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

Power Query (M Query) – Data Transformation

- Checked and corrected data types (Date, Text, Number).
- Split Date column into Year, Month, and Day.
- Created **Weather Rating** using a Conditional Column in PowerQuery
- Removed unnecessary columns and ensured clean structured data ready for modeling.

DAX Calculations (Data Analysis Expressions)

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

- Average TDI
- High Congestion Days
- Peak Day per 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?

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.