



Electric Vehicles

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2020

Market Intelligence Report

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GreenCape

GreenCape is a non-profit organisation that works at the interface of business, government and academia to identify and remove barriers to economically viable green economy infrastructure solutions. Working in developing countries, GreenCape catalyses the replication and large-scale uptake of these solutions to enable each country and its citizens to prosper.

Acknowledgements

We thank Bruce Raw and Jack Radmore, for the time and effort that they have put into compiling this market intelligence report.

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List of abbreviations and acronyms

AC	Alternating current
AEM	Automotive Export Manual
AIS	Automotive Investment Scheme
APDP	Automotive Production and Development Programme
AV	Autonomous vehicles
BEV	Battery electric vehicle
BFP	Basic fuel price
BRT	Bus Rapid Transit System
CO2	Carbon dioxide
CSIR	Council for Scientific and Industrial Research
DC	Direct current
DMEA	Department of Mineral and Energy Affairs
DMRE	Department of Mineral Resources and Energy
DoE	Department of Energy
DoT	Department of Transport
DST	Department of Science and Technology
dti	Department of Trade and Industry
dtic	Department of Trade, Industry and Competition
E-buses	Electric buses
EC	Eastern Cape
ES	Energy storage
EU	European Union
EV	Electric vehicle
FDI	Foreign Direct Investment
GERPISA	Le Réseau International de l'Automobile (International Automobile Network)
GHG	Greenhouse gases
GP	Gauteng Province
GTS	Green Transport Strategy
HEV	Hybrid electric vehicle
ICE	Internal combustion engine
IDC	Industrial Development Corporation
IDZ	Industrial Development Zone
ITAC	International Trade Administration Commission
Km/a	Kilometres per annum
KZN	KwaZulu-Natal
LCV	Light commercial vehicles
LFP	Lithium iron phosphate
LIB	Lithium ion battery
MIR	Market Intelligence Report
NCA	Lithium nickel cobalt aluminium oxide
NEC	Nippon Electric Company
NEV	New energy vehicle
NHTS	National Household Transport Survey
NMC	Nickel manganese cobalt oxide
OEM	Original equipment manufacturer
PAYS	Pay As You Save
PHEV	Plug-in hybrid electric vehicle
PI	Production incentives
PJ/a	Petajoules per annum
PPPFA	Preferential Procurement Policy Framework Act

PRCC	Production Rebate Credit Certificate
PV	Photovoltaic
RAF	Road Accident Fund
RE	Renewable energy
SA	South Africa
SAAM	South African Automotive Masterplan
SADC	Southern African Development Community
SEZ	Special Economic Zone
TIA	Technology Innovation Agency
US	United States
UWC	University of the Western Cape
VAA	Vehicle assembly allowance
VALA	Volume assembly localisation allowance
WC	Western Cape

Exchange rate used

An exchange rate of 1 USD = R14.10 was used.

Executive summary

Globally, the momentum for electric mobility has increased exponentially from 2013 to 2018. This global shift has been primarily driven by emission reduction commitments, growing urban air pollution concerns, and continued crude oil price volatility. In 2019 a year-on-year decrease in EV sales figures was seen for the first time after China halved its subsidies for new energy vehicles (NEVs).

South Africa (SA) does not have policies, subsidies or incentives in place to accelerate this market. It has thus not yet joined the ranks of those countries experiencing a steep rise in EV uptake. However, this is likely to change as battery prices continue to fall. Decreasing battery prices drive EV prices down, and it is expected that, once the price of EVs becomes competitive in SA, the same rise in uptake will be experienced.

SA already has a strong market for the manufacturing of internal combustion engine (ICE) vehicles. The automotive sector is a key player in the country's economic landscape. Total revenue from this sector was more than R500 billion (\$35.6 billion) in 2017, with the industry employing ~900 000 workers. SA is considered as a second-tier market, having produced more than 600 000 ICE vehicles in 2018, predominantly for the export market.

For SA, a thriving EV market supported by local manufacturing holds the promise of economic growth and job creation. It will also counteract the inevitable decline in demand for ICE vehicles globally.

There are a number of emerging opportunities in SA's nascent EV market:

- **Electric bus manufacturing:** Public transport presents the best business case for electrification. This is especially true for the bus market as it already produces buses largely for the domestic market. Buses are designated in SA and are subject to ~80% local content requirements by the Department of Trade and Industry (dti) for public procurement. The assembly of buses further enjoys the benefit of duty-free importation of all driveline components. SA assembled 1 131 units in 2017 with 54 (4.7%) of those destined for the export market. While this is a fairly flat market in SA, there is scope to revitalise this space. Incorporating e-bus manufacturing is a more economically viable way of achieving this revitalisation.

- **Lithium ion battery (LIB) production:** South Africa is an attractive manufacturing destination for lithium ion batteries because of its existing battery manufacturing (and recycling) industry. This is coupled with SA's mining sector's ability to provide some of the raw materials required for the nickel-manganese-cobalt-oxide cathode battery chemistry, especially manganese. SA holds 78% of the world's manganese. In addition, other raw materials required in the cathode are mined in Sub-Saharan Africa.

