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Identifying Infrastructure Risk Factors in Africa

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Presentation Outline

1. Road Safety in Africa
2. Overview of the SaferAfrica project
3. Objectives of the paper
4. Data & Methods
5. Main Research Findings
   i. Results of Macroscopic Analyses
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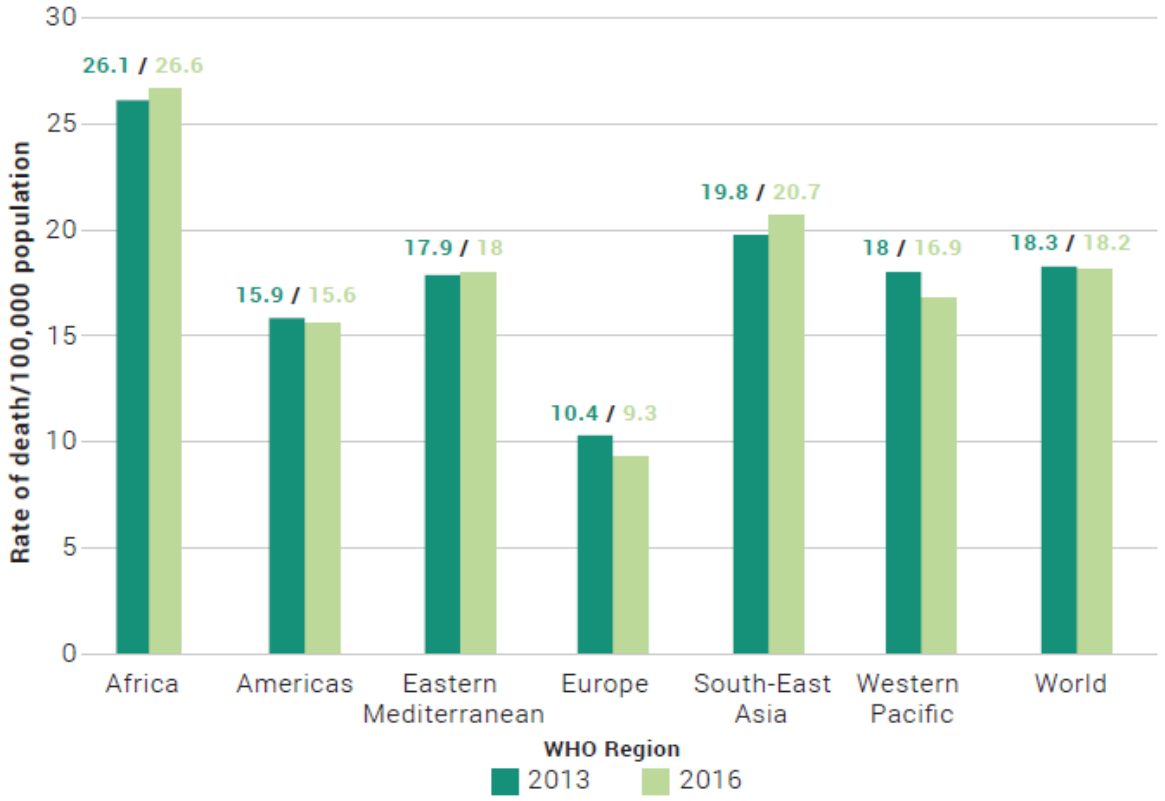
6. Concluding remarks

Road Safety in Africa (1/2)

