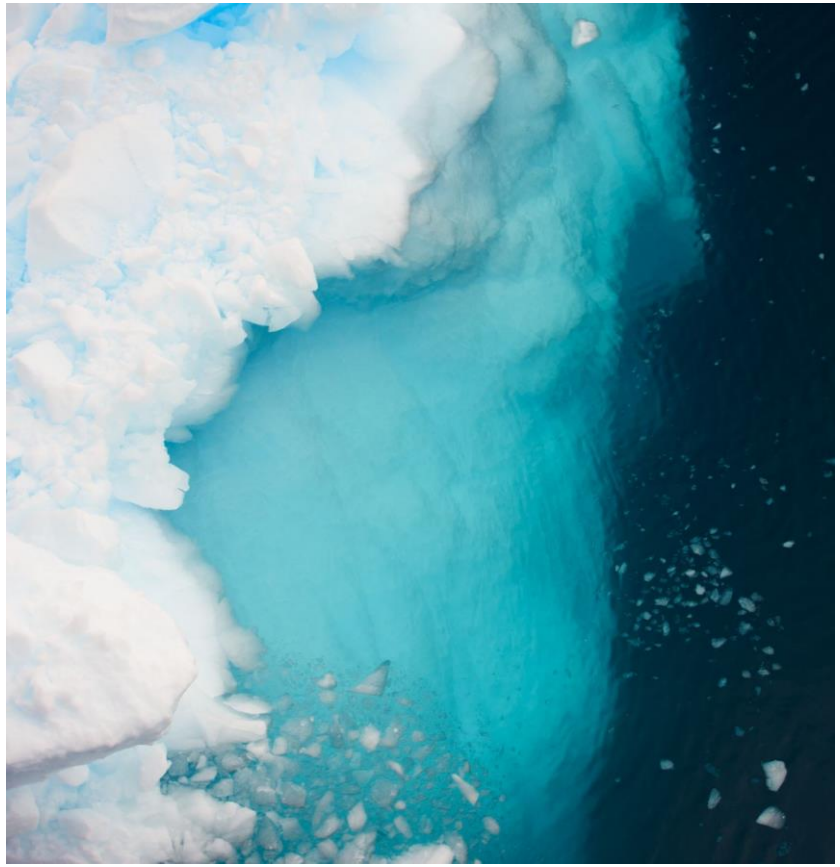
THE IMPACT OF CLIMATE CHANGE ON ROAD INFRASTRUCTURE AND FINANCIAL SUSTAINABILITY

ASAFG PRESENTATION TO THE ARMFA GENERAL MEETING

ABIDJAN, IVORY COAST
13 – 16 MAY 2024

Presentation Outline

- What is Climate Change
- Effects of Climate Change
- Impact of Climate Change on Roads
- Climate Change Impact - ASAFG Examples
- Financial Implications on Road Funds
- Climate Change Adaptation
- Adaptation Challenges
- Way Forward



What is Climate Change

- "**Climate change**" means a change of climate which is attributed directly or indirectly to **human activity** that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. (*United Nations Framework Convention on Climate Change – UNFCCC)*

- Natural factors influence slower changes to climate over time when compared to **human activities**

Effects of Climate Change

The World is experiencing dramatic changes in climate, including:

- Rising temperatures – increases in mean annual temperatures
- Rising sea levels – multiple cases of flooding
- Unpredictable weather patterns – high degree of intra and inter-year variability in rainfall
- Increase in the frequency and magnitude of extreme weather-related disasters

Impact of Climate Change on Roads

- **Widespread damage to road infrastructure – Huge loss of road asset value**

  ❖High temperatures/heat waves reduce the life span of an asphalt road surface; cause traffic related rutting, cracks as well as migration of liquid asphalt

  ❖Rising sea levels can flood and washaway roads. High precipitation make roads to easily develop potholes