- **Passenger vehicle manufacturing:** There is a medium- to long-term opportunity for SA to be used as a manufacturing hub for electric passenger vehicles for the export market. Manufacturing for the domestic market is a longer-term opportunity as demand increases.

Table 1 provides an overview of the major drivers and barriers that are also discussed in this report. Table 2 highlights the market opportunities in the electric vehicle market.

Table 1: An overview: drivers and barriers

Market drivers	Market barriers
<p>Macroeconomic drivers</p> <ul style="list-style-type: none"> ■ South Africa's commitment to reducing emissions. ■ The potential loss of automotive trade markets. <p>Local demand drivers</p> <ul style="list-style-type: none"> ■ Climate-conscious consumers. ■ Rising fuel costs. ■ Reduced range anxiety. 	<ul style="list-style-type: none"> ■ Products not fit for the South African market. ■ High import duties. ■ Lack of policy certainty.

Table 2: Overview of the market opportunities within the Electric Vehicle Market

Opportunity	Key drivers	Barriers	Term
Manufacturing and increased uptake of electric buses	<ul style="list-style-type: none"> ■ The need to meet greenhouse gas reduction targets. ■ Public transport demonstrates the best business case for alternative fuel applications. ■ Decreasing battery pricing. ■ Increase in renewable energy. 	<ul style="list-style-type: none"> ■ Slow local uptake. ■ Public procurement system. ■ Poor precedent created by Cape Town bus tender. 	Medium – Long.
Lithium Ion batteries (LIB) production	<ul style="list-style-type: none"> ■ Increasing need for lithium-ion batteries in renewable energy, electric vehicle and other sectors. ■ Availability of nickel & manganese in South Africa. ■ Availability & relative ease of access to lithium & cobalt. ■ Emerging need of Mn-rich electrodes that can compete with 'in vogue' Nickel-rich compositions (security of supply). 	<ul style="list-style-type: none"> ■ Establishing strong public-private partnerships. In particular, partnerships that extend beyond South Africa, as with Argonne and University of Limpopo, & those with foreign industry. ■ Better understanding of global Manganese-oxide demand. ■ Policy support. 	Medium – Long.
Passenger vehicle manufacturing	<ul style="list-style-type: none"> ■ Government efforts to increase local content, volume outputs and jobs. ■ Potential loss of existing trade markets. ■ South Africa already has a strong automotive industry. 	<ul style="list-style-type: none"> ■ Lack of local market. 	Medium – Long.

1 Introduction

This MIR is written for investors interested in South Africa's electric vehicles market.

Globally, the electric vehicle (EV) market has been growing steadily since 2010, supported by financial and non-financial incentives to make electric vehicles an attractive purchase. Government support and subsidies are still vital to allow EVs to compete with the internal

combustion engine (ICE) market. This was shown in 2019, when China's reductions in subsidies for new energy vehicles (NEVs) caused a first disruption in the trend of continuous growth in EV sales, as can be seen in the change in 2019 sales after June, shown in Figure 1 below.

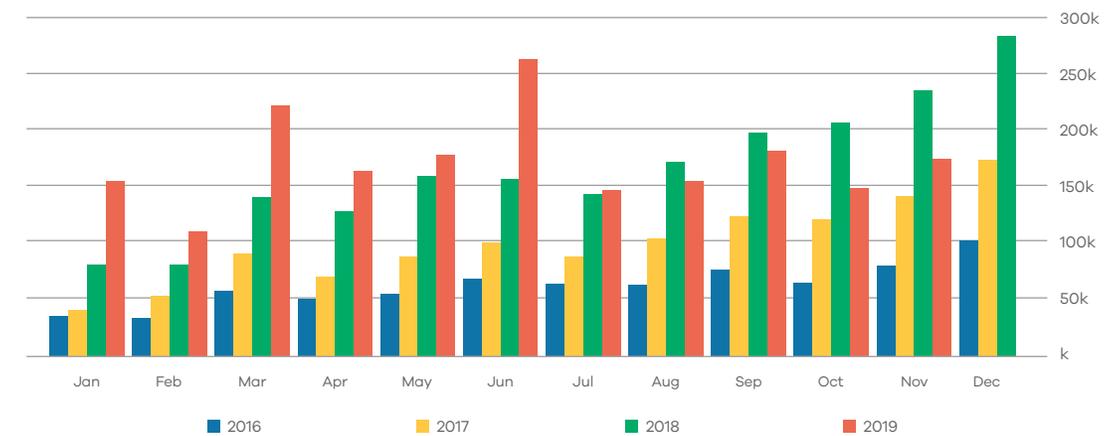


Figure 1: Global EV sales decrease after China's subsidy reductions

(Source: InsideEVs)

There are various reasons governments have chosen to support the electric vehicle market. These include:

- **Emission reduction commitments:** The transport sector has been identified as a key contributor to global greenhouse gas emissions, because of its reliance on fossil fuels. As of November 2019, the Paris Agreement, obliging signatories to reduce their emissions¹, has been signed by 197 countries and ratified by 187. Electric vehicles provide an alternative to traditional internal combustion engines as they can be powered by renewable energy.

