CESA: Development of Transport Resources

D Nkabinde

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Contents

Transportation Resources

What are these resources?

(they cannot exist in isolation)

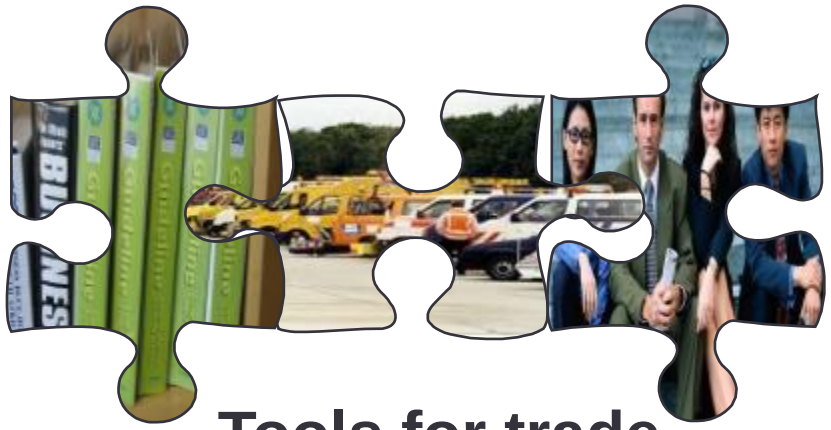
Tools of trade

Infrastructure

People

Integrated Transportation resources = capable organization

Infrastructure



People

Tools for trade

PEOPLE

- People make decisions, the rest are just to support the process and are also man dependent.

- Value chain of the entire skill development is the key (What is your contribution?????)

1. Early childhood development
2. Junior and High school
3. University/TVET etc.
4. Working environment

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PEOPLE

1. **Early childhood development**
   a) Multiple researchers are advocating the dire need for this early intervention,
   b) What is our contribution as an industry for future engineers?

2. **Junior and High school**
   a) Career guidance
   b) Holiday exposure programmes to the industry
   c) Scholarships and bursary

3. **University/TVET etc.**
   a) Bursary
   b) Industry Support to undergraduates (tutor, mentor etc)
   c) Practitioners and Professional engineers involvement to the learning institutions
   d) Financial support to the learning institutions

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PEOPLE

4. Work environment

a) ECSA specified training and mentorship aimed at Pr. registration
b) Individualised mentorship
c) Set aside ‘skills development centre’ (or budget)
   - Talent management
   - Succession planning
   - Reskilling and repurposing
   - Focus on specialization
   - Leadership skill development

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TOOLS OF TRADE

1. Hardware
2. Software
3. Funding
4. Policies

TOOLS OF TRADE

1. **Hardware**
   a) Road Survey Equipment (internally housed by SANRAL)
   b) IT Infrastructure to process the raw data (including capable computers)

2. **Software**
   a) Computer-based data Analysis and Storage Tools.
   b) Network level operation optimization decision sofware viz HDM4 soon to move to HDM5
      i. HDM5 will now incorporate the following
      ii. Cloud-based operation
      iii. Modern user interfaces
      iv. Compatibility with current operating systems
      v. Updated parameters to account for emerging challenges such as climate change, GHG emissions, resilience to natural disasters, road safety and pedestrian use of roads and sidewalks.

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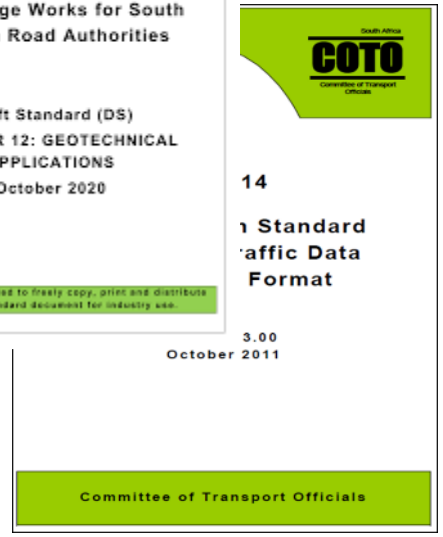
TOOLS OF TRADE

3. Funding

a) Linked to the output of network operation optimization (HDM4), budget strategy must be prioritised

i. Routine road maintenance
ii. Pro-active maintenance
iii. Planned rehabilitation
iv. Planned road expansion
v. Incremental network growth



4. Organizational policies and procedures

a) The decision-makers need rules and principles that will guide their decisions.
b) Typical Guides> PPPFA, DORA, PFMA, COTO, SAPEM, TRH etc.
c) The rules and principles assist in answering the – what, where, when and how in order to achieve rational outcomes.

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INFRASTRUCTURE

1. What is our road infrastructure as South Africa
2. How do we use it
3. TomTom Congestion tracker
4. SA Pavement Design
5. Axle Loading
6. Tyre pressure
7. Construction cost per KM
8. What

    a) Career guidance
    b) Holiday exposure programmes to the industry
    c) Scholarships and bursary

9. University/TVET etc.
    a) Bursary
    b) Industry Support to undergraduates (tutor, mentor etc)
    c) Practitioners and Professional engineers involvement to the learning institutions
    d) Financial support to the learning institutions

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INFRASTRUCTURE

South Africa has the 10th longest total and 18th longest paved road network in the world

The National Development Plan states that roads represent one of the largest public infrastructure investments in most countries.

