

**SANRAL**



BUILDING SOUTH AFRICA  
THROUGH BETTER ROADS

South Africa

**COTO**

Committee of Transport  
Officials

**TRH24**

# UPGRADING OF UNPAVED ROADS

## 50th Road Pavements Forum

16 May 2023

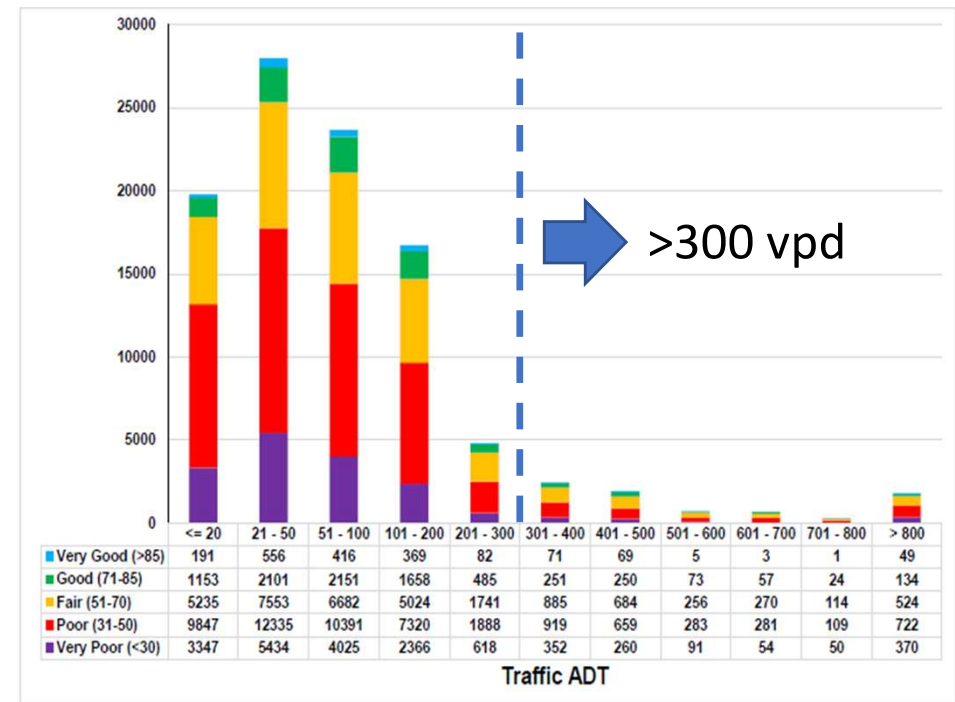
Gerhard Fourie



# Problem Statement

**A reliable surfaced road network is a prerequisite for economic development**

- SA network ~ 850 000 km ( ~ **700 000 km** unsurfaced)
- Unsurfaced road network is **poor condition**
- **Dated design standards** that are **inappropriate**
- **Diminishing natural recourses**
- Lack of available funds
  - In **2013 over 10000 km** of existing gravel roads identified with daily traffic above 300 vehicles per day, which is traditional economic threshold for surfacing a gravel road @ **R10 million per km** this translates into Budget need of **R100 bn.**
- **Applying dated standards/design/materials utilisation** methods: **> 150 years** to upgrade to surfaced standards





## Potential Benefits

- Surfacing of this gravel network urgently **needed** to:
  - **Improve community access** to vital services, markets, etc.
  - **Decrease the damage to goods, vehicles, etc.**
  - **Create employment opportunities and SMME development**
  - **Allow for equal opportunities – opening of markets**
- Surfacing of this gravel network will **require**:
  - **Review of Current approaches -1980s**
  - Drafting **Applicable standards** based on new material technologies
- **New material technologies** has **potential** to reduce surfacing costs **by > 50 %**. (From R10m down to R 3m-R4 m per km)

## Background

- Concept project initialised by the **Presidential Infrastructure Coordinating Commission Council (PICC)**
  - Strategic Integrated Project (SIP) No 26: Rural Roads Upgrade Programme (GOVERNMENT GAZETTE, 24 JULY 2020)
- **SANRAL** appointed as the **Implementing Agency**
- **SIP** subsequently incorporated into SANRAL's research projects, resulting in dual objectives.
- PICC identified **7 x Pilot Projects** to be used as trials

# TRH 24 = A NATIONAL DOCUMENT

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GOVERNMENT



Province of the  
**Northern Cape**  
REPUBLIC OF SOUTH AFRICA



**Western Cape**  
Government

# Authors/Team Members



## SANRAL Project Manager

- **Gerhard Fourie**

## Team of experts

- Prof Wynand Steyn (Research Team Lead)
- Prof Gerrit Jordaan
- Prof Don Ross
- Prof. Phil Paige-Green
- Dr. Matthew Townshend
- Mr Gerrie van Zyl





## Project main objectives & deliverables (PICC)

- **PRIMARY GOAL:** Cost-effectively improve the provision of rural roads via methods that maximise employment and SMME development.

