

# Road Rehabilitation the Green Way

## Main Road 398-1: Umhlanga to Umdloti

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**Mahendren Manicum & Devan Govender**  
Naidu Consulting



**Client**



**Contractor**



**Consultant**



# Government's 2030 Vision

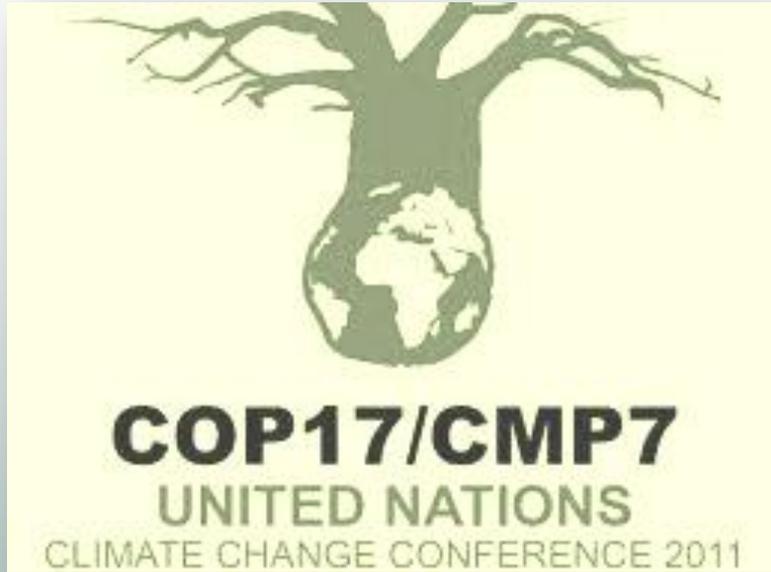
## The National Development

**Plan** is a primary response strategy to:

- Reduce unemployment (currently 28%)
- Reduce carbon emissions
- COP 17



# The Department of Transport's Vision



# Commitment

- Promoting innovation by allowing reclaimed asphalt and maximising in-situ treatment of layers.
- Innovative use of modifiers in asphalt.
- Experimenting with warm mix asphalt and high modulus asphalt.



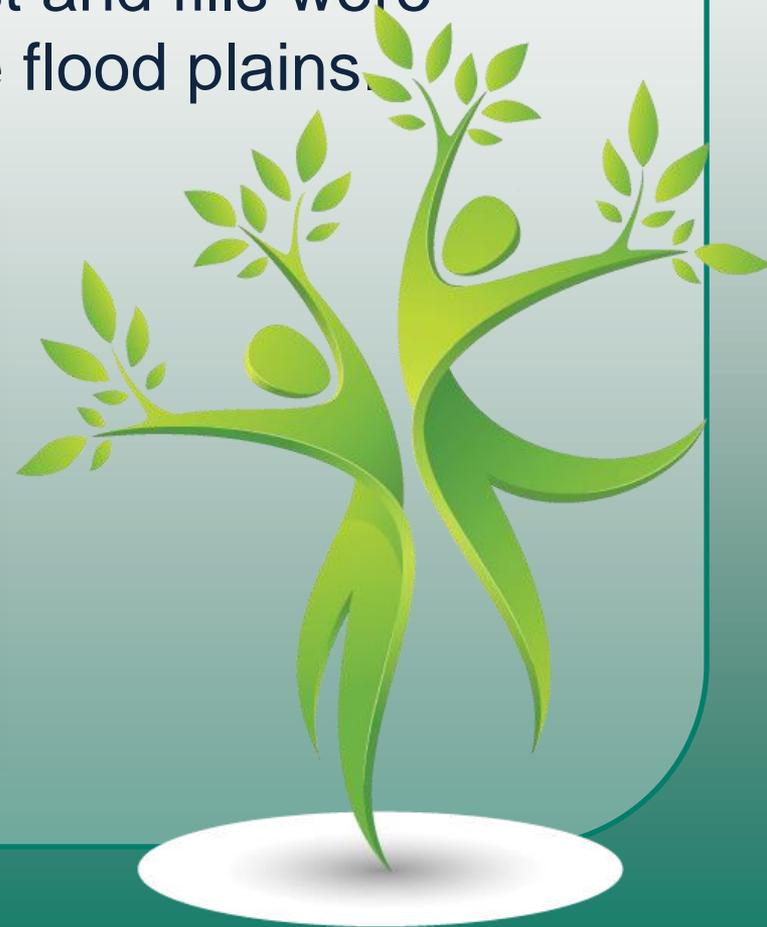
# Background to the Project

- Road constructed about **55 years** ago.
- Originally the main route to Zululand and the interior.
- Widened and lanes added to over the years.
- Road usage has evolved from light rural traffic to become a major arterial of strategic importance.