Impact of Climate Change on Roads

- **Reduction in the efficiency of roads and inconvenience to road users**

  - ❖Disrupt supply chain, resulting in high cost of materials, food prices etc.
  - ❖Poor roads lead to accidents, traffic jams, increased travel times etc.
  - ❖Damaged roads infrastructure impede access to social services and amenities

Climate Change Impact on Roads in Southern Africa - Examples

Impact of Climate Change on Roads - Zimbabwe

Nkankezi Bridge (connecting Zvishavane and Mbalabala) washaway due to Cylone Dineo induced floods

Tare River Bridge on Gokwe – Siyabuwa Road Effect of Cyclone Idai

Impact of Climate Change on Roads - Mozambique

N6: Beira – Machipanda Road, BEIRA CORRIDOR
Effects of Cyclone Idai

N1: 3 de Fevereiro - Incoluane

Impact of Climate Change on Roads - Lesotho

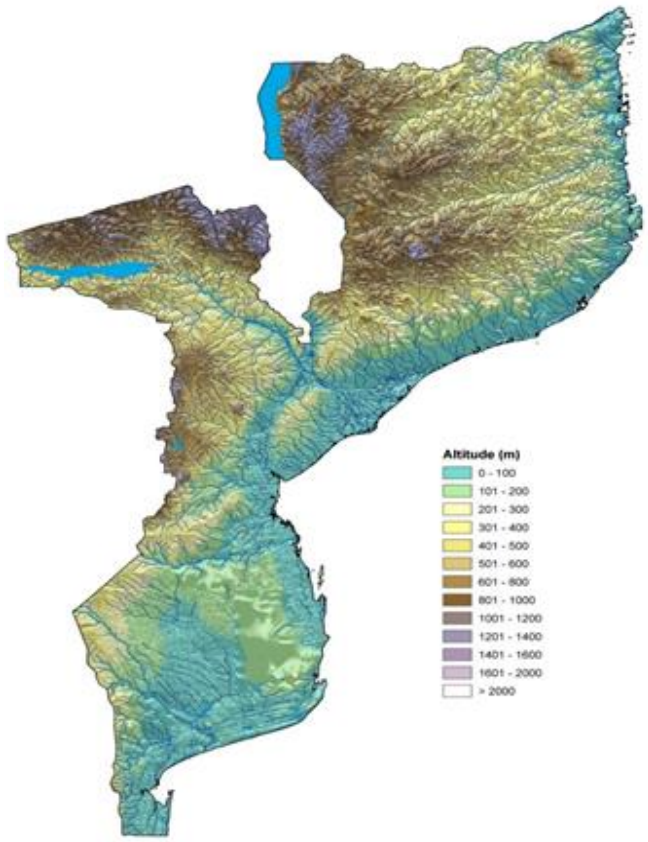
The Case of Mozambique

Countries Most Affected by Climate Change in 2019

Country	Absolute losses (USDm)	Region	Main cause
Mozambique	4,930	Sub-Saharan Africa	Cyclone Idai
Zimbabwe	1,837	Sub-Saharan Africa	Cyclone Idai
Bahamas	4,758	Caribbean	Hurricane Dorian
Japan	28,900	East Asia	Typhoon Hagibis
Malawi	452	Sub-Saharan Africa	Cyclone Idai
Afghanistan	549	South Asia	Flooding
India	68,812	South Asia	Extended monsoon
South Sudan	86	Sub-Saharan Africa	Flooding