RSA road replacement cost >R2 trillion

Rank	Country	Road length (km)
	World	64 285 009
1	United States	6 586 610
2	India	4 689 842
3	China	4 237 500
4	Brazil	1 751 868
5	Japan	1 210 251
6	Canada	1 042 300
7	Russia	982 000
8	France	951 200
9	Australia	823 217
10	South Africa	**750 000**
11	Spain	681 298
12	Germany	644 480
13	Sweden	572 900
14	Italy	487 700
15	Indonesia	437 759
16	Turkey	426 906
…	…	…
34	Dem Rep of Congo	**153 497**
45	Zimbabwe	**97 267**
54	Zambia	**91 440**
55	Tanzania	**91 049**
70	Madagascar	**65 663**
80	Angola	**51 429**
72	Namibia	**64 189**
98	Mozambique	**30 331**
104	Botswana	**25 798**
122	Malawi	**15 451**
148	Lesotho	**7 438**
161	Swaziland	**3 594**
173	Mauritius	**2 066**
193	Seychelles	**508**
SADC Total		**1 449 720**

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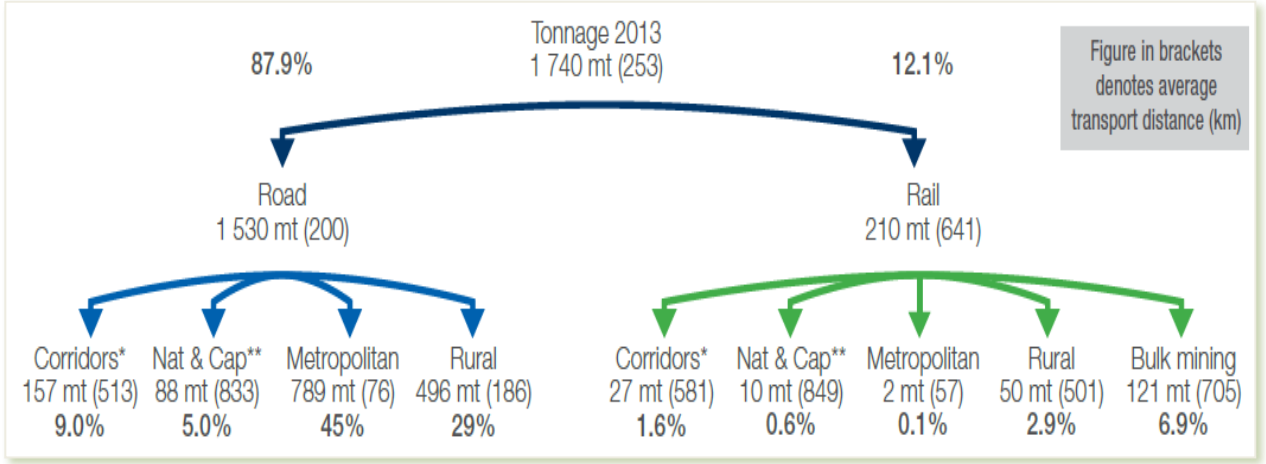
HOW DO WE USE SOUTH AFRICAN ROAD

Freight flow on road and rail (10th State of Logistics Survey 2014)



Also important to note that of the person trips recorded in National Household Travel Survey, 2020, by transport modes are as follow:

- Minibus taxi's (10,7 million)
- Private Vehicles and trucks (6,2 million)
- Walking (17,4 million)

Mode Choice Factor	Percentage
Travel time	32.6
Travel Cost	26.1
Flexibility	9.2
Other	32.1

Roads account for 87.9% of Freight and 93.7% of Person Trips

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SA ROAD CONGESTION - 2022

Country rank	World rank ▼	City	Average travel time per 10 km ▼	Change from 2021 ▼	Time in rush hour per year
1	147	Pretoria	16 min	+ 40 s	145 hours →
2	156	Cape Town	16 min	+ 1 min 10 s	132 hours →
3	172	East London	15 min	+ 40 s	132 hours →
4	183	Bloemfontein	15 min	+ 10 s	136 hours →
5	221	Johannesburg	14 min	+ 40 s	123 hours →
6	279	Durban	12 min	+ 30 s	112 hours →

Pretoria now Most Congested 2021 – Congestion Increasing in All Cities

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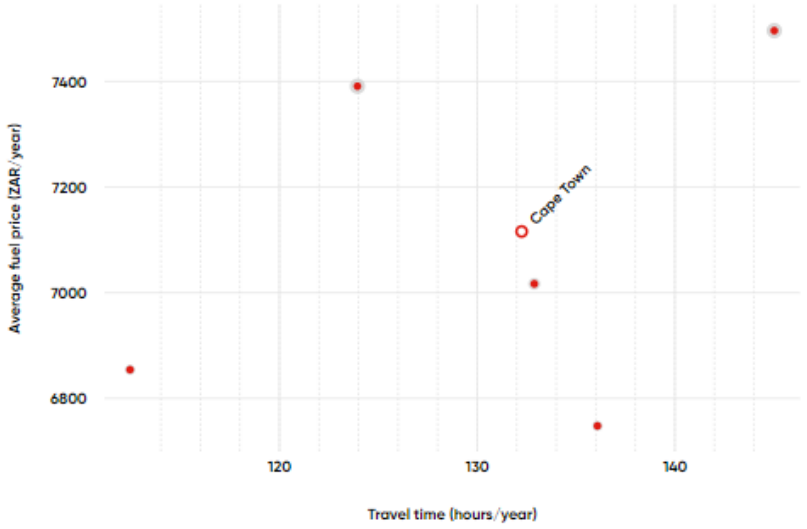
SA ROAD CONGESTION - 2022

The cost of driving in rush hour

Check the yearly impact of driving in individual cities in 2022 across three categories: time spent, money spent and CO_2 emitted.

