“ROAD ACCIDENTS ANALYTICAL DASHBOAD: POWER BI”

PROJECT REPORT

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INTRODUCTION

Road accidents have become a critical concern in modern transportation, significantly impacting lives, economies, and infrastructure. With the rise in vehicle usage, road networks are witnessing increased traffic density, leading to higher accident occurrences. Factors such as road conditions, driver behavior, weather, and vehicle types play a crucial role in determining accident severity.

The road accident landscape is dynamic, influenced by seasonal variations, urbanization, and regulatory measures. Drivers and passengers face risks based on aspects like speed limits, traffic regulations, and road maintenance quality. Understanding accident trends through data analysis can help in designing effective safety interventions, improving road conditions, and reducing casualties.

This report provides an analytical overview of road accident data within the UK, considering parameters such as total accidents, casualties, severity levels, vehicle types, weather conditions, road surfaces, and locations. The insights derived from this dashboard aim to enhance road safety awareness and inform policymakers about necessary preventive measures

ABSTRACT

This report analyzes road accident trends in the UK from 2019 to 2022, focusing on key metrics such as total accidents, casualties, accident severity, and contributing factors. The study examines the impact of weather conditions, road surfaces, vehicle types, and geographical locations on accident occurrences. Findings reveal that driver behavior, road conditions, and seasonal variations significantly influence accident severity. The analysis provides actionable insights for policymakers and road safety authorities to improve infrastructure, enforce regulations, and implement targeted safety measures. By leveraging data-driven decision-making, this report aims to contribute to reducing road accidents and enhancing overall traffic safety.

OBJECTIVE

- To analyze road accident trends and patterns across different regions in the UK
- To identify key factors contributing to road accidents, including weather conditions, road surfaces, vehicle types, and accident severity.
- To evaluate the impact of road type and seasonal variations on accident occurrences.
- To provide data-driven insights for policymakers, traffic authorities, and urban planners to enhance road safety measures.
- To facilitate real-time accident monitoring and decision-making through interactive visualizations.
- To recommend safety improvements, such as better road infrastructure, stricter traffic regulations, and awareness campaigns, to reduce casualties and fatalities..

DATA ANALYSIS

I. PROCEDURE

1. Data import

- Open Tableau Desktop.
- Click **"Connect to Data"** and select the appropriate **data source** (Excel, CSV, SQL, etc.).
- Browse and select the **dataset**.
- **Load the data** into Tableau.
- Configure **relationships** if using multiple tables.
- **Save the file**.

1. **Data Cleaning: Remove duplicates** and handle **missing values**. **Standardize data formats** (date, text, and numerical values). **Filter unnecessary fields** to optimize performance

2. **Data Transformation:** Create **calculated fields** and **measures** for key insights (e.g., **Total Accidents, Fatality Rate**). Use **Tableau Prep** (if needed) for complex **data structuring**. **Aggregate data** at different levels (**Yearly, Monthly**, etc.).

2. ABOUT DATASET

This dataset is collected from GitHub which includes road accident reports in the **UK from 2019 to 2022**. It contains detailed records of road accidents, including accident severity, casualties, weather conditions, road surface types, and vehicle involvement. The dataset helps analyze accident patterns, identify high-risk factors, and support policy improvements for road safety.

Accident Data:

- Accident **ID Unique identifier for each accident.**
- **Date & Time → When the accident occurred.**
- **Accident Severity → Categorized as Fatal, Serious, or Slight.**

Casualty Information:

- **Total Casualties** → Number of people involved in accidents.
- **Fatal Casualties** → Count of deaths due to accidents.
- **Serious Casualties** → People injured severely.
- **Slight Casualties** → People with minor injuries.

Weather & Road Conditions:

- **Weather Condition** → Fine, Rain, Snow/Fog, Other.
- **Road Surface** → Dry, Flooded, Frost/Snow, Unknown.

Road Type & Location:

- **Single Carriageway, Dual Carriageway, Roundabout, One-Way Street, Slip Road**.
- **Geographic Location** → Identifies accident-prone areas.

Vehicle Involvement:

- **Vehicle Type** → Cars, Motorcycles, Buses, Vans, Agricultural Vehicles, Other.

