



Electric Mobility and Localisation

Towards Unlocking The New Value Chain for Africa

Industrial Development Corporation South Africa Ltd
AIH Group

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Gallagher Convention Centre
Johannesburg, South Africa

smarter mobility AFRICA

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Project Objective

The aim of the study was to **identify opportunities in the NEV market** that fall outside of the mainstream OEM passenger vehicle market.

The study objective included identifying opportunities in **adjacent markets driven to adopt the electrification of transport** due to environmental, social and governance factors such as shareholder value and a just transition within South Africa and Africa.

The **project methodology:**

- Literature review, primary and secondary research, data analysis and triangulation
- Stakeholder engagement and one-on-one interviews
- Economic- and financial modelling

Scope of Work

Battery Value Chain

Cell Components to Battery Pack Battery Recycling / Second Life

Micro-mobility

L-Class vehicles: two-, three- and four wheelers, Small Segment Vehicles, Light Delivery Vehicles (LDVs), Conversions, Niche Applications (Game Viewing).

Machinery and Equipment

Non-commercial: Industry, Mining & Agriculture, Long-Haul Logistics



Public Transport

Buses, Minibus, Taxis, Light Rail, BRT Busses

Charging Infrastructure

Mobility Applications

Project Stages

1 | Project Inception
- Project Inception Report

2 | Literature Review and Situational Analysis
- Situational Analysis and Baseline Report

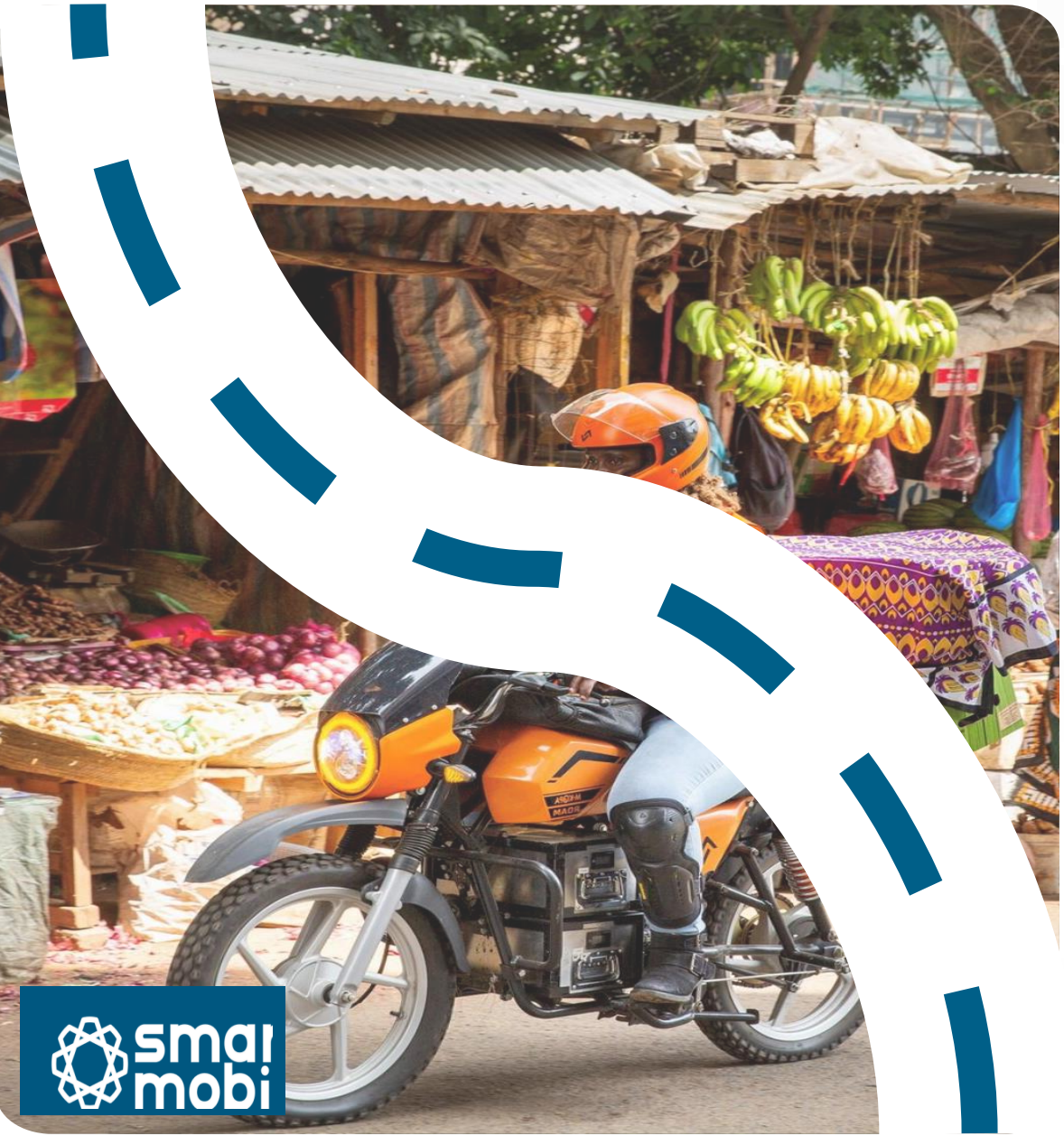
3 | Stakeholder Engagement
- Stakeholder Engagement Report

4 | Economic Model
- Economic Model to assess the impact of NEV transition

5 | Battery Value Chain
- Battery Value Chain Assessment Report

6 | Strategy and Investment Report
- NEV Strategy and Investment Report

NEV Landscape



Literature Review & Situational Analysis

- **10 Million** units New Energy Vehicles (NEVs) sold globally in 2021.
- Many countries are aiming to **reduce greenhouse gas emissions** from transportation by electrifying vehicles.
- There are also **developments in hydrogen fuel cell vehicles for heavy transport.**
- The shift to NEVs poses implications for workforce transformation, with job losses but also **new opportunities.**
- To date **China has been a global dominating force in the battery production landscape**, producing 79% of global NEV.
- The push towards micro mobility is driven by **urban congestion, air pollution, and the high cost** of traditional commuting methods.
- One element of an enabling environment for NEVs in South Africa is the greater degree of **policy** certainty brought about in the **NEV White Paper**. This is in line with the White Paper's emphasis on opportunities in the **battery value chain.**

Challenges in adopting battery electric vehicles include:

- Charging infrastructure
- Total cost of ownership

Battery swapping has emerged as an option to mitigate these challenges.

Heavy Commercial Vehicles

Literature Review & Situational Analysis

Ownership Models

Emerging to **address the high initial investment cost.** These models include leasing:

- **"Trucking as a service"** (TaaS)
- **"Pay as you drive"**
- **"Charging as a service"**
- Leasing allows for **less upfront capital investment**, while TaaS provides comprehensive **vehicle support over its lifetime.**

Companies in South Africa, such as Shoprite, Volvo, and Takealot, have begun **incorporating electric trucks into their fleets**, supported by advancements in battery technology and infrastructure development.

Challenges in electrifying trucking include:

- Addressing electricity supply
- Scaling up electric vehicle production
- Establishing charging infrastructure

Fuel Cell Electric Vehicles

- The transition to fuel cell electric vehicles (FCEVs) in South Africa is projected to reach **price parity** with internal combustion engine ICE vehicles by 2030, depending on various factors including import tariffs.
- FCEVs offer **longer ranges and support heavier vehicles** but requiring **hydrogen infrastructure**.