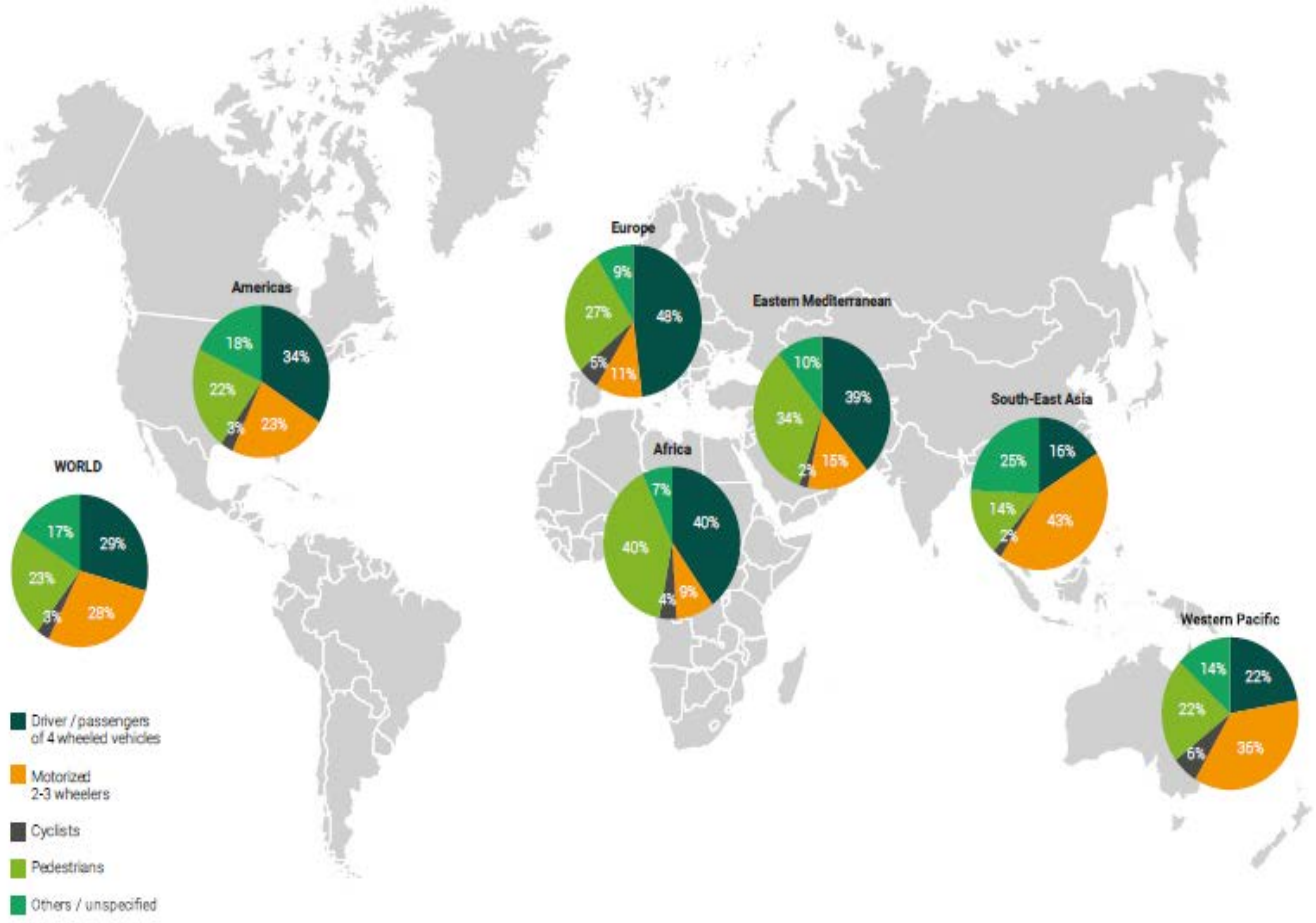
- Africa is the worst performing continent in road safety.
- Road trauma is expected to worsen further, with fatalities per capita projected to double from 2015 to 2030.
- There is a serious lack of road safety data in African countries and even when data are available, little is known about data collection systems, data definitions etc.



Source: WHO 2018

Road Safety in Africa (2/2)

- More than half of all fatalities in the world concern VRUs (motorcyclists, cyclists, pedestrians).
- The African Region has the highest proportion of pedestrian and cyclist fatalities (44%) of all road traffic deaths.
- This is partly attributed to the fact that walking and cycling are important means of transport in Africa.



Source: WHO 2018

Why SaferAfrica?

- 300,000 traffic fatalities over 5mil. injured per year
- Opportunity to exchange information and experience between Europe & Africa
  - Assist with evidence data gathering
  - Identify requirements for skills development and training needs

Overview of the SaferAfrica Project (1/3)

- Funded under the Horizon 2020 Mobility for Growth (MG-3.6-2016 – Euro-African on road safety and traffic management)

- Title:
  SaferAfrica - Innovating Dialogue and Problems Appraisal for a Safer Africa

- Duration: 36 months
  (Oct 2016 – Sep 2019)

