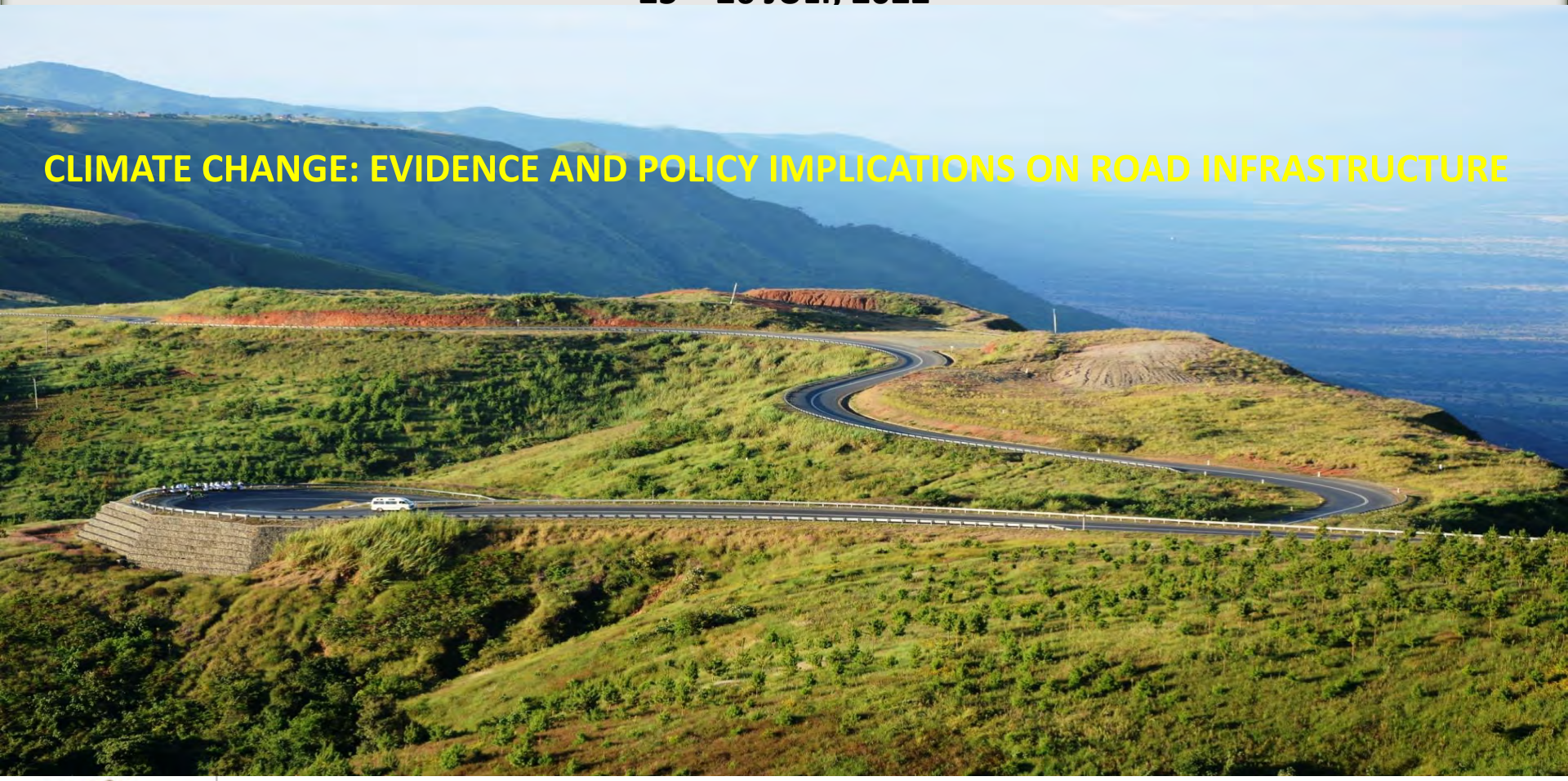
# WORKSHOP ON ADAPTATION OF IMPACTS OF CLIMATE CHANGE IN MANAGEMENT OF ROAD ASSETS