Machinery, Equipment & Agriculture

Literature Review & Situational Analysis



- Global mining industry targets net-zero emissions with accelerated decarbonization efforts.
- Leading companies, De Beers and Fortescue aim for carbon neutrality by 2030.
- Transition to electric vehicles (BEVs, FCEVs) and renewable energy key strategies.
- Environmental and operational benefits of electric vehicles in underground mining.



- Electrifying dump trucks in surface mines is the current global focus.
- Promise of FCEV mining dump trucks in South Africa, with Anglo American leading the adoption.
- Case studies highlight BEVs' potential in underground mining – with the use of battery swopping technology.



- New vehicle sale trends in South Africa shows that tractor sales slightly decreased.
- Combine harvester sales increased (note: all these tractors are diesel-powered).
- 'Greening' of agricultural transport is challenging.
- NEV solutions increase the weight of the vehicles significantly, therefore reducing range and cooling efficiencies of NEVs.



- CEMA (2022) suggests that agricultural transport equipment is often better predisposed to biogas and methane conversions for ICE vehicles, as these alternate fuels can often be generated on site.

Public Transport

Literature Review & Situational Analysis

Battery electric drive trains dominate heavy-duty vehicle sales, with fuel cell electric vehicles experiencing a decline in sales. Despite a decrease in electric bus sales between 2021 and 2022, **electric buses remain the dominant** vehicle type in this sector.

Forecasts indicate a rapid increase in the adoption of electric buses globally, with nearly **half of the world's bus fleet expected to be electric by 2032 and over 75% by 2045**.

South Africa's transition to zero-emissions buses is **driven by governmental legislation and targets across regions**.

- MAN delivered its Lion's Explorer E, an electric bus, in Cape Town - 2023.
- Golden Arrow Bus Service - Field testing BEV Bus in Cape Town

In South Africa, efforts are being made to **introduce BEV minibuses**, despite the **higher initial cost, lifetime savings in fuel costs and maintenance** are significant, indicating the potential for long-term economic benefits

Overall, the electrification of public transport is **gaining momentum globally**, driven by environmental regulations, technological advancements, and cost-saving opportunities.

Micro Mobility

Literature Review & Situational Analysis

The push towards micro mobility is driven by **urban congestion**, **air pollution**, and the **high cost** of traditional commuting methods.

It is impractical to use large vehicles for daily commutes, leading to a shift towards smaller, more efficient modes of transportation, including shared options.



Electric mobility benefits include **reduced emissions** and **costs**.

This includes **electric bicycles**, which are highly energy-efficient and cost-effective for personal transportation.

Two-wheelers: electric motorcycles gain popularity for commuting and deliveries, with China leading the electric two-wheeler manufacturing market.

Battery swapping systems support the adoption of electric scooters and bikes for deliveries.

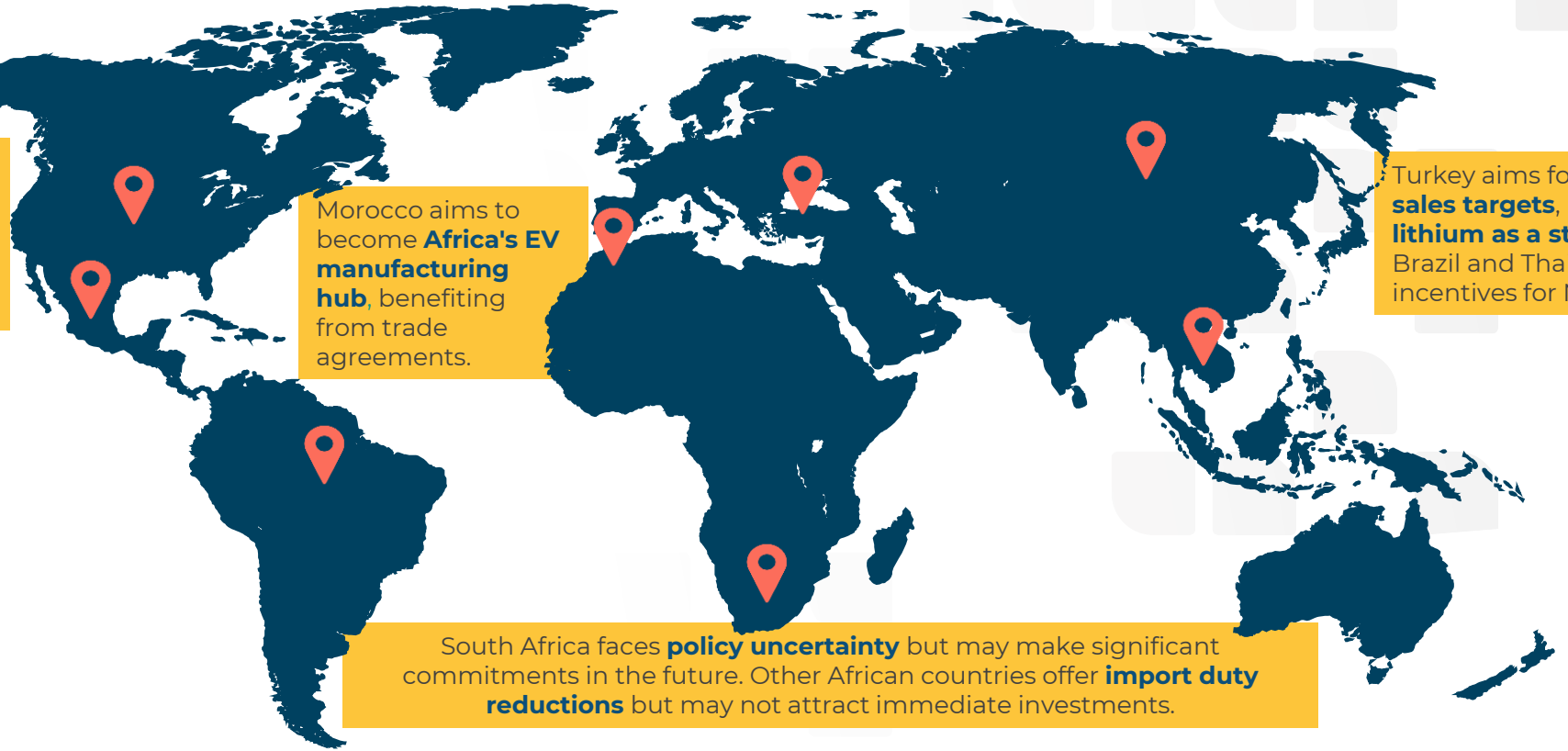


- **Electric three-wheelers:** Tuk-Tuks are gaining traction for goods transportation across Africa.
- **Electric four-wheelers:** Light delivery vehicles offer alternatives for transportation, especially in future smart cities.
- **Battery electric platforms** allow for flexible vehicle designs and market adaptation.
- **Eco-tourism vehicles:** in African game reserves offer environmental and economic benefits.

Trade, Policy, Conformity

Literature Review & Situational Analysis

- Governments worldwide are **implementing policies to speed up the shift** from Internal Combustion Engine (ICE) vehicles to New Energy Vehicles (NEVs).
- In Africa, NEV trade is **minimal due to low domestic demand and production**, with South Africa and Morocco dominating exports.
- **Used vehicle imports hinder investment** in new vehicle production.