- **Air quality concerns in cities:** Of global greenhouse gas emissions, 15% is attributed to the transport sector. Increasing motorisation in cities has resulted in increasing air pollution concerns. Because electric vehicles produce zero direct emissions, they are able to assist in improving air quality in cities.

- **Continued volatility of the crude oil price:** Reliance on fossil fuels in the transport sector poses a risk to countries because of the volatility of the crude oil price. As a result, many countries are seeking alternatives that will reduce their crude oil import bill. Because electric vehicles can be powered by local energy sources, they are becoming increasingly attractive.

¹ With a few exceptions where certain countries have been given allowances to increase

SA, having not implemented any form of incentives or policies to accelerate the growth of the EV market, has yet to join the ranks of those countries experiencing a steep rise in uptake of EVs. It is expected that, as the market matures, the competitiveness of EVs will continue to increase.

EVs will not require subsidies to be relevant, making it likely that SA will follow the global trends in time.

This report provides potential investors and businesses with an overview of the state of the EV market in SA. It highlights emerging opportunities in the EV market, and also notes barriers and risks in the market. Although the market can be segmented in several ways, based on the context of the SA market, the key market segments discussed in this report are private, public and industrial. A definition for each segment is provided in [Table 3](#), as well as the types of vehicles included in each category.

Table 3: Key market segment definitions and vehicle types

Market segment	Definition	Vehicle types
Private transport	It refers to privately owned and operated vehicles. These vehicles are predominately used for personal travel and daily commuting.	<ul style="list-style-type: none"> Single occupancy vehicles
Public transport	It refers to transport of passengers by group travel systems available for use by the general public. They are typically scheduled, have dedicated routes, and charge a fee for each trip.	<ul style="list-style-type: none"> City buses Commuter buses Minibus taxis Metered taxis
Industrial transport	This refers to vehicles used in the commercial industry to move heavy goods and materials.	<ul style="list-style-type: none"> Forklifts Trucks

While there are a number of vehicle segments where the application of electric mobility is plausible, this report will focus on three key investment opportunities:

- Uptake and manufacturing of electric buses (e-buses);
- Lithium ion battery manufacturing; and
- Local manufacturing of private vehicles and components for the export, and later domestic, markets.

Additional markets that are affected (directly or indirectly) by the emerging market for EVs, but are not discussed in this report, include:

- the impact of electric vehicles on liquid fuel dynamics;
- grid impacts of electric vehicles;
- the role of electric vehicles in energy storage;
- autonomous electric vehicles; and
- new models of vehicle ownership and the role that commercial banks can play in the market.

In what follows, this report provides potential investors and businesses with an overview of the state of the South African EV market ([Section 3](#)). It then highlights market drivers ([Section 3.7](#)), market barriers ([Section 3.8](#)), relevant policies and regulations ([Section 4](#)), and emerging opportunities in the South African EV market ([Section 5](#)). The subsequent sections highlight finance and incentives ([Section 6](#)), and the case for the Western Cape as a greentech hub for Africa ([Section 7](#)). [Section 8](#) outlines GreenCape's work and the opportunities for investors across the South African and Western Cape green economy.

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Global industry overview

This section provides an overview of the global electric vehicle industry to provide context for the South African industry.

Figure 2 shows the growth in global EV sales from 2013 to 2019. The exponential growth from 2013 to 2018 can be attributed largely to governments' commitments to emission reduction targets, and the need to achieve energy security. As a result, many governments have put in place enabling policy frameworks and mechanisms, and created generous incentives to encourage the uptake of EV.

2019 had a slightly reduced growth trajectory linked to the reduction of incentives.

