INFRASTRUCTURE South Africa

Free State Agriculture Road Initiative

13 August 2025

PRESENTATION OUTLINE

1. PROPOSED APPROACHED
2. MACROECONOMIC ANALYSIS
3. MCDA & PRIORITISATION
4. NEXT STEPS

Proposed Approach

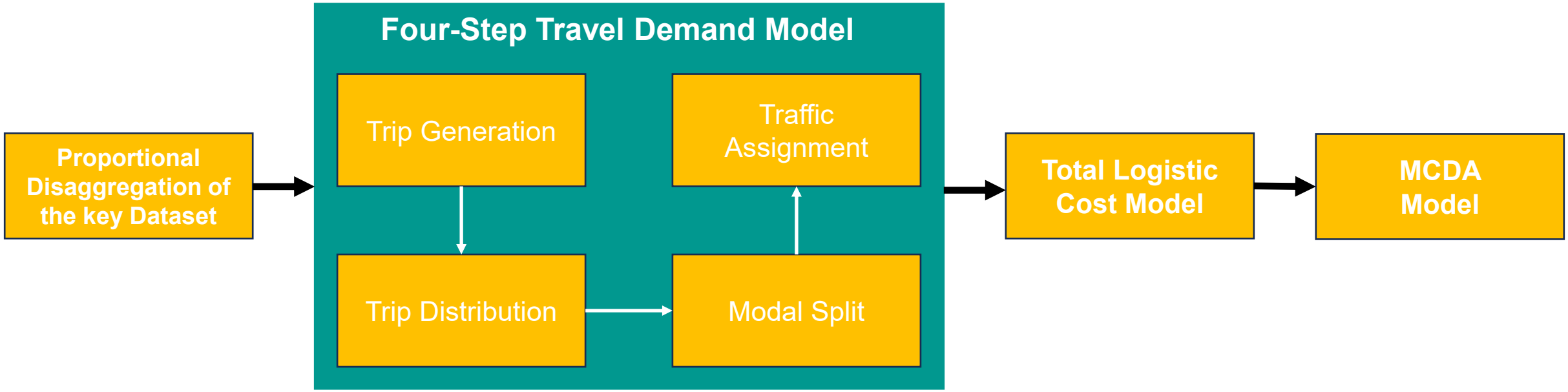
PROJECT AIM

The aim of the project is to develop and implement a data-driven approach for identifying and prioritising key agricultural roads in the Free State province that require urgent attention.