China, Europe, and the US **lead the transition to NEVs through incentives and regulations**, while African countries struggle with affordability.

Morocco aims to become **Africa's EV manufacturing hub**, benefiting from trade agreements.

Turkey aims for **zero emission vehicle sales targets**, Mexico recognizes **lithium as a strategic mineral**, and Brazil and Thailand offer significant incentives for NEV production.

South Africa faces **policy uncertainty** but may make significant commitments in the future. Other African countries offer **import duty reductions** but may not attract immediate investments.

Infrastructure & Battery Value Chain

Literature Review & Situational Analysis

Key for a battery value chain will be dependent on:

- Achieving **economies of scale** from a market perspective
- Conducive **policy and incentive** framework related to NEVs
- **Charging infrastructure** models
- Adequate **availability of electricity**
- Ability to make South Africa attractive for foreign BESS value chain **partnerships** to avoid "re-inventing the wheel".

Methodology



Stakeholder Engagement

The stakeholder engagement methodology consisted of three elements in a survey format to obtain information about the New Energy Vehicle environment:

- A set of **quantified** questions
- A set of **open-ended** questions
- **One-on-one** interviews were also conducted to add to the responses

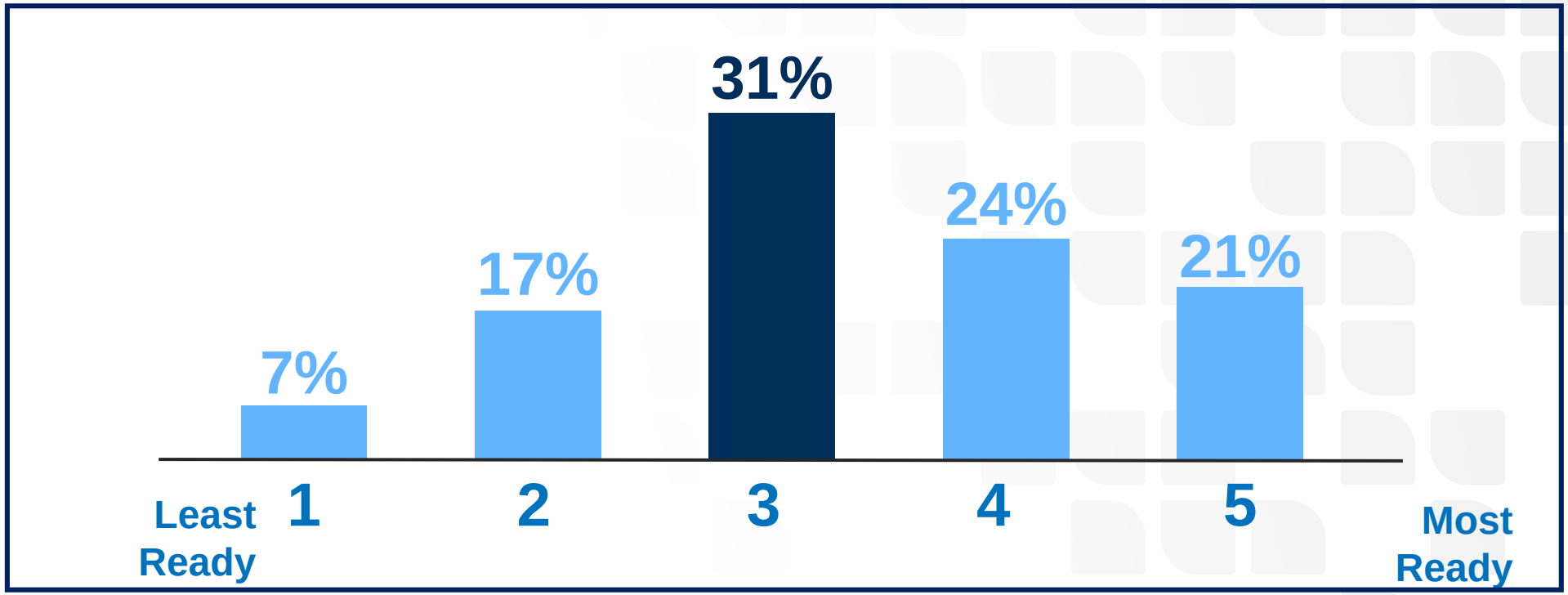
90 Stakeholders

54 Responses

60% Response Rate

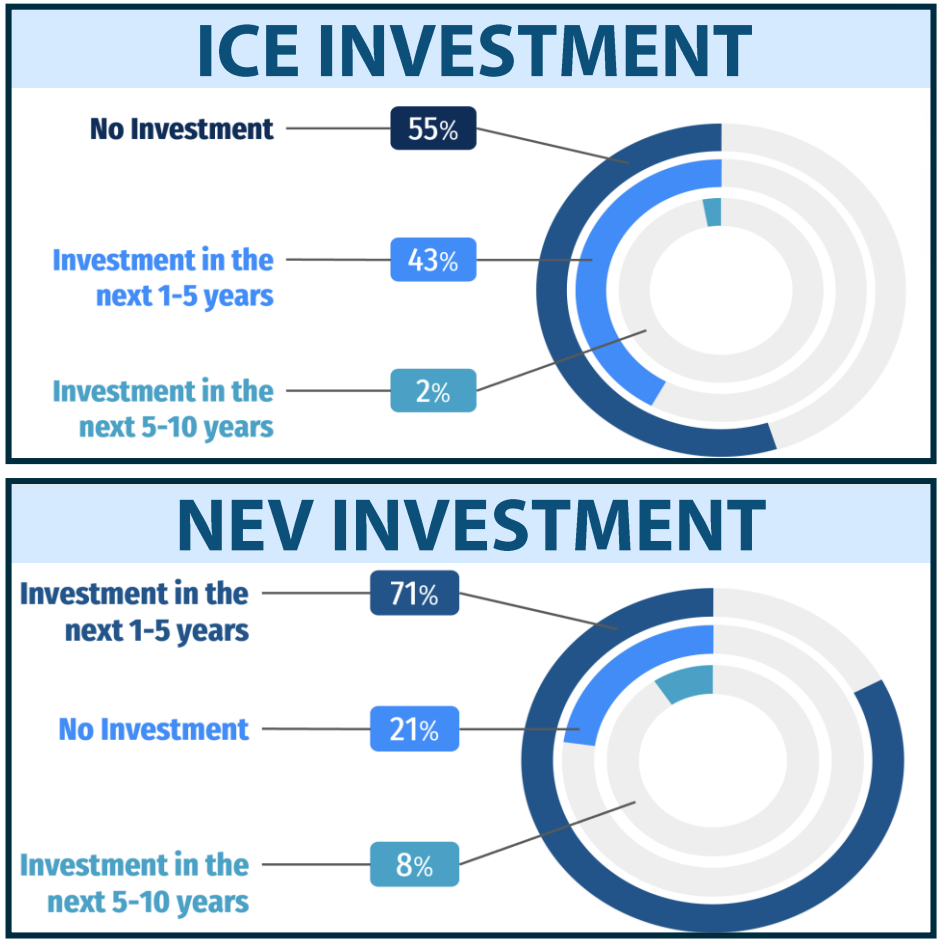
Industry Readiness

Stakeholder Engagement



- **Almost half** of the respondents (45%) rate **industry's readiness to migrate as positive**, with 31% giving a moderately ready response.
- Only 24% gives a below average readiness response.
- This indicates a **largely positive sentiment**, which is likely to **grow as more initiatives are announced.**

