
DOSER: A 360° INTEGRATED DIGITAL ECOSYSTEM FOR ROAD CRASH DATA MANAGEMENT

Evidence-Based Policies in Cameroon

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AGENDA

01 THE ROAD SAFETY CRISIS

Africa's public health emergency and data challenge

02 THE DOSER SOLUTION

A 360° integrated digital ecosystem

03 AI-POWERED INNOVATION & RESULTS

Real-time detection and Cameroon deployment

04 IMPACT & CALL TO ACTION

Global alignment, scalability, and the path forward



Abstract

Background

In Cameroon, official statistics record ~1,500 road deaths/year, while the WHO estimates the true figure at nearly 5,200 — revealing structural under-reporting caused by fragmented data collection systems.

Objectives

Design and deploy DOSER — a 360° integrated digital ecosystem — to improve quality, completeness and timeliness of road crash data in Cameroon and support evidence-based road safety policies.

Methods

Multi-layer architecture: (1) standardised offline-first mobile data capture, (2) AI-powered VAAR module for real-time detection, (3) multi-stakeholder web portal, (4) predictive BI+GIS analytics engine.

Results

880+ police/gendarmerie units · 3,000+ health facilities integrated · All 10 regions covered · VAAR alert delay < 5 min · Kofi Annan Road Safety Award 2025.

Conclusion

Digital integration is the central lever of modern road safety governance in Africa. Modular offline-first design makes DOSER a replicable model for the continent.

Background & Literature Review

Scientific Literature

WHO 2023 [1]

African fatality rate: 26.6/100,000 hab. — highest worldwide

Bhalla et al. 2009 [15]

< 20% of African countries have WHO-standard crash data systems

Khattak et al. 2022 [17]

NLP for automated incident detection on social media

Redmon & Farhadi 2021 [18]

YOLOv5: superior real-time detection in heterogeneous visual contexts

Burris & Thompson 2022 [16]

African digital safety solutions: limited institutional reach

Lartey et al. 2020 [24]

Offline-first: recommended approach for data collection in Africa

Nantulya & Reich 2002 [4]

Road injuries in LMICs: the 'neglected epidemic'

Theoretical Framework

DICA Framework [19]

Data→Information→Knowledge→Action (Elvik et al., 2009). Underpins DOSER's data-to-policy transformation logic.

Multi-level Governance [20]

Bonafous & Jensen (2005): strategic, tactical and operational levels. Structures DOSER's three governance tiers.

SOA & Open Data [21]

OECD (2021) open government data principles. CKAN platform for open data. API-first architecture for interoperability.

Safe System — WHO [12]

Reliable data systems = fundamental prerequisite for proactive road safety governance. Justifies DOSER's 360° multi-actor approach.

SDG Alignment [10,11]

UN Decade of Action 2021–2030. SDG target 3.6 (50% reduction in road deaths) and 11.2 (safe and sustainable transport).



