

Smart City Traffic Analysis Dashboard

Power BI Project

Problem Statement

The rapid growth of urbanization has led to increasing road congestion, air and noise pollution, and delayed emergency responses. To address these challenges, this project aims to **analyze** across different intersections in a city.

The goal is to provide **real-time insights** that help city planners and authorities optimize traffic flow, improve safety, and enhance overall smart city infrastructure.

Dataset Overview

Column names:

Date, Year, Month, Day, Location, Vehicle Count, Average Speed, Accidents, Weather Condition, AQI, Noise_Level_dB, Traffic_Density_Index, Traffic_Level, Congestion_Index, Smart_Light_Adjustment, Emergency_Response_Time_min

A	B	C	D	E	F	G	H	I	J	K	L	M
Date	Location	Year	Month	Vehicle_Count	Average_Speed	Accidents	Weather_Condition	AQI	Noise_Level_dB	Traffic_Density_Index	Traffic_Level	Congestion_Index
1/1/2024	Anna Salai	2024	January	2360	39.54598176	0	Rainy	136	71	29.5	Low	0.3
1/1/2024	Guindy	2024	January	6890	31.00357143	1	Clear	141	66	84.075	High	0.86
1/1/2024	Teynampet	2024	January	6726	29.2896088	0	Cloudy	103	86	83.6375	High	0.84
1/1/2024	Velachery	2024	January	6691	35.14463432	1	Cloudy	112	93	57.4	Medium	0.66
1/1/2024	Tambaram	2024	January	5272	27.83237014	0	Cloudy	145	73	58.3875	Medium	0.57
1/1/2024	Chromepet	2024	January	4592	24.47444406	1	Cloudy	127	83	90.425	High	0.9
1/1/2024	Adyar	2024	January	7234	40.41867649	0	Clear	119	66	24.575	Low	0.25
1/1/2024	T Nagar	2024	January	1966	30.07887759	0	Clear	82	77	85.425	High	0.85
1/1/2024	Koyambedu	2024	January	6834	28.33174209	0	Clear	120	72	74.075	High	0.74
1/1/2024	Ambattur	2024	January	5926	30.94120612	0	Cloudy	66	80	61.8	Medium	0.62
1/1/2024	Pallavaram	2024	January	7078	30.71674684	1	Rainy	103	65	58.3875	Medium	0.58
1/1/2024	Porur	2024	January	4944	34.28944269	1	Rainy	114	75	20.375	Low	0.2
1/2/2024	Anna Salai	2024	January	4671	29.53256633	1	Cloudy	134	72	39.8125	Low	0.4
1/2/2024	Guindy	2024	January	4419	37.49093071	1	Rainy	98	85	28.3625	Low	0.28
1/2/2024	Teynampet	2024	January	1630	38.23117066	1	Foggy	118	89	48.6375	Medium	0.49
1/2/2024	Velachery	2024	January	3185	28.62504275	0	Cloudy	165	89			
1/2/2024	Tambaram	2024	January	2269	31.90951689	0	Clear	164	84			
1/2/2024	Chromepet	2024	January	3891	32.3847138	0	Clear	157	65			

Congestion_Index	Smart_Light_Adjustment	Emergency_Response_Time_min
0.3	5	12.60285895
0.86	30	5.024478736
0.84	30	6.15384717
0.84	30	5.99007541
0.66	20	8.180770519
0.57	10	7.32479499
0.9	30	7.282827851
0.25	5	8.703932613
0.85	30	7.140489775
0.74	20	6.062141887
0.88	30	10.83251264
0.62	20	14.51737697
0.58	10	11.07164927
0.55	10	12.57020671
0.2	5	14.72176839
0.4	5	6.531626452
0.28	5	9.598099721
0.49	10	10.81847358

Excel– Data Transformation

- Checked and corrected data types (Date, Text, Number).
- Split Date column into Year, Month, and Day.

A ^B _C Year.1	1 ² ₃ Month.1	1 ² ₃ Day
2024		1
2024		1
2024		1
2024		1
2024		1
2024		1
2024		1
2024		1
2024		1
2024		1
2024		1
2024		1
2024		2

- Created Weather Rating

A ^B _C Weather Rating
2
1
1.5
1.5
1.5
1.5
1
1

- Removed unnecessary columns and ensured clean structured data ready for modeling.