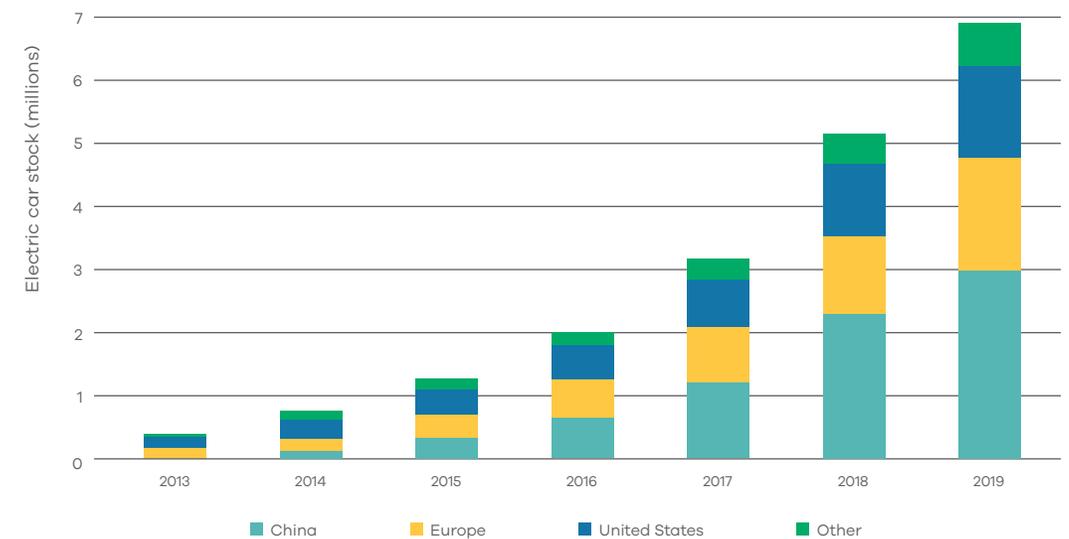


Figure 2: Cumulative global passenger EV sales

Source: IEA and CleanTechnica

According to Global EV Outlook 2019/20, the global EV market was valued at ~R1.6 trillion (USD 118.9 billion) in 2018/19, with 783 000 units sold and the global stock of electric passenger cars passing five million. Although only accounting for 2.1% of the automotive industry, the compound annual growth rate is estimated at 22.3%. The private transport segment accounts for the largest share of this global market, with public transport accounting for far less. The number of charging points worldwide was estimated to be

According to Global EV Outlook 2019/20, the global EV market was valued at ~R1.6 trillion (USD 118.9 billion) in 2018/19, with 783 000 units sold and the global stock of electric passenger cars passing five million.

approximately 5.2 million at the end of 2018, up 44% from the previous year. Most of this increase was in private charging points, accounting for more than 90% of the 1.6 million installations last year (IEA 2019).

China (42%), Europe (26%), and North America (25%) are the markets leading the global uptake in EVs. BYD, Nissan and Tesla are the leading brands in the respective territories.

China is the largest global market for passenger vehicles, driven by:

- the government's commitment to reducing greenhouse gas emissions;
- tight fuel regulations that have resulted in the provision of generous incentives and subsidies (financial and non-financial), making EV cost comparable to ICE vehicles;
- local manufacturing and economies of scale, thereby reducing the cost of vehicles; and
- extensive charging infrastructure networks.

Europe and the US are also leading global markets, driven by financial and non-financial incentives for manufacturers and consumers, as well as the respective governments' commitment to developing enabling policy environments.

Although the market is seeing rapid growth, there are key factors that could slow down the growth of the EV market. These include:

- battery prices not decreasing as expected;
- oil prices decreasing further instead of increasing; and
- limited range and charging infrastructure networks.

Without incentives and subsidies, the aforementioned barriers would result in delayed EVs and ICE vehicles cost parity, thereby limiting rapid adoption. However, Bloomberg forecasts that EV passenger vehicle sales will exceed ICE vehicle sales towards 2037 (Figure 3).

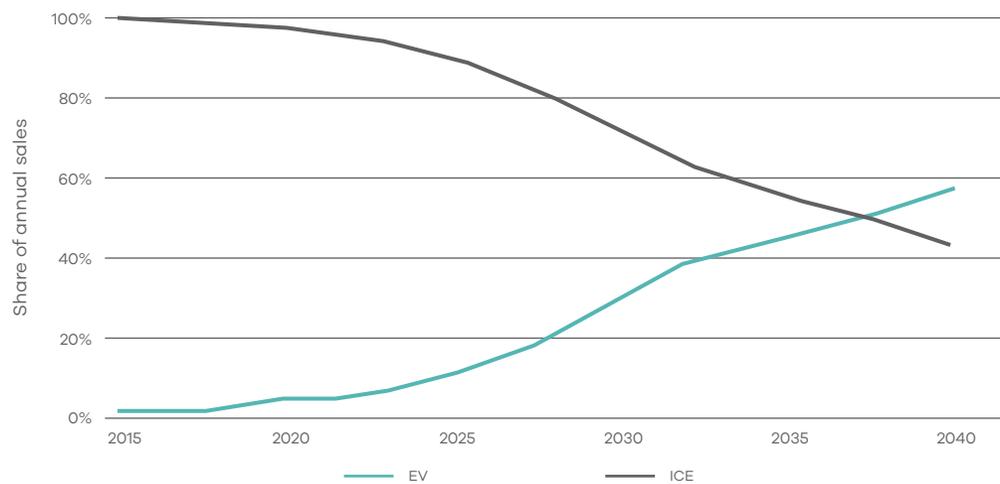


Figure 3: Bloomberg forecast of global EV sales





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South African industry overview

The emerging EV market represents substantial opportunities for businesses and investors active and/or interested in the sector.

This section will discuss how the EV market has unfolded within the SA context.