THE ROAD SAFETY CRISIS IN AFRICA

A Public Health Emergency of Epidemic Proportions

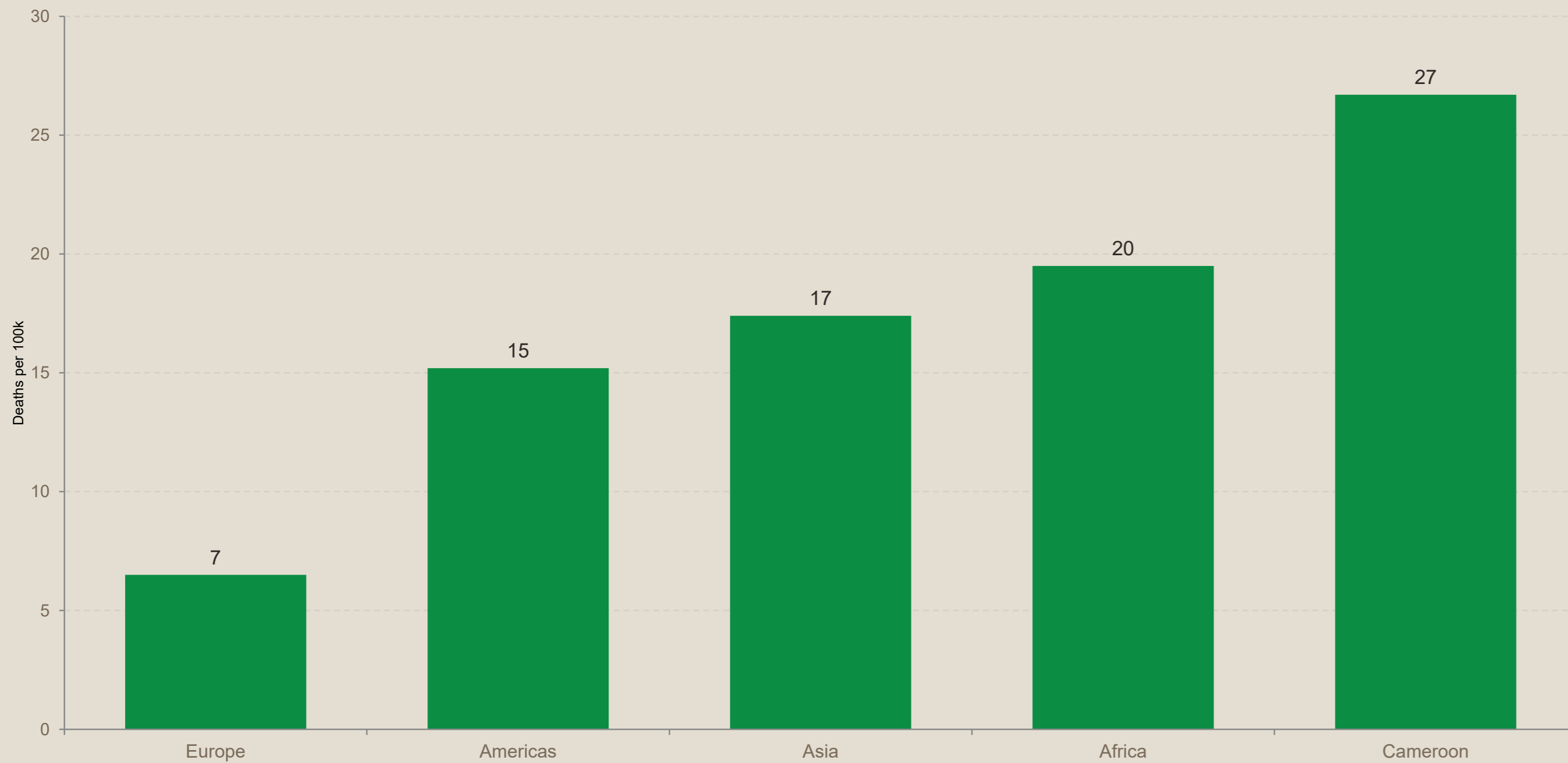


4x GAP IN REPORTING

27.4
Deaths per 100,000 (highest globally)

93%
of global road deaths occur in LMICs

1,500 vs. WHO -5,200
Annual road deaths in Cameroon (estimated)



Key Risk Factors in Cameroon

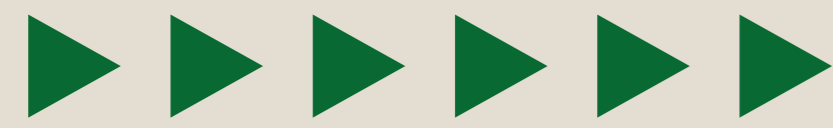
- ▶ Poor road infrastructure & maintenance
- ▶ Inadequate traffic law enforcement
- ▶ Limited emergency medical response
- ▶ Aging vehicle fleet & poor safety standards
- ▶ Rapid urbanization & unplanned growth
- ▶ Weak data collection & analysis capacity

Economic cost exceeds 3% of GDP annually



THE CORE CHALLENGE: DATA FRAGMENTATION

Why Evidence-Based Policy Remains Elusive



01 — Fragmented Collection

Data scattered across police, health, insurance, and transport institutions with no central repository or standardized format.