***Source**: Global Climate Risk Index 2021, Germanwatch*

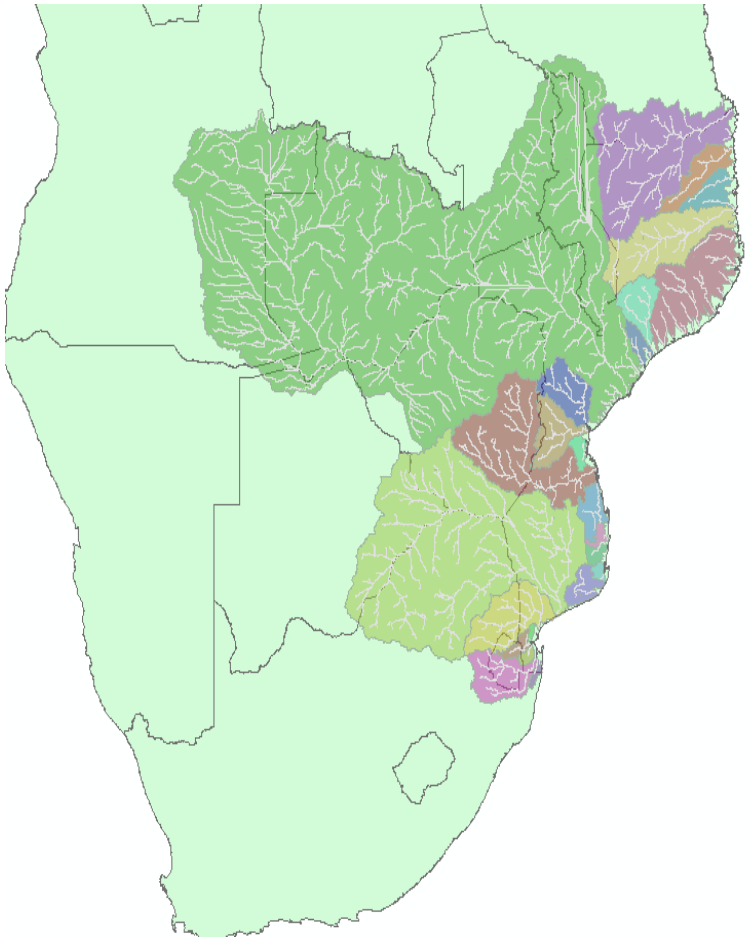
Vulnerability and Permanent Exceptional Risk - Mozambique