- Project Leader:
  University of Roma – La Sapienza

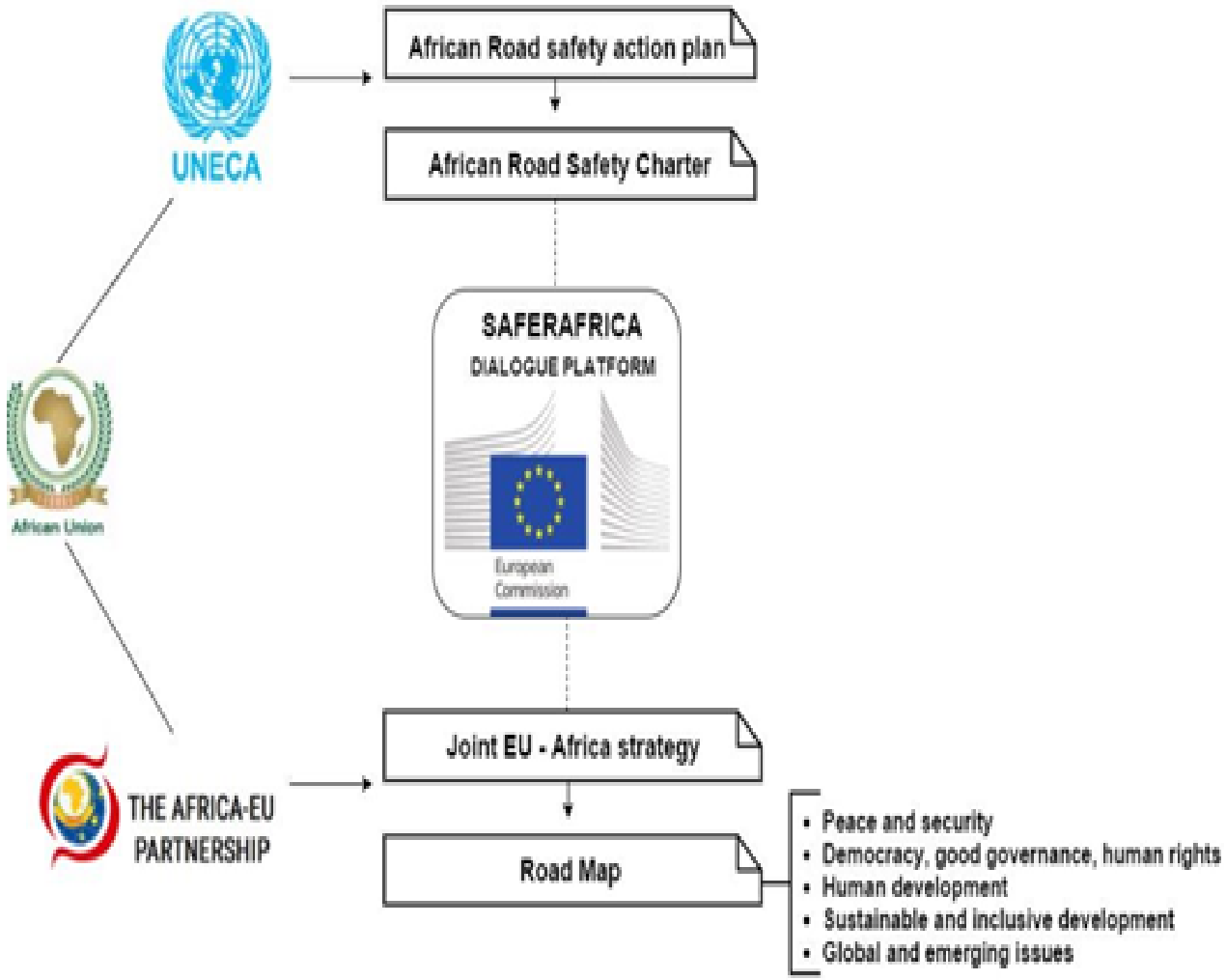
Overview of the SaferAfrica Project (2/3)

Participant Organisation Name	Country
Research Centre for Transport and Logistics (CTL) - Coordinator	Italy
National Technical University of Athens (NTUA)	Greece
Belgian Institute for Road Safety (IBSR)	Belgium
International Road Federation (IRF)	Switzerland
IFSTTAR	France
Loughborough University (LOUGH)	UK
National Laboratory of Civil Engineering (LNEC)	Portugal
Institute of Road Safety Research (SWOV)	Netherlands
SITRASS	France
Agency for the Promotion of European Research (APRE)	Italy
Vehicle and Traffic Safety Centre (SAFER)	Sweden
National Advanced School of Public Works (ENSTP)	Cameroon
Handicap International (HI)	Belgium
Abidjan – Lagos Corridor Organisation (OCAL)	Benin
ICI-Santé (ICI)	Burkina Faso
Sub-Saharan Africa Transport Policy Program (SSATP)	Kenya
International Motor Vehicle Inspection Committee (CITA)	Belgium

Overview of the SaferAfrica Project (3/3)

SaferAfrica Objectives

- Create favorable conditions and opportunities for the effective implementation of actions for road safety and traffic management in African countries, by setting up a Dialogue Platform between Africa and Europe