One-way commute: 10 km (1–50) | Petrol | City center | Metro area | Local | € EUR | $ USD

Emission (kg/year) 762.3 – 846.9



Cape Town

Travel time (yearly)	Emissions (yearly)	Fuel price (yearly)
132 h	804 kg	7116 ZAR
time spent driving	CO_2 emitted	money spent
38 h due to congestion	111 kg due to congestion	985 ZAR due to congestion
26 x Approximately **26 books**	80 x **80 trees** grown over a year to absorb	7 x Approximately **7 average-sized tanks of petrol**

Cape Town Most Congested – Congestion Increasing in All Cities

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SOUTH AFRICAN PAVEMENT DESIGN

Based on all the previous indicators then derive a design approach

South Africa

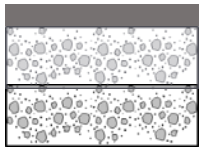
Northern Hemisphere

Increased Number of Heavy Axles Repetitions over 20-30 year Design Life

Waterproof Layer

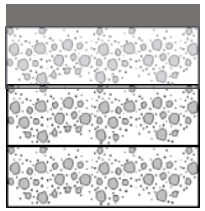
(10 to 40 mm)

(100 to 400 mm)



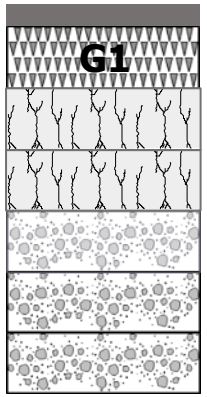
Local Street

R5m/km



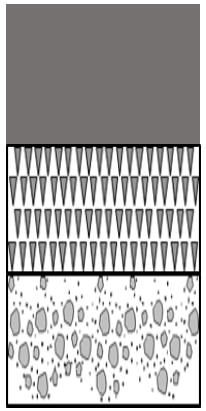
Farm To Market

R13m/km



National Road

R20m to R140m/km



Interstate Road

South African Pavement Design 40-60% cheaper by using natural gravels, but these natural gravels more sensitive to moisture ingress - not zero maintenance design.

Very short path for crack to propagate through thin surfacing – making preventative maintenance strategy crucial as at SANRAL.

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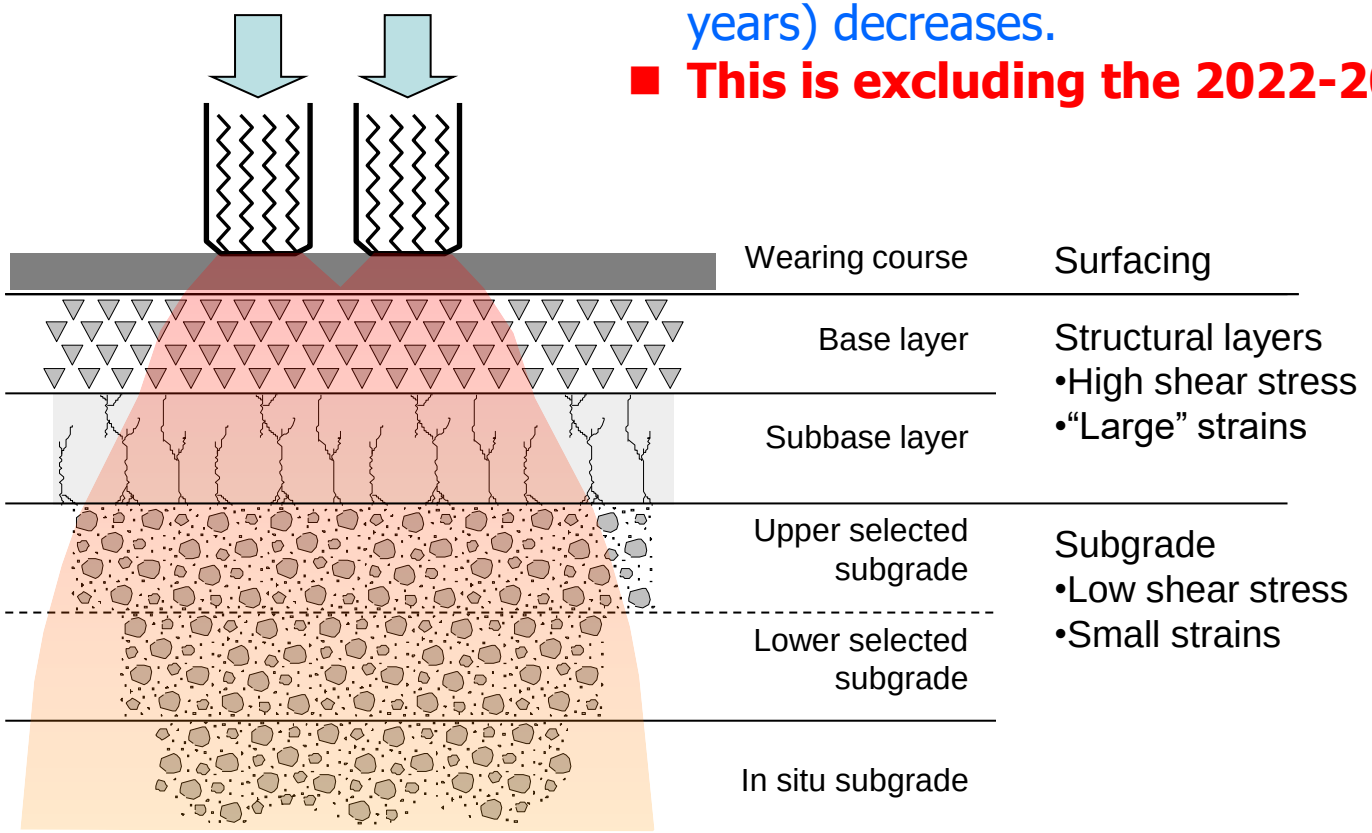
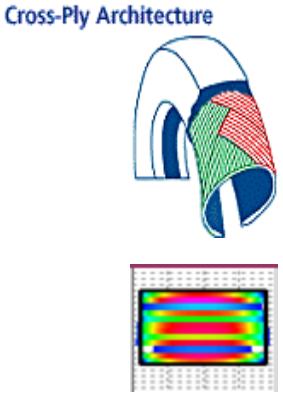
Increasing Number Axle Loads