DAX Calculations (Data Analysis Expressions)

- Total Vehicles

```
Total Vehicles = SUM(Chennai_SmartCity_Traffic_2024_2025[Vehicle_Count])
```

- Total Accidents

```
Total Accidents = SUM(Chennai_SmartCity_Traffic_2024_2025[Accidents])
```

- Average Speed

```
Average Speed = AVERAGE(Chennai_SmartCity_Traffic_2024_2025[Average_Speed])
```

- Accident Rate (%)

```
Accident Rate % = DIVIDE([Total Accidents], [Total Vehicles], 0)
```

- Average TDI

```
Average TDI = AVERAGE('Chennai_SmartCity_Traffic_2024_2025'[Traffic_Density_Index])
```

- High Congestion Days

```
High Congestion Days = CALCULATE(COUNTROWS('Chennai_SmartCity_Traffic_2024_2025'),  
FILTER('Chennai_SmartCity_Traffic_2024_2025','Chennai_SmartCity_Traffic_2024_2025'[Traffic_Level] = "High"))
```

- Peak Day per Location

```
Peak Day per Location =  
CALCULATE (  
    MAX ( 'Chennai_SmartCity_Traffic_2024_2025'[Date].[Date] ),  
    FILTER (  
        'Chennai_SmartCity_Traffic_2024_2025',  
        'Chennai_SmartCity_Traffic_2024_2025'[Vehicle_Count] =  
        CALCULATE ( MAX ( 'Chennai_SmartCity_Traffic_2024_2025'[Vehicle_Count] ), ALLEXCEPT  
( 'Chennai_SmartCity_Traffic_2024_2025', 'Chennai_SmartCity_Traffic_2024_2025'[Location] ) )))
```

Visualization Dashboard

KPI Cards

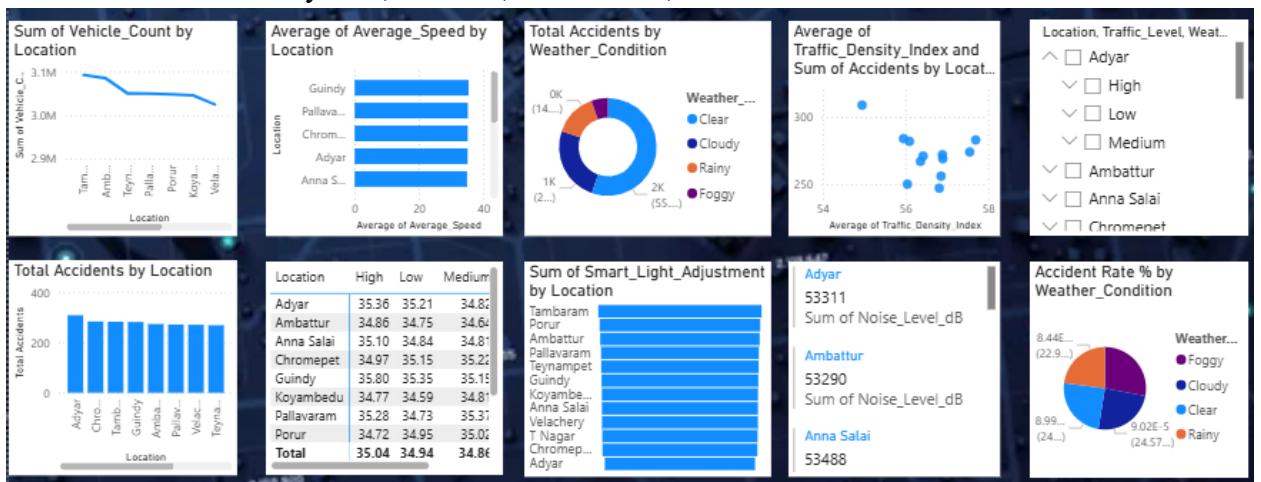
- Total Vehicles

- Total Accidents
- Average Speed
- Accident Rate (%)



Charts Used

- **Line Chart:** To show traffic flow trends over time.
- **Bar Chart:** To compare average speed across locations.
- **Donut Chart:** To show accident distribution by weather condition.
- **Column Chart:** To display total accidents by location.
- **Scatter Chart:** To analyze the relationship between TDI and accident count.
- **Matrix:** To summarize location-wise traffic level and average speed.
- **Funnel Chart:** To visualize smart light adjustment across locations.
- **Multi-Row Card:** To display noise level by location.
- **Pie Chart:** To show accident rate percentage by weather condition.
- **Slicers:** To filter data by date, location, traffic level, and weather condition.