Objectives of the paper

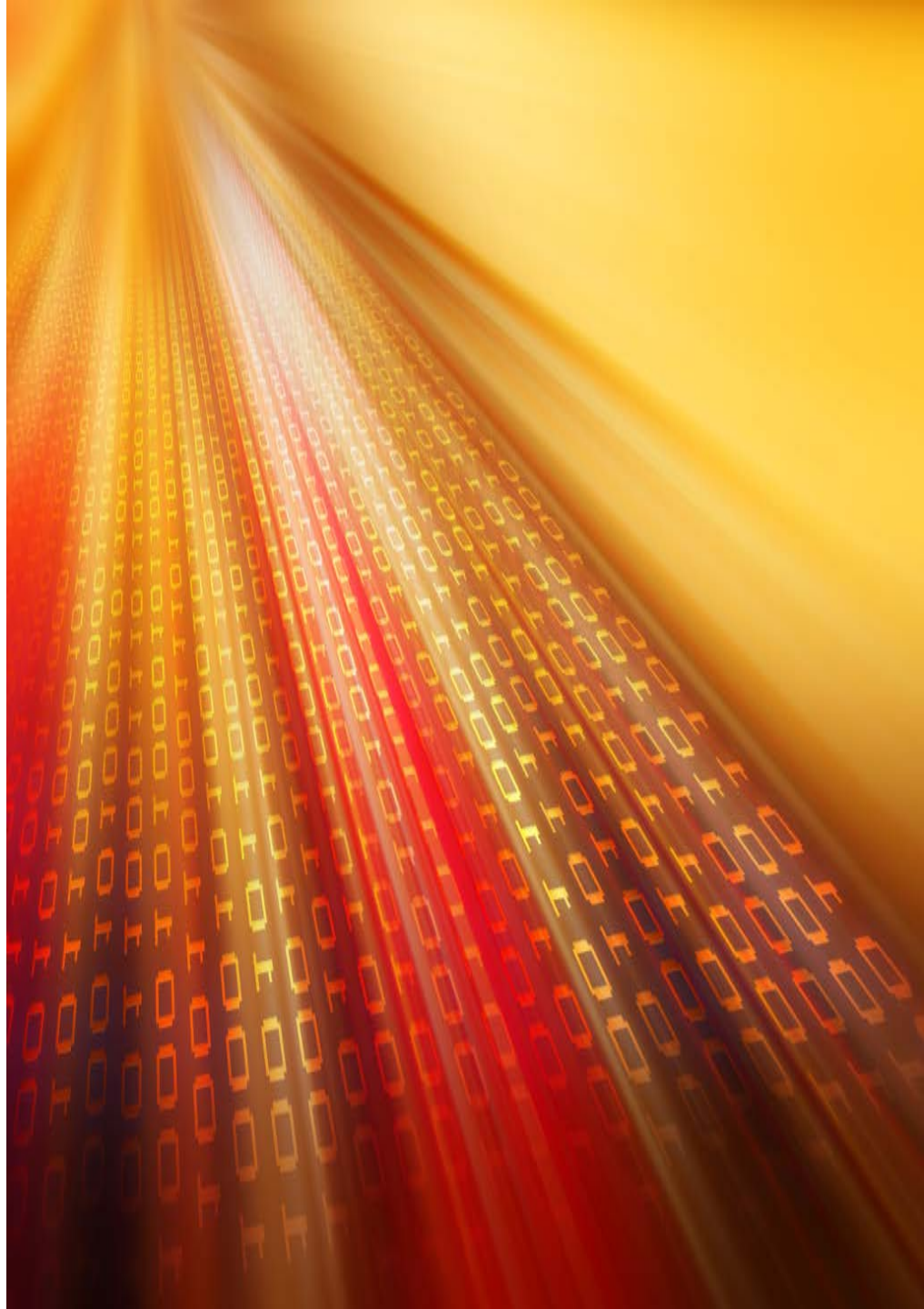
The main objectives of this study are:

- Provide a critical overview of the impact of infrastructure risk factors on road accident numbers and rates in African countries

- Such an analysis will allow the identification of priority areas for road safety actions and interventions, with special emphasis should be given on those with high road safety improvement potential.

Data & Methods

- Both macroscopic (generic level) and microscopic (infrastructure element level) potential risk factors are examined.
- African countries were divided in the five regions
  - Northern Africa
  - Eastern Africa
  - Southern Africa
  - Western Africa
  - Central Africa
- Fatality rates per population coming from the 2013 World Health Organization international database, available for 54 African countries.
- Linear and Polynomial regression models were applied.



