

REDUCING NAMIBIA'S ROADS CARBON FOOTPRINT

Perspective: Namibia, SADC and African Continent



RFA

Road Fund Administration

Funding roads, steering growth.

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Presenter

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1. INTRODUCTION

- Roads carry over 80% of passenger and freight traffic in Namibia and SADC.
- Critical for trade, mining, agriculture, tourism, social access and regional integration.
- Road sector is a major source of lifecycle greenhouse gas (GHG) emissions through:



Materials production

Construction and
maintenance

Vehicle operating emissions
linked to pavement condition

2. THE CLIMATE CHALLENGE

- Climate change accelerating pavement deterioration and costs.
- Rising emissions and lifecycle costs.
- Increased climate risks: flooding, heat, prolonged drought.
- Traditional road design and construction approaches are no longer adequate.

Appropriate and sustainable solutions

- Apply Life-Cycle Assessment (LCA) to guide low-carbon road development.
- Identify mitigation technologies and enabling frameworks.
- Proposed a roadmap for carbon-smart and climate-resilient roads for Africa.

3. LCA FRAMEWORK



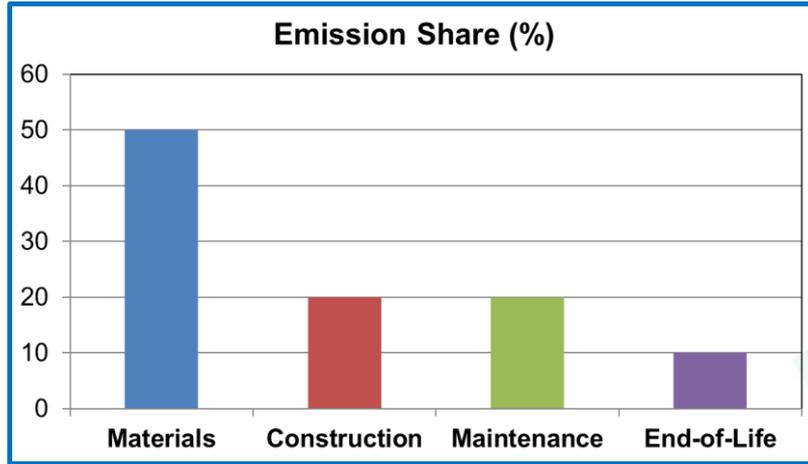
Life-Cycle Assessment (LCA) evaluates emissions across materials, construction, maintenance and end-of-life: road life cycle.



Identifies high-impact mitigation opportunities.



Enables better planning, design and procurement = supporting evidence-based investment decisions.



**Lifecycle Emissions Breakdown:
Typical African Paved Road**

Key Emission Insights:

- **Materials account for 40-60% of embodied emissions**
- **Construction equipment and maintenance activities: 20-30%**
- **Pavement condition influences vehicles fuel use**



4. MITIGATION TECHNOLOGIES

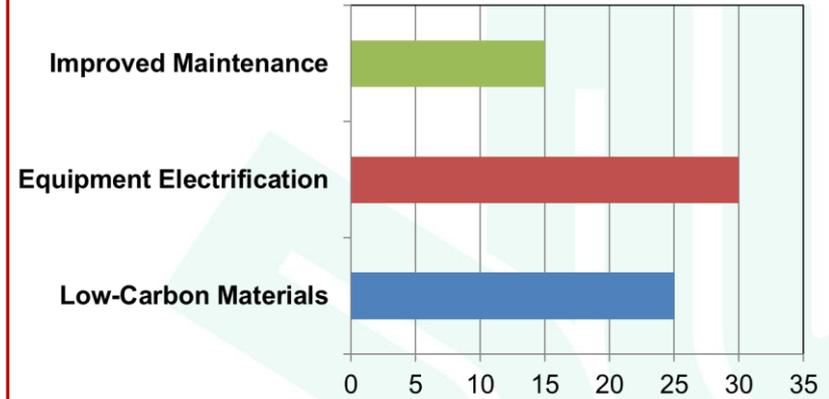
Electrification and Automation

- Hybrid and electric construction equipment
- Emission reductions of 20-40% in pilot projects
- Digitalisation improves efficiency and reduces rework

Low-Carbon Materials

- Supplementary cementitious materials
- Recycled asphalt pavement (RAP)
- Warm and cold mix asphalt
- Stabilised gravel and alternative surfacing solutions

Estimated Reduction (%)



Potential Emissions Reduction by Intervention

Renewable Energy Integration along Road Corridors

- Roads as energy corridors: solar lighting and signage; PV installations in road reserves; energy-neutral toll plazas and weighbridges
- Benefits: reduced operational emissions; improved energy resilience in remote areas

5. CASE STUDIES: NAMIBIA AND SADC



NAMIBIA

- Climate-resilient pavement design
- Modified materials specifications



SOUTH AFRICA

- Green public procurement
- Recycled materials economy including recycled asphalt



BOTSWANA &
ZAMBIA

- Climate-resilient design guidelines
- Barriers to low-carbon: costs and limited supply chains

Improved pavement life
and reduced emissions



Opportunity

Resilient pavements reduce:

- Maintenance frequency
- Vehicle operating costs
- Long-term emissions

6. POLICY, FINANCING AND ENABLERS

Requirement of enabling frameworks and financing instruments



Climate-responsive road design standards

Green public procurement policies and LCA-based tender evaluation

Fiscal incentives for low-carbon materials and equipment

Access to climate finance (e.g. Green Climate Fund)

Alignment to:

- **Nationally Determined Contributions (NDCs)**
- **Regional and continental development goals**

7. STRATEGIC ROADMAP

Proposed phased roadmap to support the transition to carbon-smart roads in Namibia and Africa

**Short term
(0-3 years)**

Policy alignment and integrate LCA into project appraisal

Update specifications to allow use of recycled materials

Pilot low-carbon projects/ technologies

**Medium term
(3-7 years)**

Scale electrification of construction equipment/ machinery

Strengthen local supply chains of low-carbon materials

Mainstream performance-based contracting

**Long term
(+7 years)**

Net-zero road improvement programmes

Smart and energy-positive road corridors

Full alignment with Agenda 2063 infrastructure aspirations

7. CONCLUSION

Low-carbon and climate-resilient roads are achievable and necessary.



Life-Cycle Assessment, policy support and financing are critical enablers.



Alignment with Agenda 2063 ensures sustainable road and infrastructure development on the continent.



THANK YOU



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