



Dangerous-Goods Spillages Along N1 & N4 Routes in South Africa for Year 2009 - 2023

Name: Mr. Prince Nhlanhla Msibi

Date: October 2025



Presentation outline

1. Problem statement.
2. Total dangerous goods spillages per country.
3. Dangerous goods spillages/road crashes by country category and municipality.
4. Spillages of heavy vehicles by country per route.
5. Causes of dangerous goods spillage incidents on the road.
6. Annual dangerous goods spillages by weather and causes.
7. Contributing factors to road incidents on dangerous goods spillages.
8. Dangerous goods spillage incidents analysis by country.
9. Possible actions.



Problem Statement

Problem statement

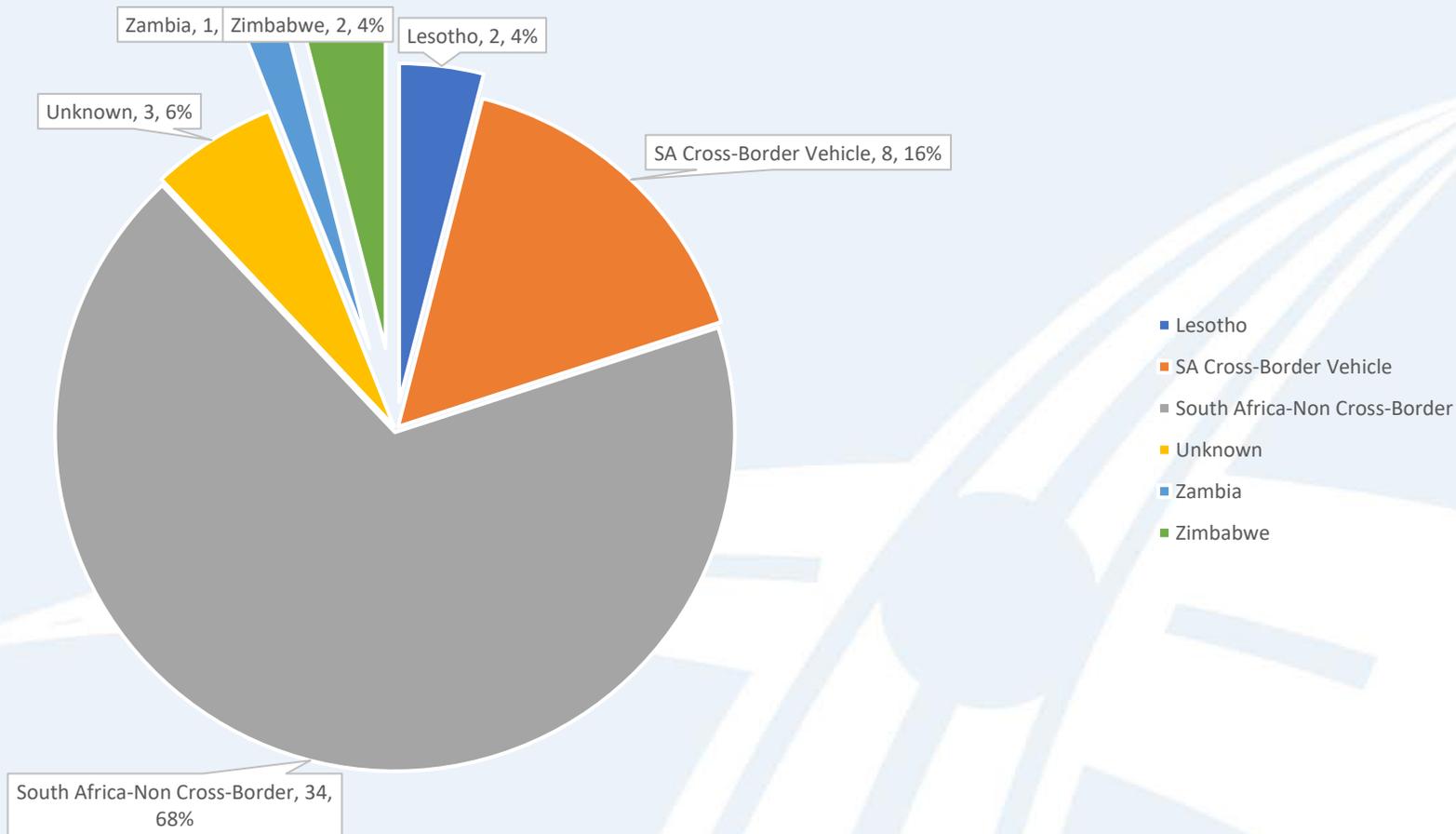
Road incidents spillages and road crashes involving dangerous goods vehicles in a portion of N1 and N4 routes within Bela-Bela, City of Tshwane, Madibeng, Ramotshere Moiloa and Rustenburg municipalities in South Africa for the period between year 2009 and 2023.