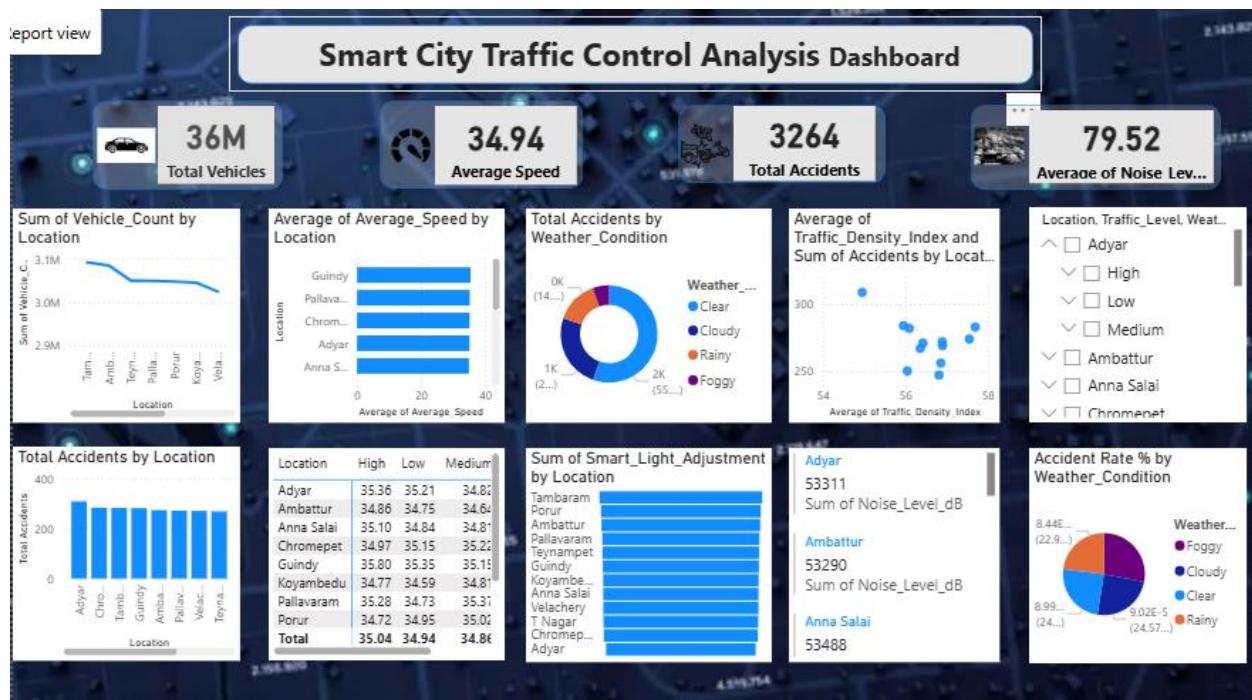
Analysis Questions

- 1) Which intersection experiences the highest traffic volume?
- 2) How many high congestion days occurred across all locations?
- 3) Which month recorded the highest overall vehicle count?
- 4) Which intersection has the lowest average speed?
- 5) How does the average speed vary under different weather conditions?

- 6) What is the overall trend of traffic flow over time?
- 7) Which intersection reported the most accidents?
- 8) How does accident frequency change with weather conditions?
- 9) What is the overall accident rate percentage across all locations?
- 10) Which location has the highest Traffic Density Index (TDI)?
- 11) How does TDI correlate with accident count?
- 12) Which intersections benefit most from Smart Light Adjustment?
- 13) Which location records the highest noise level in decibels (dB)?
- 14) How does Noise Level relate to Vehicle Count across intersections?
- 15) How can the dashboard assist in real-time traffic management and emergency response?

Analysis Questions	Answers
Which location reports the most accidents?	Tambaram
How many high congestion days occurred across all locations?	2555 days
Which month had the highest overall traffic volume?	January
Which intersection has the lowest average speed?	Guindy
How does average speed vary under different weather conditions (Rainy, Foggy, Clear)?	Foggy conditions reduce vehicle speed significantly due to limited visibility
What is the trend of average speed over the last 12 months?	Fluctuating
Which intersection reported the most accidents?	Adyar
How does accident frequency change with weather conditions?	Clear - Highest Acciden(55.36%), cloudy - Next Highest(24.88%), Lowest - Rainy(14.28%) and Foggy(5.48%)
What is the total accident rate % across all locations?	Adyar
Which location has the highest Traffic Density Index (TDI)?	Tambaram
How does TDI correlate with accident count?	Weak or inverse correlation
Which intersections benefit most from Smart Light Adjustment?	Tambaram
Which intersection records the highest Noise_Level_dB?	Guindy
How does Noise_Level correlate with Vehicle_Count?	Moderate positive correlation
How can the dashboard assist in emergency response or real-time traffic control?	The dashboard enables faster emergency response and real-time traffic control by identifying high-risk intersection

Dashboard Full view



Conclusion

This Smart City Traffic Dashboard helps in **identifying congestion patterns, weather-based risks, and environmental impacts**, providing actionable insights for traffic authorities.

It supports **data-driven decisions** to enhance safety, reduce delays, and promote sustainable smart city development.