02 — Severe Underreporting

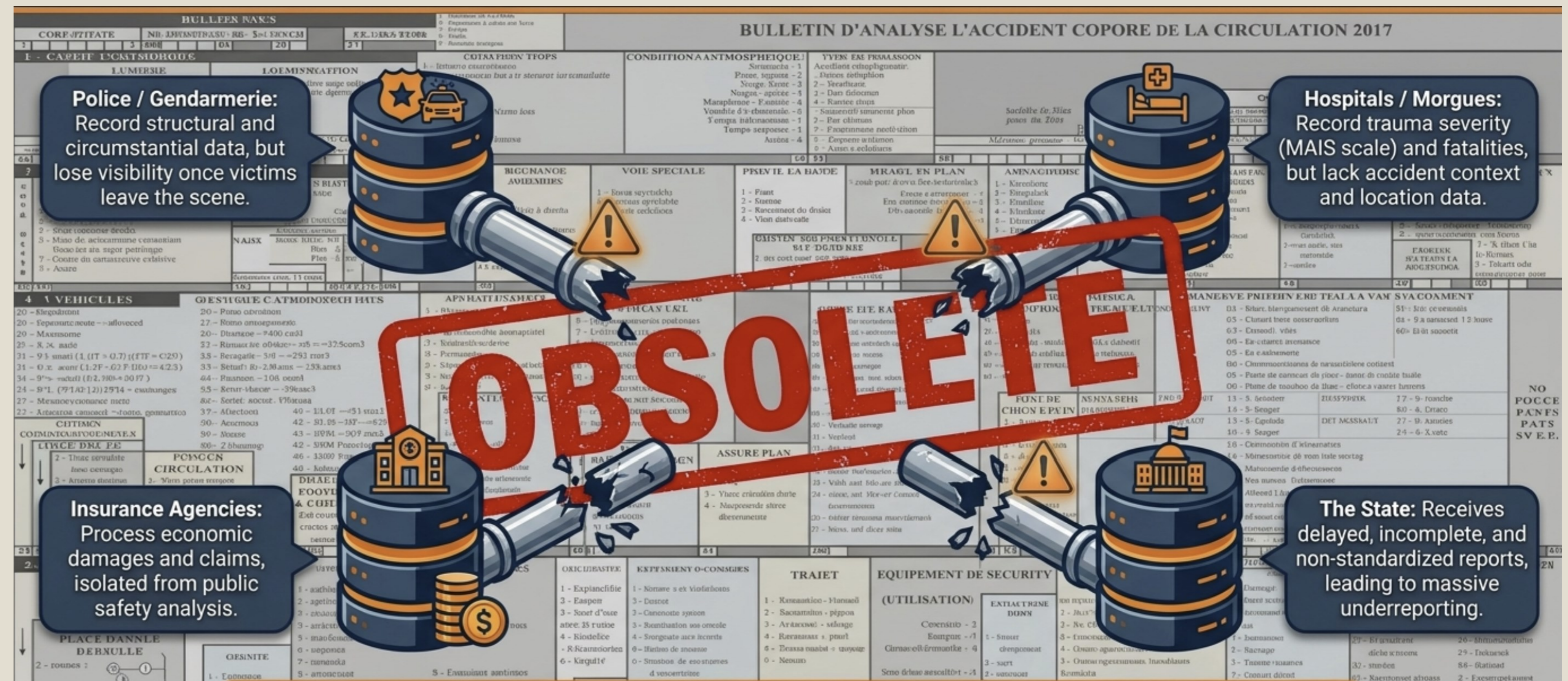
WHO estimates only 30-40% of road crashes are officially recorded. The true scale of the crisis remains hidden from policymakers.

03 — Paper-Based Processes

Dominant paper-based systems are slow, error-prone, impossible to analyze at scale, and create months-long reporting delays.

04 — No Real-Time Analytics

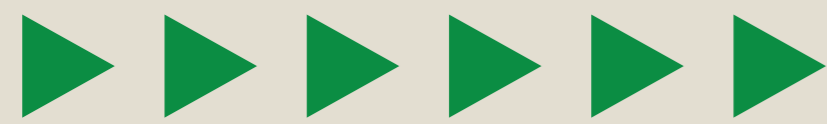
Decisions are reactive rather than proactive. No capability for black spot identification,



The Result: Policymakers lack reliable evidence to design effective interventions, allocate resources, or measure progress.

DOSER VISION: A 360° INTEGRATED APPROACH

Six Integrated Pillars Transforming Road Safety Data



Mobile Data Capture

Offline-first standardized data collection at accident scenes. Geolocation, photos, sketches, and structured forms for police and health workers.

Key: Works without internet, auto-syncs when connected

Web Collection Portal

Centralized web interface for all actors: hospitals, insurance companies, morgues, and transport agencies to input and manage data.

Key: Role-based access, unified data standards

BI & AI Analytics

Dynamic dashboards, black spot mapping, and predictive risk analysis. Transform raw data into actionable intelligence for decision-makers.

Key: Real-time insights, trend detection

VAAR Module (AI Alerts)

AI-powered social media monitoring for real-time accident detection. NLP and computer vision analyze posts to generate instant alerts.