Accountability, Integrity, Efficiency and Safety



Total dangerous goods spillages as per country

Total Dangerous Goods Spillages per country



Domestic Vehicles in Dangerous Goods Spillages:

A significant majority—approximately 68%—of reported spillages involve South African non-cross-border vehicles, indicating a dominant role of domestic transport operations in hazardous goods incidents.

Cross-Border Vehicle Involvement:

Vehicles registered under cross-border categories—including South African cross-border, Lesotho, Zimbabwe, and Zambia—collectively account for 26% of spillages, reflecting a measurable level of regional connectivity and transnational movement of dangerous goods.

Undetected Registration Numbers:

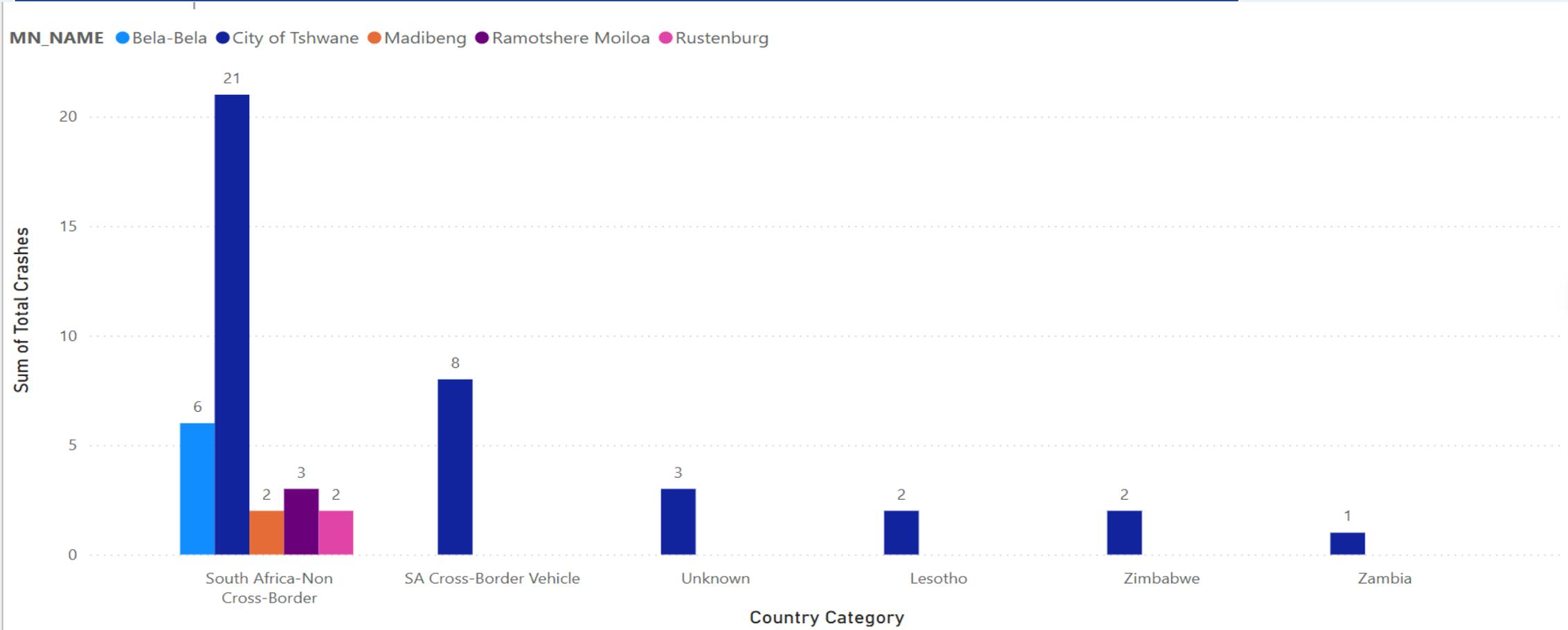
The remaining 6% of incidents fall under the “Unknown” category, where vehicle registration numbers could not be identified. This gap may impact the accuracy and completeness of spillages reporting and analysis.