The PICC's primary project objectives are to produce:

- **Technical Guidelines** applying **economic principles** to prioritise the network of rural gravel/earth roads for upgrade to surfaced standards, and
- **Technical Guidelines** on **best practice and new technologies** (i.e. nano stabilisation) that **reduce the cost** to upgrade gravel/earth roads to surfaced standards, enabling the same budget to:
  - **Accommodate more kilometres** of gravel/earth road upgrades to a surface class; and
  - Reduce the Annual Daily Traffic (ADT) – **socio-economic factors** threshold at which it becomes financially viable to conduct such upgrades.

## Project objectives & deliverables (SANRAL)



- **Map and classify the road network**, using the Cost-Effectiveness Analysis (CEA) road classification system
  - New classification and prioritization strategy for all unsurfaced rural roads in SA
- **New/update procedures**, guidelines, manuals (National), e.g., **TRH24**
- **Appropriate standards & specifications**
- **Implementation of NME research** and other modifiers (RT3.6 link)
- Promote **training and development** (Labour & SMME's)



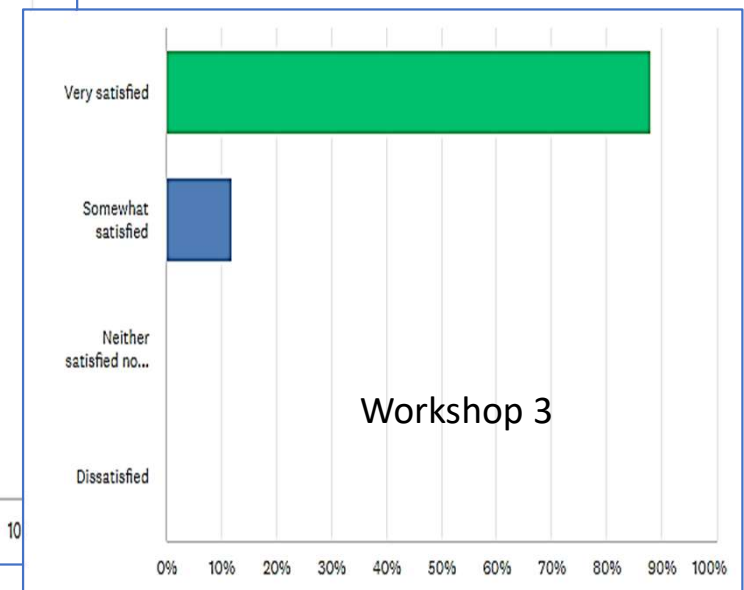
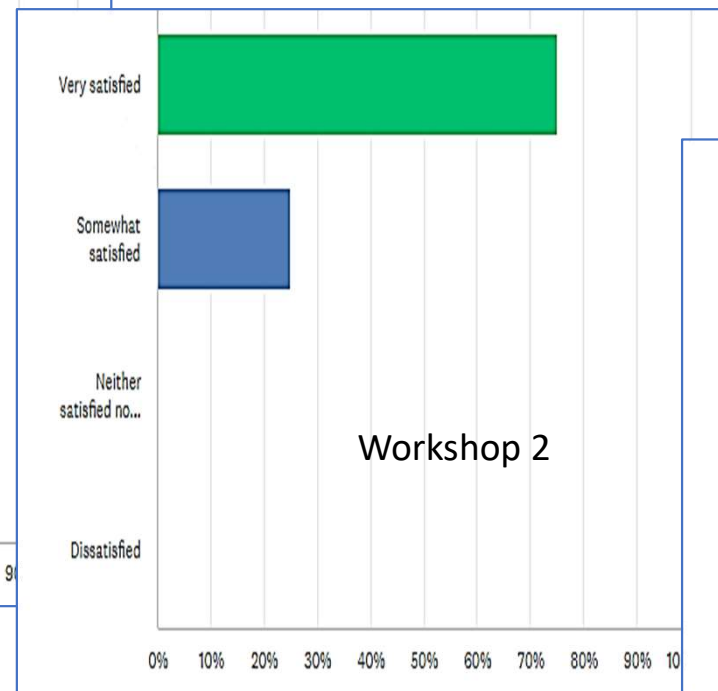
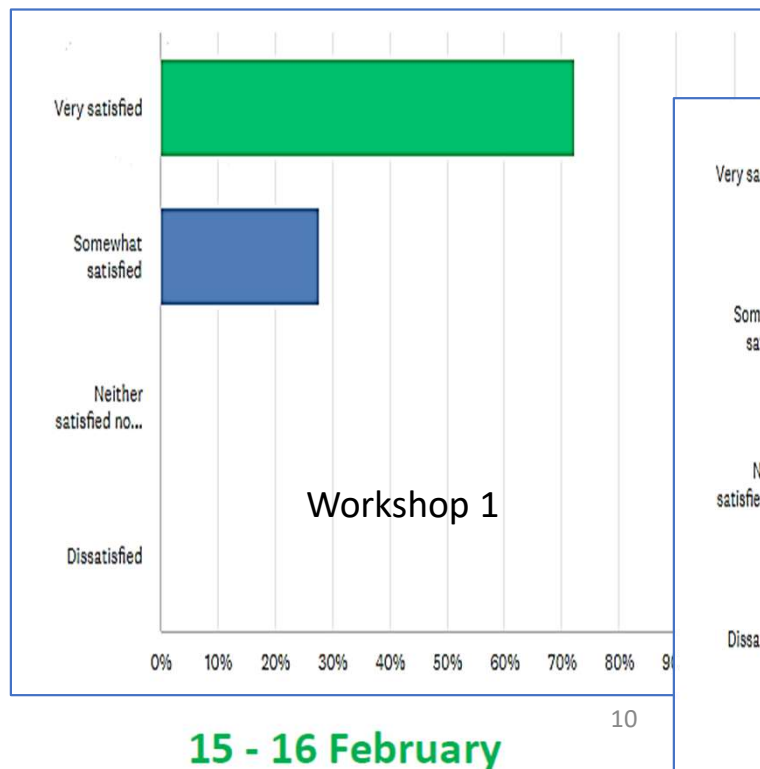
# Programme (Milestones)