## INSTITUTE OF BANK OF TANZANIA - MWANZA

## 25 – 26 JULY, 2022

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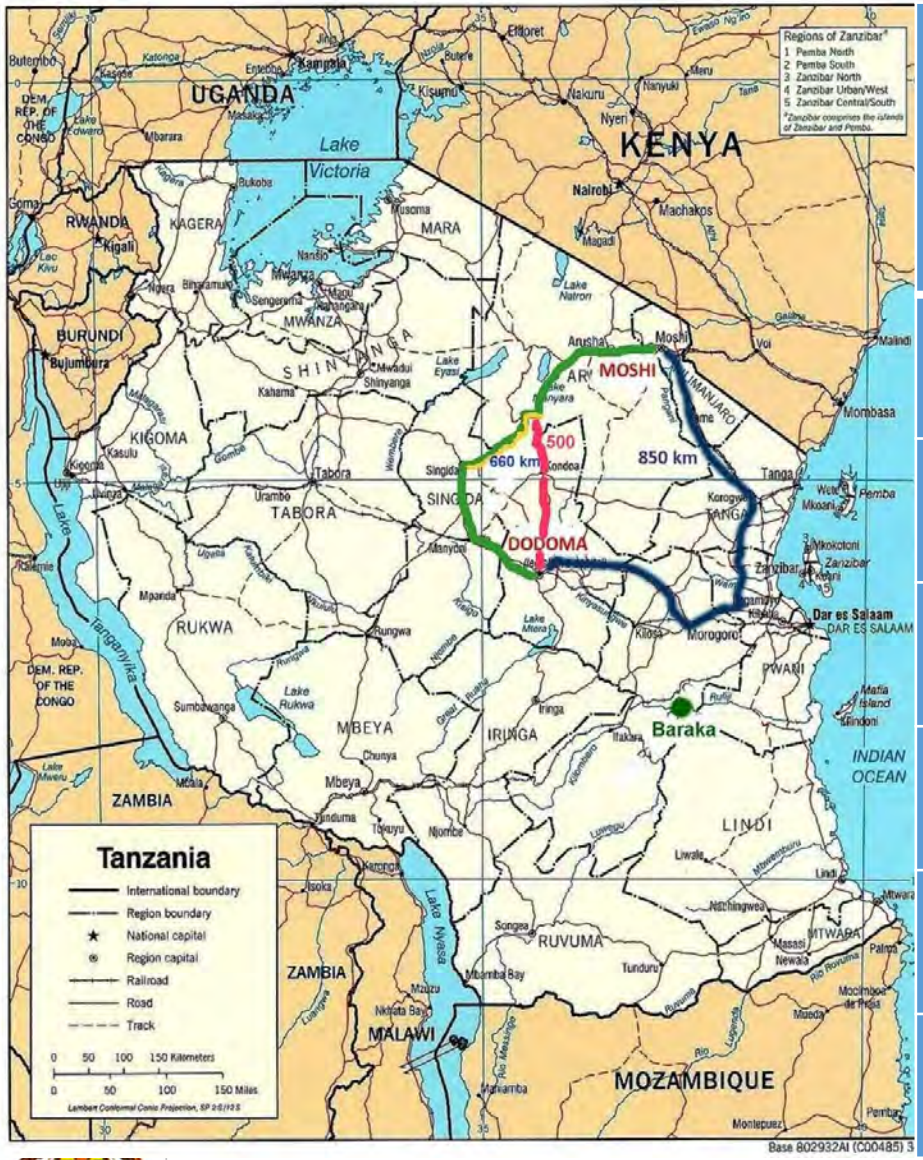
# ROAD NETWORK




| Road Class | Paved Roads (KM) | Unpaved Roads (KM) | Total (KM) | % |
|---|---|---|---|---|
| Trunk Roads | 9,058.2 | 3,157.3 | 12,215.5 | 6.8 |
| Regional Roads | 2,127.94 | 21,512.2 | 23,591.7 | 13.2 |
| Sub-total | 11,186.16 | 25,175.7 | 36,361.95 | 20.0 |
| District roads | 2,250.69 | 141,630.3 | 143,881 | 80.0 |
| Total | 13,436.8 | 166,806.1 | 180,242.9 | 100 |
| % of total network | 7.5 | 92.5 | 100 | |

# Why Impact of Climate Change Critical for the Network?

- ✓ The most valuable public asset
  - ➢ TZS 21 trilion – about 16% of GDP: estimated total depreciated value of the network (2020)

# Why Impact of Climate Change Critical for the Network?

Mostly used means of transport:

- **Over 80% of cargo use road**
- **Over 90% of passangers**


# Large Proportion on Network Vulnerable to Heavy Rains

- Over 92% of network is gravel and earth



# Impact of Climate Change on Road Infrastructure






# Evidence of Impact of Climate Change on Road Infrastructure in TZ

Destruction of road pavement and collapse of pipe culvert and structures along Mtowisa – Ilemba road section. Road closed

# Evidence of Impact of CC .. contd

Damage of Ntendo Muze Rd Section by landslide (Sumbawanga)