Investment Plan

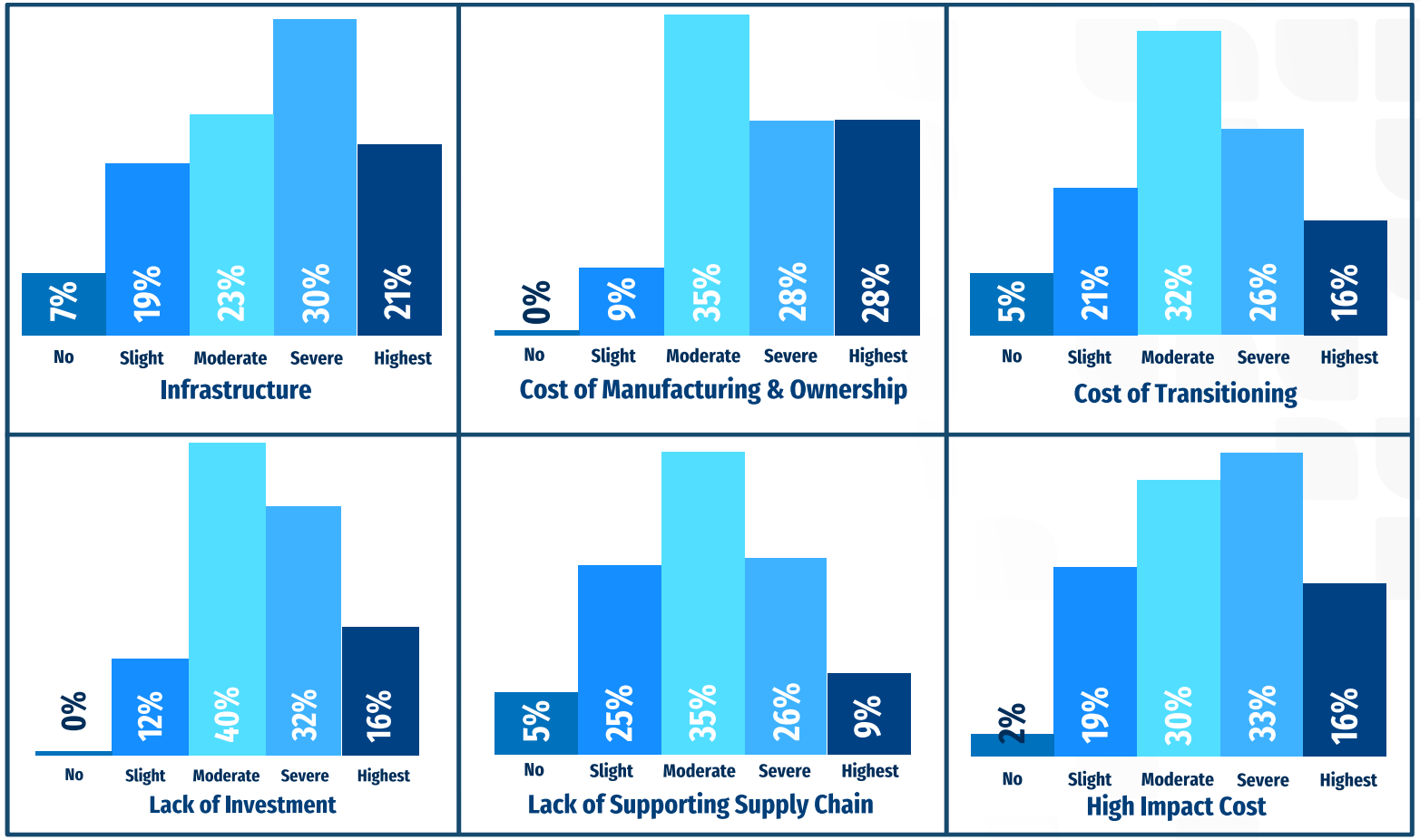


Stakeholder Engagement

- Developing **charging stations** across the country for long distance routes and shopping centers.
- Investment opportunities in the battery industry:
  - **Battery Recycling and Assembly.**
- Addressing challenges of **grid stability** and reducing dependence on coal power generation.

Practical Challenges

Stakeholder Engagement

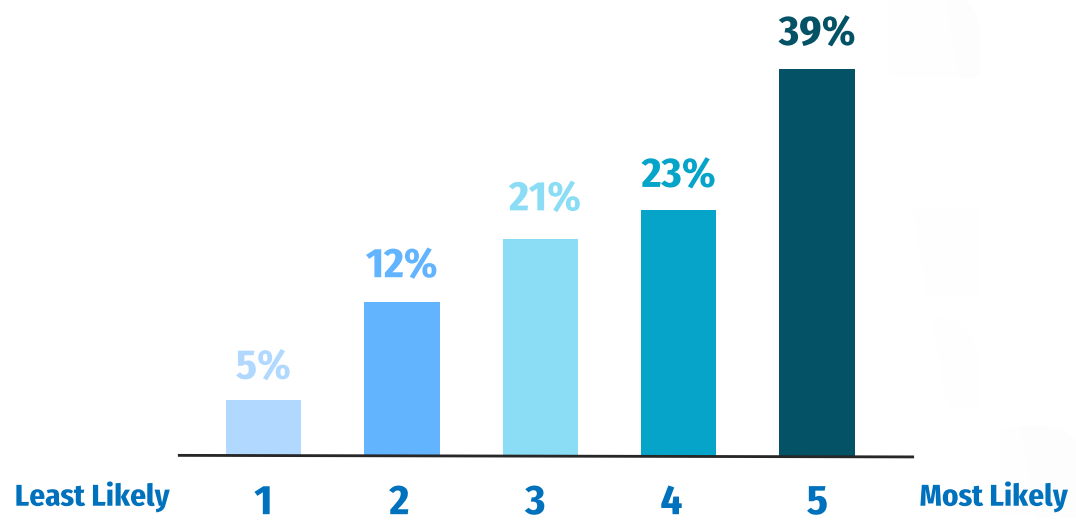


- **Infrastructure and high cost of manufacturing and ownership** are the most significant challenges.
- Lack of **charging infrastructure** for long distance travel and heavy commercial vehicles such as trucks and busses.
- **Price of batteries** for EVs make it less affordable.
- **High initial capital costs** in comparison to ICE.