Half-axle tyre loads

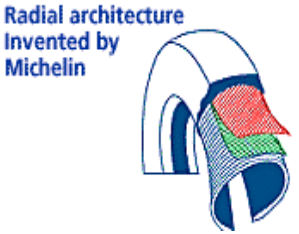
- Economic growth, "Just in Time" manufacturing, limited warehousing, results in the need for smaller more frequent deliveries, which favour Road transport above Rail.
- The result is increased number of heavy vehicle axles on roads, and since road pavements are design for number of heavy vehicle axles over i.e. 20 years, the lifespan (in years) decreases.
- **This is excluding the 2022-2023 side tippers**



Increasing Tyre Pressure

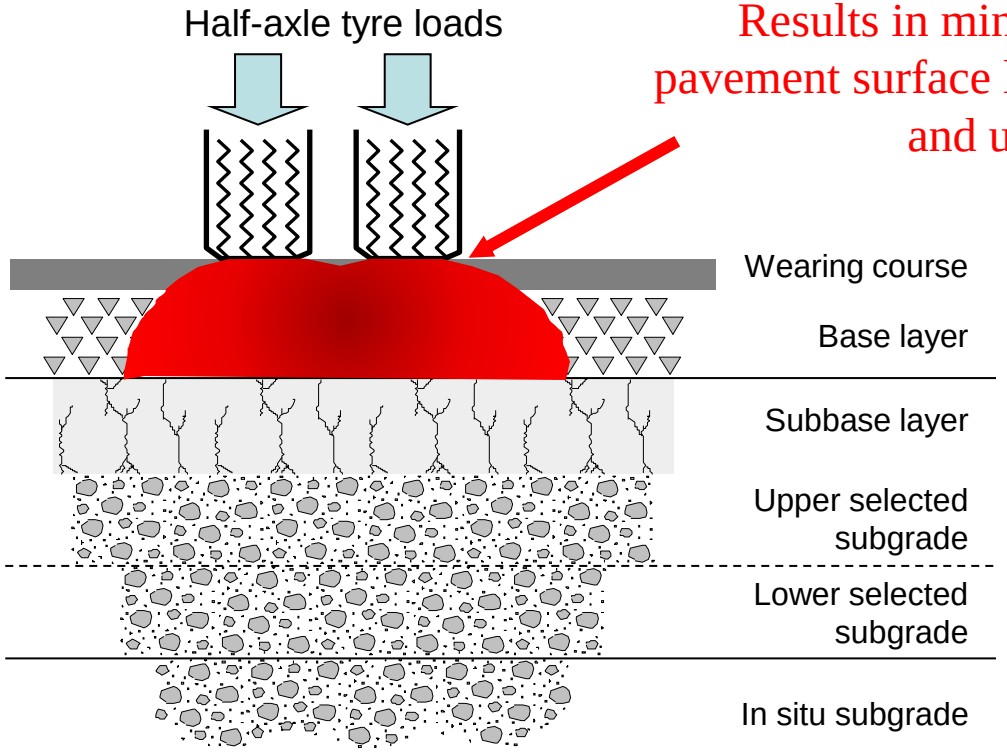


New Tyre Technology



Increased Tyre Pressure to Reduce Contact Area Which results in reduce Rolling Resistance and 30% decrease in Fuel Consumption

Results in min 30% + increase in damage to pavement surface layers (especially when overloaded and under or over-inflated)



Surfacing

Structural layers
- High shear stress
- "Large" strains

Subgrade
- Low shear stress
- Small strains

Decreasing Layer Strength

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New Road CONSTRUCTON Cost per km

Description	From	To
Dual Carriageway 	R80 million	R140 million **(N3 300million)**
4-Lane Undivided 	R30 million	R100 million
2-Lane Single 	R20 million	R50 million

Difference due to terrain (Flat, Rolling, Mountainous), Number of Interchanges, Number of Trucks, Climate, etc.