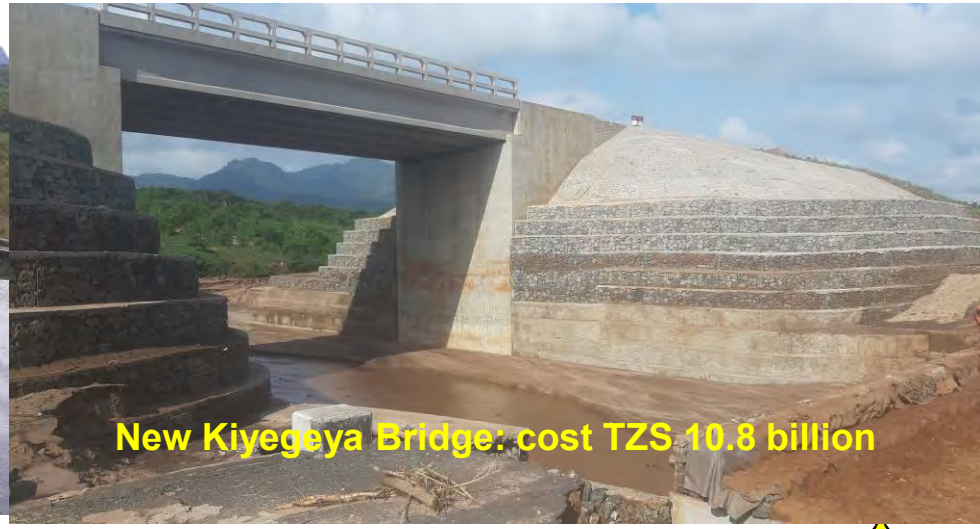
Collapse of Kalumbaleza Box culvert approaches - road closed (Rukwa)

# Evidence of Impact of CC .. contd

Washed away road embankment at Sindeni along Korogwe – Handeni Road in 2019

Reinstated of the road embankment at Sindeni cost: TZS 907.06 million

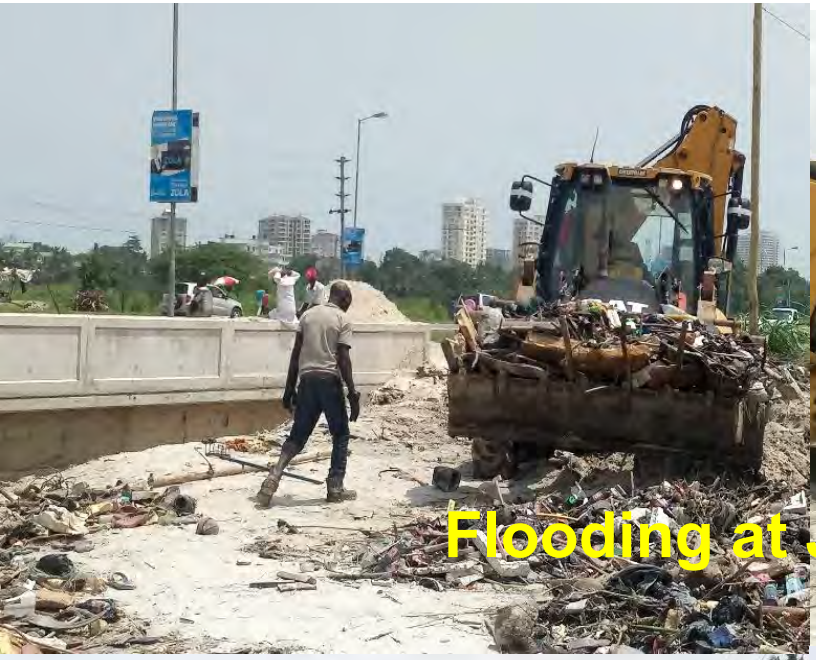
Washed away of Kiyegeya cross drainage structure along Morogoro – Dodoma Rd in March 2020



New Kiyegeya Bridge: cost TZS 10.8 billion

# Evidence of Impact of CC .. *contd*


# Evidence of Impact of CC .. *contd*



Flooding at Jangwani Area - DSM

About TZS 4 billion is spent on urgent restoration

# Evidence of Impact of CC .. *contd*

Kitumba/Mirumba bridge along Katete – Kibaoni (Katavi)

Doma Bridge in Morogoro along TANZAM Highway

Sitalike – Kasansa

# Impact of high Temperature on bituminous layers

- Forensic investigation **conducted (2014) to determine causes of premature failures of bituminous layers.
- Temperature plays a key role in durability and rut resistance of mix.
- Temperatures >45°C decreases shear resistance of an asphalt wearing course due to softening of the binder

- High temperatures under high traffic loading conditions, and if not taken into account, lead to a poor asphalt mix design, and subsequently to severe rutting if wrong types of binder and aggregate skeleton are specified.