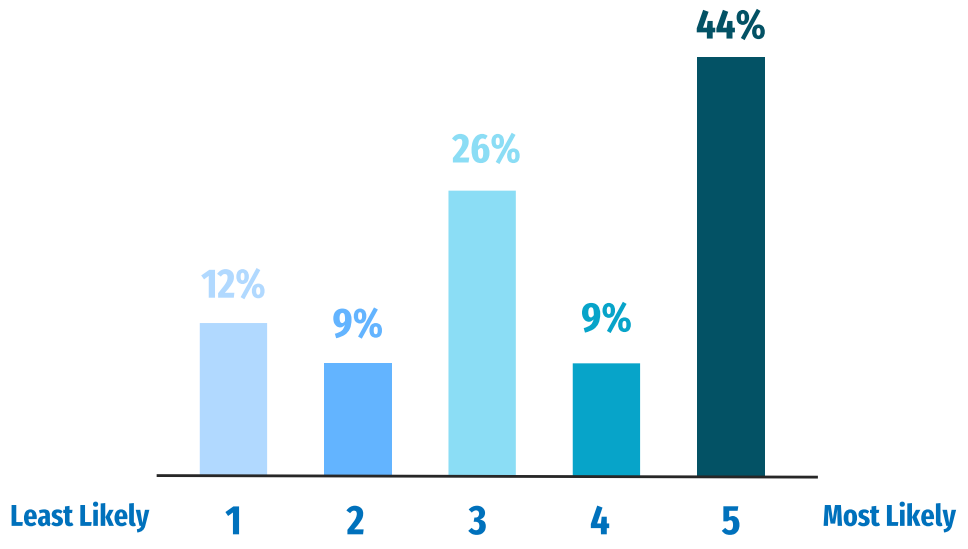
Potential International Partnerships

Stakeholder Engagement

COMPONENT LOCALISATION



TECHNOLOGY DEVELOPMENT



- Need to attract international EV component suppliers and localise subcomponents to **increase volume and scale.**
- Beneficial for international partners to **cost R&D in ZAR rather than in USD or Euro.**
- South Africa has a **well-established component industry** with the ability to adjust to many NEV needs.

NEV TRANSITION ECOSYSTEM

- Global warming & climate change as major drivers
- Logistics & supply chain
- Battery value chain
- Vehicle/Fleet offering
- End-user choices
- Strategic framework
  - Policy/Regulatory
  - Funding & Incentives
  - Energy systems
- Production
  - Manufacturing/Assembly
  - R&D
  - Standards/Specifications
  - Human Capital

METHODOLOGY

- Structured survey
- Open-ended questions
- 60% response rate
- One-on-one interviews

INDUSTRY READINESS TO TRANSITION

- 45% rate industry readiness higher than average
- 30% rate it as average
- Only 24% rate it below average

POTENTIAL PARTNERSHIPS

- 62% rate component partnerships as likely to most likely
- 53% rate technology partnerships as likely to most likely



STAKEHOLDER ENGAGEMENT

NEV INVESTMENTS

- 45% plan ICE investment in 1-10 years
- 78% plan NEV investment in 1-10 years

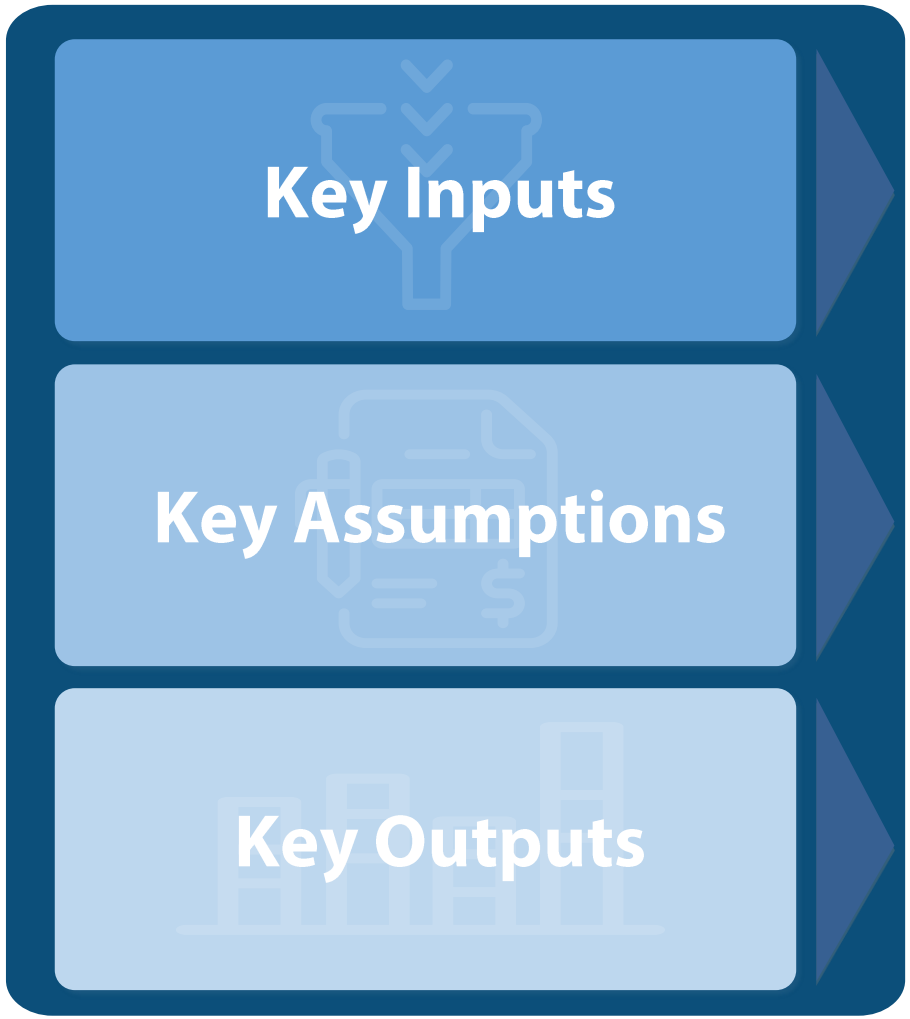
PRACTICAL CHALLENGES

- Lack of infrastructure: 51%
- Cost of manufacturing & ownership: 56%
- Cost of transitioning: 42%
- Lack of investment: 48%
- Lack of supporting supply chain: 35%
- High impact cost: 49%

RECOMMENDATIONS

- Shared vision and road map
- Policies and incentives
- Opportunities: local manufacturing & infrastructure
- Purchase price parity
- Energy supply

Model Overview



Economic Model

- Vehicle parks
- Manufacturing costs
- Transition Scenario
- Localisation Scenario

- NEVs are currently not produced as efficiently as ICE vehicles – in the future their price will be at least the same
- The vehicle classes considered are too niche, and the South African demand is not high enough to warrant more localisation than current ICE vehicles. The main localisation potential lies in the assembly of vehicles and the packing of batteries for BEVs.
- BEVs will be the main NEV in all categories. FCEV and HEV only play a minor role.

- Gross Domestic Product supported by the production of NEVs and batteries
- Employment supported by the production of NEVs and batteries
- CO_2 emissions avoided due to the transition from ICE to NEVs