3. METHODOLOGY

Data Collection

- The data comes from official UK road accident records, with details such as accident severity, weather conditions, road types, vehicle types, and casualty information for 2019-2022.
- Key metrics include:
    - **Accident Severity**: Serious, Fatal, Slight
    - **Vehicle Types**: Agriculture vehicle, Bus, Car, Motorcycle, Van, and Others
    - **Road Types**: Single Category, Dual Category, Roundabout, One Way Street, Slip Road, and N/A
    - **Weather Conditions**: Fine, Rain, Fog, Snow, Other
    - **Casualty Information**: Serious, Fatal, Slight casualties.

Data Transformation

- **ETL Process**: The data was cleaned and transformed to align with Tableau's analysis requirements. Any missing values were addressed, and necessary calculations were made to categorize accident severity and calculate casualty percentages for different categories.
- **Calculated Fields**: Created calculated fields in Tableau to derive key metrics, such as the percentage of serious casualties based on weather conditions, road types, and vehicle types.

Data Visualization

- **Donut Charts**:
    - Serious casualties by weather condition.
    - Serious casualties by road types.
- **Line Graphs**:
    - Display trends over time, such as total accidents, total casualties, fatal casualties, serious casualties, and slight casualties.
- **Interactive Filters**:
    - Filters for Year, Accident Severity, Accident Location, Vehicle Type, and Weather Condition to enable deeper analysis.
- **Maps**: To show accident hotspots across the UK.

Examples of Visuals:

- **Serious Casualties by Weather Condition**: Pie chart showing the percentage of serious casualties based on weather types.

- Fine: 83%, Fog: 2.19%, Rain: 10.54%, Other: 3.54%.

- **Serious Casualties by Road Type**: Pie chart showing the percentage of serious casualties by road type.
  - Dry: 69%, Flood: 24%, Frost/Snow: 5.5%, Unknown: 4%.
- **Line Graphs**:
  - Trends for total accidents, total casualties, serious casualties, fatal casualties, and slight casualties across the years (2019-2022).
- **Serious Casualties by Road Type**: Analysis of serious casualties by road categories such as single category, dual category, roundabouts, etc.

4. DATA INTERPRETATION

The analysis focuses on identifying the relationship between the **dependent variable** and **several independent variables**.

a) Dependent Variable: Total Accidents/Casualties

b) Independent Variables & Their Impact on Road Accidents:

1. Vehicle Type:

- **Common Vehicle Types Involved in Accidents:**
  - The dataset includes multiple vehicle types such as **cars**, **motorcycles**, **vans**, **buses**, and **agricultural vehicles**.
  - **Cars** are likely to be the most frequently involved in accidents based on the dataset.
  - **Motorcycles** may have a higher accident frequency due to their size and speed variability, which leads to more severe casualties.
- **Implication**: Certain vehicle types (e.g., motorcycles) might require more focused safety measures (e.g., helmet use, speed regulations).

2. Weather Conditions:

- **Weather Impact on Accidents:**

- Different weather conditions such as **rain**, **snow/fog**, **fine** (clear weather), and **other** conditions influence the frequency and severity of accidents.
- **Rain** and **fog** conditions often contribute to higher accident rates due to reduced visibility and slippery roads.
- **Fine weather** generally leads to fewer accidents, but still, there may be instances where other factors, like human error, increase the risk.

- **Implication**: Accidents are more likely to occur during adverse weather conditions, especially in **rain** and **fog**, suggesting the need for better weather-related road safety measures.

3 Road Conditions and Types:

- **Types of Roads**:
  - The dataset includes information on **urban** vs. **rural** areas, and different **road conditions** (dry, frosty, flooded, etc.).
  - **Rural roads** might see fewer accidents than urban roads, but when accidents do occur, they may be more severe due to longer emergency response times or fewer safety features.
  - **Dry conditions** contribute to a high number of accidents (as shown by the dataset), but accidents in **flooded** or **frosty** conditions are likely to be more severe.
- **Implication**: Roads in rural areas or certain weather conditions (like flooding or frost) might require more infrastructure development or better safety systems to mitigate accidents.