Heavy vehicles statistics analysis on dangerous goods spillages

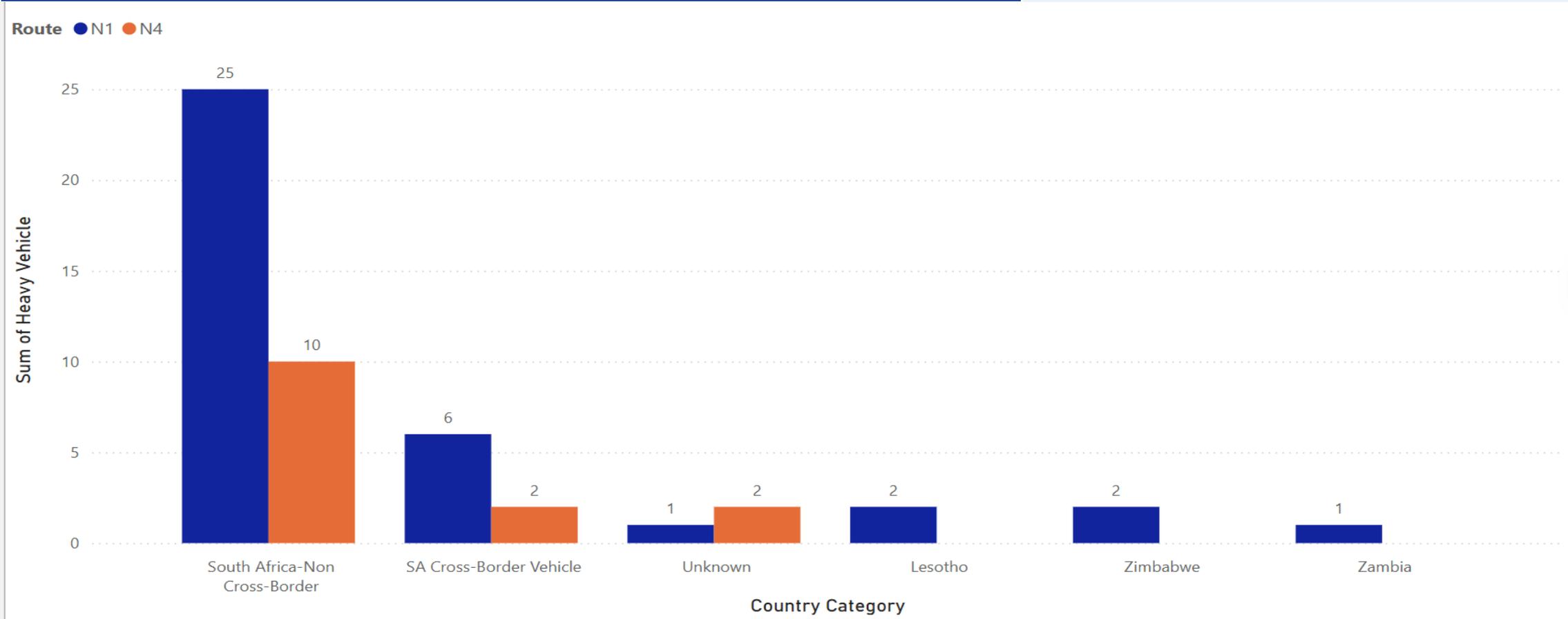


Spillage crashes by country category and municipality



- **Local transport within South Africa is the highest risk**, especially in the City of Tshwane and less in other areas.
- **Cross-border movement within South Africa** is the second major contributor, which may require stricter compliance and monitoring.
- **Neighboring countries (Lesotho, Zimbabwe, Zambia)** have very low spillage incidents, but still require attention for prevention.
- **Unknown category (3 incidents)** indicates gaps in data collection or reporting accuracy.