# The surrounding environment

During initial construction, the Road was constructed through sensitive dune forest and fills were constructed over estuarine flood plains.



The road is popular with day trippers,  
as well as being an alternative route to the airport.



This includes many commercial vehicles which avoid the tolls and the weighbridge.

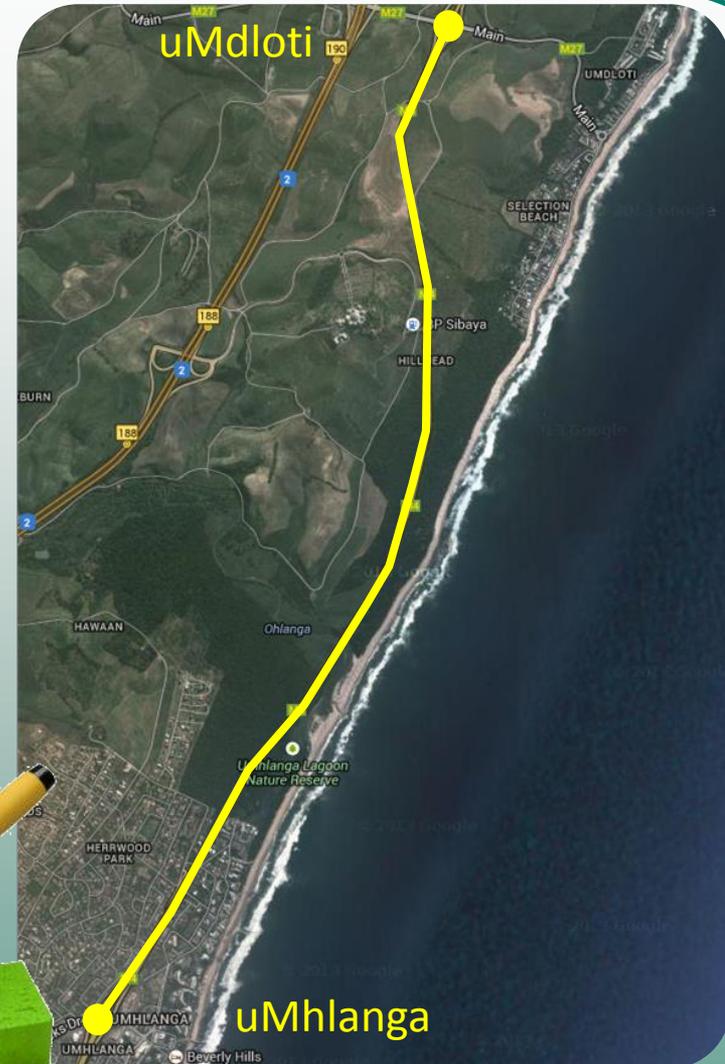


# Cyclists love the road



# Project Scope

- **Value:** R125 Million
- **Duration:** 12 Months
- **Contractor:** Milling Techniks
- Rehabilitation of 9.2km of Pavement (KM3.6 to KM12.8)
- 12 Million E80s (ES30)
- Repair slips and washaways.
- Minimise disruption of the eco-system