- Starting date: Final Approval **November 2021**
- Draft TRH24 documentation: **March – Nov 2022**
- **Technology Transfer** - design & Pre-constr. Economic benefit study: **Feb./March 2023**
- **Pilot Project implementation (7 Projects): Aug.2022 - Feb.202(3)/4**
  - Dependent on procurement of contractors
- **Document update & Technology transfer & Post-constr. Economic benefit study: May 2023 & Oct. 2024**
- Materials design, specifications and implementation of certain technical aspects already taking place
- **National roll-out: March 2023 / Aug 2024**
- **Continued Technology transfer, training and SMME empowerment**

# Technology Transfer – feedback

- 4 x Technology transfer events : December 2022 – March 2023
  - **695 attendees**
  - **2023 – 3 Workshops**
    - **How Satisfied are you with the knowledge you gained throughout the workshop**



## Download TRH24



- The new TRH24 can be downloaded from the SANRAL website at:

[https://www.nra.co.za/sanral-downloads/detail/TRH24-Upgrading-of-Unpaved-Roads?region\\_id=national](https://www.nra.co.za/sanral-downloads/detail/TRH24-Upgrading-of-Unpaved-Roads?region_id=national)

# TRH 24 Upgrading of Unpaved Roads



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## Chapter 1 – Rec. approach

≈ 500 pages !!