Spillages of heavy vehicles by country per route



N1 Route dominates overall: Higher counts across all categories. **South Africa – Non Cross-Border** is the leading category with: **25 incidents on N1** (blue bars) **10 incidents on N4** (orange bars) This indicates that most spillages occur within South Africa and not during cross-border transport.

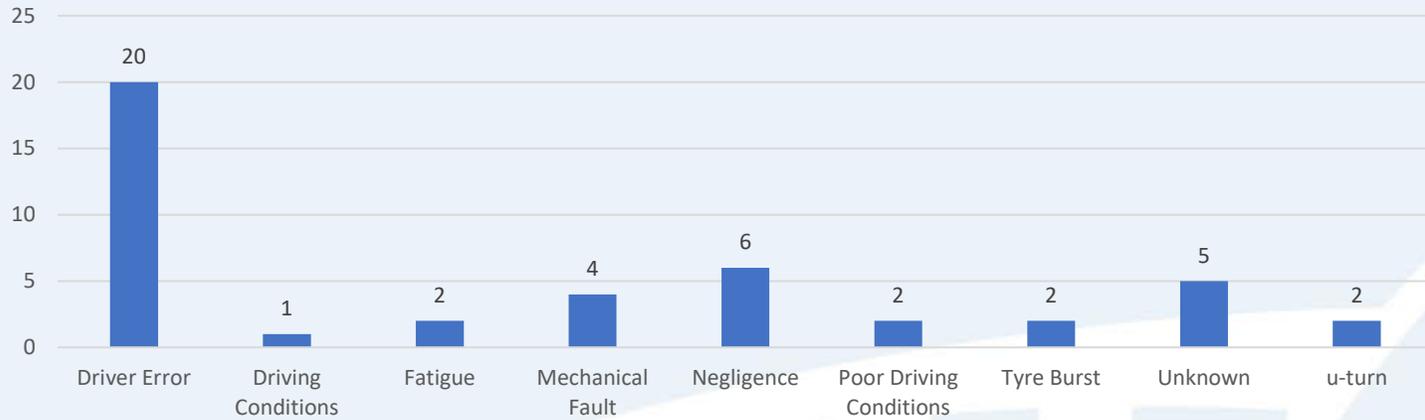
N4 Route has fewer incidents, but still significant for South Africa – Non Cross-Border (10 cases).

Cross-Border Vehicles SA Cross-Border Vehicle accounts for: **6 incidents on N1 - 1 incident on N4** This suggests that cross-border transport is a smaller but still notable contributor, especially on N1.

Other Categories: Unknown: 2 incidents on N4.

Lesotho, Zimbabwe, Zambia: Each has **1–2 incidents**, all on N1. These numbers are minimal compared to South Africa, showing that spillages from neighboring countries are few.

Causes of spillage incidents



Driver Error (20): This accounts for the majority of incidents, suggesting a strong need for driver training, awareness programs, or stricter compliance measures.

Negligence (6): The second most common cause, possibly linked to lapses in attention or disregard for safety protocols.

Unknown (5): A notable portion of incidents lacks clear attribution, which may indicate gaps in reporting or investigation processes.

Mechanical Fault (4): Indicates some technical issues, but far less frequent than human-related factors.

Fatigue, Poor Driving Conditions, Tyre Burst, U-turn (2 each): These are minor contributors but still relevant targeted interventions.

Driving Conditions (1): The least frequent cause, suggesting environmental factors are less of a concern compared to human and mechanical issues.

Dangerous goods spillages by weather and cause



Key Observations

a) Highest Spillage Frequency 2011 (Driver Error): Peak at **4 incidents**, all under **South Africa Non-Cross-Border (Clear weather)**.