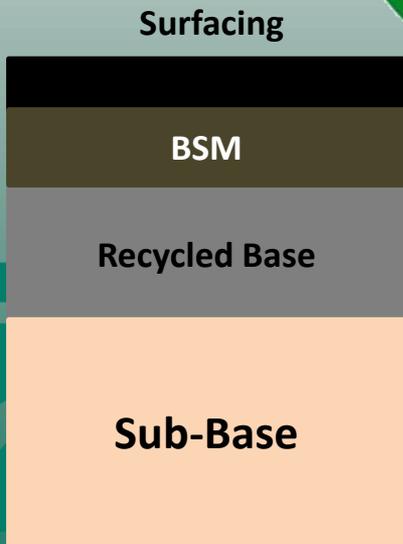
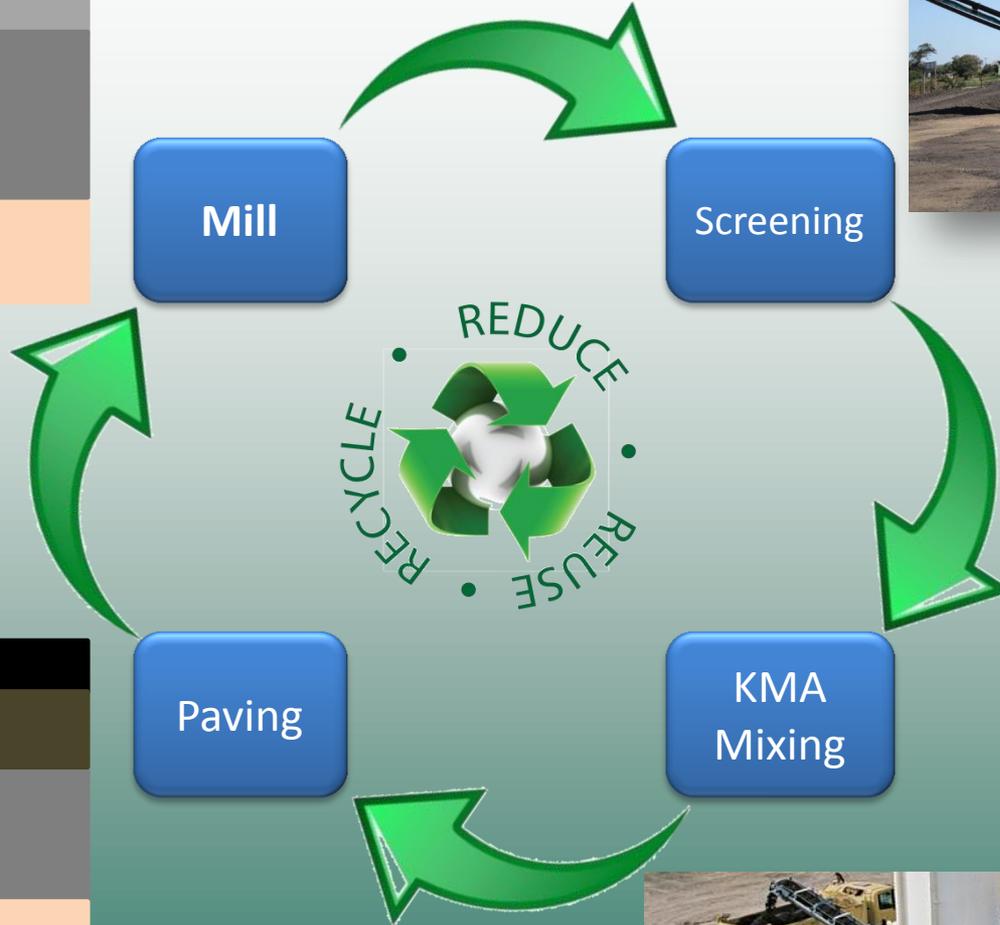
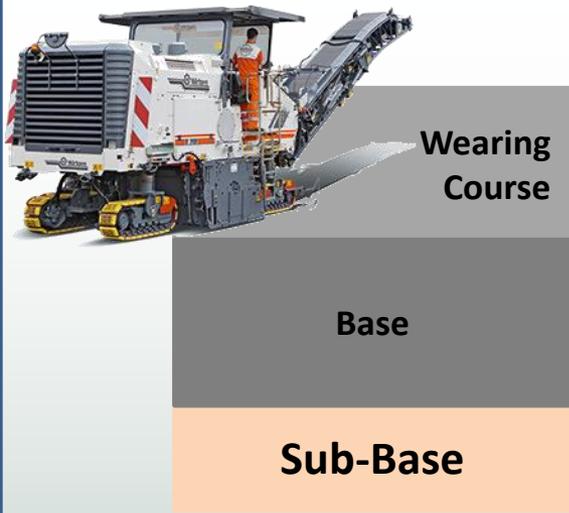


# Replacing Old Asphalt

- Replacing old asphalt with new means:
  - Mining aggregates
  - Heat generation
    - Manufacturing the asphalt
    - Transportation.
  - Asphalt Spoil Sites created