Key: BERT + YOLOv5, African linguistic context

Open Data Platform

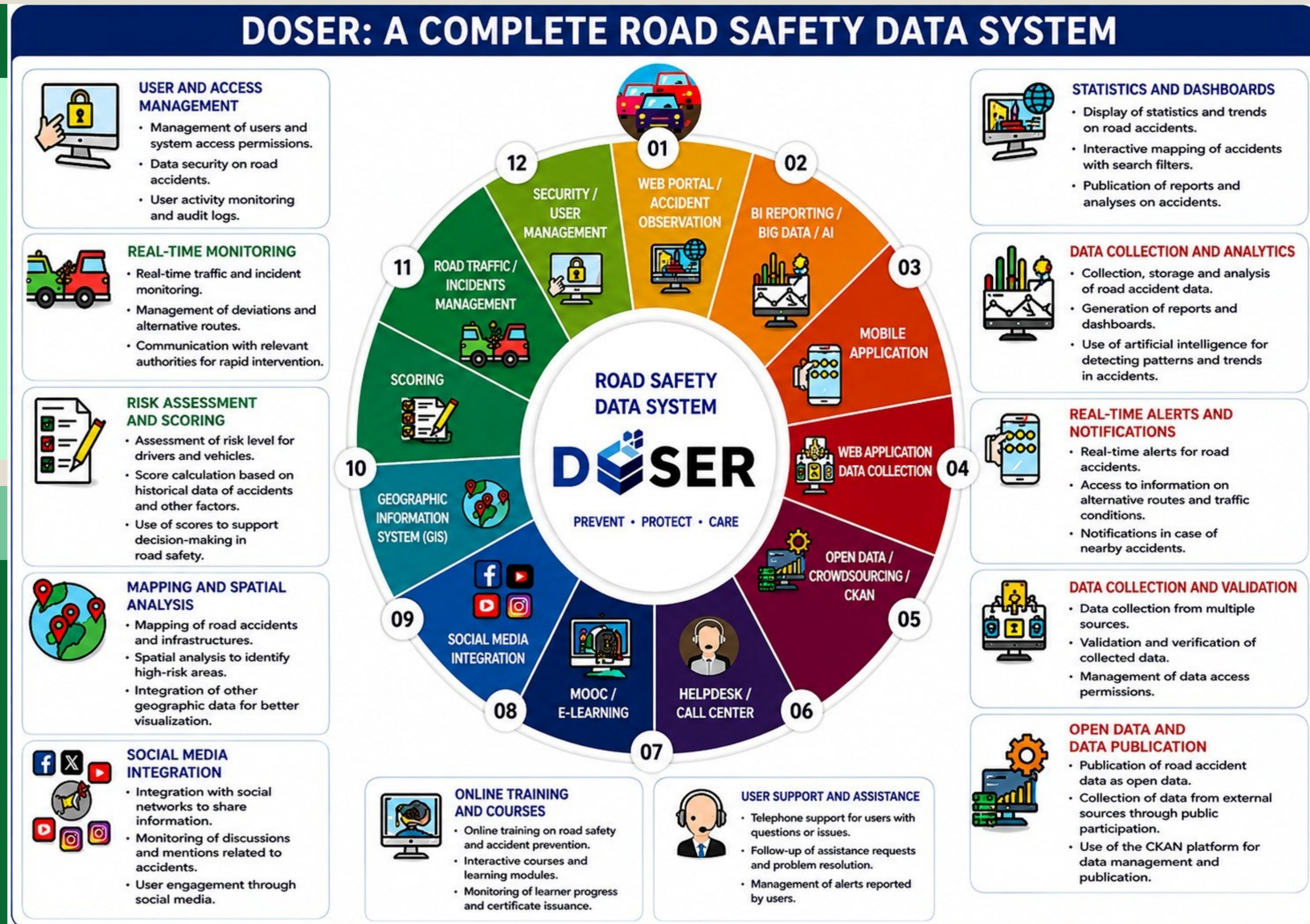
CKAN-based open data portal for researchers, citizens, and policymakers. Promotes transparency and enables third-party innovation.

Key: Standardized APIs, interoperability

Collaborative Ecosystem

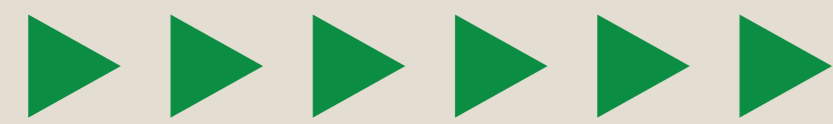
Single platform connecting all stakeholders across the road safety value chain — from first responders to national policymakers.