2020 (Driver Error): Second peak at **3 incidents**, also under **Clear weather**.

b) Common Causes

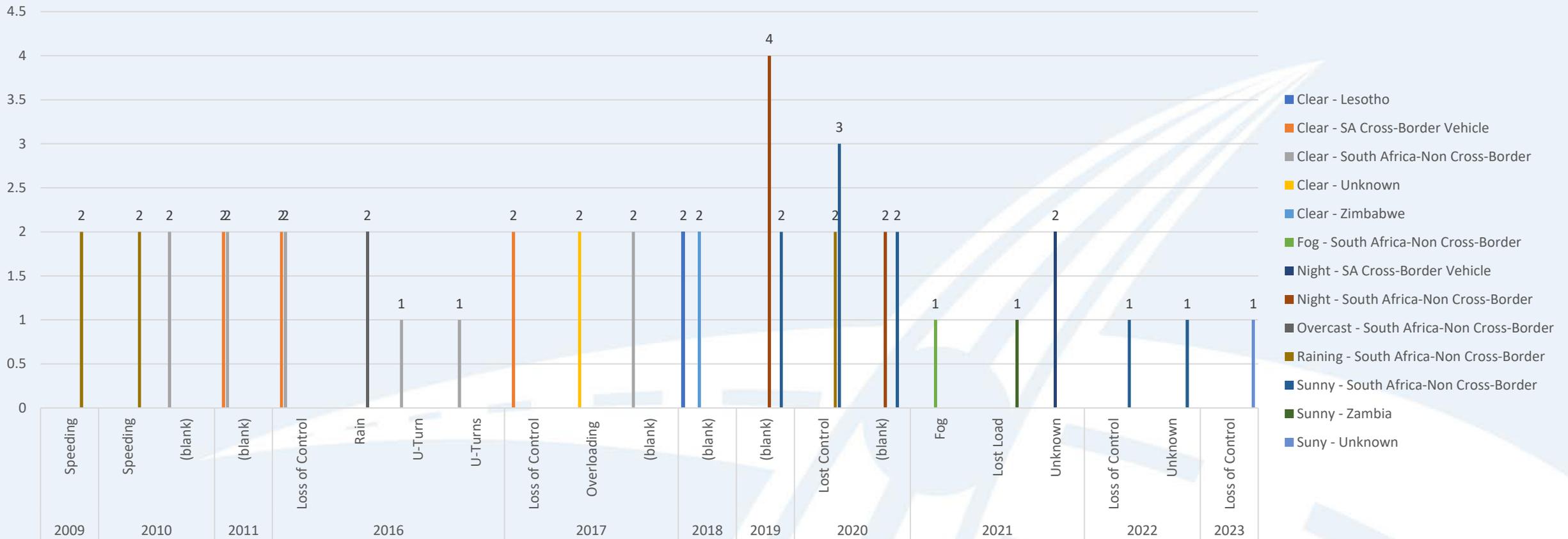
Driver Error dominates across multiple years (2011, 2016, 2020, 2023). Other recurring causes: **Negligence, Mechanical Fault, Poor Driving Conditions, Tyre Burst**.

c) Weather Influence: **Clear weather** is most associated with spillages, especially for South Africa Non-Cross-Border vehicles. **Sunny conditions** appear in later years (2019 onward), but with lower frequencies (mostly 2 incidents). **Night and Overcast** conditions show minimal representation (isolated bars). **Raining** appears only once in 2021 with **1 incident**.

d) Cross-Border vs Non-Cross-Border: **Cross-Border vehicles (Blue bars)** have fewer incidents compared to Non-Cross-Border (Pink bars). Most incidents are concentrated in **South Africa Non-Cross-Border** category.

• **Clear weather** does not reduce risk; in fact, most spillages occur under clear conditions, possibly due to underestimating the hazard or higher traffic volumes. **Driver Error** is the leading cause, suggesting a need for stricter training and monitoring. **Cross-Border vehicles** show better safety performance compared to domestic routes.

Contributing factors to road incidents on vehicles transporting dangerous goods



Dominant Contributing Factors: **Loss of Control** appears most frequently across multiple years (2011, 2016, 2019, 2020, 2022, 2023). **Speeding** is significant in early years (2009–2010). **Overloading** and **U-Turns** appear occasionally (2016–2017). **Unknown factors** show up in later years (2021–2022), indicating possible gaps in reporting or investigation.