4 Time and Seasonality:

- **Accidents Based on Time**:
  - The dataset shows patterns of accidents occurring at different times of the day and during specific months.
  - More accidents are reported towards the **end of the month** and during **peak seasons** (e.g., festival seasons or year-end).
- **Implication**: Time-based trends suggest that factors like salary cycles (end-of-month) and increased vehicle movement during festivals may contribute to higher accident rates during certain periods.

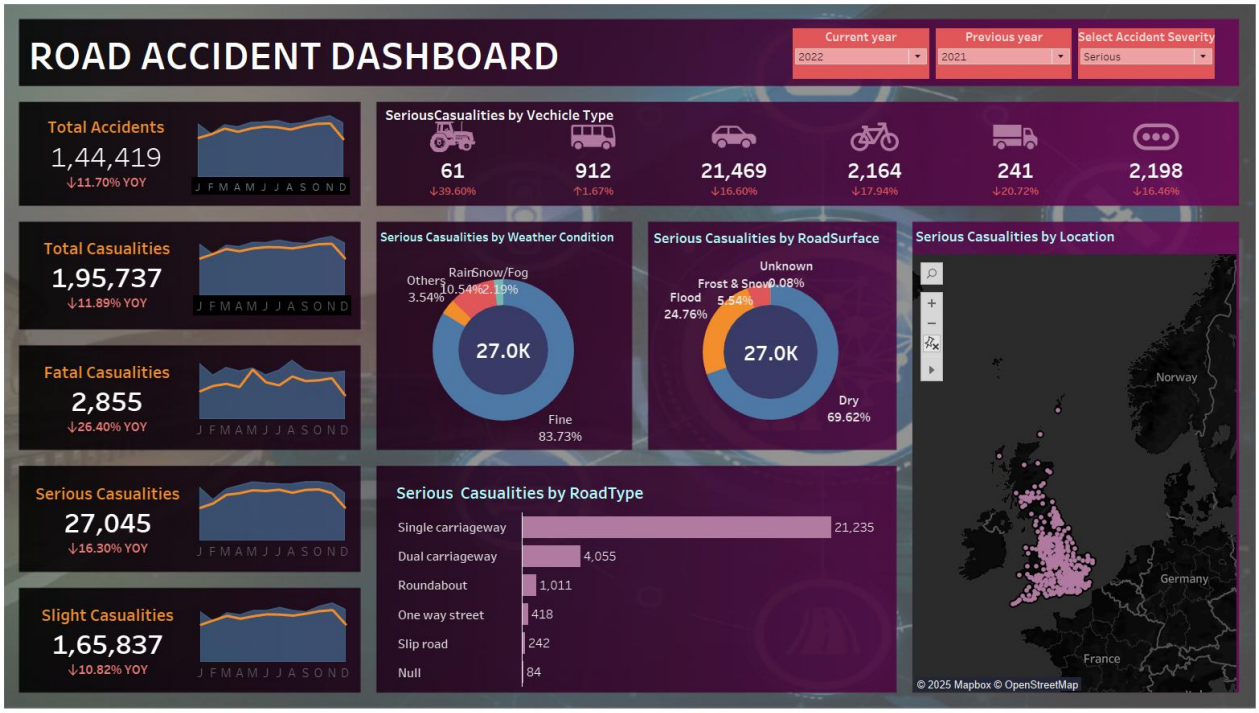
5 Location:

- **Urban vs Rural Areas**:
  - Accidents occurring in **urban areas** may be more frequent due to denser traffic, while **rural areas** may experience fewer accidents but with potentially more severe outcomes.
- **Implication**: Urban areas may require better traffic management and monitoring systems, while rural areas might benefit from enhanced road infrastructure and emergency services.

6 Previous Year's Accidents:

- **Yearly Comparison**:
  - **Current year** accidents compared with **previous year** casualties can show trends, such as a reduction or increase in accidents due to improved safety measures, stricter enforcement of laws, or other factors.
- **Implication**: A significant increase in accidents from the previous year might indicate the need for improved safety interventions, awareness campaigns, or changes in driving behavior.