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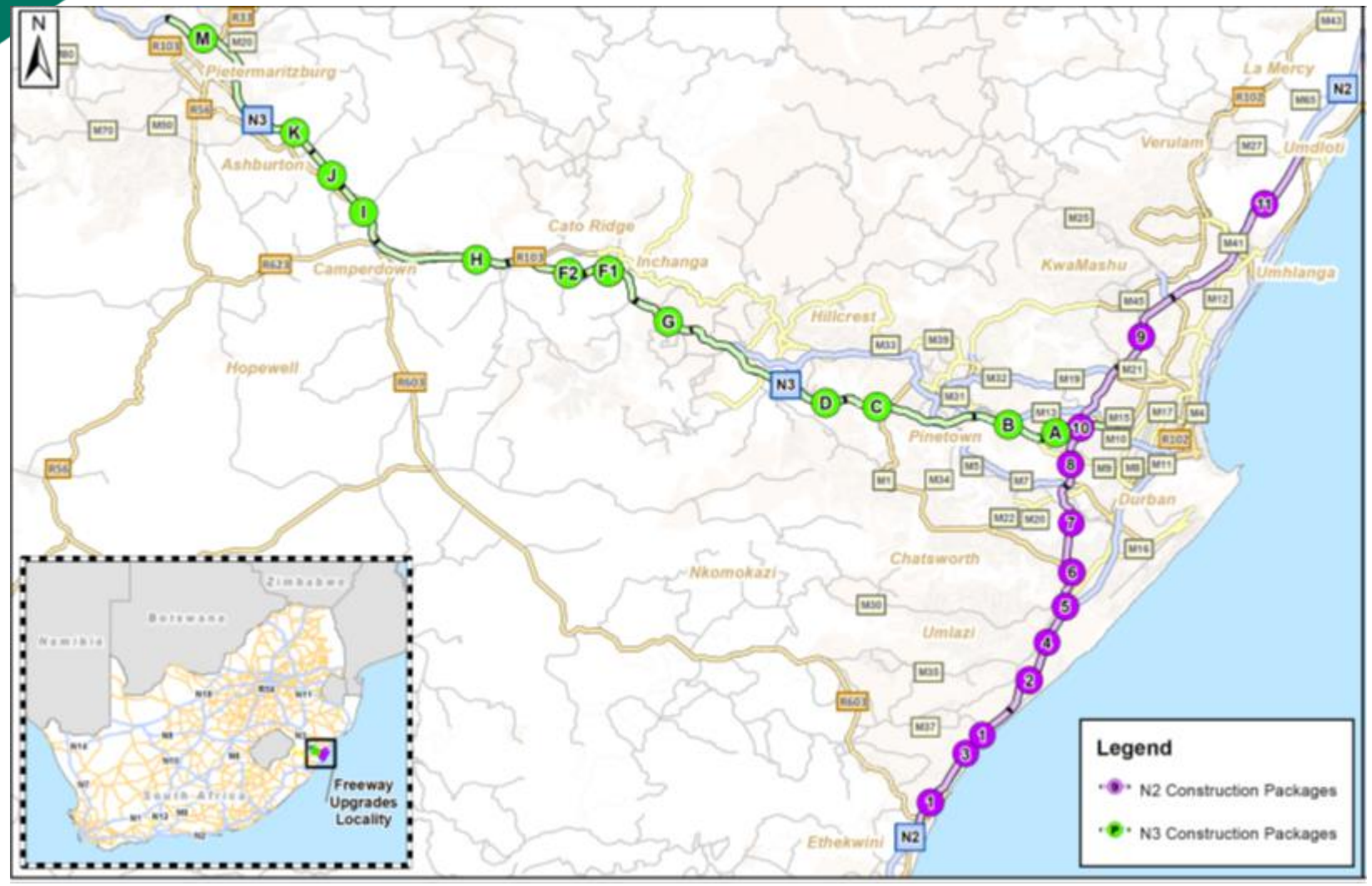
N3 Programme update

N2/N3 FREEWAY UPGRADE PROGRAM – FLAGSHIP PROJECT



N2 Upgrades

- 55km of upgrades
- From Lovu River on the South Coast, to uMdloti on the north coast.
- 11 work packages in total.
- 2 Packages currently in construction stage
- Estimate- R17billion

N3 Upgrades

- 80km of upgrades
- From Pietermaritzburg to Durban.
- 14 work packages in total.
- 6 packages currently in construction stage.
- Awards for few more are imminent
- Estimate R23 billion

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N3 Priority: Durban to Pietermaritzburg