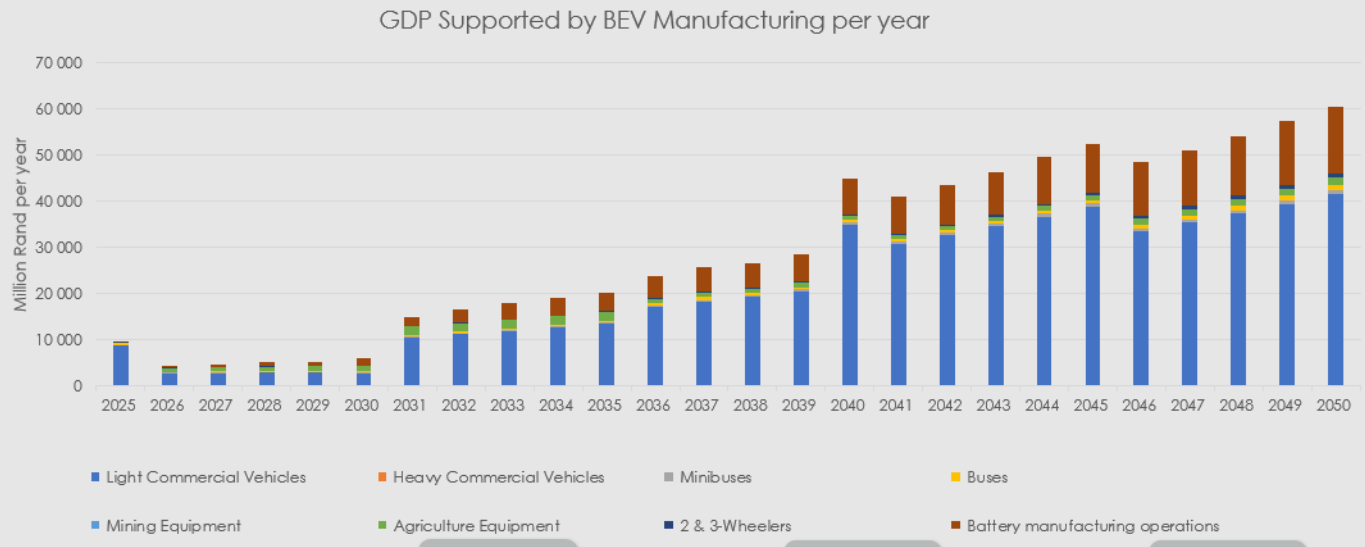
Economic Impact

Comments

- Custom GDP multipliers were estimated for each segment based on Quantec GDP economy-wide type II operational expenditure multipliers and cost structures.
- Local values of manufacturing operation per year were multiplied with the economic multipliers to derive the impacts.
- The Light Commercial Vehicle class is by far the largest in terms of vehicle park and impact. Battery packing has the second largest impact.

Economic Model

GDP supported from manufacturing per vehicle segment – 2025 to 2050
(ZAR Mn)



GDP supported (ZAR Mn)	2030	2040	2050
	6 158	44 935	60 588

Automotive manufacturing accounted for ~2.9% of GDP in 2022, which is roughly 200,000 Million Rand (200 Billion Rand)

Employment Impact

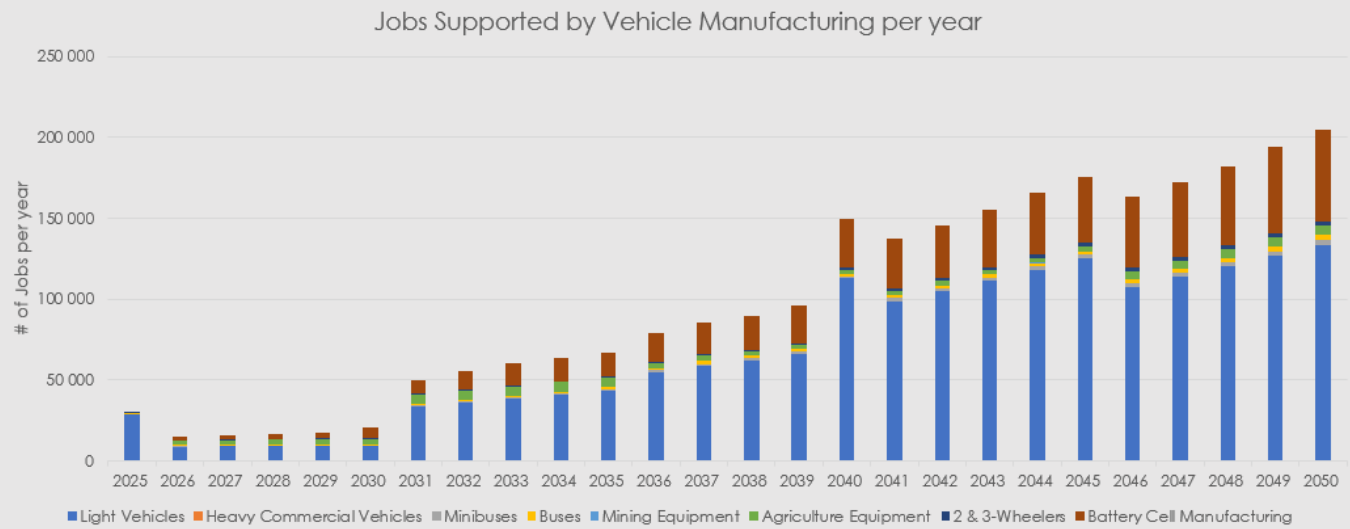
Comments

- Custom Employment multipliers were estimated for each segment based on Quantec employment economy-wide type II operational expenditure multipliers and cost structures.
- Manufacturing costs were estimated per NEV segment based on ICE to NEV ratios to derive local value of manufacturing operation per year.
- Local values of manufacturing operation per year were then multiplied by the custom employment multipliers to derive the employment impact.

Economic Model

Jobs supported from manufacturing per vehicle segment – 2025 to 2050

(# of jobs)



Employment supported (# of Jobs)

2030	2040	2050
20 930	149 636	204 284

Automotive manufacturing accounted for ~1 000 000 jobs in South Africa (including multiplier effects)

Emissions Impact

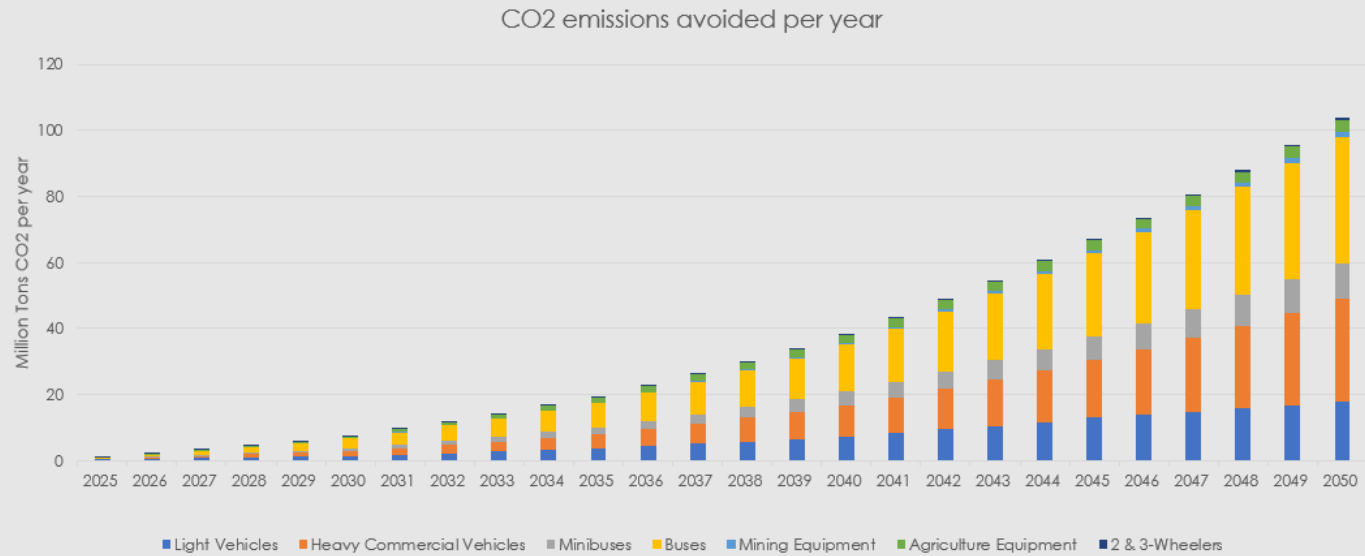
Comments

- Scope 3 downstream ICE emission estimates were obtained for each vehicle segment.
- Annual emissions per replaced ICE were classified as avoided.
- Buses, Heavy Commercial and Light Commercial make up a large part of the avoided emissions.
- The Mining Dump Trucks also have a significant share despite their small vehicle park.