# Design



# Sustainable Design Approach

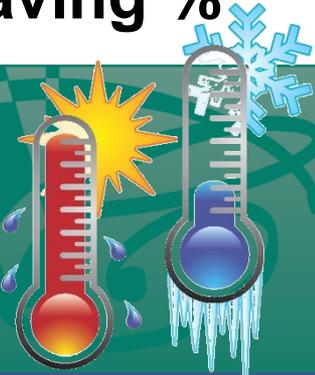
| Applicable Chainage   | kM3.6 – kM8.2<br>kM 11.9 – kM 12.8   | kM8.2 – kM11.9 |
|---|--|----------------|
| Total Length applied  | 6.5km  | 2.7km          |
| Mill thickness  | 50mm   | 50mm           |
| Recycle in-situ asphalt/gravel basecourse, with 2.1% bitumen and 1% lime. | 250mm  | 175mm          |
| BSM   | None   | 100mm KMA      |
| Paving  | 68 mm surfacing in 3 layers: <ul style="list-style-type: none"> <li>•20 mm scratch coat;</li> <li>•30 mm wearing course; and</li> <li>•18 mm ultra-thin friction course</li> </ul> |                |

# Design Approach



# Design Comparison

| Base Course     |             |                   |
|-----------------|-------------|-------------------|
|                 | Black Base  | Bitumen           |
|                 | Tonnes      | Litres (millions) |
| Conventional    | 57000       | 2,8 (4.5%)        |
| New Design      | 0           | 1,8               |
| Saving          | 57000       | 1                 |
| <b>Saving %</b> | <b>100%</b> | <b>36%</b>        |



# Advantages

## Reduction

Bitumen content  
Heat Generation  
Mining  
Waste Product  
Travel Distance  
Pavement damage  
Traffic  
Noise Levels (UTFC)  
Carbon emission



**R17 million  
Saving**

Used for urgent repairs  
alongside the road.











# The Expanded Public Works Programme

- Use of local labour to reduce unemployment for particular works:
  - Alien Vegetation eradication
  - Gabion construction
  - Drainage – kerb laying, pipe laying
- On-site and formal training was provided.
- Safety on site – all staff inducted prior to starting work.



# ***Caring for our environment***



***The Project was registered with  
Green Roads in South Africa.***



# Green Roads



**HOW LARGE IS YOUR CARBON**



**FOOTPRINT?**



# What is Greenroads?

Originated in the U.S in 2007 due to a concern about energy usage in transport development.

Greenroads is a rating system introduced to reward roadway projects that exceed expectation for environmental, economic and social performance

## Greenroads quantification:

- Define sustainability features
- Evaluate sustainability goals
- Encourage innovative practices
- Communicates Greenroads features



# Why Greenroads?

Decrease carbon dioxide emission and other harmful environmental exhausts

**Greenroads** - a roadway designed and constructed to a higher level of sustainability, than common practice

Increase energy efficiency standard

Compare road projects for performance towards being more sustainable





## Requirements for Greenroads

- Environmental Review Process
- Life Cycle Cost Analysis
- Life Cycle Inventory
- Quality Control Plan
- Noise Mitigation Plan
- Waste Management Plan
- Pollution Prevention Plan
- Low Impact Development
- Pavement Management System
- Site Maintenance Plan
- Educational Outreach

## Project Certification

### Voluntary Activities

- Environment and Water
- Access and Equity
- Construction Activities
- Materials and Resources
- Pavement Technologies
- Custom Credits

# Minimum Project Requirements

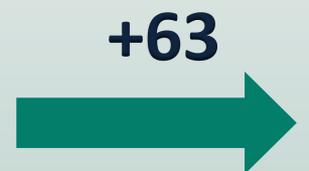
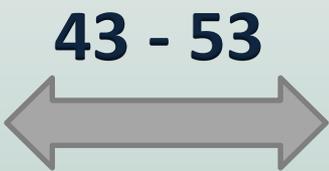
(11 Activities : show sustainability in planning, design, construction and operation)



Certification levels are acquired by completing voluntary credits in addition to PRs



# CERTIFICATION



Certification levels are acquired by completing voluntary credits in addition to PRs