PACKAGE	DESCRIPTION	LENGTH KM	STATUS	CONSTRUCTION DURATION (MONTHS)	% CONSTRUCTION COMPLETE	ENVISAGED CONSTRUCTION START (start of 3 month mobilisation period)
A	EB Cloete (including portion of N2 North and N3 West)	6.3	Construction			Jan 2023
B	Westville Viaduct (Km11.8) to Paradise Valley (Km17.5)	5.7	Tender Evaluation	48	Not Commenced	Mar 2023
C	Paradise Valley (Km17.5)-Marianhill Toll Plaza	7.5	Tender documentation	48	Not Commenced	Aug 2023
D	Marianhill Toll Plaza (25) to Key Ridge (2.8)	11.1	Design	54	Not Commenced	Apr 2024
E	Hammarsdale I/C upgrade (Km 9.4)	0	Complete	Complete	Complete	-
F1	Hammarsdale (8,8) to BP Oasis (15.5)	7	Tender	42	Not Commenced	Sep 2023
F2	BP Oasis (15.5) to Cato Ridge (20.1)	4.6	Draft Tender docs	36	Not Commenced	Apr 2024
G	Keyridge (Km2.8) to Hammarsdale (Km 8.1)	5.3	Tender Evaluation	48	Not Commenced	Mar 2023
H	Cato Ridge (Km19.4) to Dardenelles I/C (Km26.6)	7.2	Construction	45	28%	Apr 2021
I	Dardenelles I/C (26.6) to Lynnfield Park (Km 30.6)	4	Construction	42	45%	Jan 2021
J	Lynnfield Park (Km 30.6) to Asburton I/C (Km 1.5)	5.3	Construction	39	40%	Apr 2021
K	Asburton I/C (Km 1.5) to Murray Road (Km6.1)	4.6	Construction	45	0%	Dec 2023
L	Murray Road (Km 6.1) to New England Rd I/C	2.9	Tender Evaluation	42	Not Commenced	Mar 2023
M	New England Rd I/C to Twickenham Road (Km16.4)	7.5	Design	48	Not Commenced	Apr 2024
-	Crushing Contract to Supply Packages H,I,J,KL	-	Construction	60	25%	Oct 2021
-	Construction and Supply of Temporary Barriers	-	Construction	24	85%	Aug 2021
N	PMB Ring road (N3 re-alignment)	14	Route alignment/ Environmental	72		April 2025

N2 Priority: Illovu River to uMdloti

PACKAGE	DESCRIPTION	LENGTH (KM)	STATUS	CONSTRUCTION DURATION (MONTHS)	% CONSTRUCTION COMPLETE	ENVISAGED CONSTRUCTION START (start of 3 month mobilisation period)
1	DICAL: Lovu and Moss Kolnick	7,70	Design	36	Not Yet Commenced	Mar2024
2	DICAL: Moss Kolnick to Isipingo (Package2)	7,30	Design	42	Not Yet Commenced	Sep 2023
3	DICIC: Adams Road Interchange	0,00	Design	36	Design only	Future
4	DICIC: Isipingo Interchange	0,00	Tender Document	24	Not Yet Commenced	Included under Package 2
5	DICAL: Isipingo to Higginson Interchange	6,05	Tender Document	42	Not Yet Commenced	Jan 2024
6	DICIC: Higginson Interchange	0,00	Design	36	Not Yet Commenced	Dec 2024
7	DICAL: Higginson Interchange to Edwin Swales	6,00	Tender Document	42	Not Yet Commenced	Jan 2024
8	DICAL: Edwin Swales IC (km 12.3) to south of EB Cloete IC (km 16.0)	9,20	Tender evaluation	48	Not Yet Commenced	Mar 2023
9	DICAL: Mgeni Interchange to Kwa Mashu Interchange	9,60	Supervision Tender evaluation	48	Not Yet Commenced	Jan 2024
10	EB Cloete (including portion of N2 North and N3 West)	6,30	Construction	60	0%	Jan 2023
11	DICAL: KwaMashu I/C (km -2.0) to Umdloti I/C (km 11.6)	8,75	Construction	36	10%	May 2022

Nyeleti

SANRAL Mohamad Parak

RAUBEX

H

Cato Ridge to Dardanelles

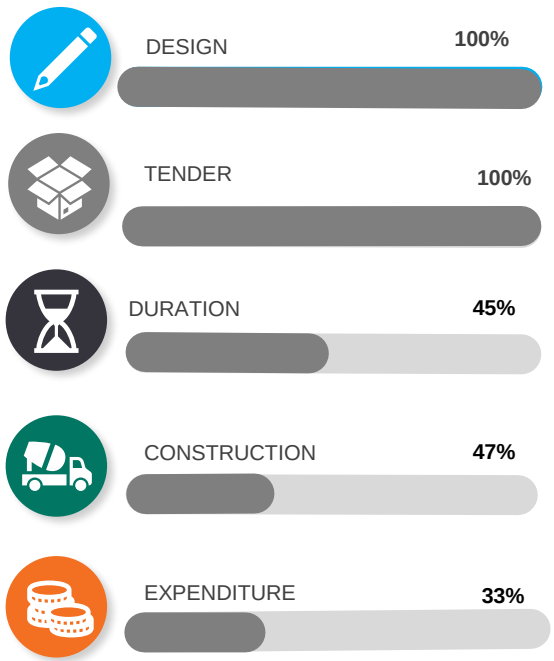
N.003-020-2017/8

6.4 km

Addition of lanes
Bridge widenings

April 2021

48 Months



SOCIO-ECONOMIC/ PUBLIC PARTICIPATION

Progress

- Targeted CPG: R 375 510 591.96
- CPG expenditure to date: R 135m
- CPG expenditure % to date: 25%
- # of jobs created to date: 452 labours
- Total Exp to date Labour: R 25m of R100m
- # of SMMEs sub-contracted to date: 42 Suppliers and Enterprises
- # of SMMEs trained to date: 19 (finance, business admin, HR, tendering)
- CSDG (Apprentices, TVET, P1/P2, Graduates): 15 (72 to commence Feb 23)
- CD Project: Traffic circle design in progress, construction planned in Oct 2023
- CSI: Uniform handout done in 29 Sep Meeting 8% labour target.