TRH 24

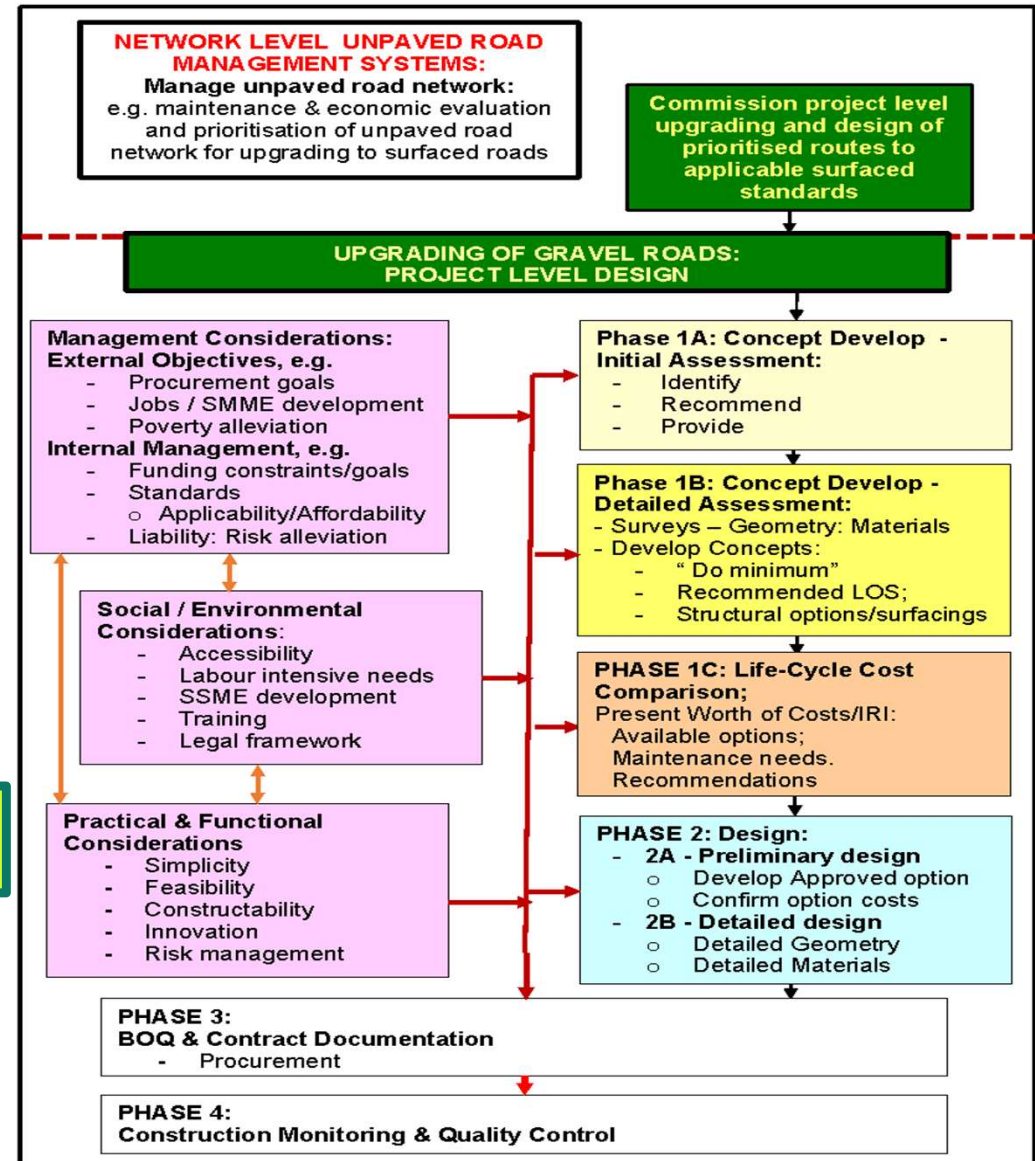
### UPGRADING OF UNPAVED ROADS

Committee Draft 1.0

November 2022

Manual is largely limited to the upgrading (surfacing) of roads carrying less than about 300 vehicles per day (vpd).

Committee of Transport Officials



# TRH 24 Upgrading of Unpaved Roads

## Chapter 2:

- **Economic factors – socio-economic factors (exogenous influences)**

to be applied for the economic evaluation, identification and prioritisation of unpaved Roads (LVRs) earmarked for surfacing, e.g.:

- benefits to communities
  - All-weather access to markets, schools, health facilities, etc.
  - Less damage to transported goods;
  - Improved development of labour opportunities and SMMEs



# TRH 24 Upgrading of Unpaved Roads

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## Chapter 3:

Recommendations towards applicable

- **Levels of Service (LOS),**
- **Geometric standards,** and
- **Drainage requirements**

as a function of the Category of Road within the broader concept of the Upgrading of Unpaved Roads



LOS classification facilitates cost savings resulting from:

- Reduced but appropriate geometric standards
- Shorter design life;
- Optimising the use of in situ and local materials;
- More effective pavement design, and
- Low-level cross-drainage structures.