Economic Model

CO_2 emissions reduced per vehicle segment – 2025 to 2050

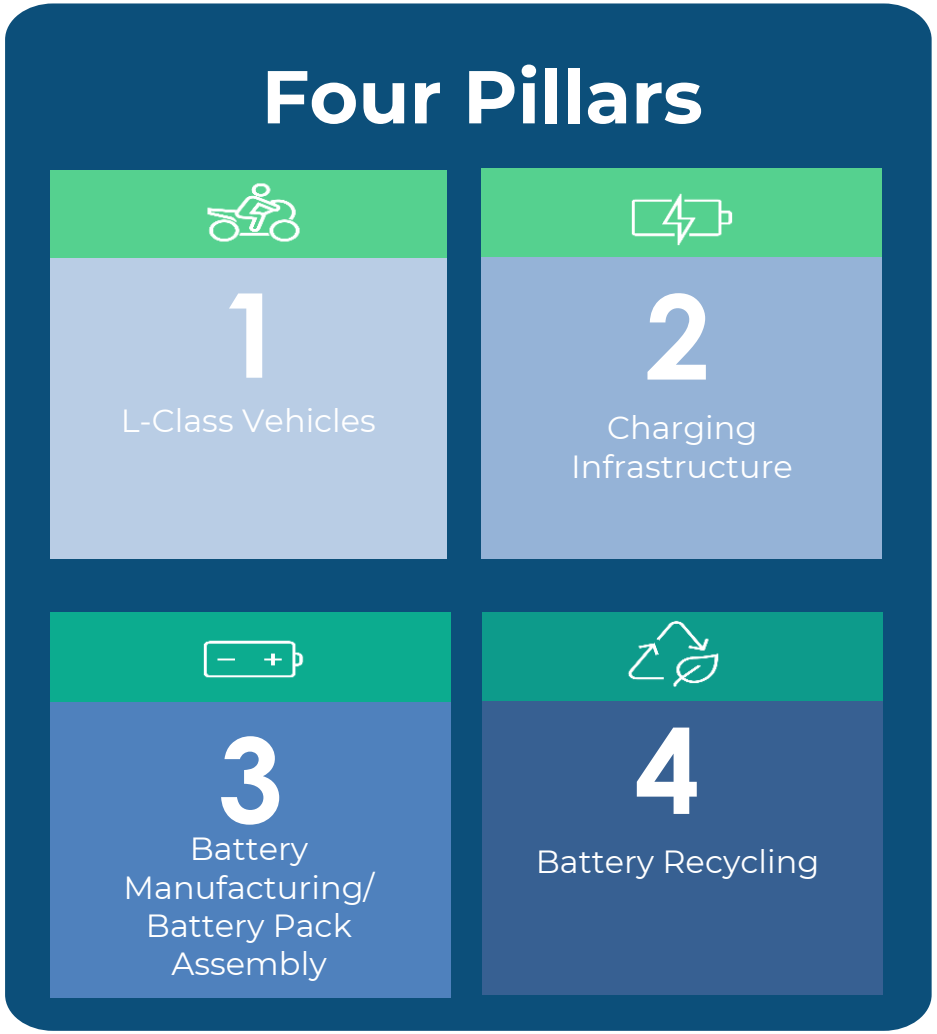
(mt CO_2-eq)



CO2 emissions avoided (Mn CO_2 tons)	2030	2040	2050
	7	38	104

South Africa emitted 436mn tons in 2021. The calculated emissions are downstream emissions from using the vehicles, and not related to manufacturing of the vehicles.

Localisation Strategy



Strategy and Investment

- The Strategy and Investment phase aimed to capture the NEV market growth to substantiate developing industrial strategies as a **catalyst to provide large scale funding** that will support the development of a **NEV eco-system** in South Africa and Africa.

- The four pillars are identified to form the **basis of the localisation strategy**: L-Class Vehicles, Charging Infrastructure, Battery Manufacturing/Battery Pack Assembly and Battery Recycling.

- The **light vehicle class** (L-Class) includes two, three, and four wheelers. Collectively these are also referred to as **"micro-mobility".**

Market Overview

Strategy and Investment

The motorcycle import demand in Africa is estimated at 1.4 million units in 2022 at a value of USD2.5 billion.

The electric motorcycle import demand in Africa is estimated at 13 000 units in 2022 at a value of USD34 million.

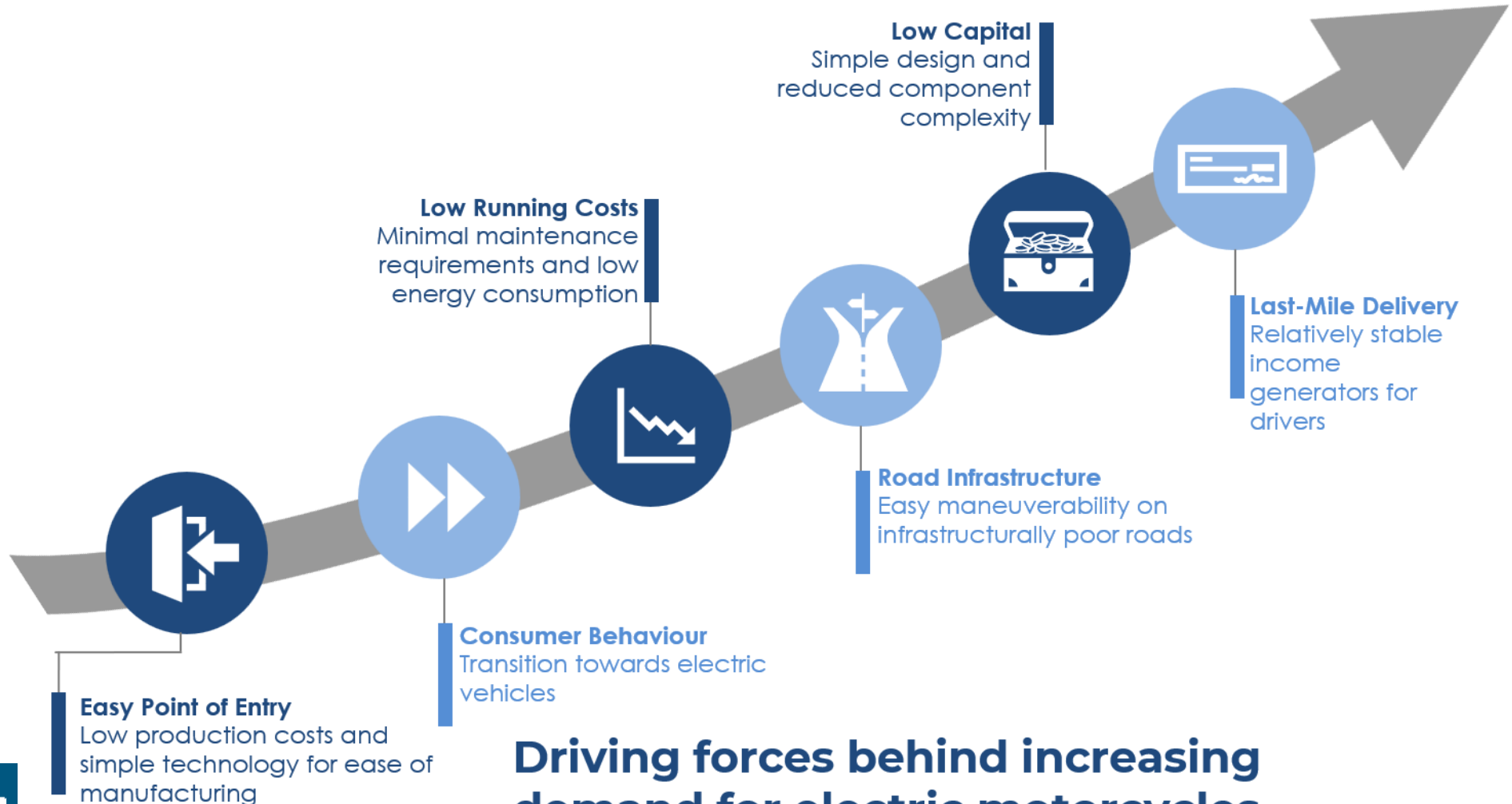
The two-wheeler electric market could grow to circa 50% of the total two-wheeler market by 2040. To achieve this projected market penetration, the CAGR for the sales of electric motorcycles should be more than 25% per annum.