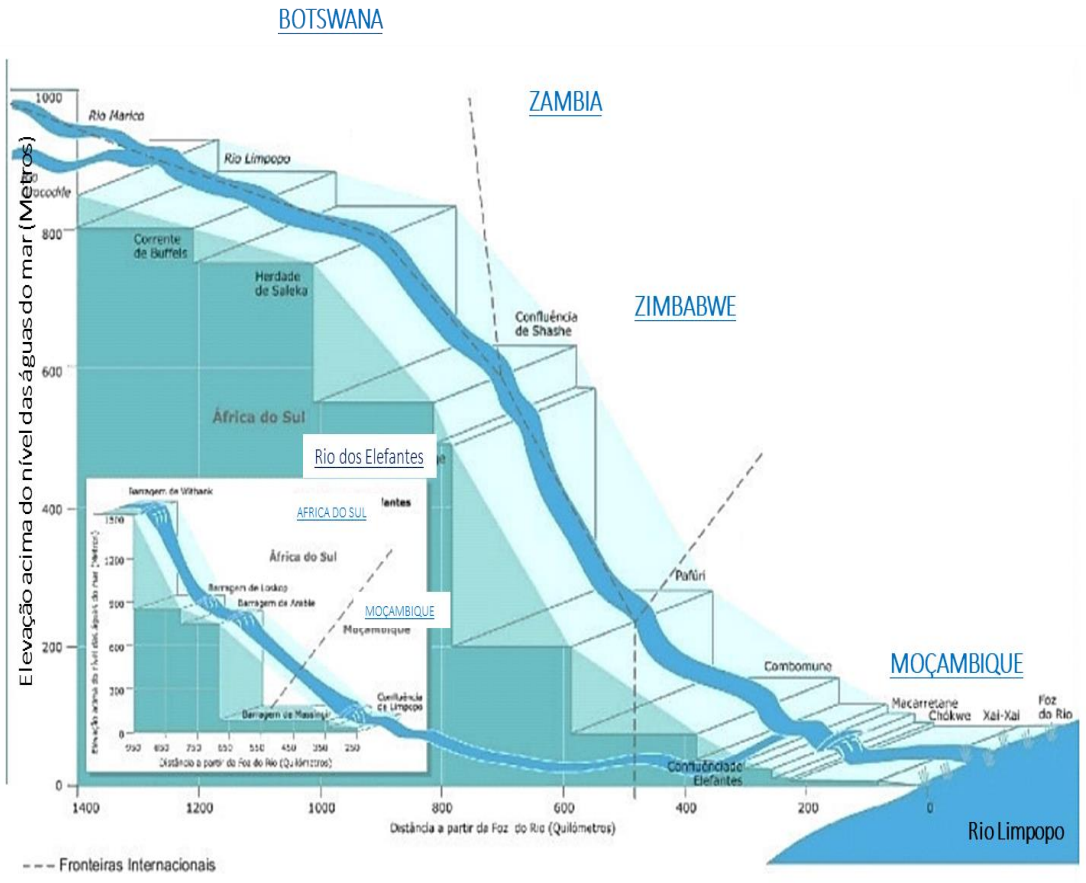
About 40% of the country is in low lying areas at below 200 meters above sea level