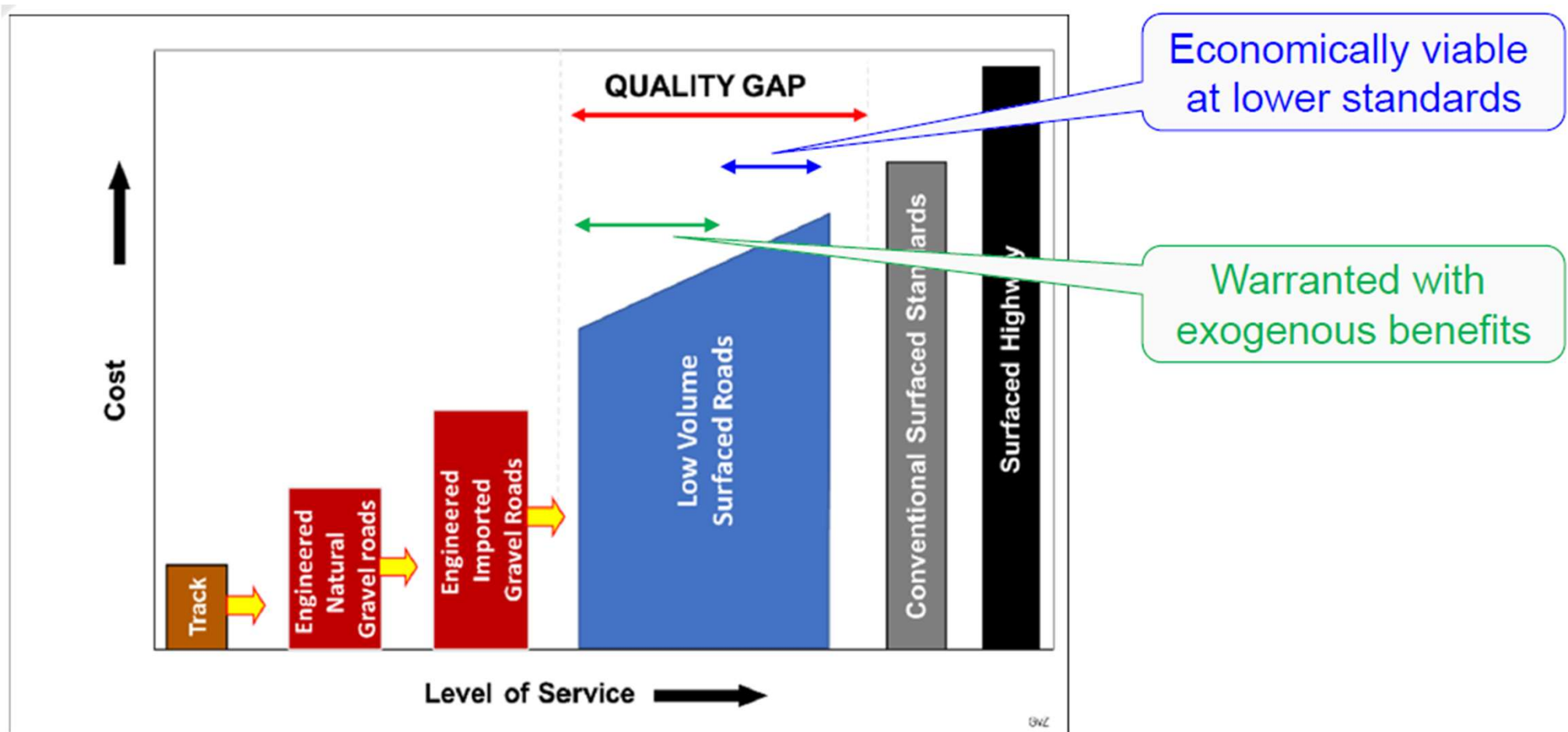


# Bridging the quality gap

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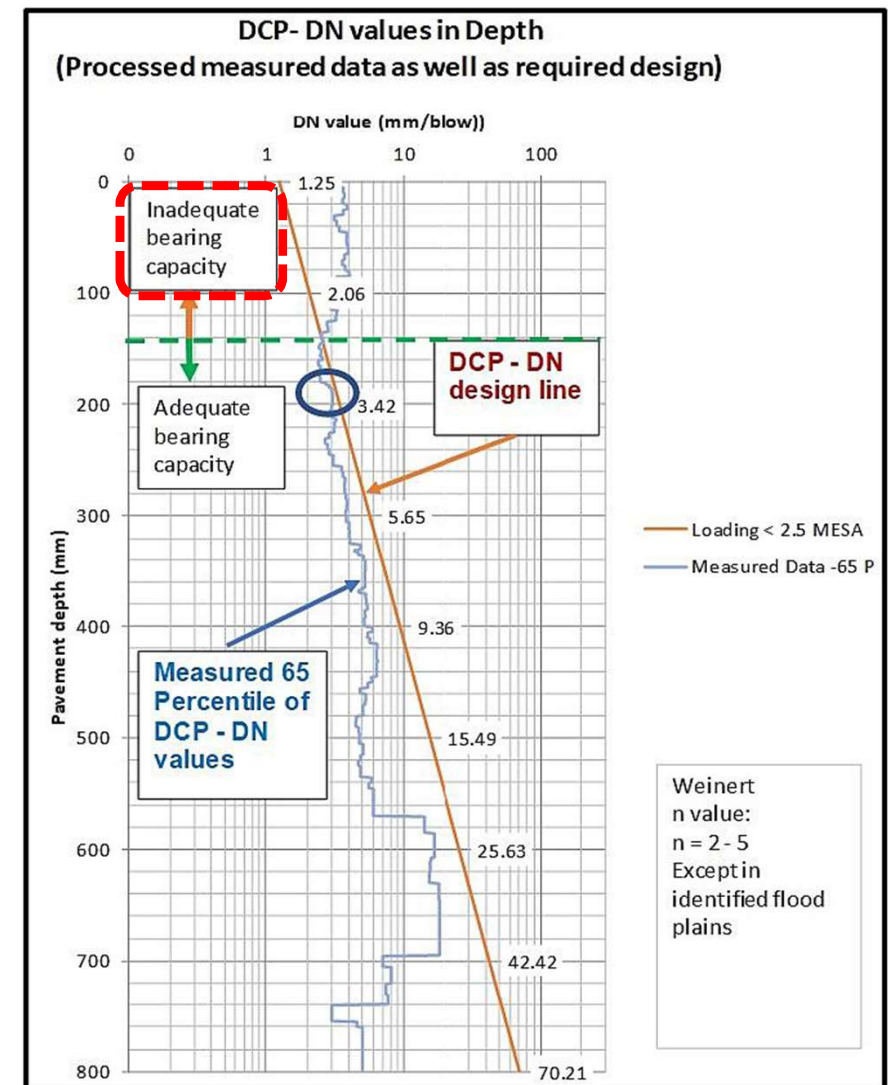
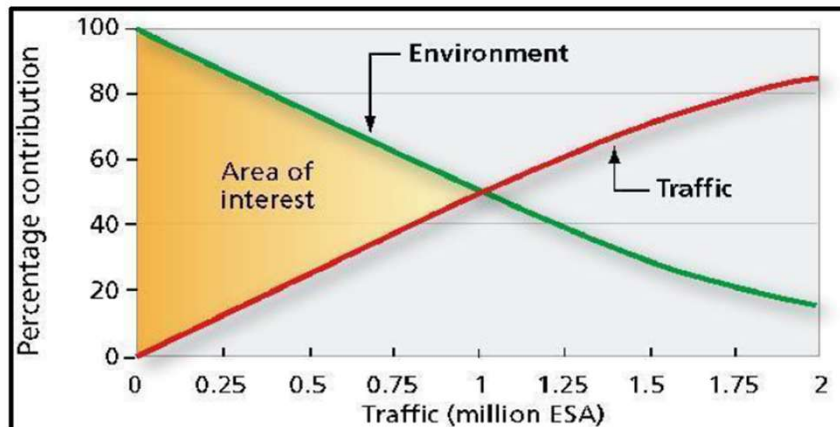


## TRH 24 Upgrading of Unpaved Roads

### Chapter 4:

## Pavement: Structural Evaluation & Design Methods

- **DCP-DN design methods –**
  - **2 Approaches** for the assessment of in-situ bearing capacity of existing routes (< 1 MESA >)
- **Materials testing**
- **Environmental factors**