Incident Peaks: **2019:** Highest single-year spike with **4 incidents** (factor not specified – marked as blank). **2020:** Second highest with **3 incidents**, including “Loss of Control.” **2011:** Two incidents linked to “Loss of Control.”

Weather Influence: Most incidents occurred under **clear weather conditions**, suggesting that **driver behavior and operational issues** (not weather) are primary contributors. **Fog** appears only once (2023), linked to South Africa non-cross-border vehicle.

Cross-Border Context: Color coding indicates incidents involve **cross-border vehicles** (South Africa, Lesotho, Zimbabwe), which may imply: **Regulatory compliance challenges** across jurisdictions. **Driver fatigue or route unfamiliarity** on international routes.



Incident analysis by country

Incident Analysis: Dangerous goods spillages by country

1. Lesotho

Two trucks originating from Lesotho were involved in chemical spillages at Carousel Plaza. Both incidents occurred within the lanes of the plaza and involved the loss of UN3377-classified chemicals. These cases highlight the risks associated with hazardous material transport through toll infrastructure and the need for improved containment protocols.

2. South Africa – Cross-Border Vehicles

Four distinct incidents were reported involving South African cross-border vehicles:

A driver lost control, resulting in a vehicle overturn.

An oxide bag was torn by a toll gate iron bar, causing a spillage.

A trailer overturned while reversing onto a colbert.

Locked wheels led to a fire outbreak.

These incidents suggest operational challenges during toll gate navigation and mechanical failures, emphasizing the importance of driver training and vehicle maintenance for cross-border operators.

3. South Africa – Non Cross-Border Vehicles

This category accounted for the majority of incidents, with a wide range of causes and outcomes:

Fuel-related spillages (diesel and petrol).

Fires involving LDVs carrying gas bottles and tankers.

Multiple head-on collisions and loss-of-control events.

Overturned vehicles due to evasive maneuvers or mechanical failure.

Construction zone hazards, including collisions with delineators and parked vehicles.

Multi-vehicle pileups and rear-end collisions.

A unique case where a Volvo truck made a U-turn and was struck by a Mercedes Benz, resulting in fire.

The diversity of incidents reflects systemic issues in domestic freight safety, including inadequate hazard awareness, poor road conditions, and insufficient emergency response preparedness.

4. Unknown Origin

Two incidents involved vehicles with undetected registration numbers:

A white Scania truck overturned, spilling oil and gas bottles.

Cobalt powder was spilled at a tollgate.

The lack of registration data may hinder accountability and reporting accuracy. These cases underscore the need for improved vehicle tracking and enforcement mechanisms.

5. Zambia

One incident involved a Zambian vehicle that lost its load of substance UN1350. This highlights the transboundary nature of hazardous goods movement and the importance of harmonized safety standards across the region.

6. Zimbabwe

A Zimbabwean vehicle struck a booth protector, resulting in a chemical spillage on the truck board. This incident points to infrastructure-related vulnerabilities and the need for reinforced protective barriers at toll facilities.



Possible actions

Possible actions

1. Prioritize safety interventions in South Africa, especially N1 in Tshwane and N4 for other municipalities with multiple incidents: Driver training should focus on speed management and vehicle control.
2. Strengthen cross-border safety protocols for vehicles transporting dangerous goods.
3. Improve reporting systems to reduce “Unknown” cases.
4. Cross-border harmonization of safety standards could reduce risks: collaborate with neighboring countries to maintain low incident rates.
5. Enforcement of loading regulations is critical to prevent overloading-related incidents.



Thank you



350 WITCH-HAZEL AVENUE
ECO POINT OFFICE PARK,
BLOCK A, ECO PARK,
CENTURION, PRETORIA
SOUTH AFRICA

PO Box 560
MENLYN,
0063
PRETORIA
SOUTH AFRICA

TEL: +27 12 471 2000

WWW.CBRТА.CO.ZA

 @cbrta_za

 @cbrtaza