Key: 7+ actor types, unified workflows

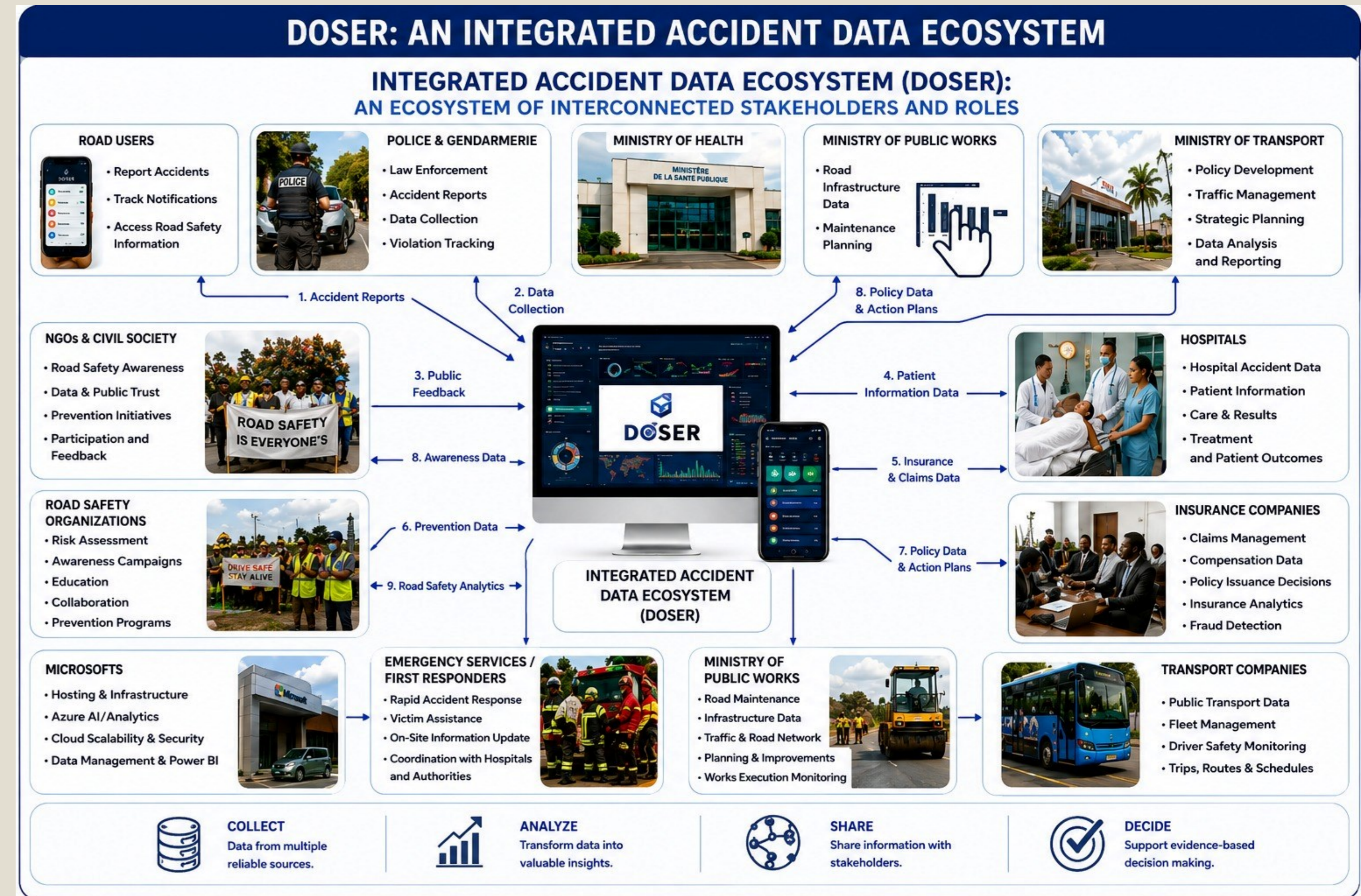


MULTI-ACTOR COLLABORATION FRAMEWORK

Connecting All Road Safety Stakeholders on One Platform



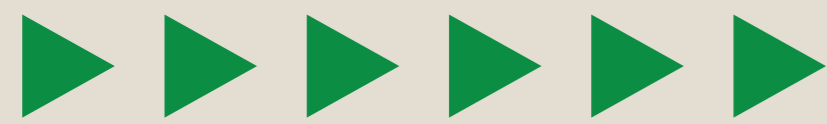
<p>Police / Gendarmerie</p> <p>Accident reporting, validation, geolocation, witness statements, technical findings, sketch creation</p>	<p>Hospitals</p> <p>Victim registration, trauma documentation, medical care tracking, injury statistics reporting</p>	<p>Emergency Services</p> <p>Team deployment, first aid, victim transport, hospital coordination, response time tracking</p>	<p>Insurance</p> <p>Claims registration, damage assessment, victim compensation, risk trend analysis</p>
<p>Transport Agencies</p> <p>Fleet registration, driver scoring, accident reporting, safety compliance monitoring</p>	<p>Morgues</p> <p>Body reception, victim identification, autopsy records, death certificate issuance</p>	<p>Public / Citizens</p> <p>Alert submissions via mobile app and social media, Open Data portal access for research and advocacy, risk zone information, community feedback on road conditions</p>	



Unified Platform: Each actor has role-specific interfaces and workflows, while all data flows into a single integrated repository.

KEY INNOVATION: VAAR MODULE

AI-Powered Real-Time Accident Detection & Alerts



01

COLLECT

Real-time monitoring of social media (X/Twitter, Facebook) and web sources for accident-related posts, images, and videos.

02

CLEAN

Automatic data cleaning, standardization, and deduplication of raw texts and images to prepare structured inputs.

03

AI ANALYZE

BERT NLP extracts location, date, vehicle type, severity. YOLOv5 analyzes imagery. VADER assesses urgency.

04

ALERT

Enriched, qualified alerts generated in DOSER, notifying relevant actors for rapid emergency response and resource deployment.

Impact: Reduces accident reporting time from **hours/days to minutes** — enabling faster emergency response and saving lives.

