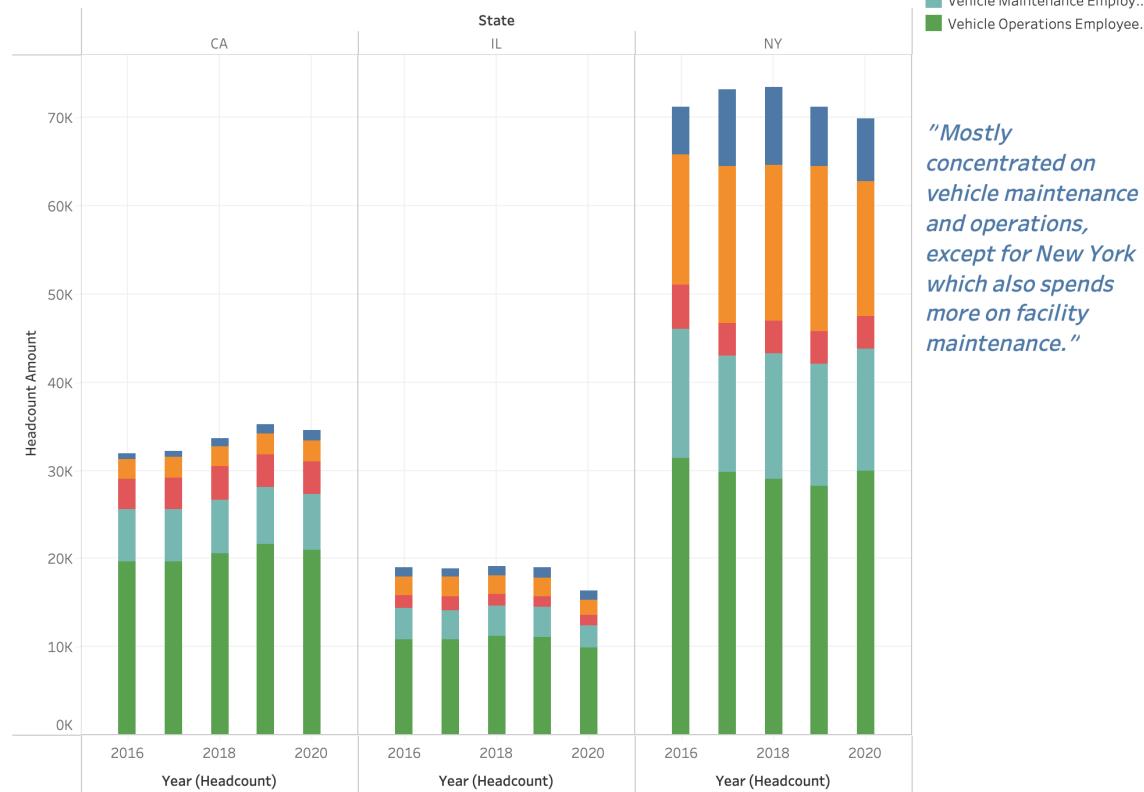
Key Metrics:  
Operational (Part 2 of  
2)

Key Metrics:  
Environmental (Part 1  
of 2)

Key Metrics:  
Environmental (Part  
2 of 2)

### OPERATIONAL - Capital Labor

Capital Labor (Headcount) by Type, State, Year



# TABLEAU VISUALIZATION

## US Public Transportation Analysis

Key Metrics:  
Financial (Part 2  
of 3)

Key Metrics: Financial  
(Part 3 of 3)

Key Metrics:  
Operational (Part 1 of  
2)

Key Metrics:  
Operational (Part 2 of  
2)