3.1. South African automotive market supply

As the largest manufacturing sector in South Africa's economy, vehicle and component production accounted for 29.9% of the country's manufacturing output in 2018 and more than 14% of South Africa's total exports. According to the 2019 Automotive Export Manual (AEM), the revenue from the automotive sector was more than R503 billion (\$35.6 billion) in 2018, with the industry employing ~900 000 skilled, semi-skilled and unskilled employees. Approximately 600 000 ICE vehicles were manufactured in 2018, predominantly for the export market.

Exports of automotive products, which reached a record R178.8 bn, were shipped to a record 155 export destinations, up from 149 in 2017 (Cision, 2019). Since the stabilisation of the sector in the post-Apartheid era, the market has expanded to include all major global brands, with several brands also manufacturing locally. [Table 4](#) provides an overview of known original equipment manufacturers (OEMs), importers, and distributors in each market segment, and a map that shows where manufacturing facilities are located in South Africa.

[Figure 4](#) highlights that SA has three key automotive manufacturing hubs located in the Eastern Cape (EC), KwaZulu-Natal (KZN) and Gauteng (GP). Although the EC does not experience high commuter patterns like the WC, KZN and GP, the EC has been an attractive manufacturing destination because of the incentives provided by the East London and Coega Industrial Development Zones (IDZs). All three transport hubs have commonalities in that they all harbour private, public and industrial transport manufacturing industries, as well as component companies that support them.

Vehicle and component production accounted for 29.9% of the country's manufacturing output in 2018 and more than 14% of South Africa's total exports.

Table 4: Private transport representation in SA

Original equipment manufacturers
BMW (South Africa (Pty) Ltd Ford Motor Company of Southern Africa (Pty) Ltd Mercedes-Benz SA Ltd Volkswagen Group South Africa (Pty) Ltd Nissan South Africa (Pty) Ltd Toyota South Africa Motors (Pty) Ltd Isuzu South Africa
Importers and distributors
Audi (VW Group) European Automotive Imports South Africa (EAISA) (Pty) Ltd (Maserati) FCA South Africa (Pty) Ltd (Fiat Chrysler Automobiles Group) Jaguar Land Rover Mini South Africa Porsche Volvo Car South Africa Honda Mahindra & Mahindra South Africa (Pty) Ltd Mazda Southern Africa (Pty) Ltd Mitsubishi Motors South Africa (MMSA) Peugeot SA (Pty) Ltd Renault South Africa (Pty) Ltd Subaru Suzuki Auto South Africa Hyundai Auto South Africa Pty Ltd (MOTUS Group) KIA Motors South Africa (Pty) Ltd HAVAL Motors South Africa (Pty) Ltd (HMSA) TATA Motors South Africa

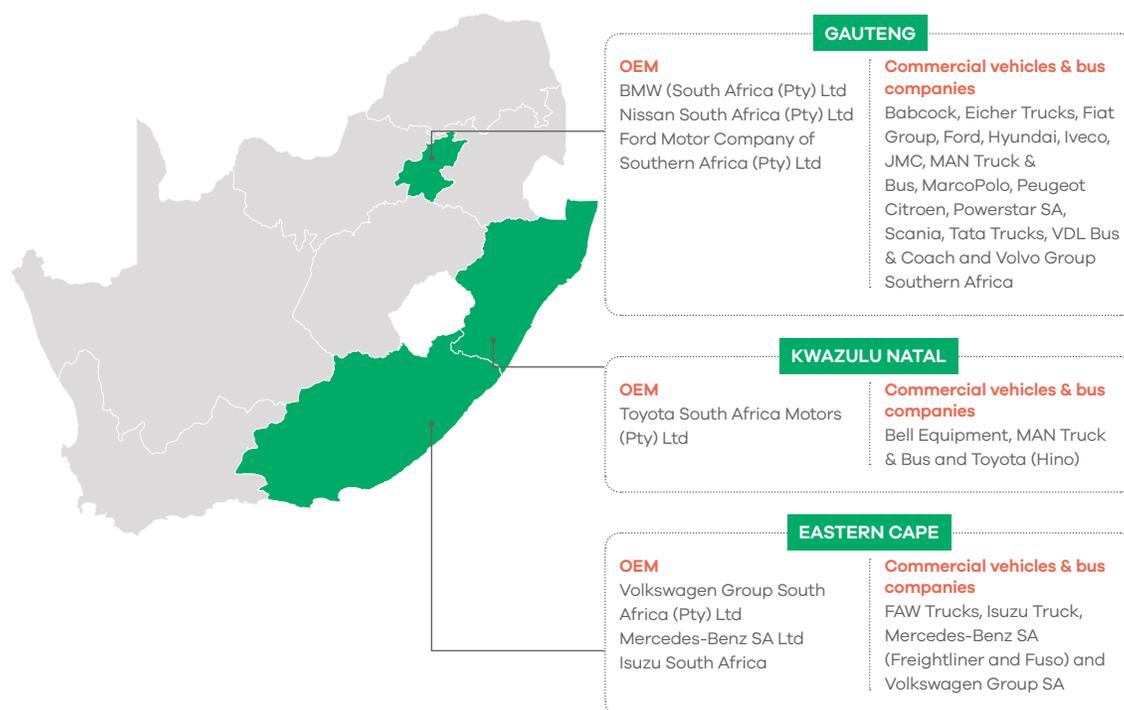


Figure 4: Manufacturing transport hubs in SA

3.2. South African automotive market demand

Commuter behaviour and travel patterns, as well as consumer preference, all play an important role in shaping the automotive market demand in SA.