Challenges & Interventions

Risks

LAND ACQUISITION

Progress

- Completed.
- Expro's outstanding (not delaying construction)
- Landowner's awaiting

Challenges & Interventions

- Transnet: Rail Bridge extension completed without delays.
- Eskom powerline relocation.
- R103 realignment and access road to be re-aligned.
- Payments outstanding to some landowners

Risks

- Community unrest
- National strikes re loadshedding

DESIGN & CONSTRUCTION

Progress

- Design 100% complete
- Construction 47% complete
- Expenditure to date: R573m
- Delays – 35 days.
- EOT Approved – 21 days.
- Achieved milestones: Complete Contraflow achieved 5 Oct 2022 from Cato Ridge to Dardanelles. Umgeni subcontractor for pipe relocation appointed 1 Nov 2022. R103 new link subcontractor appointed and work commenced 4 Oct 22. Rail Bridge extension completed without any delays.

Challenges & Interventions

- Eskom re powerline relocation over R103.

Risks

Description	Cause
Constructability	Bitumen Supply
Constructability	Material Restrictions - shortage
Constructability	Barriers (exit/ entry positions)
Construction program	Business forums
Construction program	SMME low Expenditure
Construction Program	Local labour related to CPG
Construction Program	National Sutdown - loadshedding

Environmental & OHS

- Envr Audit rating: **96%** Compliant
- OHS Audit rating: **93%** Compliance

Claims

- # of Claims submitted : 6 (2 withdrawn)
- # of claims approved by NCC: 4
- # of claims referred to DAB: 1

PROCUREMENT

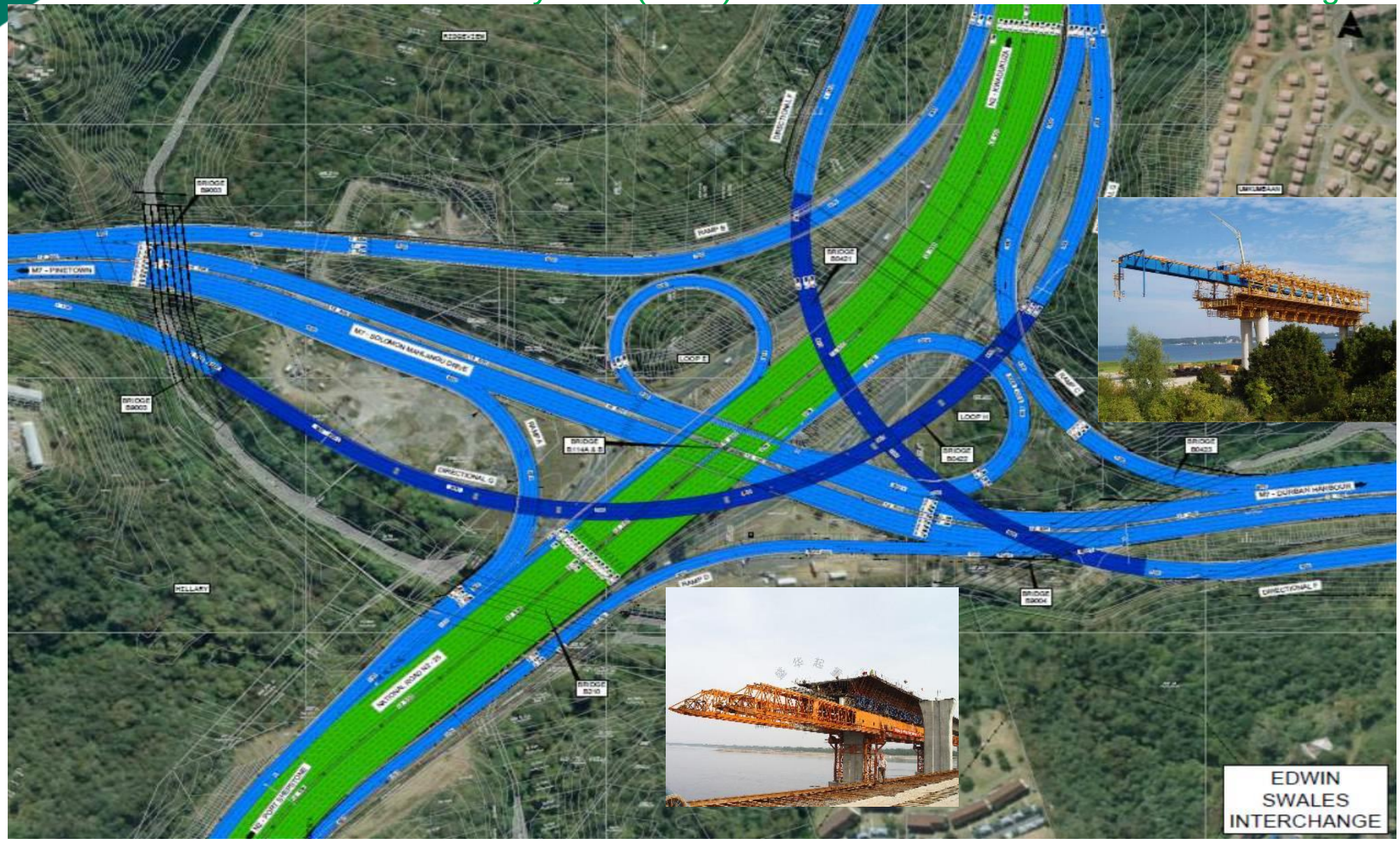
Construction Tender

- RBEC : 29 August 2020
- RBAC : 7 September 2020
- MBAC : 25 September 2020
- Board approval : 26 October 2020
- **Contract Award: R 1 439 457 269.19**