PHASE 1: Economic Analysis, Identification and Prioritisation
PHASE 2: TBD

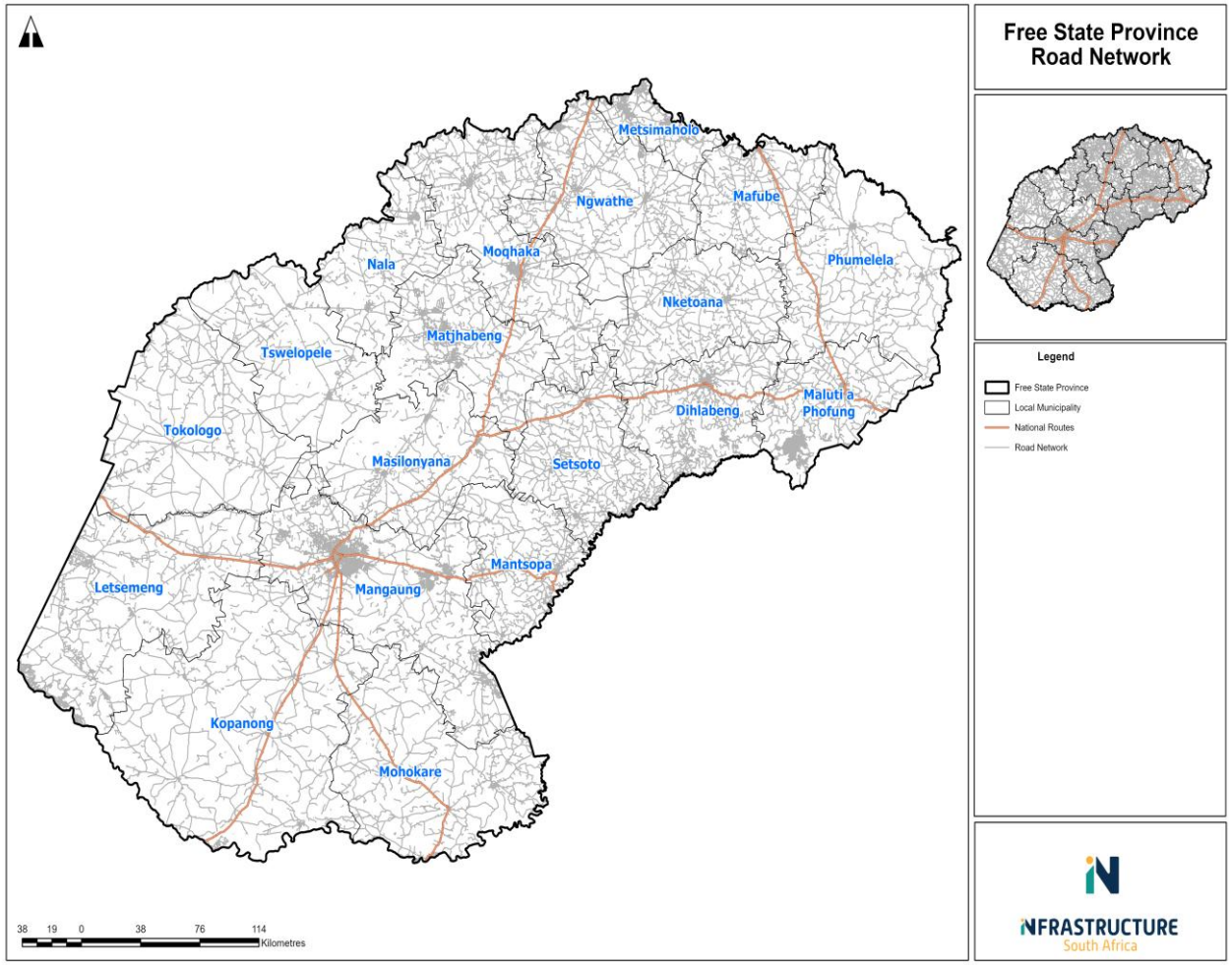
OVERALL APPROACH

ISA CURRENT APPROACH

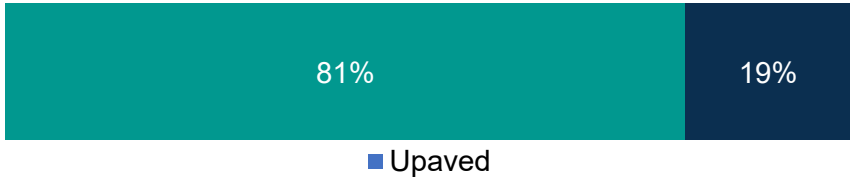


Macroeconomic Analysis

FREE STATE LOGISTICS SECTORS & ROAD NETWORK

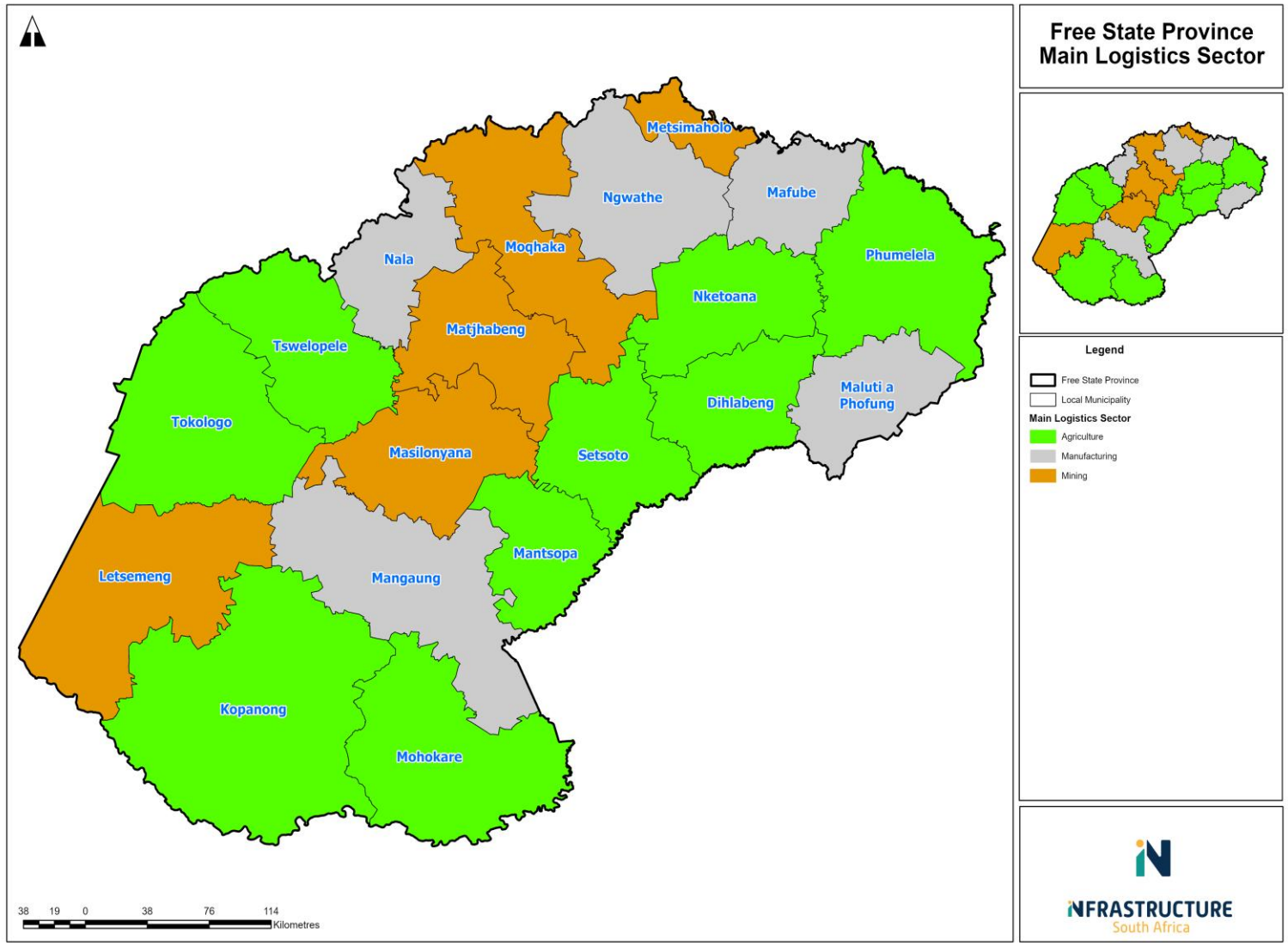


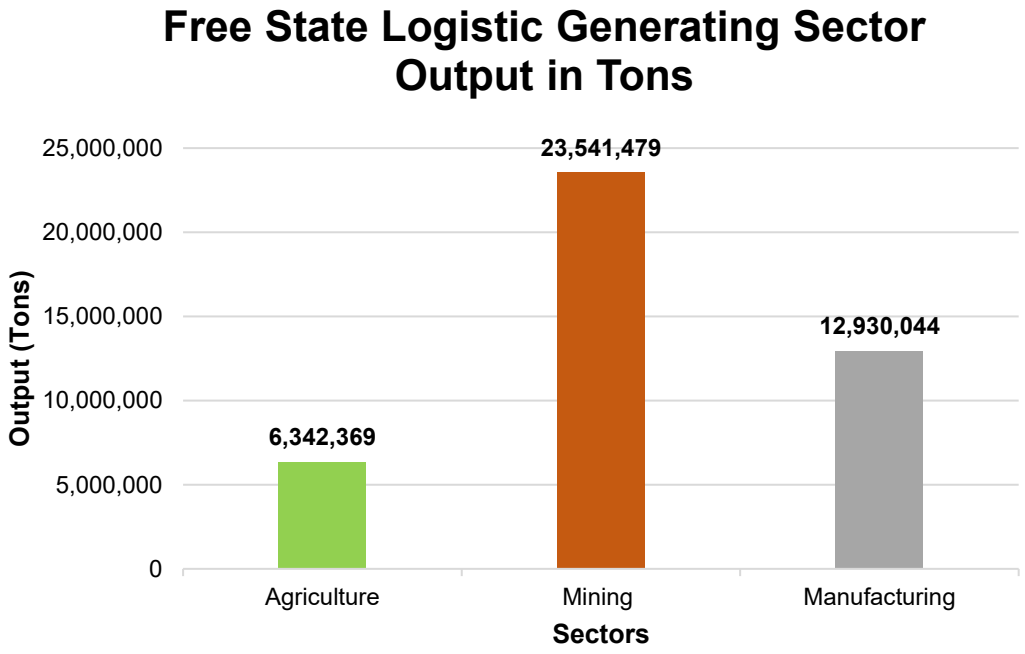