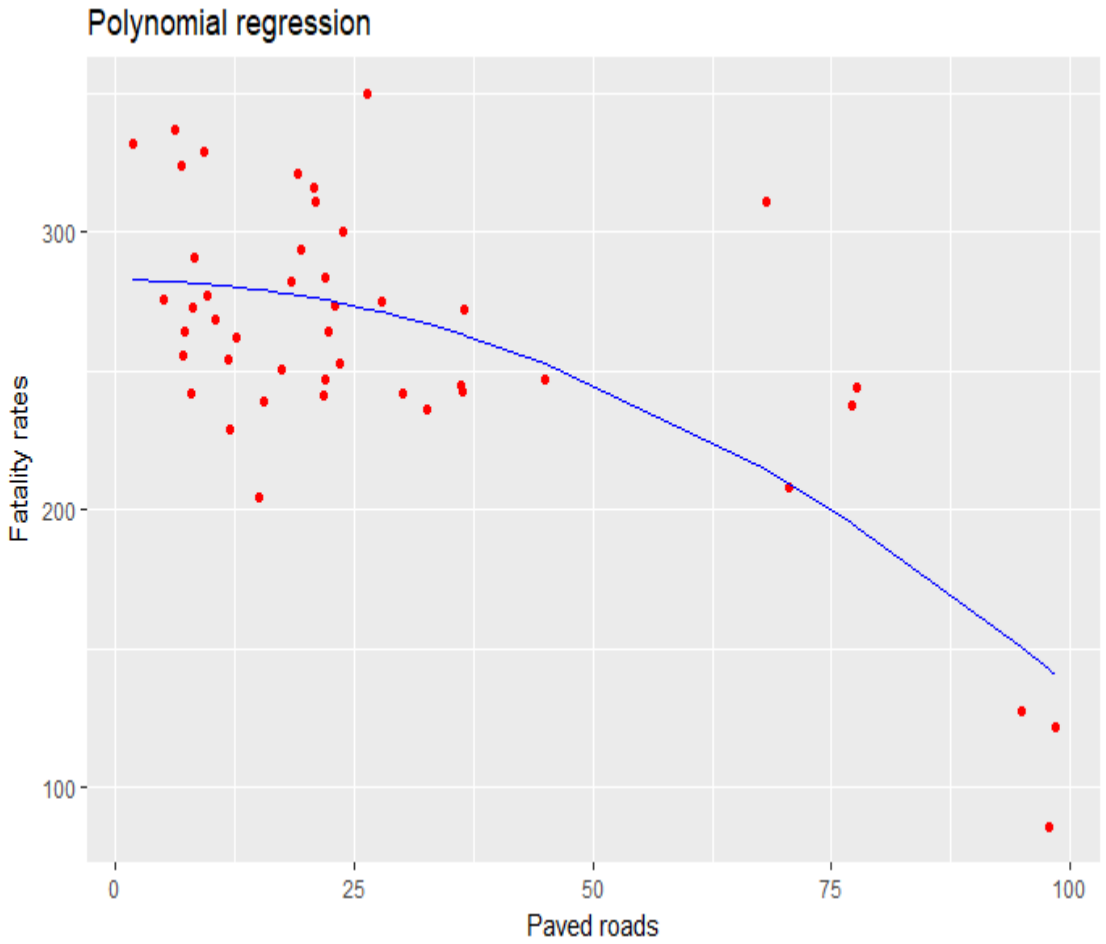
Results of Macroscopic Analysis (1/2)

Country level analyses

- Negative correlation with paved roads and road network density

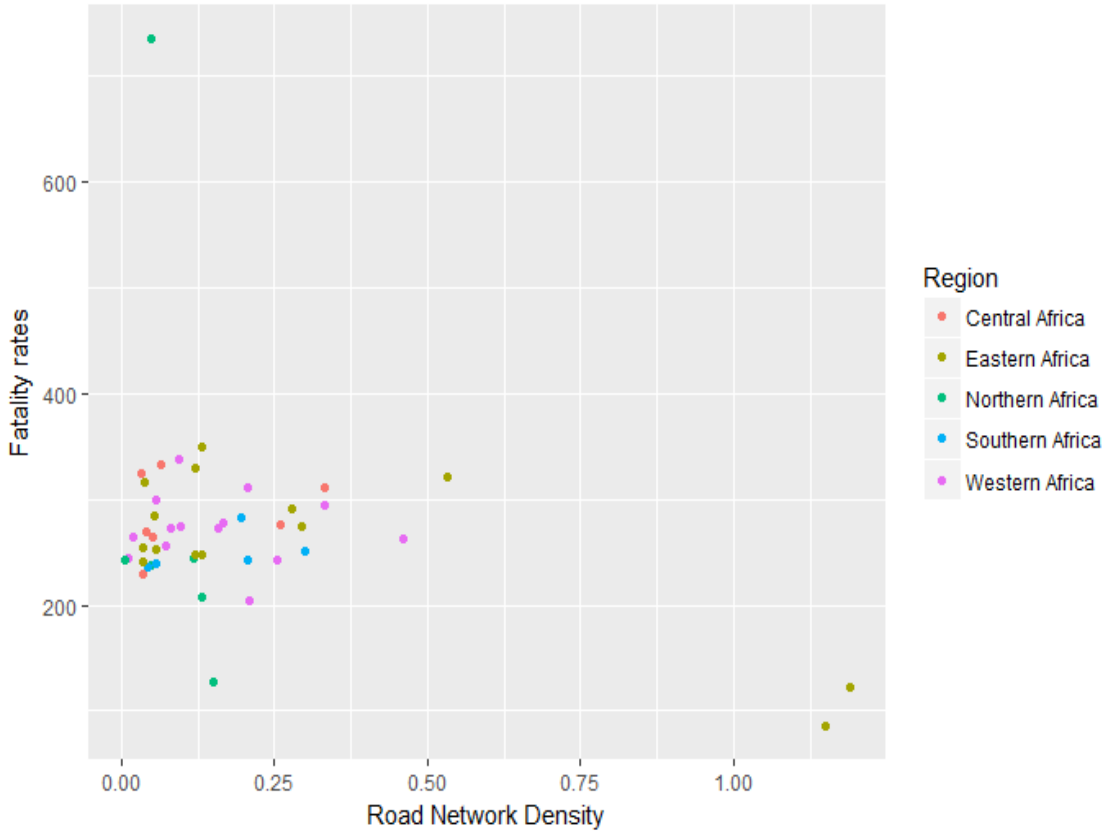
Variables	Beta coefficient	Std. Error	p-value
Constant term	282.755	6.340	<0.001*
Paved Roads^2	-0.0147	0.00213	<0.001*