3.2.1. Commuter behaviour and travel patterns

There are more than 12 million vehicles on South Africa's road networks. Gauteng, KwaZulu-Natal and the Western Cape are the provinces with the highest vehicle sales and ownership. Uptake for EVs is expected to grow in a similar geographic pattern as the incumbent vehicle market, based on a higher purchasing power in these provinces.

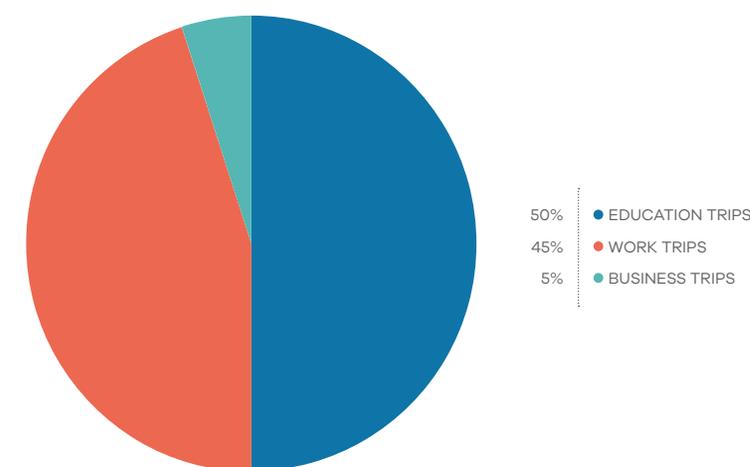


Figure 5: Commuter travel patterns indicated by the number of annual travel trips by trip type

Source: NHTS 2013

The public transport share of the total market has increased marginally since 1995. Minibus taxis have been the dominant mode of choice for public transport users, marginally increasing their market share at the expense of trains and

buses. It is also worth noting that South Africa's population continues to increase and city residents are also travelling more than previously, causing the total number of trips to increase.

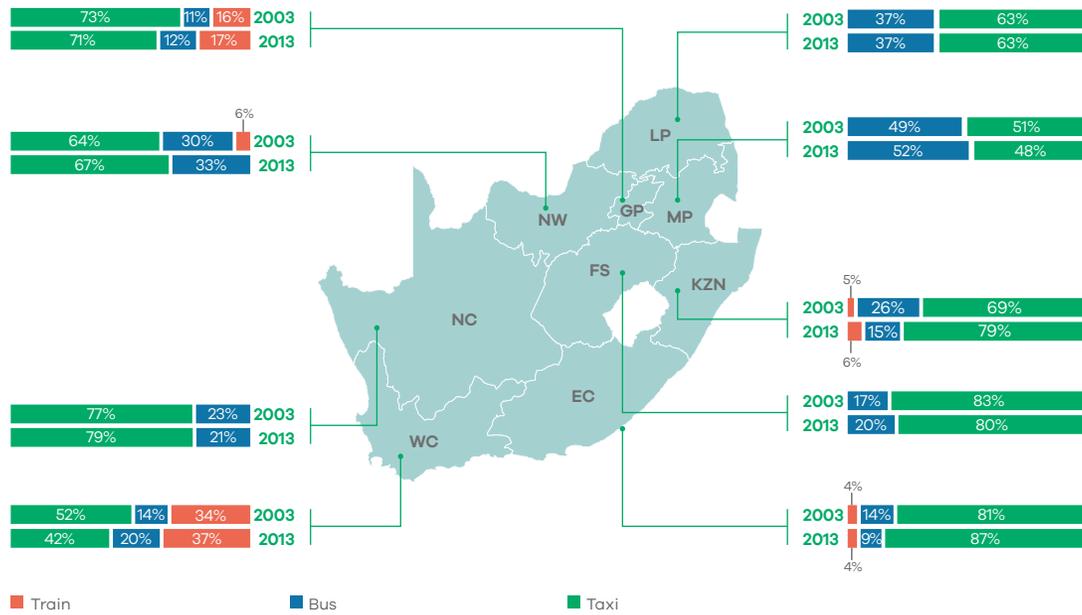


Figure 6: Modal split of work travel in South Africa by province

Figure 6 is a comparison of how commuters have used public transport for work trips in 2003 and 2013 (NHTS 2013). The figure shows that:

- **minibus taxis** are the dominating mode; this has increased in all provinces except for Gauteng and the Western Cape;
- **bus** usage has also marginally increased in almost all provinces; this number would also have increased substantially with the introduction of bus rapid transit (BRT) systems that have dedicated lanes and have improved reliability and travel efficiency for many commuters; and
- **trains**, despite being the most cost-effective mode of travel, is the least used option and one that has seen the smallest increase between 2003 and 2013. Reliability, safety and travel time are some of the factors cited as reasons for this limited increase in use.