***Council for Scientific and Industrial Research, TANROADS and CML*

# Economic and Social Losses

- *Increase disruption time of road networks;*
  - *More critical in case of bridges*
- *Shorten rehabilitation life-cycle;*
- *Increased costs - repair, replacement and rehabilitation;*
- *Huge loss of asset value; and*
- *Reduce efficiency of road transport/competitiveness*

- *Impede access to social services – hospitals and schools*

- *Affect urban mobility*

*and access in rural areas*

- *Disruption of supply chains:*
  - ✓ *High input prices*
  - ✓ *High food prices*

# Adaptation of Impacts of CC on Rd Infrastructure

Two responses:

**i. Reactive response (inaction)**

- Disadvantage: additional maintenance and repair made necessary by cc

**ii. Proactive Adaptation**

- involves changes to road design standards and investments in more resilient construction
- **Advantages:** reduction of financial costs of maintenance and repair/replacement and reduced road disruption

- Decision making considering road disruption effects: compare risks of inaction with benefits of proactive adaptation action

# Importance of Scheduled and Adequate Road Maintenance

- Scheduled and adequate maintenance is the f**irst defense to climate risks**
- **Is the** most critical and most efficient way of reducing impact of cc on the road network.
- Delayed maintenance increase chance of failure and thus increases risks.
- Main interventions are:
  - ✓maintenance of pavements and sealing activities;
  - ✓regular maintenance of bridges, culverts, and drainage structures;
  - ✓maintenance and improvement of slope protection works; and
  - ✓systematic assessments to identify and incrementally address vulnerable and critical road sections.

# Some Policy Options for the Adaptation

| Policy Overview | Policy Description/Question |
|---|---|
| Develop appropriate model outputs – e.g. flood models | Integrate climate data and projections, and more information into transport planning<br>• Currently the TRRL EA Flood Model (1976) is used. Qn. Is the model still valid? Or its inputs appropriate? Need for review? |
| Identify inventory assets | Is inventory of road network and structures in place, locations that are vulnerable to cc impacts documented and plans for appropriate interventions in place? Is important information for structures available?<br>• What are response options for sedimentation prone areas like Jangwani area, Mkapa bridge (Rufiji) and Mkundi bridge (Dumila)? |
| Support decision making | Is modelling and adaptation planning tools available to Agencies to help identify vulnerability? |
| Expand planning timeframes | Possible for Agencies to incorporate effects of longer-term cc into planning processes? |
| Documentation of cc related events | Are events properly documented? Reasons? Measures taken? |

# Some Policy Options for the Adaptation …… *contd*

| Policy Overview | Policy Description/Question |
|---|---|
| Consider land-use | Multi-sectoral collaboration to influence land use decisions and avoid inappropriate devt in high-risk areas (up-steam and catchment areas).<br>✓ *Is land-use issue in relation to road transport discussed during Regional Road Board meetings?*<br>✓ *Enforce limit of human activities 60 meters from river banks* |
| Develop new design standards | Is it time to consider new design standards and codes to incorporate projected cc? |
| Update regulations | Consider requirement for cc adaptation screening in EIA? |
| Plan for emergency preparedness | Are cc strategies to integrate emergency responses into road transport design and operations in place? |
| Regular and systematic inspection of structures | Is the inspection properly planned and implemented? |
| Maintenance and repairs stages | Is maintenance plan properly developed at design stage to address concerns associated with accumulation of debris, overtopping, aging etc.?<br>Is there any maintenance policies established? |

# Conclusion

- ✓ Road infrastructure is the most valuable public asset
- ✓ Is the most used mode of transport for passengers and cargo
- ✓ However, large part of the network (gravel & earth) is susceptible to impact of cc
- ✓ Impact of cc on the network cause huge economic and social losses
  - ➢ Loss of asset value
  - ➢ Repair and replacement costs
  - ➢ Disruption of supply chains and access to social services
    - High input prices
    - High food prices
    - Limited access to schools and hospitals
  - ➢ Reduced competitiveness of trade corridors and competitiveness of the economy

# Conclusion … *contd*

✓There are two responses: reactive response (inaction) vs proactive response (adaptation).

- Proactive adaptation is most cost-effective option
- reactive response - additional maintenance and repair made necessary by cc

✓Scheduled and adequate maintenance is the first defense to climate risks - the most critical and most efficient way of reducing impact of cc on the road network.

✓Important therefore to discuss and agree on appropriate policy options for effective **PROACTIVE** adaptation of impacts of cc on roads infrastructure.

# ASANTENI

# SANA