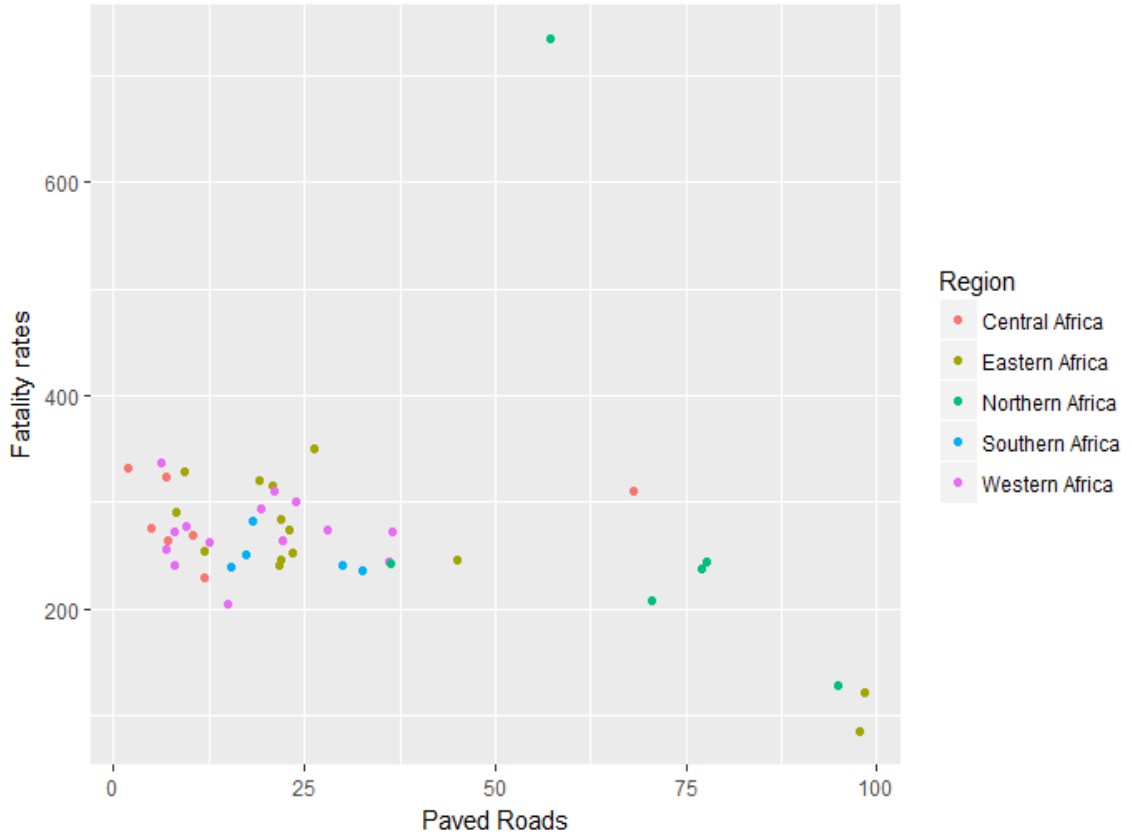
Variables	Beta coefficient	Std. Error	p-value
Constant term	271.595	6.712	<0.001*
Road Network Density^2	-112.821	22.673	<0.001*



Results of Macroscopic Analysis (2/2)