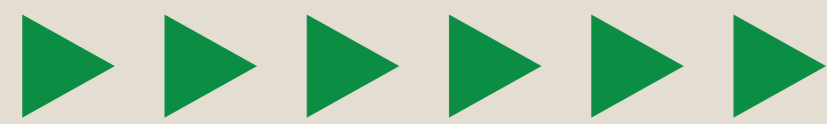
AI/ML Models — Fine-Tuned for African Contexts

- **BERT (NLP):** Fine-tuned on African linguistic corpora for multilingual accident report extraction — French, English, Pidgin, and local languages
- **YOLOv5 (Computer Vision):** Trained on region-specific accident imagery for vehicle detection, damage assessment, and scene classification
- **VADER (Sentiment):** Adapted for African social media expression patterns to assess urgency and severity from user posts
- **Continuous Learning:** Feedback loops from field users continuously improve model accuracy and relevance



FOUR-TIER ANALYTICS ENGINE

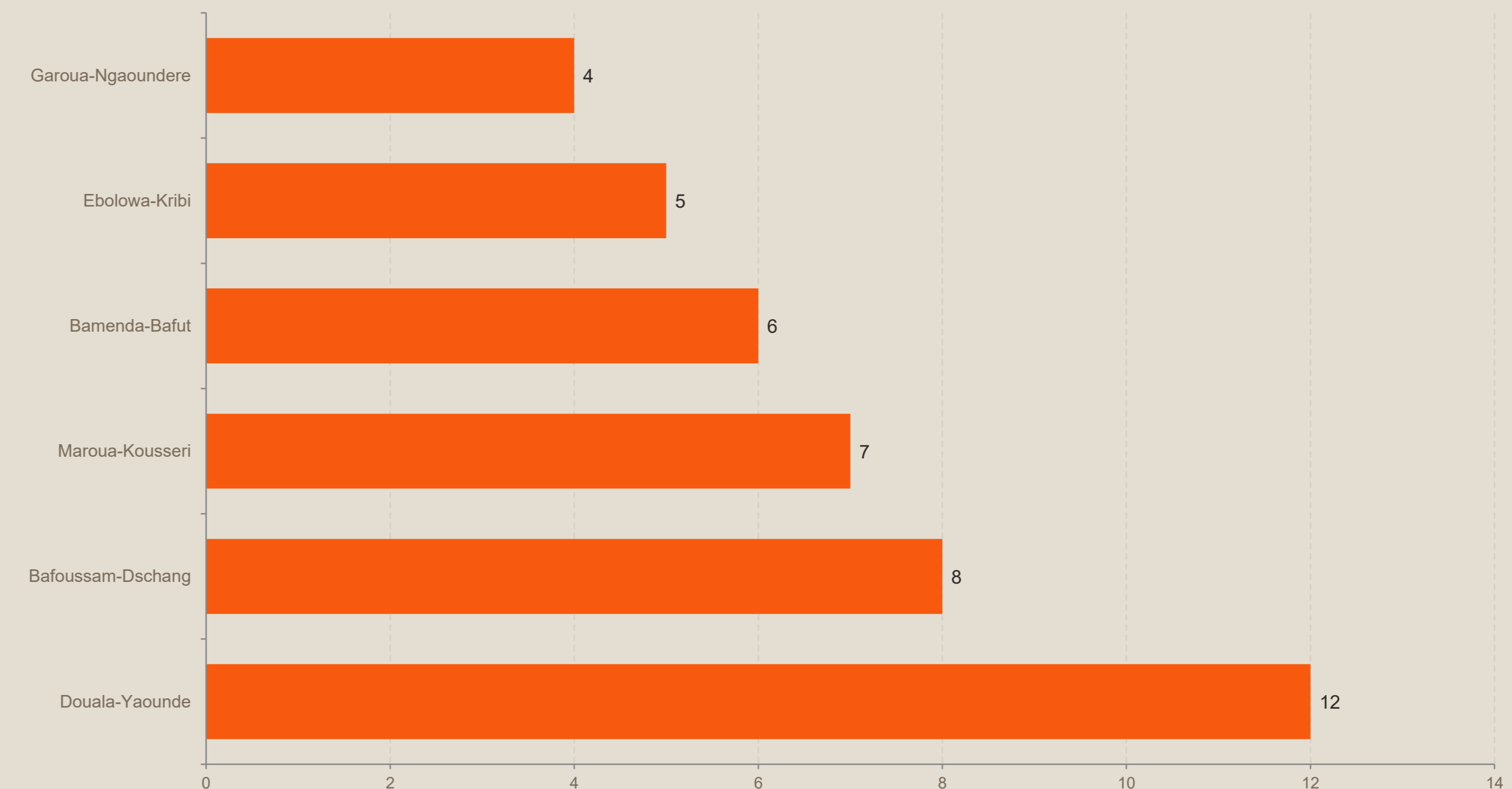
Connecting All Road Safety Stakeholders on One Platform



FOUR-TIER ANALYTICS ENGINE

01	DESCRIPTIVE <i>What happened?</i> Real-time dashboards showing crash trends (e.g., +15% fatal crashes in Littoral region)
02	DIAGNOSTIC <i>Why did it happen?</i> Root cause analysis (e.g., night crashes + unlit roads + two-wheelers = 67% of fatalities)
03	PREDICTIVE <i>What could happen?</i> ML-powered risk forecasting (e.g., high-risk alerts for holiday weekends)
04	PRESCRIPTIVE <i>What should we do?</i> Automated recommendations (e.g., deploy helmet campaign + speed patrols)

PREDICTED RISK HEAT MAP



From raw data to actionable intelligence for policymakers



Unified Platform: Each actor has role-specific interfaces and workflows, while all data flows into a single integrated repository.