50% of Mozambique shares 9 large basins with its neighbouring countries and at a downstream of 8 of them

Resulting in high flood flows from neighbouring countries

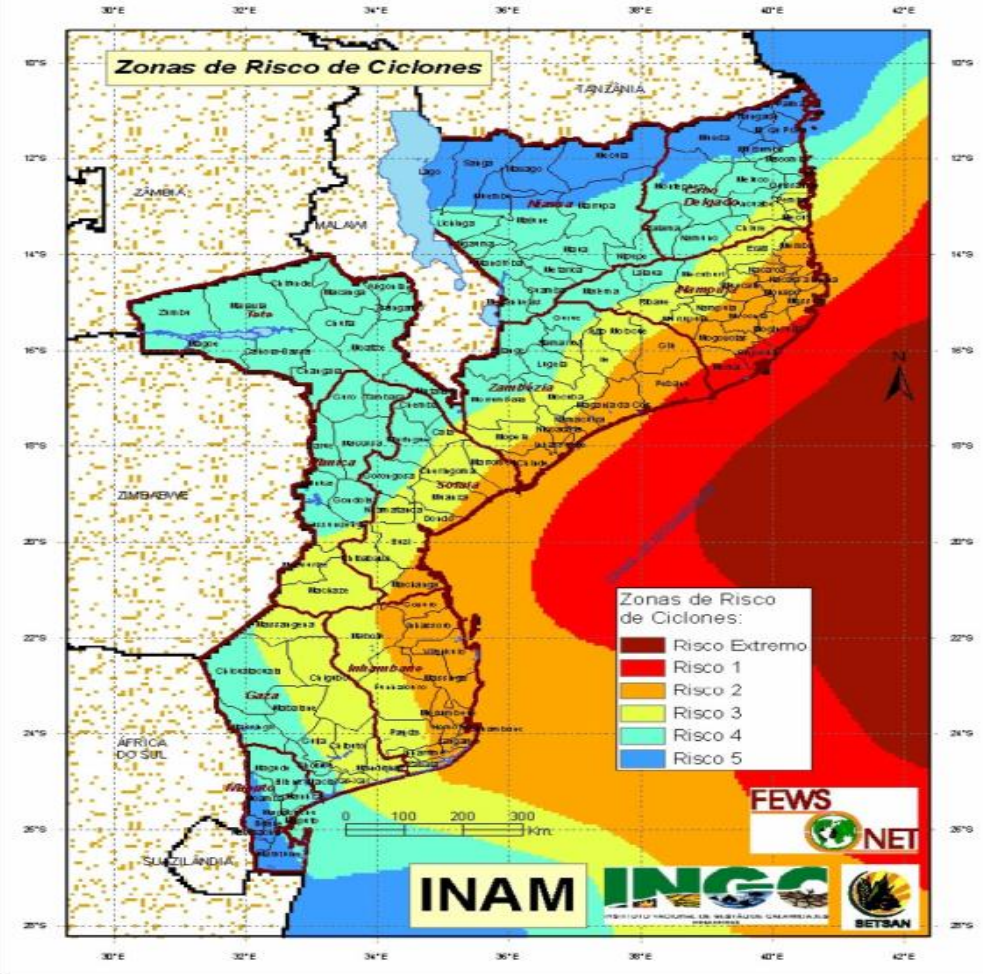


Vulnerability and Permanent Exceptional Risk - Mozambique



Most of the rivers' flows are from West-East, including from the neighbouring countries, creating areas prone for flooding

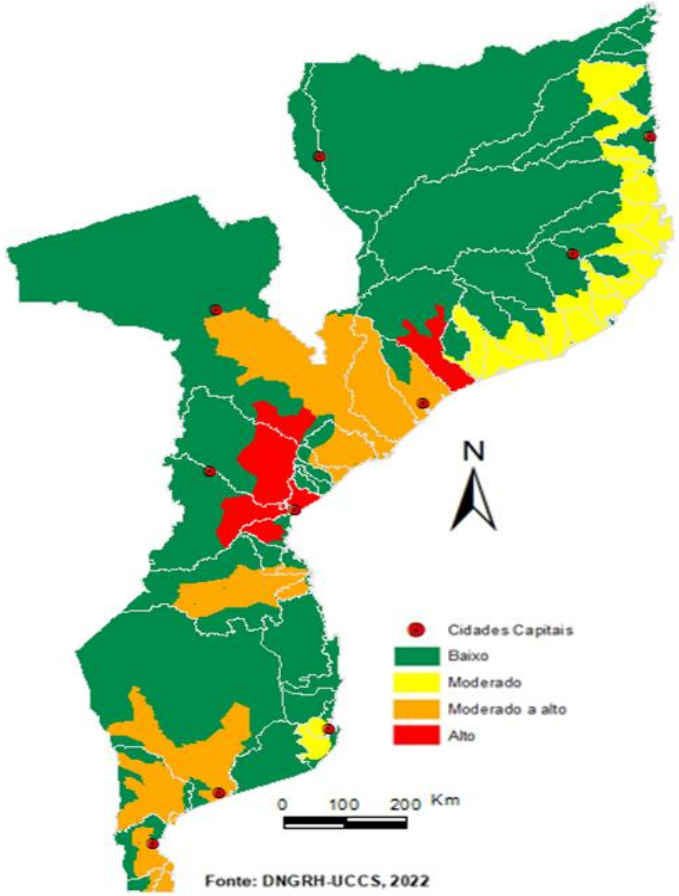
Vulnerability and Permanent Exceptional Risk - Mozambique