Total Free State Road Network
~65k Kilometers



Local Municipality	Road Network
Mangaung	9 258 KM
Moqhaka	4 530 KM
Matjhabeng	4 430 KM
Maluti a Phofung	4 036 KM
Kopanong	4 175 KM

FREE STATE LOGISTICS SECTORS





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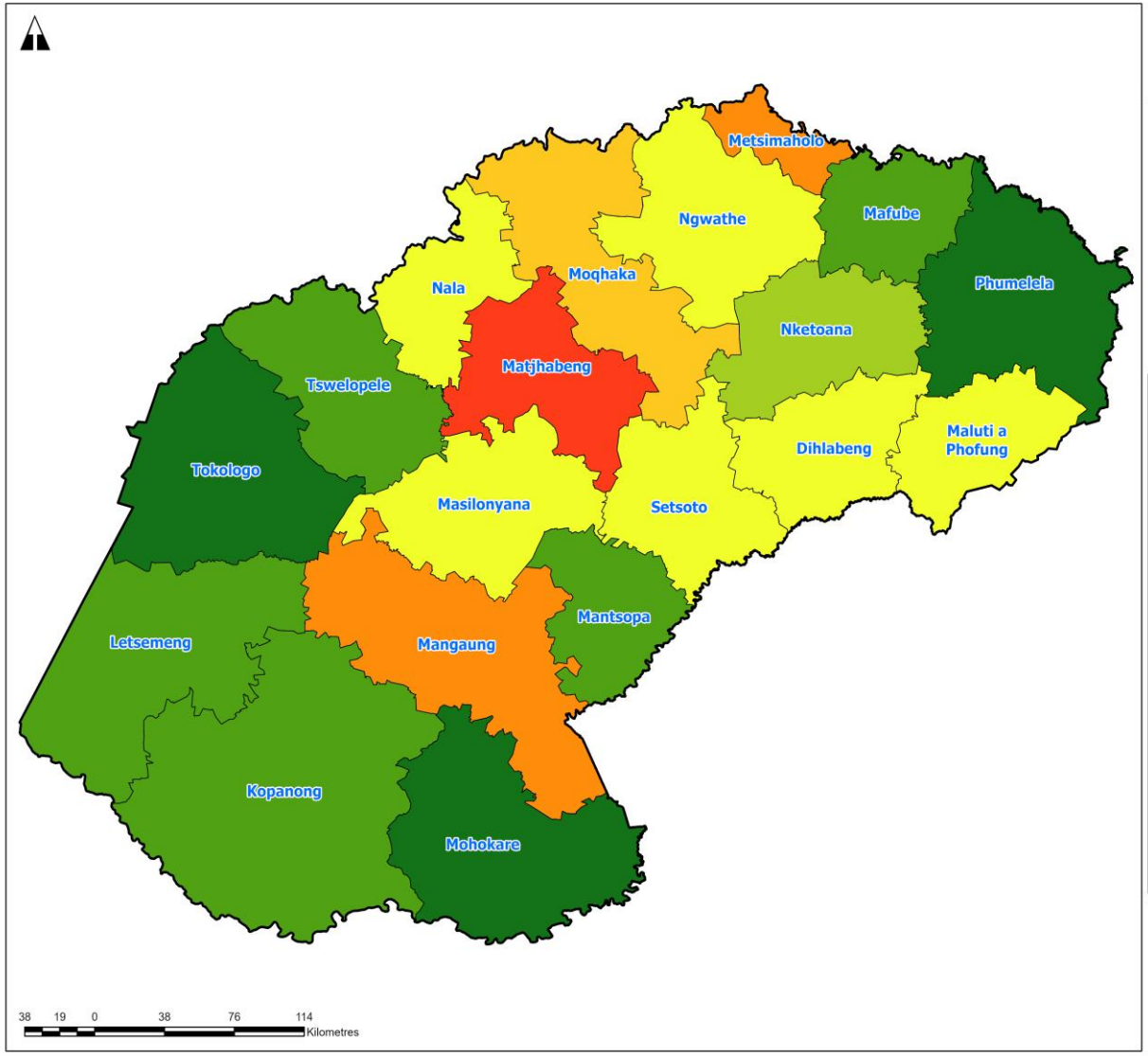
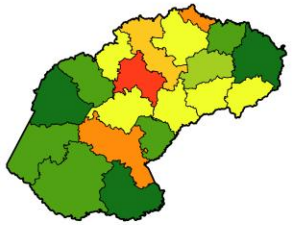
TRIP GENERATION