**Environmental Review**  
(complete a comprehensive environmental review)

**Lifecycle cost analysis**  
(perform LCCA for pavement section)

**Lifecycle Inventory**  
(perform a LCI of pavement section)

**Pollution Prevention Plan**  
(have a TESC/SWPP)

**Noise Mitigation Plan**  
(have a construction noise mitigation plan)

**Waste Management Plan**  
(have a plan to divert C&D waste)

**What are the mandatory project requirements?**



**Low Impact Development**  
(complete a LID feasibility study)

**Educational Outreach**  
(publicize sustainability information for project)

**Quality Control Plan**  
(have a formal contractor quality control plan)

**Site Maintenance Plan** (have a roadside maintenance plan)

**Pavement Management System** (have a pavement management system)

# Voluntary Activities

- Environment and Water
- Access and Equity
- Construction Activities
- Materials and Resources
- Pavement Technologies
- Custom Credits



## GREENROADS RATING SYSTEM

LIST OF CREDITS (v1.5)

| No.  | Title                                    | Pts.       | Description                                       |
|--|--|------------|---|
| <b>Project Requirements (PR) – Mandatory for all projects</b>  |  |            |   |
| PR-1   | Environmental Review Process             | Req        | Complete a comprehensive environmental review     |
| PR-2   | Lifecycle Cost Analysis (LCCA)           | Req        | Perform LCCA for pavement section                 |
| PR-3   | Quality Control Plan                     | Req        | Perform QC of pavement section                    |
| PR-4   | Noise Mitigation Plan                    | Req        | Have a formal contractor quality control plan     |
| PR-5   | Waste Management Plan                    | Req        | Have a construction noise mitigation plan         |
| PR-6   | Pollution Prevention Plan                | Req        | Have a plan to divert C&D waste from landfill     |
| PR-8   | Low Impact Development (LID)             | Req        | Have a TESC/SWPPP                                 |
| PR-9   | Pavement Management System               | Req        | Complete a LID feasibility study                  |
| PR-10  | Site Maintenance Plan                    | Req        | Have a pavement management system                 |
| PR-11  | Educational Outreach                     | Req        | Have a roadside maintenance plan                  |
|  |  | Req        | Publicize sustainability information for project  |
| <b>Environment &amp; Water (EW) – Up to 21 Points</b>  |  |            |   |
| EW-1   | Environmental Management System          | 2          | ISO 14001 certification for general contractor    |
| EW-2   | Runoff Flow Control                      | 1-3        | Reduce runoff quantity                            |
| EW-3   | Runoff Quality                           | 1-3        | Treat stormwater to a higher level of quality     |
| EW-4   | Stormwater Cost Analysis                 | 1          | Conduct an LCCA for stormwater elements           |
| EW-5   | Site Vegetation                          | 1-3        | Use native low/no water vegetation                |
| EW-6   | Habitat Restoration                      | 3          | Restore habitat beyond what is required           |
| EW-7   | Ecological Connectivity                  | 1-3        | Connect habitat across roadways                   |
| EW-8   | Light Pollution                          | 3          | Discourage light pollution                        |
| <b>Access &amp; Equity (AE) – Up to 30 Points</b>  |  |            |   |
| AE-1   | Safety Audit                             |            |   |
| AE-2   | Intelligent Transportation Systems (ITS) | 1-2        | Perform roadway safety audit                      |
| AE-3   | Context Sensitive Solutions              | 2-5        | Implement ITS solutions                           |
| AE-4   | Traffic Emissions Reduction              | 5          | Plan for context sensitive solutions              |
| AE-5   | Pedestrian Access                        | 5          | Reduce emissions with quantifiable methods        |
| AE-6   | Bicycle Access                           | 1-2        | Provide/improve pedestrian accessibility          |
| AE-7   | Transit Access                           | 1-2        | Provide/improve bicycle accessibility             |
| AE-8   | Scenic Views                             | 1-5        | Provide/improve transit accessibility             |
| AE-9   | Cultural Outreach                        | 1-2        | Provide views of scenery or vistas                |
|  |  | 1-2        | Promote art/culture/community values              |
| <b>Construction Activities (CA) – Up to 14 Points</b>  |  |            |   |
| CA-1   | Quality Management System                |            |   |
| CA-2   | Environmental Training                   | 2          | ISO 9001 certification for general contractor     |
| CA-3   | Site Recycling Plan                      | 1          | Provide environmental training                    |
| CA-4   | Fossil Fuel Reduction                    | 1          | Have a plan to divert waste from landfill         |
| CA-5   | Equipment Emissions Reduction            | 1-2        | Use alternative fuels in construction equipment   |
| CA-6   | Paving Emissions Reduction               | 1-2        | Meet EPA Tier 4 standards for non-road equip.     |
| CA-7   | Water Tracking                           | 1          | Use pavers that meet NIOSH requirements           |
| CA-8   | Contractor Warranty                      | 2          | Develop data on water use in construction         |
|  |  | 3          | Warranty on the constructed pavement              |
| <b>Materials &amp; Resources (MR) – Up to 23 Points</b>  |  |            |   |
| MR-1   | Life Cycle Assessment (LCA)              | 2          | Conduct a detailed LCA of the entire project      |
| MR-2   | Pavement Reuse                           | 1-5        | Reuse existing pavement sections                  |
| MR-3   | Earthwork Balance                        | 1          | Use native soil rather than import fill           |
| MR-4   | Recycled Materials                       | 1-5        | Use recycled materials for new pavement           |
| MR-5   | Regional Materials                       | 1-5        | Use regional materials to reduce transportation   |
| MR-6   | Energy Efficiency                        | 1-5        | Improve energy efficiency of operational systems  |
| <b>Pavement Technologies (PT) – Up to 20 Points</b>  |  |            |   |
| PT-1   | Long-Life Pavement                       |            |   |
| PT-2   | Permeable Pavement                       | 5          | Design pavements for long-life                    |
| PT-3   | Warm Mix Asphalt (WMA)                   | 3          | Use permeable pavement as a LID technique         |
| PT-4   | Cool Pavement                            | 3          | Use WMA in place of HMA                           |
| PT-5   | Quiet Pavement                           | 5          | Contribute less to urban heat island effect (UHI) |
| PT-6   | Pavement Performance Tracking            | 2-3        | Use a quiet pavement to reduce noise              |
| <b>Custom Credits (CC) – Available for all projects based on context and innovation, subject to approval</b> |  |            |   |
| CC-1   | Custom Credit 1                          | 1          | Relate construction to performance data           |
| CC-2   | Custom Credit 2                          | 1-5        | Design a new voluntary credit                     |
|  |  | 1-5        | Design a new voluntary credit                     |
| <b>Greenroads Total Points:</b>  |  | <b>118</b> |   |