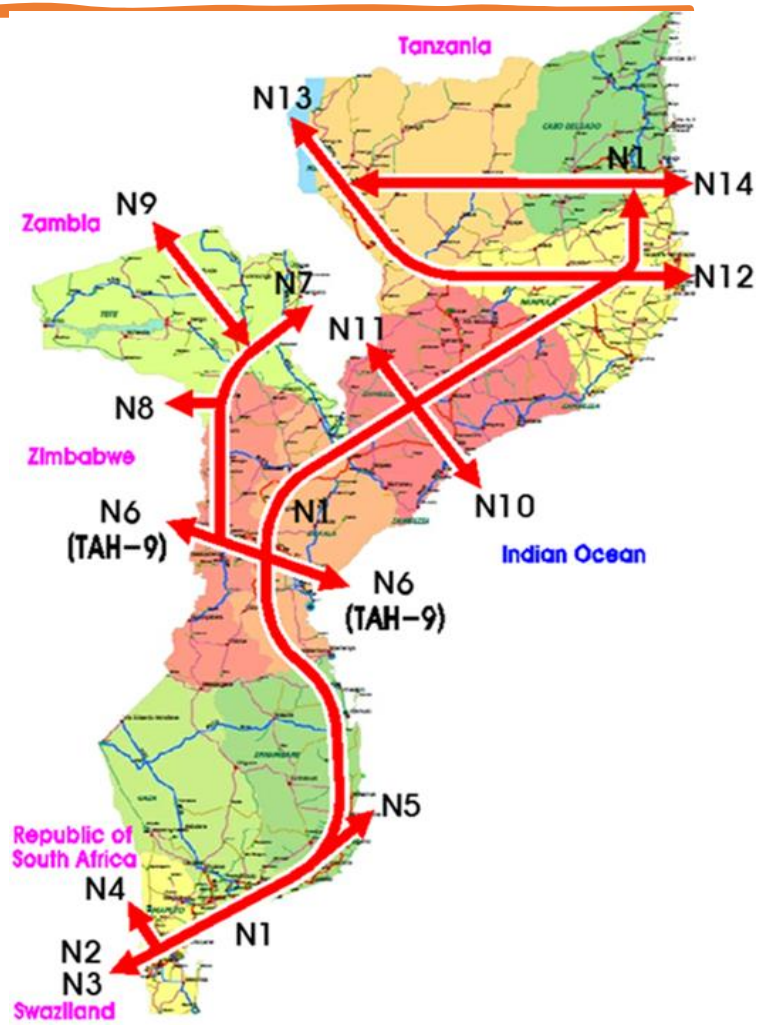
The country has around 3000 km of coastline, facing the Mozambique Channel, where various atmospheric phenomena develop, including cyclones.

Mozambique has since 2019 been affected by 23 cyclones/storms. **The frequency and intensity of cyclones/storms is increasing**

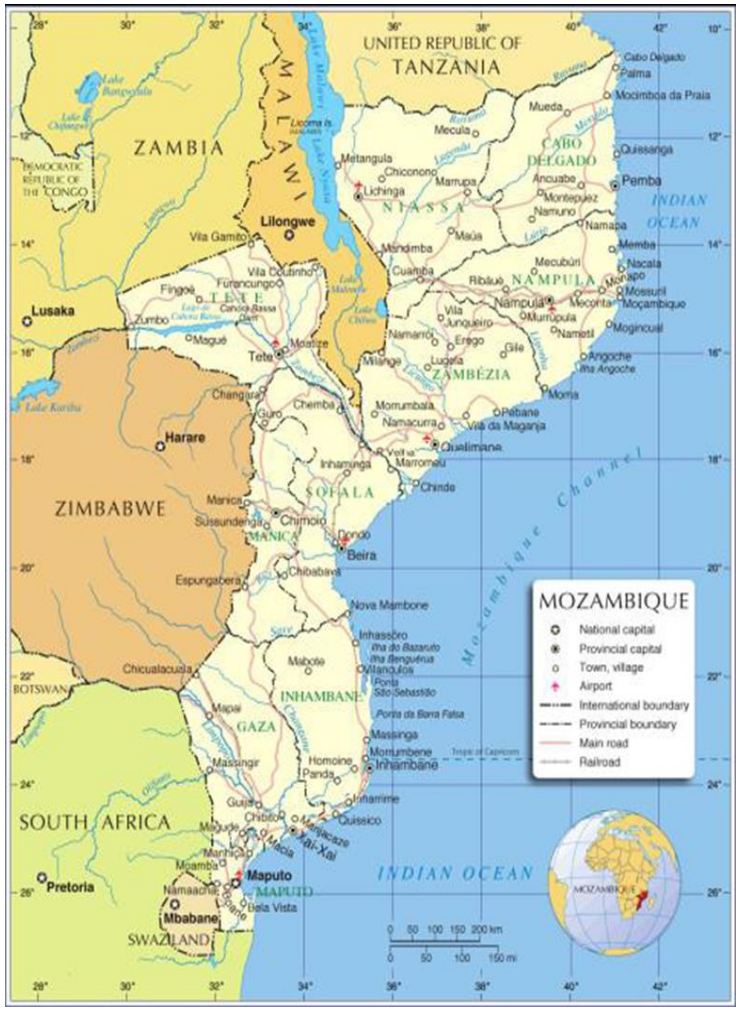
Vulnerability and Permanent Exceptional Risk - Mozambique