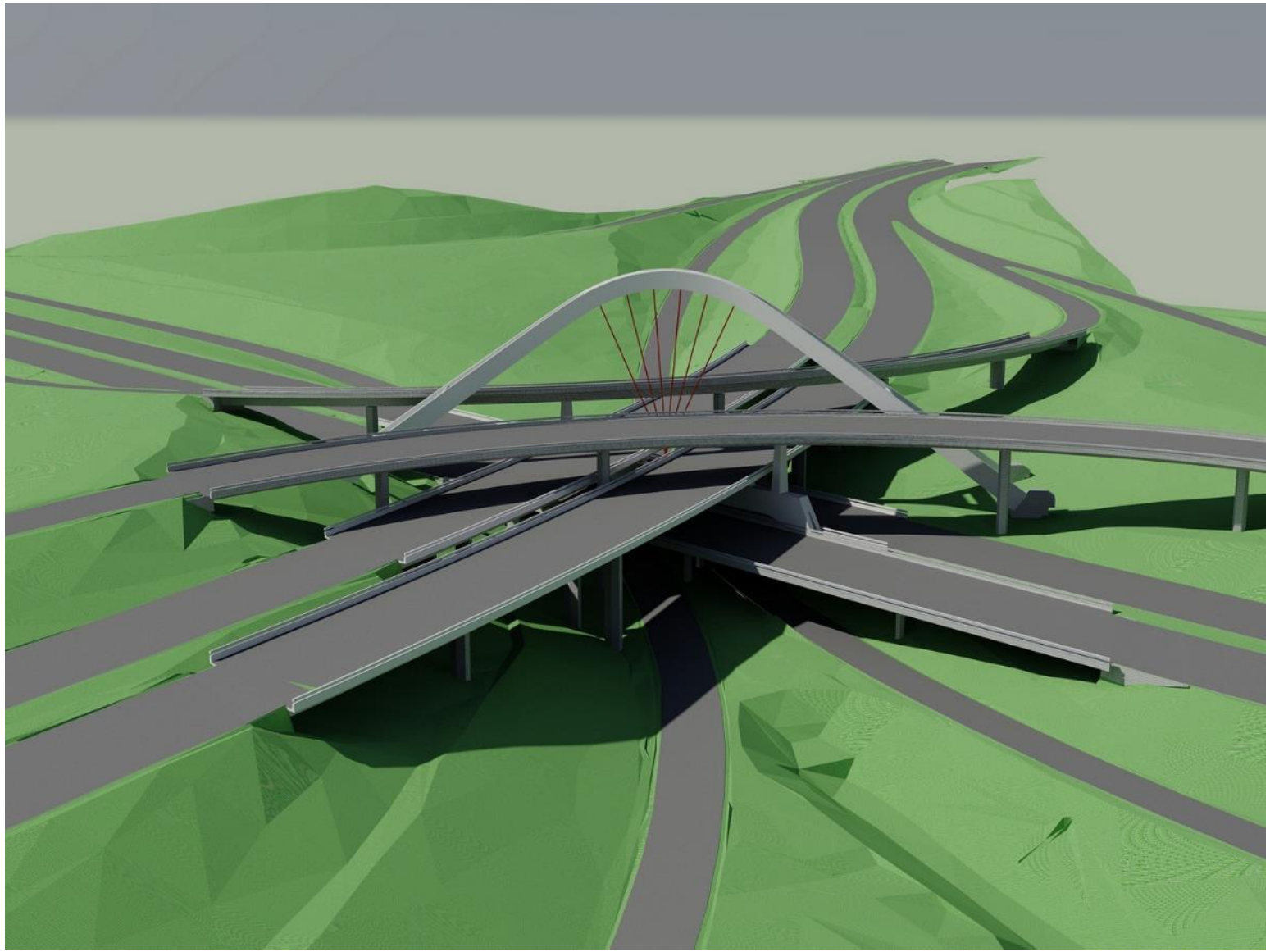
Construction Tender

- Advert date: 20 Sep 2019
- Closing date: 13 Nov 2019
- Appointment: Nov 2020
- Mobilisation period: 13 Jan 2021 to 12 Apr 2021
- Construction period: 48 months

Planning, Design and Construction –
N2/M7 (Edwin Swales) Interchange – Main Port Access
Movable Scaffold System (MSS) – First time Construction method being used in SA!



Planning, Design and Construction
EB Cloete Interchange



N3 Upgrading between Cato Ridge and Ashburton

N3 UPGRADE SANRAL EXCO VISIT (Learnership)

THANK YOU

ROLIVHUWA

DANKIE

SIYABONGA

KEALEBOGA