3.2.2. Consumer behaviour

This section discusses how South African consumers make decisions regarding vehicle purchases. It is expected that these factors will affect the way customers engage with the EV market.

3.2.2.1 Brand loyalty

According to a study done on consumer brand loyalty, South Africans are brand conscious and loyal. They stick to tried and tested brands. They have high spending limits, but only when the price is considered fair. Any price premiums need to be linked with well-defined benefits. This is especially true for the middle class and the new black middle class².

Though anecdotal, this highlights two notable insights for the EV market:

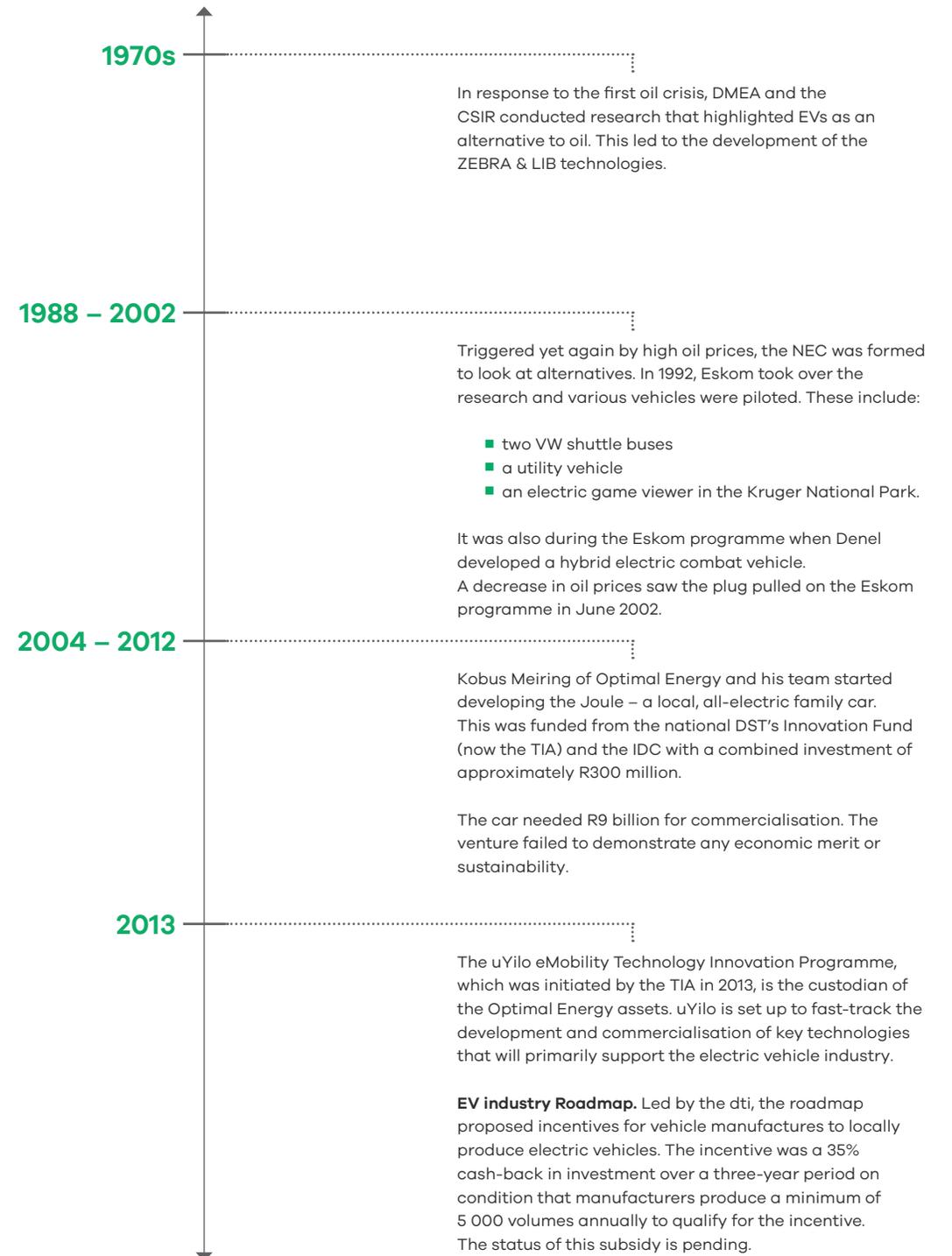
- People identify and associate with premium brands, hence the higher uptake in EV sales for BMW in the country and an increased willingness to pay a premium price.
- A large portion of consumers have not been able to link the benefits of electric vehicles to their lifestyle, hence the limited uptake of EVs.

² <https://en.portal.santandertrade.com/analyse-markets/south-africa/reaching-the-consumers>

3.3. An overview of the development of SA's EV industry

The early foundations of the EV market in SA can be seen as far back as the early 1970s as a response to the first oil crisis hitting SA. Table 5 details the developments from these early foundations until 2013.