The **National Institute for Natural Disaster Management (INGD)** established the following risk maps, where the risk zones coincide with the main national road network and the international corridors



Regional Implications of Climate Change



Climate change is a global phenomenon.

It is at regional level, however, that climate change can be best treated/managed as neighboring countries suffer together.

Mozambique is a regional “HUB” for logistic and international business, allowing hinterland countries to access international markets.

Disruption to Mozambique roads has huge impacts in several Southern African countries.

Financial Impact of Climate Change on Roads Funds

Financial Implications to Road Funds

- **Increased financial needs for restoration works.** Steep increases in costs of maintenance and rehabilitation of repairs, replacements and reconstructions.
- **Emergencies/state of disaster in roads**. Emergency response eats into budgets for normal maintenance/rehabilitation works
- **Budget constraints** – Reduced capacity of the Road Funds to meet the annual road maintenance/rehabilitation needs
- **Huge borrowing** to maintain and repair damages caused to roads because of climate change effects.

Financial Implications to Road Funds Mozambique Example

Mozambique Road Infrastructure Reinstatement Costs

Year	US$ million
2019	51.64
2020	37.15
2021	37.85
2022	287.26
2023	68.83

Impacts of 2022/2023 Rainy Season

Item	Quantity
Km of road affected	13,883
Km of road damaged	5,447
Bridges affected	47
Small bridges affected	26
Culverts affected	282
Drifts affected	29

Climate Change Adaptation

Adaptation Measures

Policy adaptation: Country policies should adapt to climate change at all stages of the project cycle, including land use and green planning

Engineering adaptation: Improvements on design standards, codes, specifications, guidelines, technologies and construction methods

A culture of maintenance: Adequate routine and periodic maintenance of roads is the most efficient way of reducing climate change impacts

Improved planning for roads to accommodate climate changes – including vulnerability maps, climate change screening in EIAs

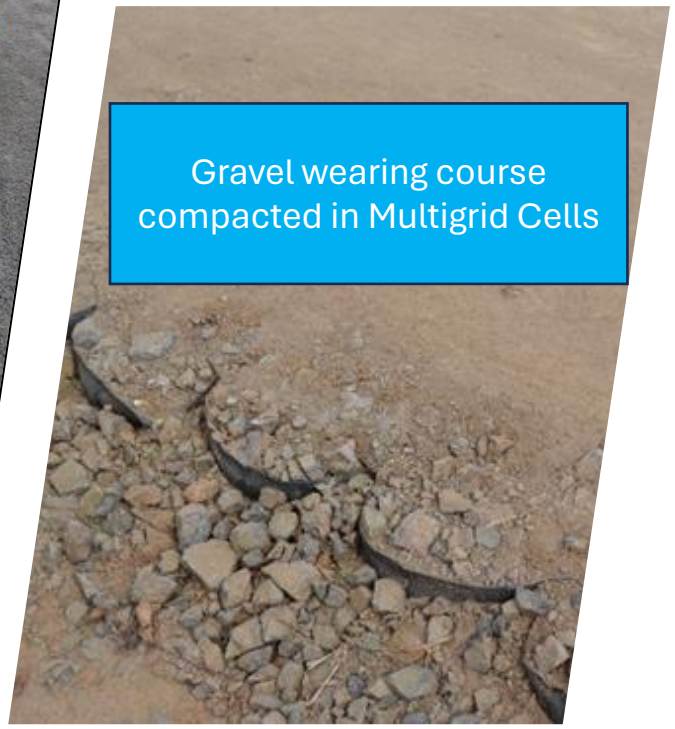
Training and development: Adaptation requires ongoing training and capacity development within road MDAs and training institutions