Free State Province Total Number of Trips



Legend

- Free State Province
- Local Municipality

Estimated Total Number of Trips

- 26055 - 32554
- 32555 - 39910
- 39911 - 44046
- 44047 - 111807
- 111808 - 181177
- 181178 - 600640
- 600641 - 899544

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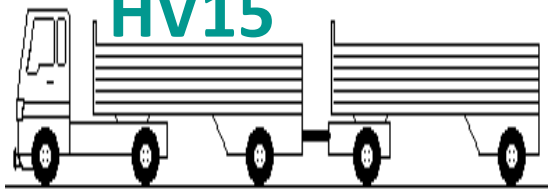
Vehicle Class

HV5

HV15



Vehicle Class Split Assumptions

Sector	HV5	HV15
Agriculture	0,6	0,4
Mining	0	1
Manufacturing	0,9	0,1

Est. No. of Trips

Est. No. of Trips

2,9 Million

Top Local Municipalities (Annual Trips)

Local Municipality	Sector	Trips
Matjhabeng	Mining	899 544
Metsimaholo	Mining	600 640
Manguang	Manufacturing	428 787
Moqhaka	Mining	181 177
Dihlabeng	Agriculture	111 807

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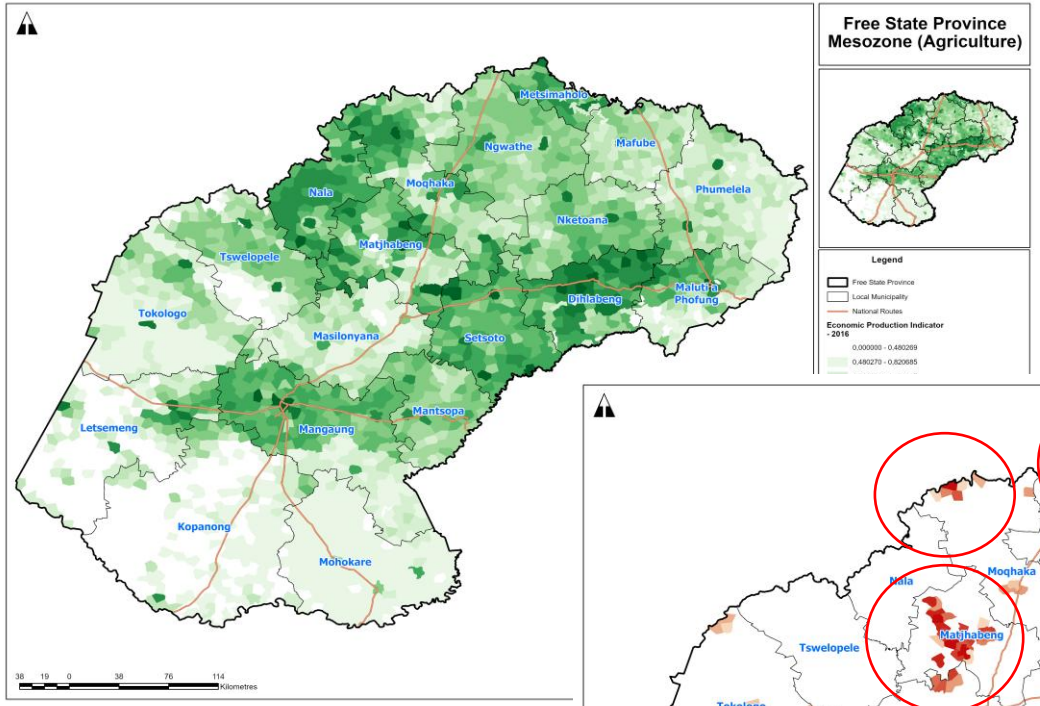
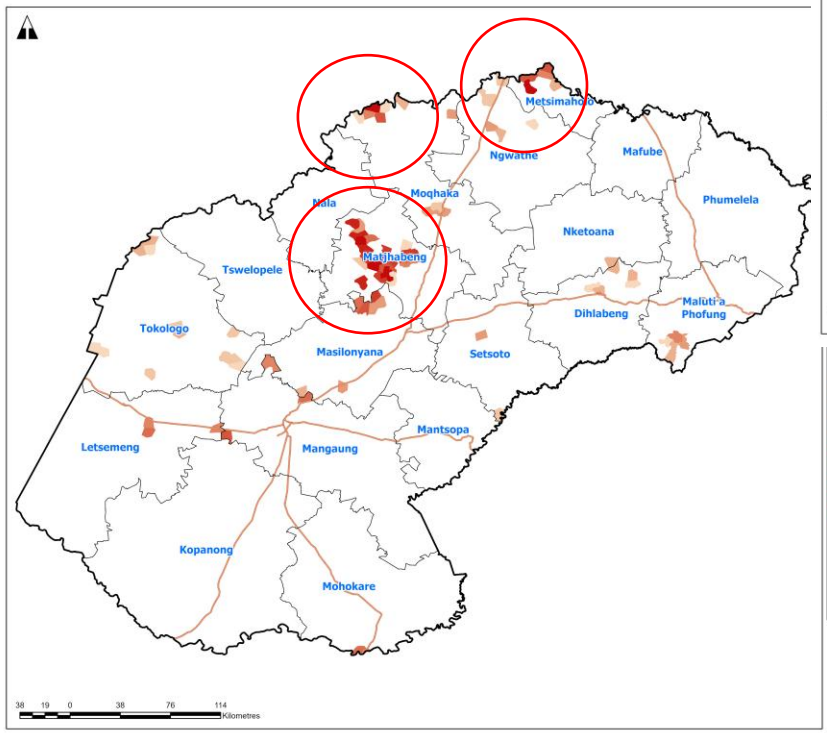
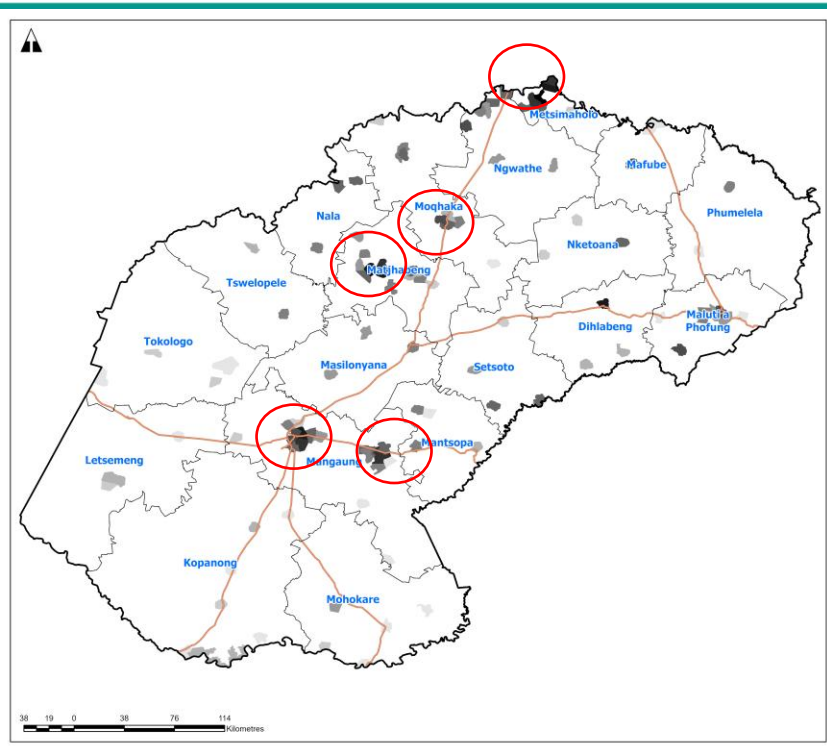
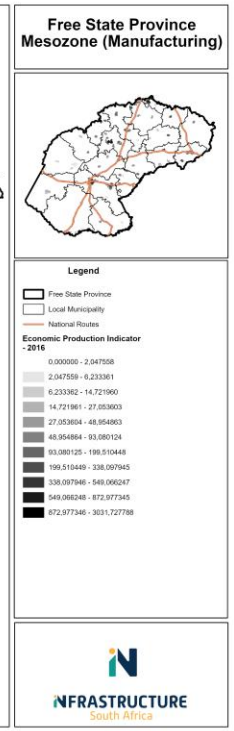
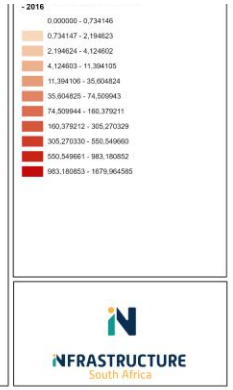
MESOZONE AGRICULTURE, MINING & MANUFACTURING