# Voluntary Credits

| Code | Title                  | Credits | Code | Title                   | Credits   |
|------|------------------------|---------|------|-------------------------|-----------|
| CA1  | QMS                    | 2       | EW2  | Run-Off Flow Control    | 1         |
| CA2  | Environmental Training | 1       | EW5  | Site vegetation         | 3         |
| CA3  | Site recycling Plan    | 1       | EW6  | Habitat Restoration     | 3         |
| CA5  | Equipment emissions    | 2       | EW7  | Ecological Connectivity | 1         |
| CA6  | Paving Emissions       | 1       | AE1  | Safety Audit            | 1         |
| CA-7 | Water use tracking     | 2       | AE5  | Pedestrian Crossing     | 1         |
| CA8  | Contractor warranty    | 3       | AE6  | Bicycle Access          | 1         |
| MR2  | Pavement Reuse         | 5       | PT2  | Permeable Pavement      | 3         |
| MR4  | Recycled materials     | 5       | PT5  | Quiet Pavement          | 2         |
| MR-5 | Regional Materials     | 5       |      | <b>TOTAL</b>            | <b>43</b> |

# Custom Credits

- Labour Based Works:
  - Alien Vegetation removal
  - Kerb & channel Construction
  - Guardrails
  - Slip Repairs
  - Drainage
- Training
  - NQF Level 2 training
  - Mentorship
  - Development of emerging contractors



# Key Environmental Considerations

- The **design** considered environmental impact
- The **construction** responded to site conditions in a manner which limited the carbon footprint.
- The construction considered **environmental impact** including the position and design of the stockpiles, drainage and the leaching of the RAP.
- Impact Assessments were undertaken when working in sensitive areas (emergency and additional scope of works)



# The registration process

- Communication with Green Roads SA
- Register on the website (company & individual)
- Register the project on the website
- Issue payment
- Upload documents for review
- Interview and further uploads (US)
- Reports and accreditation



# The Way forward

- Green Roads objectives are not far off from best practise.
- Minor modification of records and the elements of design will improve the potential for registration.
- Improved planning with consideration of the Green Roads credits will ensure smooth registration.
- Policy on sustainable rehabilitation





*Providing a fine balance  
between engineering innovation,  
job creation and care for the environment*



# Thank you

