CrashLens: Road Accident Analysis Report (2021-2022)

1. Executive Summary

CrashLens is a comprehensive road accident analysis project developed to examine casualty patterns from 2021 and 2022 using SQL-driven insights and interactive Power BI dashboards.
The objective of this analysis is to support data-driven decision-making for government bodies, transport authorities, and road safety agencies by identifying high-risk conditions, trends, and contributing factors behind road accident casualties.

The analysis covers time trends, accident severity, road infrastructure, lighting conditions, vehicle categories, and geographical areas, providing a 360-degree view of road safety performance.

2. Data Overview

The dataset contains aggregated casualty information categorized by:

- Year and Month (2021–2022)
- Accident Severity
- Road Type
- Road Surface
- Light Conditions (Day/Night)
- Area Type (Urban/Rural)
- Vehicle Category

All insights presented in this report are derived directly from validated SQL queries.

3. Year-wise & Monthly Trend Analysis

	Current Year Accidents bigint
1	144419

	Current Year Casualties bigint
1	195737

13	2022	1	13163
14	2022	2	14804
15	2022	3	16575
16	2022	4	15767
17	2022	5	16775
18	2022	6	17230
19	2022	7	17201
20	2022	8	16796
21	2022	9	17500
22	2022	10	18287
23	2022	11	18439
24	2022	12	13200

	year numeric	month numeric	total_casualties bigint
1	2021	1	18173
2	2021	2	14648
3	2021	3	17815
4	2021	4	17335
5	2021	5	18852
6	2021	6	18728
7	2021	7	19682
8	2021	8	18797
9	2021	9	18456
10	2021	10	20109
11	2021	11	20975
12	2021	12	18576

Key Findings

- 2021 recorded consistently higher casualties than 2022 across all months, indicating a year-on-year improvement in road safety.
- In 2021, casualties peaked during:
  - October (20,109 casualties)
  - November (20,975 casualties – highest overall)
- In 2022, casualties were comparatively lower but followed a similar pattern, peaking in:
  - November (18,439 casualties)

Business Insight

- Accident volumes increase significantly during October–November, likely due to:
  - Increased travel activity
  - Festive season traffic
  - Reduced daylight hours
- Seasonal patterns highlight the need for targeted safety interventions toward year-end.

	Fatal Casualties bigint
1	7135

	Slight Casualties bigint
1	351436

	Serious Casualties bigint
1	59312

4. Accident Severity Analysis

	accident_severity character varying (20)	total_casualties bigint	casualty_percentage numeric
1	Slight	351436	84.10
2	Serious	59312	14.19
3	Fatal	7135	1.71

Key Findings

- The majority of casualties are slight injuries, indicating high accident frequency.
- Serious and fatal cases together form ~16%, representing the most critical safety concern.

Business Insight

- While reducing minor accidents improves efficiency, preventing serious and fatal accidents delivers the highest social impact.
- Severity-based prioritization is essential for policymaking.

5. Urban vs Rural Area Analysis

	urban_or_rural_area character varying (20)	total_casualties bigint	casualty_percentage numeric
1	Urban	121251	61.95
2	Rural	74486	38.05

Key Findings

- Urban areas account for nearly 62% of total casualties, driven by traffic density.
- Rural accidents, though fewer, are often associated with higher speeds and delayed emergency response.

Business Insight

- Urban safety requires traffic flow management, while rural safety needs speed control and faster emergency response systems.

	road_type character varying (50)	total_casualties bigint
1	Single carriageway	144653
2	Dual carriageway	31912
3	Roundabout	12683
4	One way street	3499
5	Slip road	2990

6. Road Type Analysis

Key Findings

- Single carriageways are the most accident-prone, contributing nearly 4.5 times more casualties than dual carriageways.
- Roads with lane separation and controled movement show significantly lower casualties.

Business Insight

- Infrastructure design directly impacts accident risk.
- Upgrading single carriageways offers maximum safety return on investment.

	light_type text	total_casualties bigint	casualty_percentage numeric
1	Light	144539	73.84
2	Dark	51198	26.16

7. Light Condition Analysis

Key Findings

- Most accidents occur during daytime, due to higher traffic volume.
- Night-time accidents, though fewer, are generally more severe.

Business Insight

- Daytime safety measures should focus on traffic management.
- Night-time safety requires better lighting, enforcement, and visibility measures.

	vehicle_category text	total_casualties bigint
1	Other	157250
2	Goods	15905
3	Bike	15610
4	Bus	6573
5	Agricultural	399

8. Vehicle Category Analysis

Key Findings

- Private vehicles dominate casualty numbers, reflecting high usage.
- Two-wheelers and goods vehicles form a high-risk group due to exposure and vehicle size.

Business Insight

- Safety campaigns should primarily target private vehicle users and two-wheelers.
- Enforcement and training for goods vehicle drivers can significantly reduce casualties.

9. Combined Risk Patterns

- 🚗 Private vehicles on single carriageways represent the highest risk combination
- 🏙️ Urban areas contribute the highest volume of casualties
- ⚠️ Serious and fatal accidents, though fewer, demand priority intervention
- 📅 Year-end months (Oct-Nov) consistently show elevated risk

10. Strategic Recommendations

For Transport Authorities

- Prioritize single carriageway upgrades (dividers, signage, speed cameras)
- Strengthen enforcement during high-risk months

For Road Safety Agencies

- Focus awareness programs on:
  - Two-wheeler safety
  - Seatbelt and helmet compliance
  - Urban traffic discipline

For Emergency Services

- Improve rural response times
- Increase deployment during peak daytime hours

For Policymakers

- Allocate funds based on severity-weighted impact
- Use CrashLens insights to evaluate year-on-year safety performance

11. Conclusion

CrashLens successfully transforms raw accident data into actionable intelligence.
By integrating SQL-based analysis with Power BI visualization, the project enables stakeholders to:

- Understand accident patterns
- Identify high-risk conditions
- Make informed, evidence-based road safety decisions

This dashboard serves as a scalable foundation for future data expansion and advanced predictive analytics.