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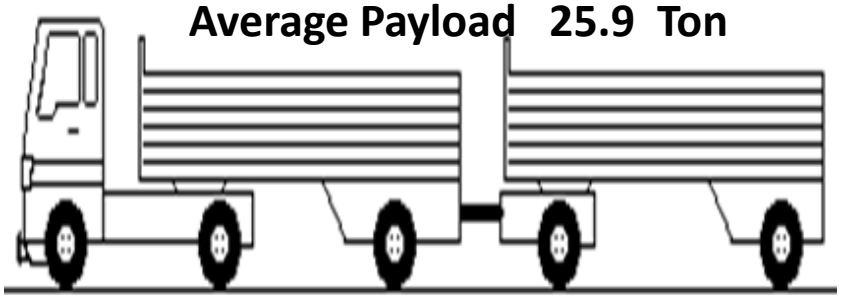
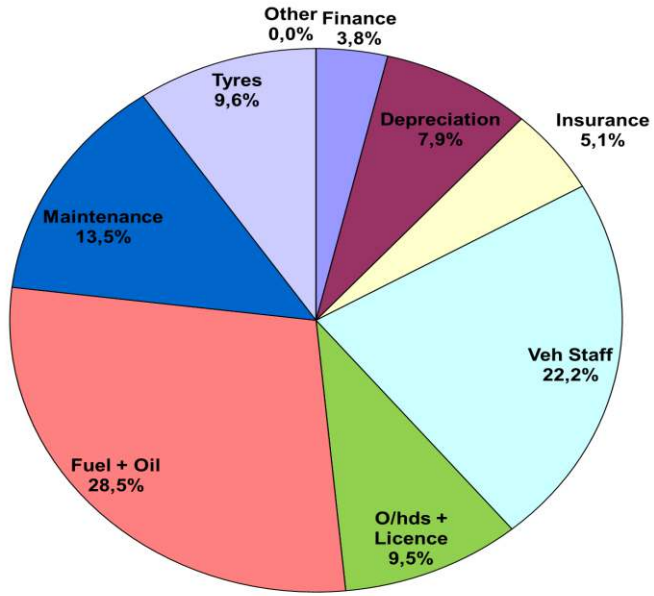
2030 NDP