Geographic region analyses



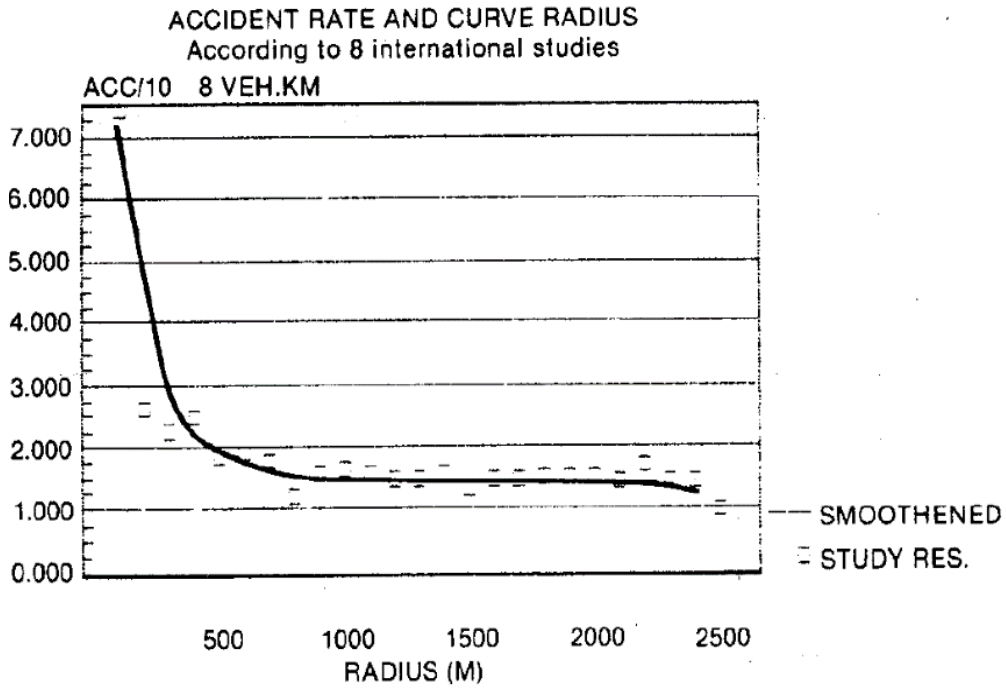


Results of Microscopic Analysis (1/3)

Technical report results

- The 4 main categories of critical infrastructure risk factors (according to international studies) are:
  - Road alignment
  - Road width
  - Sight distance
  - Road environment

- For instance, a radius of less than 500m can increase crash risk while one of 200m or less can cause significantly higher risk.

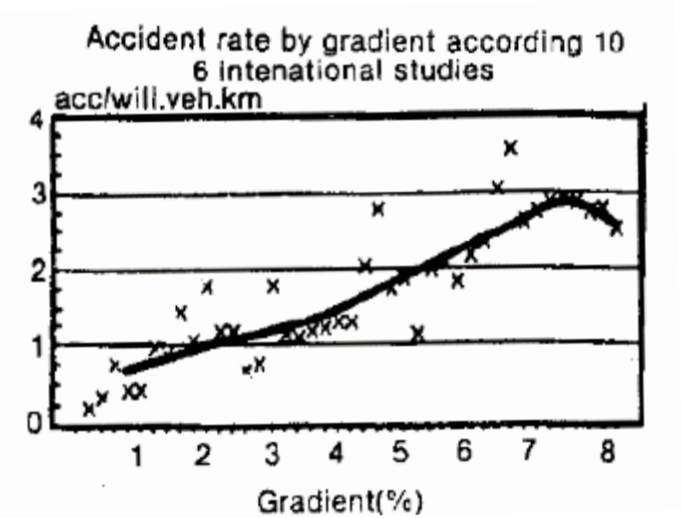


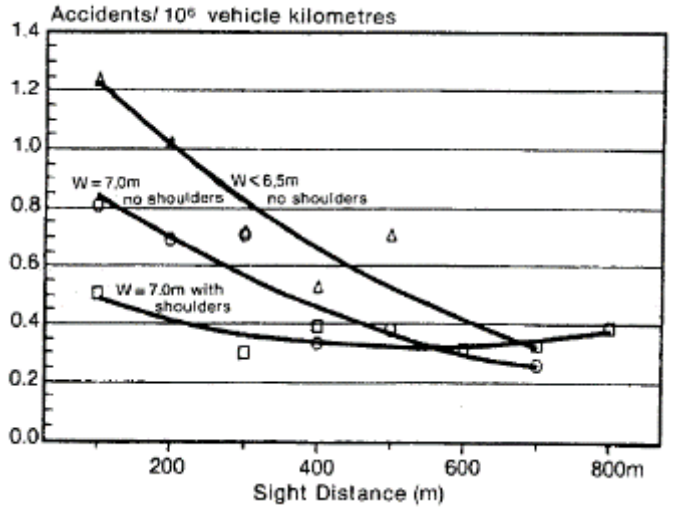
Source: United Nations-Economic Commission for Africa, 1989.