# TRH 24 Upgrading of Unpaved Roads

## Chapter 5:

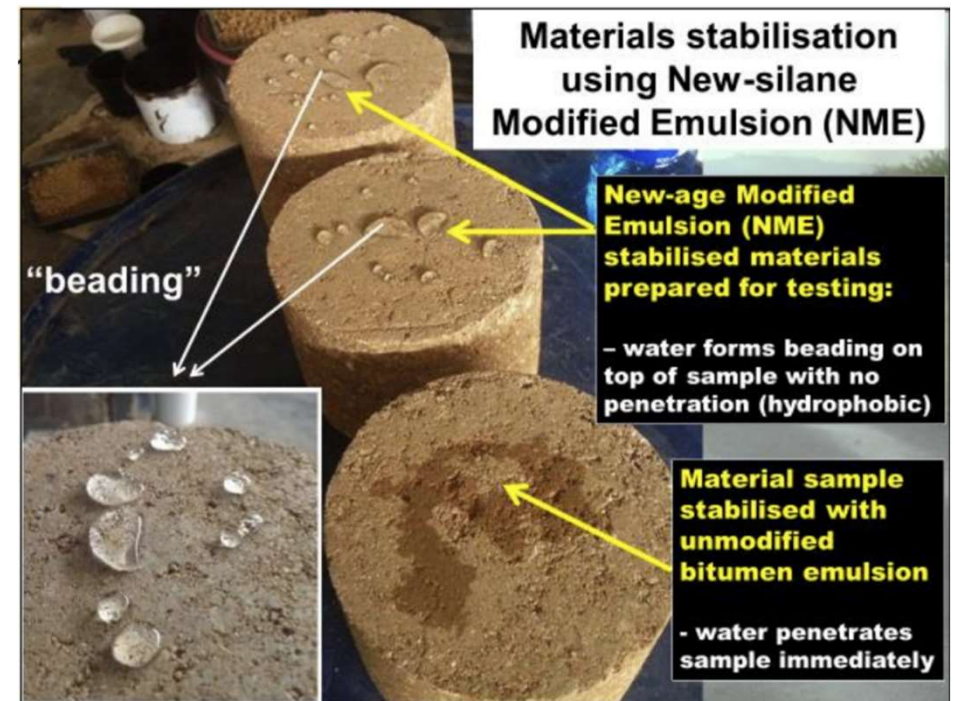
### Optimisation of naturally available materials

- **New Modified Emulsions (NME) technologies**

that negate the influence of

- **Environmental factors**
  - Use at normal temperatures (no heating)
  - Result in climate resilient materials;
  - End product resistant to water influences and formation of deep pot-holes.
- **Not sensitive to overloading,**
- **Optimisation of naturally available materials;**
- **Optimisation of costs**

### Hydrophobicity





# TRH 24 Upgrading of Unpaved Roads

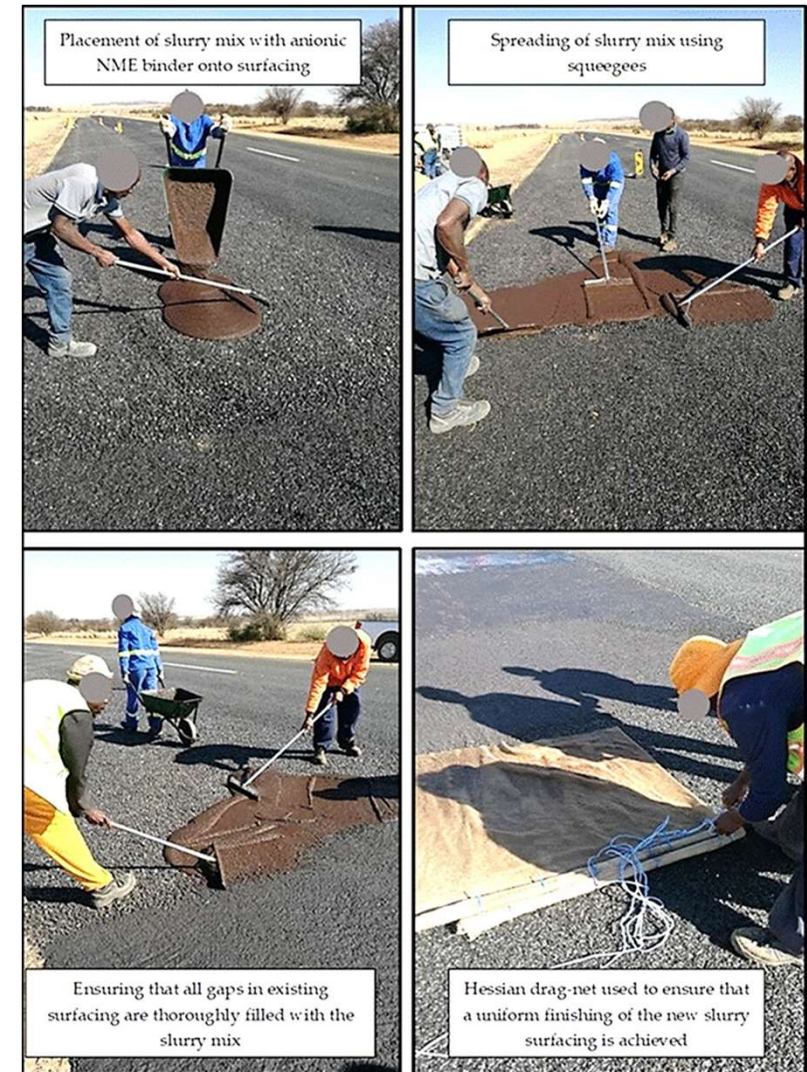
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## Chapter 6:

- **Selection and design of applicable protective surfacings,** with the emphasis on environmental resistance, labour intensive applications and cost-effectiveness




# TRH 24 Upgrading of Unpaved Roads

## Chapter 7:

Recommendations towards required

- **Maintenance actions**
- **Optimisation of labour/SMME opportunities**



Road surface integrity compromised beyond Periodic Maintenance stage with cracking, patches, surface disintegration and new potholes – requiring intensive restoration

1  
Step 1: Restore hydrophobicity of surfacing through a NPNS clear-seal

2  
Step 2: Repair existing potholes with an anionic NME mix Pothole repair with a proven strength and hydrophobicity

3a  
Step 3: Restore localised deformation and crack-filling with a uniformly anionic NME slurry mix, providing a hydrophobic seal

3b

3c

# TRH 24 Upgrading of Unpaved Roads

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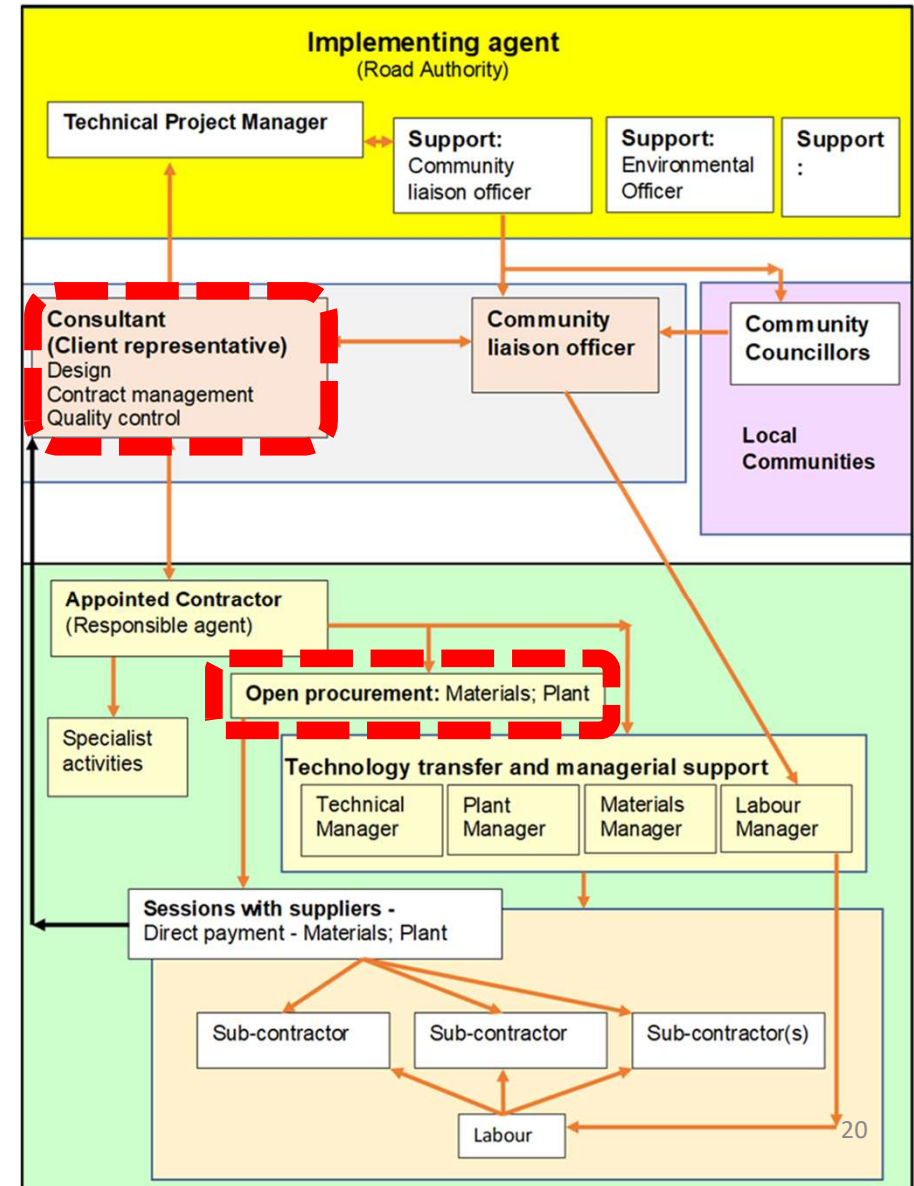


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## Chapter 8:

### Recommended method of contract:

- **End Product Specifications**
  - Prevent use of inferior products
  - Protect integrity of end product (road)
  - Reduce risk to road authorities