IMPLEMENTATION RESULTS IN CAMEROON

880+
Security units using DOSER

3,000+
Healthcare facilities integrated

10
Regions covered nationwide

24/7
Emergency center operations

Police & Gendarmerie

- Accident scene management & validation
- Geographic location of accident sites
- Scaled sketches & photographic case files
- Vehicle condition examination
- Alcohol and drug testing
- Real-time data transmission & alerts

Healthcare Network

- 176 public hospitals integrated
- 180 health districts connected
- 1,600+ CSI (health centers)
- Victim registration & triage
- Trauma documentation & severity classification
- Insurance notification linkage

Emergency Center Yaounde

- 24/7 emergency response center
- Hospital-police-insurance data linkage
- Rapid victim transport coordination
- Real-time victim transport tracking
- Hospital availability monitoring
- Statistical reporting to national observatory



IMPACT, GLOBAL ALIGNMENT & SCALABILITY

Expected Outcomes

40-60%

Data completeness improvement within 2 years

Real-time black spot identification

Evidence-based resource allocation optimization

50%

Reduction in data collection time

Designed for African Realities

- **Offline-First Architecture** — full functionality without internet
- **Modular Deployment** — on-premise, hybrid, or cloud
- **Multi-Language AI** — French, English, Portuguese, Arabic, Swahili, Pidgin
- **Low Total Cost of Ownership** — open-source components
- **Regional Customization** — adapted to national legal frameworks



Alignment with Global Frameworks

UN Decade of Action for Road Safety
Target: 50% reduction in deaths and serious injuries by 2030

SDG 3.6 & SDG 11.2
Halve traffic deaths; ensure safe, sustainable transport for all

African Union Road Safety Charter
Pan-African commitment to coordinated road safety action

WHO Global Status Report
Recommendations on data systems and evidence-based policy

5+

African countries targeted for DOSER deployment by 2030 through adaptation toolkits, regional training, and South-South knowledge exchange.

SCALABILITY: A REPLICABLE MODEL FOR AFRICA

Designed for African Contexts, Ready for Continental Scale



Designed for African Realities

- **Offline-First Architecture**

Addresses connectivity challenges common across the continent — full functionality without internet, auto-sync when connected

- **Modular Deployment**

Adapts to varying infrastructure: on-premise, hybrid, or cloud — based on each country's digital maturity

- **Multi-Language AI**

Models fine-tuned on African linguistic contexts — French, English, Portuguese, Arabic, Swahili, Pidgin, and local languages

- **Low Total Cost of Ownership**

Phased investment model, open-source components, minimal hardware requirements

- **Regional Customization**

Configurable data fields, workflows, and reporting adapted to national legal frameworks

Replication Pathway Across Africa

- ▶ **Adaptation Toolkit** for rapid country-level deployment

- ▶ **Regional Training Academy** for system administrators and data collectors

- ▶ **South-South Knowledge Exchange** through the AfroSAFE Network

- ▶ **Development Partner Co-Financing** model for sustainable funding

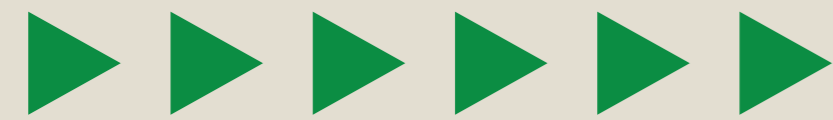
- ▶ **Technical Assistance** from PROOFTAG-CATIS for initial setup