Results of Microscopic Analysis (2/3)

Technical report results

- Positive but non-linear relationship between gradient and crash rates
- Negative correlation between sight distance and crash rates





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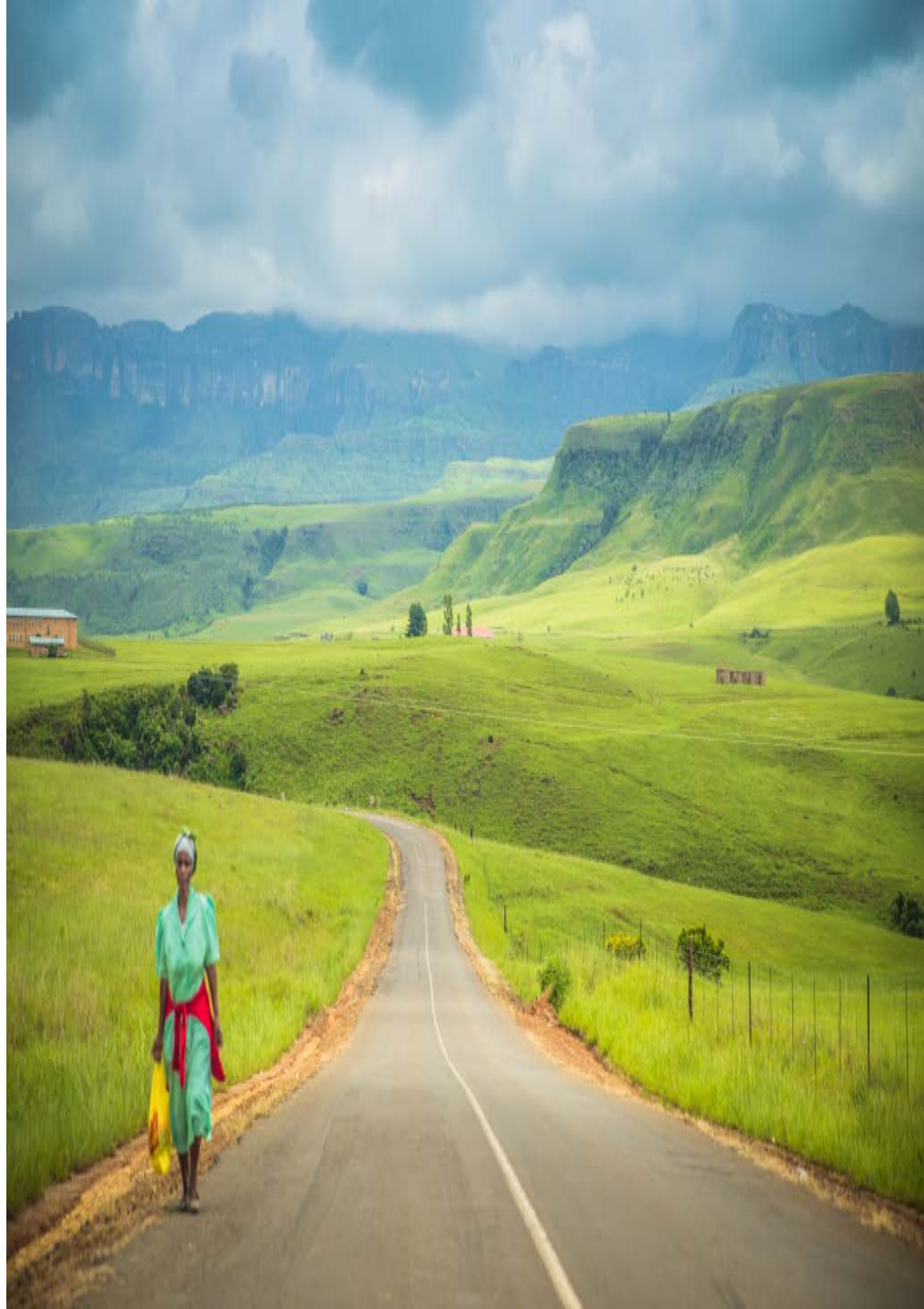

Results of Microscopic Analysis (3/3)

International literature (examples of main risk factors)

- **Ethiopia:** nighttime driving in the absence of street lights (Abegaz et al., 2014)
- **Cameroon:** flat road profile, irregular road surface conditions, roadside obstacles situated less than 4m from the road edge line, three-legged intersections and four-legged intersections (Bhatti et al., 2010).
- **Nigeria:** Almost 2/3 of injuries occur at long tangents or steep curve. Most of crashes at intersections occurred when motorcycles were turning right than when turning left. (Oluwadiya et al., 2009)
- **South Africa:** Decreased lane and shoulder widths lead to an increase in crash rates. Interestingly, long straight roads with low curvature rates may be riskier (Bester and Makunje, 1994; Das and Burger, 2016)

Concluding Remarks

- A strong declining trend when examining the relationship between fatality rates and percentage of paved roads.
- The same trend (but weaker) was identified when examining the impact of road network density on fatality rates per million population.
- The main sources of microscopic infrastructure risk factors were technical reports and scientific papers, which revealed various potential risk factors, such as low road width, curve radius, low median width, absence of street light etc.
- The major identified drawback is the lack of data.
- Future studies in Africa should also have specific focus on vulnerable road users .

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