Adequate Road Maintenance - Examples

Steep gradient concrete paved section

Multigrid Cells

Asphalt surfacing placed on steep sections of the road



Gravel wearing course compacted in Multigrid Cells

Adaptation Challenges in Most Countries

- **Policy gaps**: Gaps in policies that address climate change in the road sub-sector. Policies activation in roads sub-sector has not featured strongly
- **Collaboration**: Lack of in-country collaboration between sectors. Climate science base is largely missing from road MDAs, or its role is very limited
- **Balancing road activities**: Development vs Road preservation ratio, where development is prioritized due to lack of adequate road infrastructure.
- **Inadequate Road Fund resources**: Most Road Fund are unable to meet the annual routine and periodic maintenance requirements of their countries' road networks

The Way Forward

Road Funds Responses

- To ensure adequate maintenance, Road Funds should continuously explore possible revenue streams and introduce innovative and efficient ways of collecting revenue
- Road Funds, working with Road Agencies, should encourage to:
  - ❖ Develop a culture of planned routine and periodic maintenance interventions
  - ❖Embed climate change adaptation in all stages of the life cycle of roads
  - ❖Update and adapt design practices to climate change projections
  - ❖Enhance cooperation between MDAs to address climate change
  - ❖Be partners in climate change adaptation research, training and development

The Fund for Damages and Losses

2009: The richest nations agreed in 2009 to mobilize USD 100 billion annually for a certain period, starting in 2020, to address the damage caused by the climate and some of the contributions were started already.

2022: COP27, which took place in Egypt established the Fund for Damages and Losses to assist developing countries that are particularly vulnerable to the adverse effects of climate change in responding to economic and noneconomic loss and damage associated with the adverse effects of climate change.

The Fund for Damages and Losses

The other purpose of the Fund is to assist vulnerable countries in mobilizing external finance to strengthen their efforts to respond to loss and damage while supporting the achievement of international goals on sustainable development and the eradication of poverty.

2023: COP28, which took place in Dubai in 2023, decided to operationalize the funding arrangements for the Fund for Damages and Losses resulting from climate-induced disasters.

2024: The Board of the Loss and Damage Fund had its first meeting on 31st January 2024.

ARMFA Responses

1. Africa needs supplementary financial resources to face the impacts of climate change. ARMFA should join Governments in lobbying for Green Financing for Loss and Damage Funds to cater for emergencies arising from climate change effects in its member countries.

2. ARMFA, with at least 32 member countries, is a big voice. Lobbying for Loss and Damage Funds needs to be continental.

3. ARMFA should establish a working relationship with the nominated African members in the Loss and Damage Fund Board.

Loss and Damage Fund Board Nominations for Africa

Member	Country	Constituency	Alternate	Country
Richard Sherman	South Africa	African States	Selam Kidane Ababe	Ethiopia
David Kaluba	Zambia	African States	Sumaya Zakiedeen Hamdan	Sudan
Mohamed Nasr	Egypt	African States	Tosi Mpanu Mpanu	D. R. Congo
Djibril Ibila	Benin	The Least Developed Countries	Madeleine Diouf Sarr	Senegal

CONCLUSION

Climate change is bringing uncertainties in Road Funds operations

1. **Likelihood**: We do not know when and where climate induced disasters will hit us, whilst we see them in our neighbours.

2. **Magnitude**: We do not know whether it will be a cyclone, a flood, a heatwave or long periods of drought.

We need to adapt to climate change, NOW!

Thank You. Muito Obrigado. Merci. Asanteni Sana