5. DATA VIZUALIZATION



Filters:

1. Accident Year
2. Accident Severity (Serious, Fatal, Slight)
3. Weather Condition (Fine, Rain, Snow, Fog, Other)
4. Road Type (Single Category, Dual Category, Roundabout, One-Way Street, Slip Road, Unknown)
5. Vehicle Type (Car, Motorcycle, Van, Bus, Agricultural Vehicle, Other)
6. Location Type (Urban, Rural)
7. Time Period (Monthly or Daily)
8. Previous Year Casualties
9. Casualty Type (Total Casualties, Serious Casualties, Slight Casualties, Fatal Casualties)

PROJECT INSIGHTS – ROAD ACCIDENTS ANALYSIS

A. Overview (4-Year Accident Performance)

- Total Accidents Recorded: 104,419 incidents
- Total Casualties: 957,370 casualties
- Total Fatalities: 2,855 fatalities
- Serious Casualties: 2,745 serious injuries
- Slight Casualties: 165,837 minor injuries

B. **Accident** Severity **& Casualties**

- **Fatal Casualties**: **2,855** fatalities across 4 year
- **Serious Casualties**: **2,745** injuries
- **Slight Casualties**: **165,837** injuries
- **Average Casualties per Accident**: **9.16**

C. Key Factors Influencing Accidents

- Top Weather Conditions Contributing to Accidents:
  - Fine Weather – **83% of accidents**
  - Rain – **10.54% of accidents**
  - Fog – **2.19% of accidents**
  - Other – **3.54% of accidents**
- Road Type Distribution:
  - Dry Roads – **69.4% of total accidents**
  - Flooded Roads – **2.4% of total accidents**
  - Frost/Snow-Covered Roads – **5.5% of total accidents**

- Unknown Road Conditions – **8% of total accidents**

D. Vehicle Type & Accident Frequency

- **Top Vehicle Types Involved in Accidents**:
  - Car – **Major contributor to accidents**
  - Motorcycle – **Second highest**
  - Bus – **Moderate contribution**
  - Van – **Lower accident rate**
  - Agricultural Vehicle – **Least common**

SUGGESTION

1) Road Safety Optimization:

- Implement **speed reduction measures** (e.g., speed cameras, smart signals) in high-accident zones.
- **Improve** road infrastructure **in accident-prone areas (better lighting, road markings, and barriers).**

2) Accident Reduction Strategies:

- Identify **high-risk road types and locations** and apply targeted safety interventions.
- Introduce **stricter regulations for high-risk vehicles** (motorcycles, heavy vehicles) and promote defensive driving programs.

3) Emergency Response Improvement:

- Reduce **accident response times** by enhancing emergency service coordination with real-time accident tracking.
- Implement **AI-driven accident prediction models** to anticipate and prevent potential crashes.

4) Weather & Road Condition-Based Safety Measures:

- Improve **drainage systems in flood-prone areas** to reduce hydroplaning risks.
- Enhance **gritting services and winter weather warnings** in frost/snow regions.
- Install **better signage and alerts for fog-prone zones** to prevent low-visibility accidents.

5) **Demographic-Based Safety Campaigns:**

- Develop targeted awareness campaigns for **young drivers, motorcyclists, and commercial vehicle operators**.
- Encourage **elderly and new drivers** to take refresher safety courses.

6) **Geographical Expansion & Accident Prevention Strategies:**

- Focus on **high-accident regions** and implement localized interventions (e.g., better traffic enforcement, speed limit reductions).
- Identify **underreported accident zones** and increase traffic monitoring in those areas

CONCLUSION

The **Top-Floor Road Accidents Dashboard** provides comprehensive insights into accident trends across the UK from **2019 to 2022**. By analyzing key factors such as **accident severity, weather conditions, road types, vehicle categories, and geographical locations**, the dashboard highlights critical areas for safety improvements.

Key findings indicate that **serious and fatal accidents are prevalent on dry roads (69.4%)**, with fine weather conditions accounting for the highest percentage (83%) of serious casualties. This suggests that driver behavior, rather than external conditions, plays a significant role in accident severity. Additionally, **flooded roads (24%) and frost-covered roads (5.5%)** pose significant risks, emphasizing the need for enhanced infrastructure and preventive measures.

The data also reveals a high number of accidents involving **cars and motorcycles**, reinforcing the necessity of targeted road safety measures such as **speed control, improved signage, and awareness campaigns**. Furthermore, accident hotspots and time-based trends suggest the importance of **real-time monitoring, emergency response optimization, and stricter enforcement in high-risk zones**.