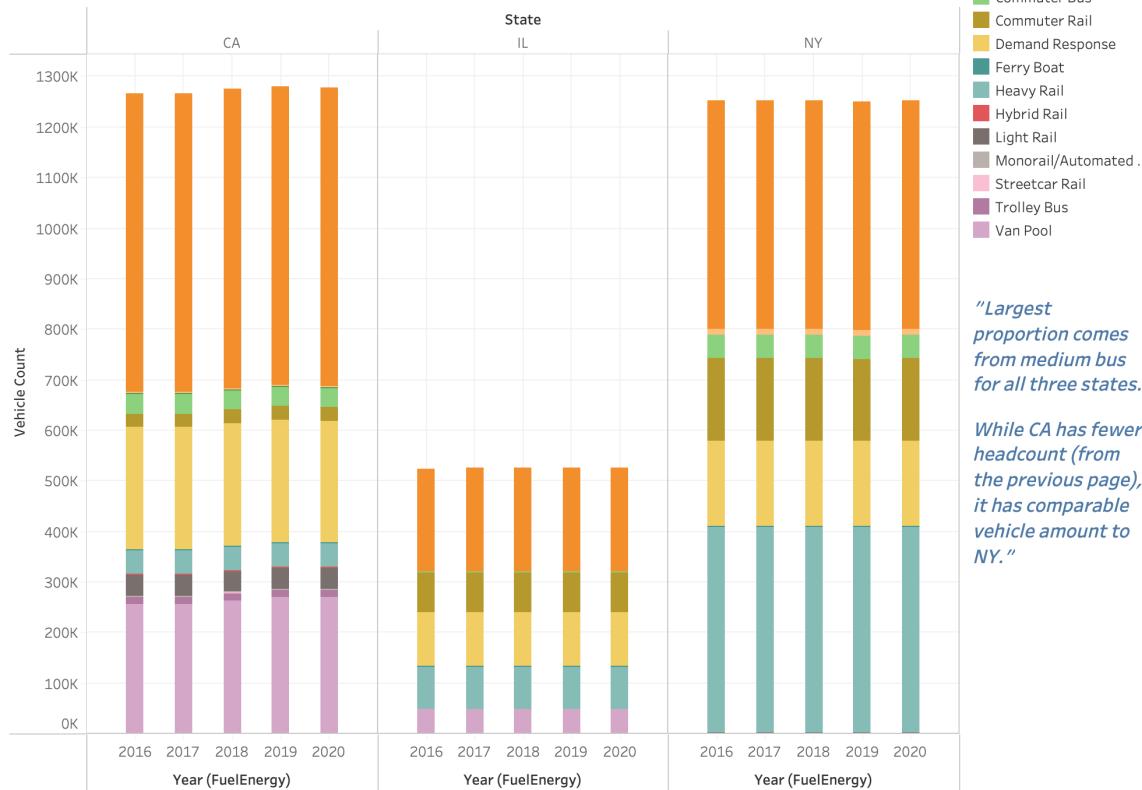
Key Metrics:  
Environmental (Part 1  
of 2)

Key Metrics:  
Environmental (Part 2  
of 2)

Key Metrics: Others

### OPERATIONAL - Vehicles

Vehicle Count by Type, State, Year



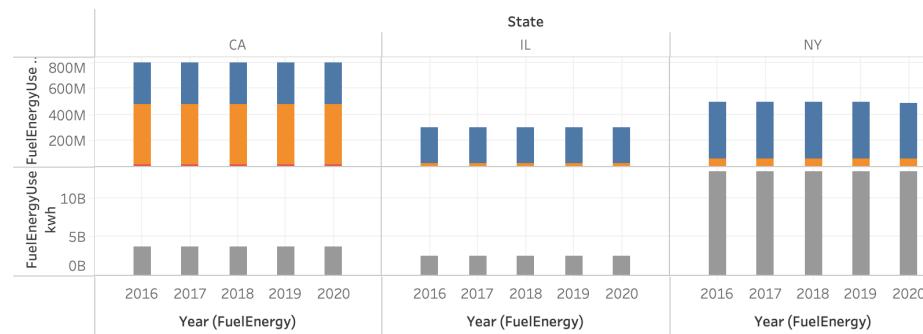
# TABLEAU VISUALIZATION

## US Public Transportation Analysis

Key Metrics: Financial (Part 3 of 3)	Key Metrics: Operational (Part 1 of 2)	Key Metrics: Operational (Part 2 of 2)	Key Metrics: Environmental (Part 1 of 2)	Key Metrics: Environmental (Part 2 of 2)	Key Metrics: Others	Recommendation
--------------------------------------	--	--	--	--	---------------------	----------------

### ENVIRONMENTAL - Green Energy vs Fossil Fuel Usage

Fuel/Energy Usage by Category (Green vs Fossil Fuel)



#### Fuel Energy Category

- Fossil Fuel
- Green/Renewable
- Others

#### FuelEnergyType (FuelEne..)

- Bio-Diesel (gal)
- Compressed Natural ..
- Diesel (gal)
- Electric Battery (kwh)
- Electric Propulsion (k..)
- Gasoline (gal)
- Liquefied Petroleum ..
- Other Fuel (gal/gal eq..)