5+

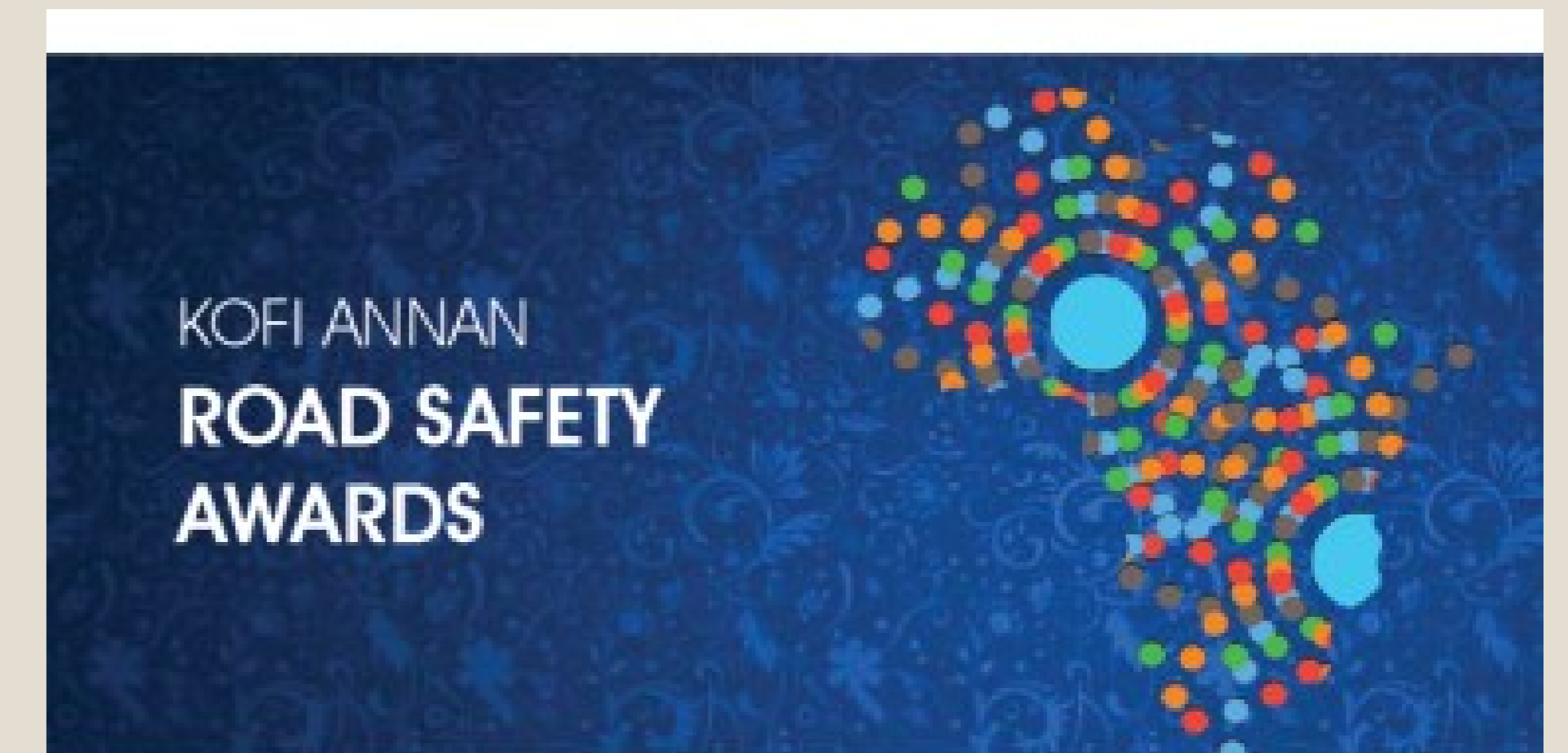
African countries targeted for DOSER deployment by 2030

★ KOFI ANNAN ROAD SAFETY AWARD 2025

14-15 April 2025 | Happy Valley Hotel, Ezulwini, Kingdom of Eswatini



"DOSER, by integrating multiple actors — Police, Gendarmerie, Hospitals, Insurance, Transporters, and Morgues — has established an optimal and efficient data collection system that transforms road safety management in Cameroon and serves as a model for Africa."



INTEGRATED ACTORS — THE DOSER MULTI-STAKEHOLDER ECOSYSTEM

Police
Accident reporting, validation, geolocation, evidence collection

Gendarmerie
Traffic enforcement, accident investigation, technical reports

Hospitals
Victim care, trauma documentation, medical data reporting

Insurance
Claims processing, damage assessment, victim compensation

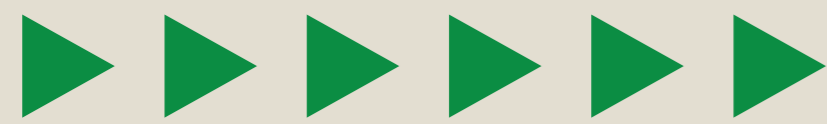
Transporters
Fleet registration, driver scoring, safety compliance

Morgues
Body reception, victim identification, autopsy records

"By bringing together all road safety stakeholders on one unified platform, DOSER has created a 360-degree data ecosystem that is transforming how Cameroon manages road safety."

CONCLUSION & CALL TO ACTION

Building the Safe Roads Africa Deserves



Road safety is a public health crisis, an economic burden, and a development imperative.

Data is the foundation of effective road safety policy — without it, we are flying blind.

Technology must be adapted to African realities — offline-first, modular, sovereign, collaborative.

CALL TO ACTION

For Governments
Invest in digital road safety infrastructure and data governance. Prioritize evidence-based policy making.

For Development Partners
Support scalable, African-designed solutions. Co-finance phased deployment for sustainable impact.

For Researchers
Leverage Open Data to generate evidence. Publish findings to inform policy and save lives.

For AfroSAFE Network
Champion cross-border knowledge sharing and replication across the continent.

"As an engineer and a citizen, I believe technology must serve humanity. DOSER is not just a platform — it is a commitment."
— TAMPOLLA Serge Destion

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THANK YOU

Questions & Discussion



Acknowledgements: Road Safety Stakeholders | Development Partners | AfroSAFE Network
Together, through evidence, innovation, and collaboration, we can build the safe roads Africa deserves.



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