TOTAL LOGISTIC COST MODEL

Average Payload 25.9 Ton





$$TLC = TC + SC + MAP + ICC$$

TLC = total logistics cost

TC = transport cost

SC = storage and port handling cost

MAP = management, admin and profit cost

ICC = inventory carrying cost

With: Transport Cost:

$$TC = L + D + R + A + S + P$$

TC = transport cost

L = road line haul cost

D = road distribution cost

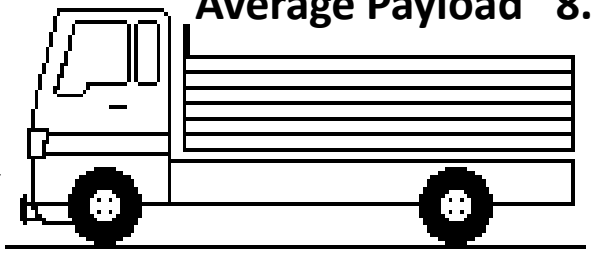
R = rail transport cost

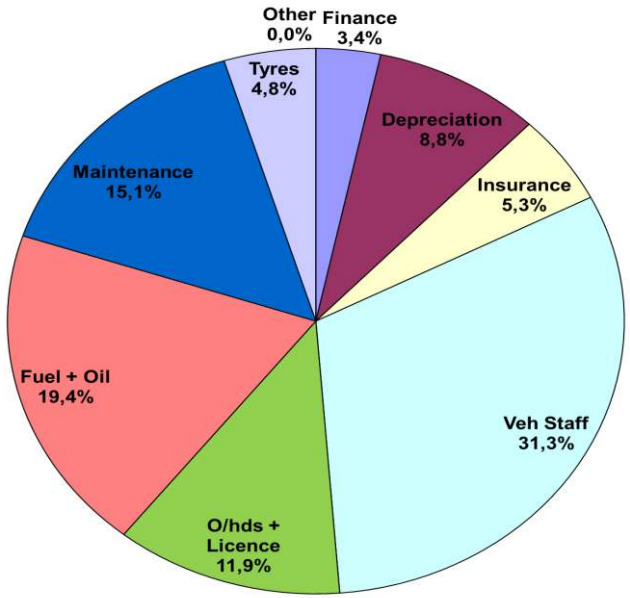
A = air transport cost

S = coastal shipping cost

P = pipeline transport cost

Average Payload 8.1 Ton





Multi-Criteria Decision Analysis (MCDA) & Prioritisation

INFRASTRUCTURE SOUTH AFRICA PRIORITY MODELS

- ISA has developed various priority models that are used at different stages:

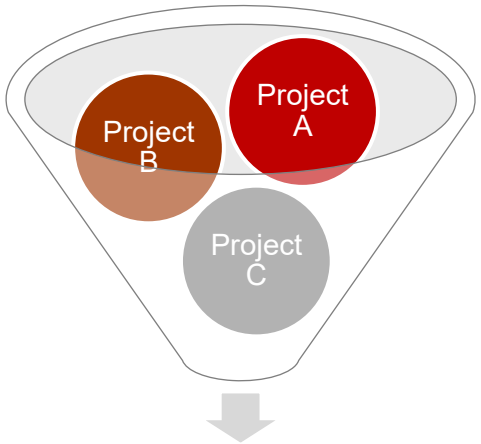
ISA Provincial Screening Model
- Pre-ISA registration tool for provincial screening

ISA Portfolio Optimization Model
- Post registration, before early business case

ISA Pipeline Prioritization Model
- Post-registration and post-TWG evaluation

- Each model has a **designated purpose**, which also guides the choices regarding the evaluation criteria and associated sub-criteria.

- The models follow a **standardised methodology** in terms of how they operate; however, the output of the respective models is for different purposes:
  - **Provincial screening** provides a ranking of projects at a high level, showing which may be **eligible for registration** at a quick glance
  - **Portfolio optimisation** provides a ranking of projects that should ideally be **evaluated first at a technical level**
  - **Pipeline model** provides a ranking of projects for those that should be **escalated further outside of ISA**



Prioritised Project List

PRIORITY MODELS HIGH LEVEL METHODOLOGY

- The typical approach used in developing the model includes:

1. Identify Project Evaluation Criteria

- Identification of key criteria to be used in evaluation
- Criteria considered must have a way to be scored
- Examples of potential criteria include
  - ✓"Alignment with policy"
  - ✓"Project Readiness"
  - ✓"Economic Impact"

2. Criteria Weighting Determination

- Determine whether to used **equal weighting** (i.e. same importance) or **apply different weighting** (can be done through pairwise comparisons)
- Other sophisticated techniques can be applied in determining the weighting, such as *Analytical Hierarchy Process (AHP) technique.*

3. Scoring

- Appropriate scoring of criteria
- Scoring should use a numeric system towards a final score
- Approaches for **potential scoring**:
  - ✓Scoring of 0 – 5
  - ✓Scoring of 1 and 5 (binary)
  - ✓Scoring of 1, 3 and 5 (categorical)

4. Performance Index

- Calculates the sum product of the scores with the respective weights
- Can also be converted to percentages for contextual interpretation out of 100

5. Analyse Project Scores

- Analysis of the various scores/performance indices of each initiative evaluated
- Ranking can be applied to highlight top initiatives as well as low-performing initiatives in terms of scoring