# Basics of “End Product Specifications”

## Specifies:

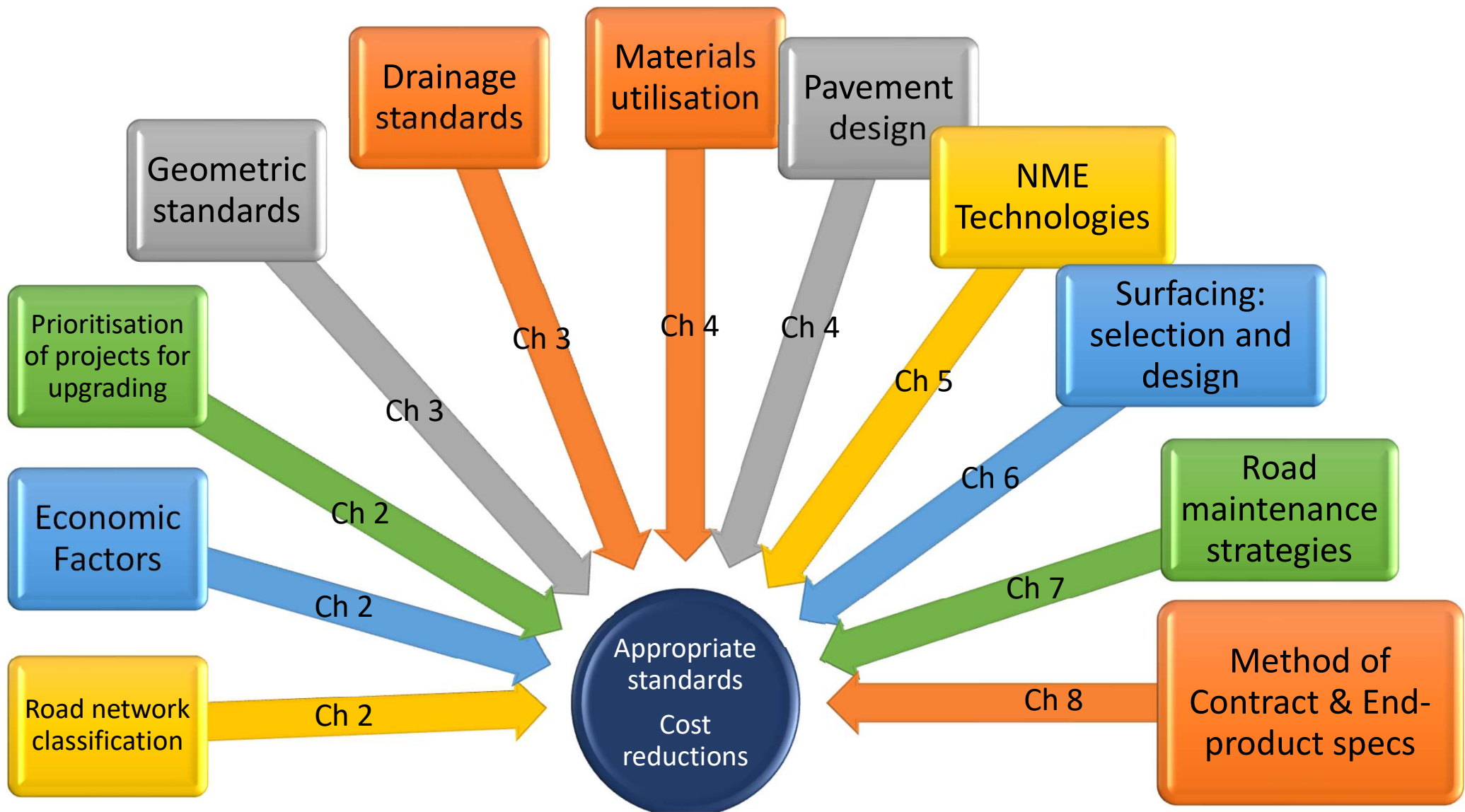
- **Environmental impact and toxicity** (safety sheets – verification)
  - **By-products** generated during **Hydrolysis And Consolidation**
- **Minimum stability period on site under harsh conditions:**
  - At least 4 months without signs of separation
  - At least 4 months without Increase in viscosity
- **Ease of use:**
  - Mixing with construction water
  - Use at ambient temperatures (winter and/or summer)
  - Limited contamination
- **Prove of concept (MC-NME) to be provided:**
  - Prescribed test procedure – NO variations from specifications
  - To be verified
- **Costs per volume of material to be treated (after compaction)**
- **Ease of quality control:**
  - Testing on site

# TRH24 = Holistic Approach

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## Conclusions/Challenges

- **Appropriate specifications and New material technologies have the potential to reduce upgrading costs by > 50 %.** (From R10m down to R3 – R4m per km)
  - More km surfaced with same budget
  - Local Labour maximization
  - Road user cost reduction
- **Potential Challenges:**
  - Procurement processes to be followed;
  - Community issues
  - Design approach requiring expedition of outputs not familiar in industry – **traditional** vs. **new cost-effective** approach;
  - Technology Transfer must include the revisiting of entrenched design approaches within **Road Authorities** to expedite project design and approval and focus on:
    - Applicable standards;
    - New cost-effective technologies, and
    - Development of opportunities for employment and SMME development



THANK YOU



QUESTIONS?