Based on the projected growth of electric motorcycle sales in Africa at 25% per annum in volume, the sales of electric motorcycles could exceed 1.1 million units in 2040.

- Last-mile deliveries account for the majority of growth related to electric L-class vehicles in SA.
- Companies that provide electric L-class vehicle rentals or lease services: Everlectric and Green Riders (Woolies Dash), Pingo (Checkers Sixty60), and Valternative Energy (Uber Eats, Take-a-Lot and Mr D Food).
- The projected demand for electric two-wheelers in the South African last mile delivery market alone is estimated at 2,367 units per annum by 2034.

Drivers of Demand

Strategy and Investment



Driving forces behind increasing demand for electric motorcycles

Establish NEV Environment

Policy Recommendations

- ❑ Supportive Infrastructure
- ❑ The phasing down of fossil fuel subsidies
- ❑ Demand Support
- ❑ Investment and Production Support
- ❑ Public and Fleet Purchases
- ❑ Achieving scale through export of motorcycle parts

Strategy and Investment

- A **favourable environment** for NEV will lead to an investment value chain, the localisation of components, and an improved auto economy.
- **How do we prepare South Africa?**
  - ❑ Government intervention is needed in the form of policies, incentives, and financing.
  - ❑ International and local partnerships to transfer knowledge and develop skills in South Africa.
  - ❑ Establish a shared vision in South Africa and across the continent regarding NEVs.
- There is a general **lack of standards** for the electric motorcycle industry, specifically regarding safety, charging infrastructure and building codes.
- **Policy recommendations** for L-class vehicles in South Africa and the Rest of Africa.

Emissions Impact

L-Class and Sustainable Manufacturing Locations

- ❑ Atlantis SEZ
- ❑ Coega SEZ
- ❑ East London IDZ, and
- ❑ Dube Tradeport SEZ

Battery Assembly and Recycling Locations

- ❑ Atlantis SEZ
- ❑ Coega SEZ
- ❑ East London IDZ, and
- ❑ Dube Tradeport SEZ

ASEZ came out as the ideal SEZ for sustainable assembly of L-Class vehicles and manufacturing of components for the export market.

Strategy and Investment

Analysis of all eleven operational SEZs within South Africa included:

- Location, size, infrastructure, and green support infrastructure (Renewable Energy Available, Recycling and Waste) and investments

SEZs provide incentives for manufacturing (Preferential 15% Corporate Tax, Building Allowance, Employment Incentive, Customs Controlled Area, 12I Tax Allowance)



Ranking Opportunities

Strategy and Investment

The high-level opportunity scoring matrix presents a strategy to prioritise key opportunities and components to localise first.

Opportunity Scoring Matrix

Opportunity / Component	Criteria: Projected Demand (<5 yrs)	Economic Potential	Job Creation Potential	Current Capability	International Partners	Support Industries	OEM Support	Local Partners	Total	Average
Opportunity										
L-class Vehicle Manufacturing and Assembly	9	7	8	10	7	10	6	8	65	8.13
Charging Infrastructure Provision	9	6	5	9	8	9	6	8	60	7.50
Battery Cell Manufacturing	7	8	7	1	5	3	5	3	39	4.88
Battery Pack Assembly	8	6	8	9	8	6	5	9	59	7.38
Mining and Beneficiation of Battery Minerals	8	8	8	7	8	6	5	7	57	7.13
Battery Recycling Facility	6	5	7	5	5	4	5	5	42	5.25
Component										
Steel Frame	8	7	9	10	9	10	9	9	71	8.88
Tyres	9	8	9	9	9	10	9	9	72	9.00
Brake System	8	6	7	6	6	10	8	8	59	7.38
Shock Absorbers	8	6	7	7	6	10	8	8	60	7.50
Harness	6	6	9	8	8	10	9	9	65	8.13
Battery Cell	6	9	7	1	5	3	5	3	39	4.88
Battery Pack	8	6	8	9	8	6	5	9	59	7.38

Ranking Opportunities

Strategy and Investment

- Electric two and three wheeler assembly and component manufacturing facilities
- Major growth in South Africa due to last mile delivery market
- 1.1 mil projected electric motorcycles sales in Africa by 2040



01 Electric Mobility

- Public charging and off-grid charging infrastructure
- Battery Energy Storage Systems opportunities
- Battery as a Service business models



02 Charging Infrastructure

- Battery value chain participation with access to key minerals for cell manufacturing and battery assembly
- Collaboration with international battery manufacturers
- Battery swapping



03 Battery Manufacturing

- NEV growth results in batters for second life usage
- Growing stockpile for recycling
- Re-use of recycled battery minerals



04 Battery Recycling

Conclusion

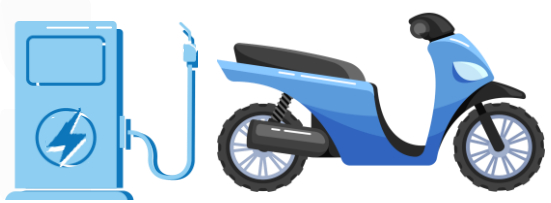
As **micro mobility transitions to electric** powertrains, supporting NEV value chain localisation projects will enhance South Africa and Africa's **manufacturing and export** capabilities.

Thereby driving **economic growth**, **technological innovation**, and **environmental sustainability** in the sub-Saharan Africa region.

Key recommendations include **two- and three- wheeler manufacturing**, developing **charging infrastructure** with battery swapping capabilities and monitoring the local **battery value chain.**

Way Forward

- Feasibility analysis of establishing an **assembly facility** in South Africa for both electric and internal combustion engine (ICE) **two- and three- wheelers**.
- Determine potential for **regional assembly hubs** across Africa.
- Determine potential for supply of **local manufactured two- and three-wheeler components** and sub-assemblies.



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Thank you



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