*"Most transportation options are already using renewable energy sources, except for Illinois."*

Fuel/Energy Usage by Type (Details)



# TABLEAU VISUALIZATION

## US Public Transportation Analysis

Key Metrics: Operational (Part 1 of 2)	Key Metrics: Operational (Part 2 of 2)	Key Metrics: Environmental (Part 1 of 2)	Key Metrics: Environmental (Part 2 of 2)	Key Metrics: Others	Recommendation	Appendix: Data Analytics Process
--	--	--	--	---------------------	----------------	----------------------------------

### ENVIRONMENTAL - Fuel/Energy Efficiency

Miles Traveled per Energy Use (gal/kwh): Green vs Fossil Fuel



# TABLEAU VISUALIZATION

## US Public Transportation Analysis

Key Metrics:  
Operational (Part  
2 of 2)

Key Metrics:  
Environmental (Part 1  
of 2)

Key Metrics:  
Environmental (Part 2  
of 2)

Key Metrics: Others

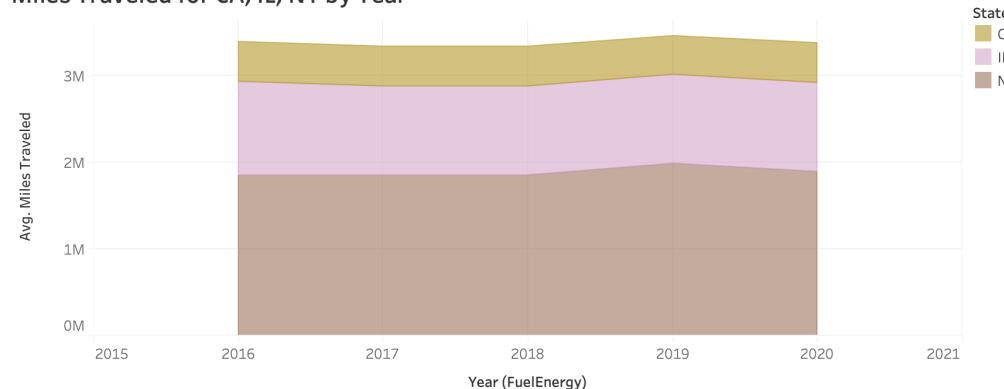
Recommendation

Appendix: Data  
Analytics Process

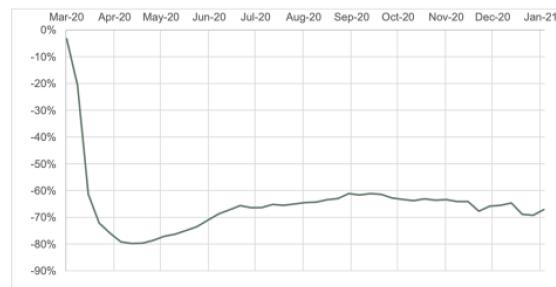
Appendix:  
References

### OTHER - Mileage Trend

Miles Traveled for CA, IL, NY by Year



### Public Transit Ridership Losses due to Pandemic



Source: APTA Ridership Trends Dashboard powered by Transit, January 2021, <https://transitapp.com/APTA>.

*"A significant decline in mileage and ridership due to global pandemic."*

# KEY RECOMMENDATIONS , LESSONS LEARNED & RECOMMENDATION

- **Key Recommendations**

- Shift to sustainable green energy, with better efficiency, e.g. Illinois shift from diesel to bio-diesel.
- Change the structure of expenditure: maintain the level of operational labor, try to improve on high-skilled labors that support the transformation prior to the start of infrastructure funding.
- Given the low current demands as a result of the global pandemic, begin to punctually restructure transportation modes in preparation for post-pandemic demands.

- **Lessons Learned**

- Even when the tools are compatible for all operating systems (OS), unique/specific problem may still arise for each OS
- Difficulty in importing data directly from CSV to MySQL, with regards to capacity and file conversion format
- Source-to-target mapping requires significant time for completion
- Due to time constraints, we need to adjust the approach outside the normal process to incorporate more required data

- **Recommendation**

- Ensuring the usability across operating system is crucial before moving forward with the tools and methods
- For data input to MySQL, better to convert the source CSV files to SQL scripts
- Allocate sufficient time for table transformation (source-to-target mapping) during ETL
- It is possible to use additional approach/workaround to add more information