IDENTIFY PROJECT EVALUATION CRITERIA

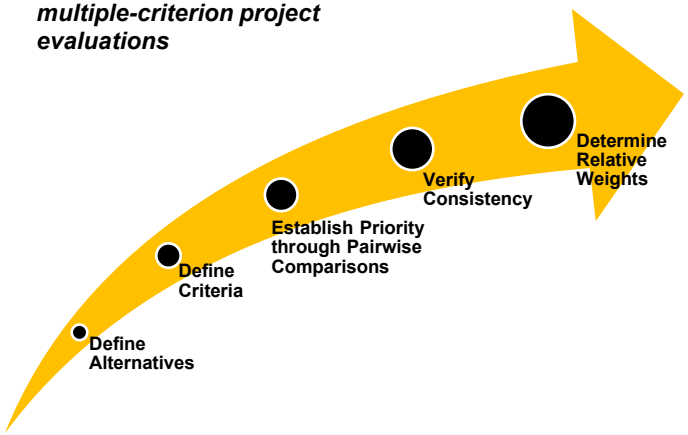
- Most crucial step in developing the prioritisation framework
- Example of criteria previously used in models, as well as the scoring guide for the respective criterion:

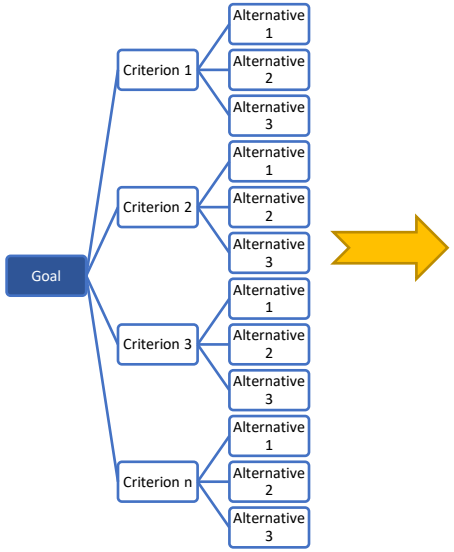
Project/Shovel Readiness	Location Quotient (Sector Comparative Advantage)	Growth Performance Index of Sector (GPI scores)	Job Creation Potential (Direct Jobs)
Construction Ready **(Score 5)**	LQ > 1 **(Score 5)**	GPI > 100 **(Score 5)**	Jobs > 15 000 **(Score 5)**
Defined and in feasibility stage **(Score 3)**	Regional/National/International **(Score 3)**	GPI < 100 **(Score 1)**	5 000 < Jobs < 15 000 **(Score 3)**
Conceptual **(Score 1)**	LQ < 1 **(Score 1)**		Jobs < 5 000 **(Score 1)**

- Scoring approach used defines how the scores are assigned using a mixture of categorical scoring and binary scoring

CRITERIA WEIGHTING DETERMINATION

Analytical Hierarchy Process (AHP) –Technique used for decision making in complex multiple-criterion project evaluations





Criteria	X1	X2	X3	X4	X5	X6	X7
X1	1,00	3,00	1,00	1,00	0,50	4,00	2,00
X2	0,33	1,00	0,33	0,50	0,14	2,00	1,00
X3	1,00	3,00	1,00	3,00	1,00	3,00	3,00
X4	1,00	2,00	0,33	1,00	0,33	3,00	3,00
X5	2,00	7,00	1,00	3,00	1,00	7,00	5,00
X6	0,25	0,50	0,33	0,33	0,14	1,00	0,33
X7	0,50	1,00	0,33	0,33	0,20	3,00	1,00
Total	**6,08**	**17,50**	**4,33**	**9,17**	**3,32**	**23,00**	**15,33**

Criterion Weighting Determination

Table 2
AHP scale. Pairwise comparison scale.

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance	Experience and judgement slightly favour one activity over another
5	Essential importance	Experience and judgement strongly favour one activity over another
7	Very strong importance	An activity is favoured very strongly over another; its dominance demonstrated in practice
9	Extreme importance	The evidence favouring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values	When compromise is needed between two

Table 3
Random Index.

n:	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

The quality of the AHP is related to the consistency of the pair-wise comparison judgments. Therefore, it is important to judge the consistency of the decision-making. The Consistency Index (CI) is calculated using the following equation:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

Consistency ratio (CR) can conclude whether the evaluations are sufficiently consistent.

According to Random Index (RI), if the number of CR exceeds the value of 0.1, the evaluation procedure has to be repeated to improve consistency (Table 3). A CR of 0.1 or less is generally stated to be acceptable. The AHP method applied in this study is based on research method developed by Saaty [28,30] and used by Görener, Lee, and Kahraman [26,27,32].

$$CR = \frac{CI}{RI}$$

SCORING AND PERFORMANCE INDEX (1)

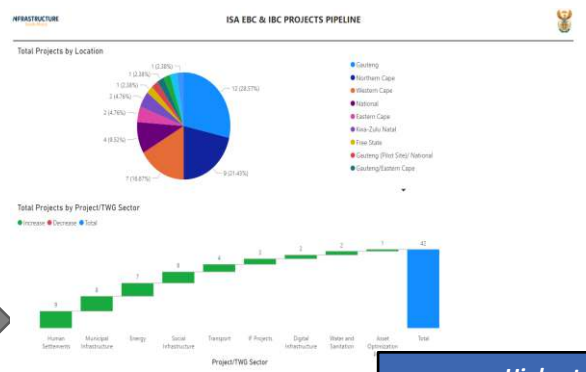
Project Evaluation Criterion

- 5 Excellent
- 4 Good
- 3 Satisfactory
- 2 Below average
- 1 Poor

Project Scoring Metrics

- 5 Full Compliance
- 3 Partial Compliance
- 1 No Compliance

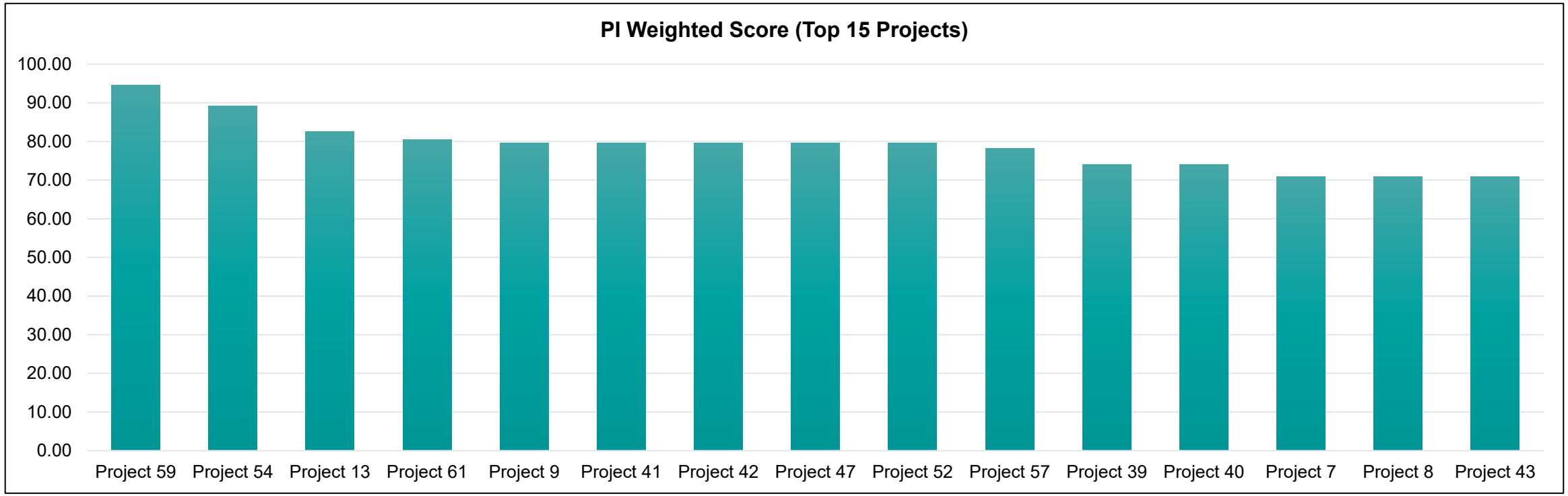
Analytics Reporting



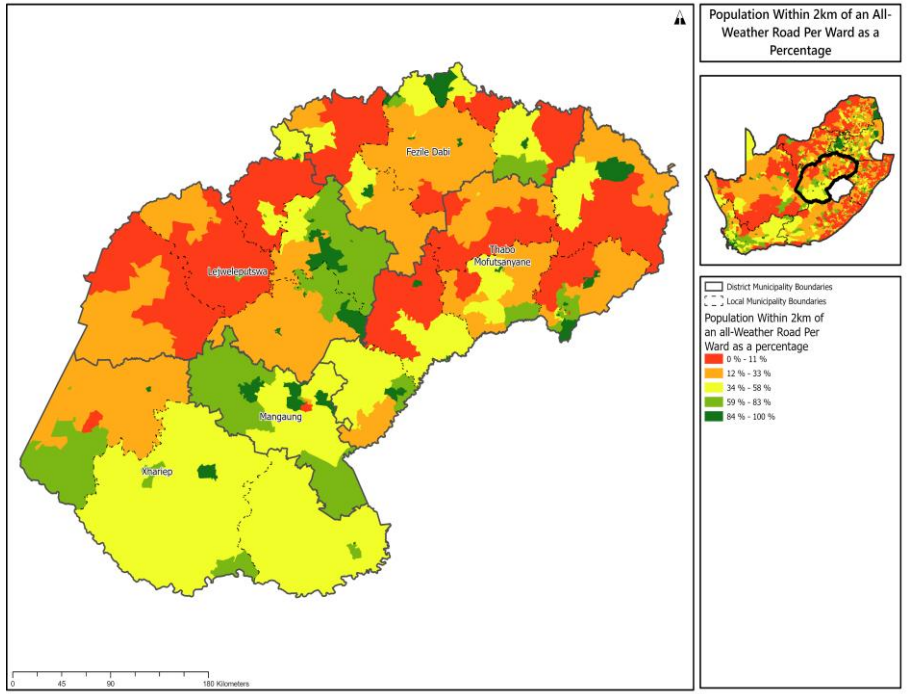
Highest and Lowest Rated Projects

SCORING AND PERFORMANCE INDEX (2)

- Example of the Performance Index Score (PI Score) output



MCDA MODEL (DRAFT)



	Policy Implication		Economic Impact		Risk		Project Readiness		Road Evaluation	
Criteria	Spatial Policy	Provincial Policy	GDP Impact	Job Impact	Road Demand (ADT)	Average cost of road network (R/m²)	Timelines / Readiness	Financing	Cost Effectiveness Analysis (CEA)	Road Access Index (RAI) rating
Scoring										
1	Limited compliance with policy as the road project is serving mostly an urban	Road project has limited potential to support provincial policy principles	< R2 mil	< 4 000 jobs	Less than 300 ADT	High average cost of road network	Conceptual stage only	Unfunded	Road network has poor CEA rating	Road network located in area with good RAI
2										
3	Average compliance with road project serving both urban and rural areas	Road project has the potential to support provincial policy principles	R2 mil -R5 mil	4 000 - 10 000 jobs	ADT between 300 and 600 vehicles	Moderate average cost of road network	Road planning and designs completed	Funding application submitted	Road network has average CEA rating	Road network mostly serves areas with average RAI
4										
5	Road project mostly serving rural areas	Road project supports provincial policy principles	> R5 mil	> 10 000 jobs	ADT > 600 vehicles	Low average cost of road project	Construction ready	Funding allocated	Road network has good CEA rating	Road network located in area with poor RAI

NEXT STEPS