Table 5: The history of the EV market development in SA: 1970s to 2013



This market has seen a slow growth path since Nissan entered the market in 2013, with BMW and Jaguar following in 2015 and 2018 respectively. Although the market is small and not showing significant growth, Audi, Porsche, and Mercedes are some of the automakers that are expected to enter the SA EV market in 2020.

3.4. The South African EV value chain

A variety of key players are competing to shape the South African EV market. The exact dynamics of the industry are still emerging and the timing of key tipping points are unknown. Notwithstanding,

car manufacturers and charging infrastructure companies are the most active investors in the market, with very limited activity currently from the battery companies (see Figure 7).

As the EV market grows and local manufacturing is established, there will be an impact on the traditional internal combustion engine (ICE) value chain. Unlike ICE vehicles that have more than 1 000 moving parts, EVs are much simpler with fewer parts. Although there are valid reasons for South Africa's transition towards electric mobility, it will not occur without potential losses.

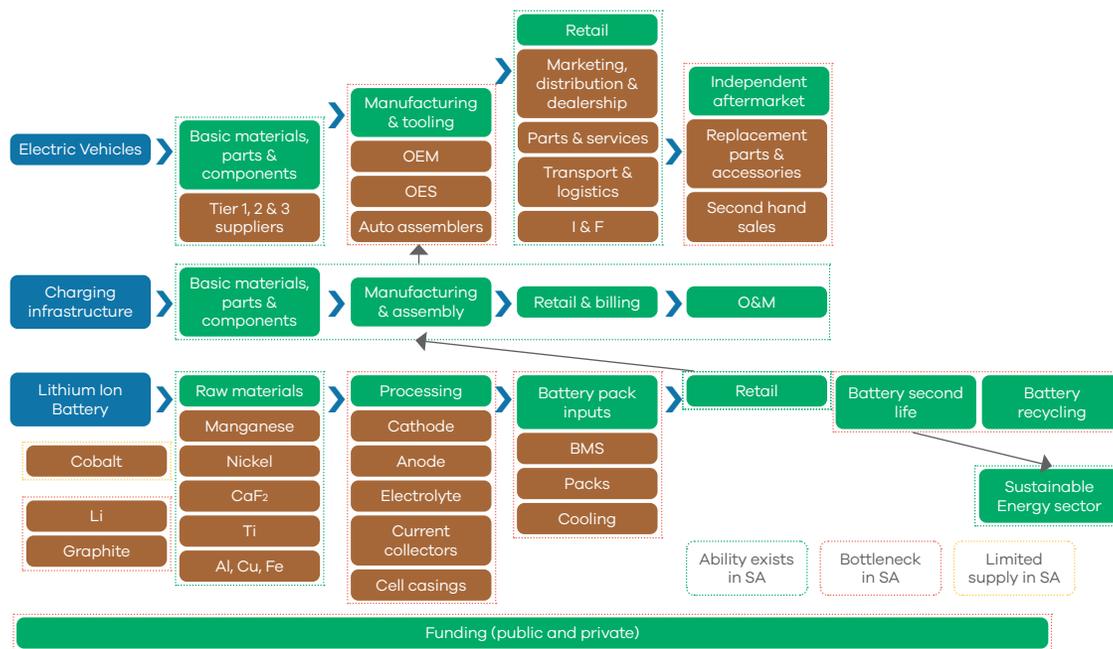


Figure 7: EV value chain in SA

3.5. Potential impacts of EV market growth on the ICE value chain and economy

Figure 8 shows where we are likely to see gains and losses in the ICE value chain. SA's involvement in the local EV market will result in minimal job losses, should there be a concerted effort towards upskilling across the value chain.

Expected job gains and losses are, however, unquantifiable at this stage due to the nascence of the market.

Impact on major auto components

Negative Impact		Neutral		Positive Impact	
Engine parts		Steering systems		Electric motors	
Clutch		Seats		Batteries	
Radiators		Brake lining	Headlights	Inverters	Wiring harnesses
	Gears		Leaf springs	Microprocessors	
		Shock absorbers		Controllers	

Figure 8: Illustration of gains and losses in the ICE value chain due to EV uptake

Where there will be a notable impact is on fuel levies. Fuel levies are Government's fourth biggest and most efficiently collected revenue stream. At present, a fuel tax is levied on petrol, diesel, and biodiesel. With the policy silent on electricity as a fuel for mobility. Under the current fuel levy structure, EV uptake would have a significant impact on the fiscus over time.

The effect of EVs on oil imports, the balance of trade and Government revenue

The South African transport sector consumes ~27 billion litres of liquid fuels per year, with additional oil used in the chemicals sector (for non-energy uses). Sixty per cent of South Africa's liquid fuels consumption is met through crude oil imports, with an additional eight billion litres per year produced from coal and natural gas. Figure 9 overleaf is an illustration of South Africa's petrol and diesel consumption from 2007 to 2016 (DOE 2017).



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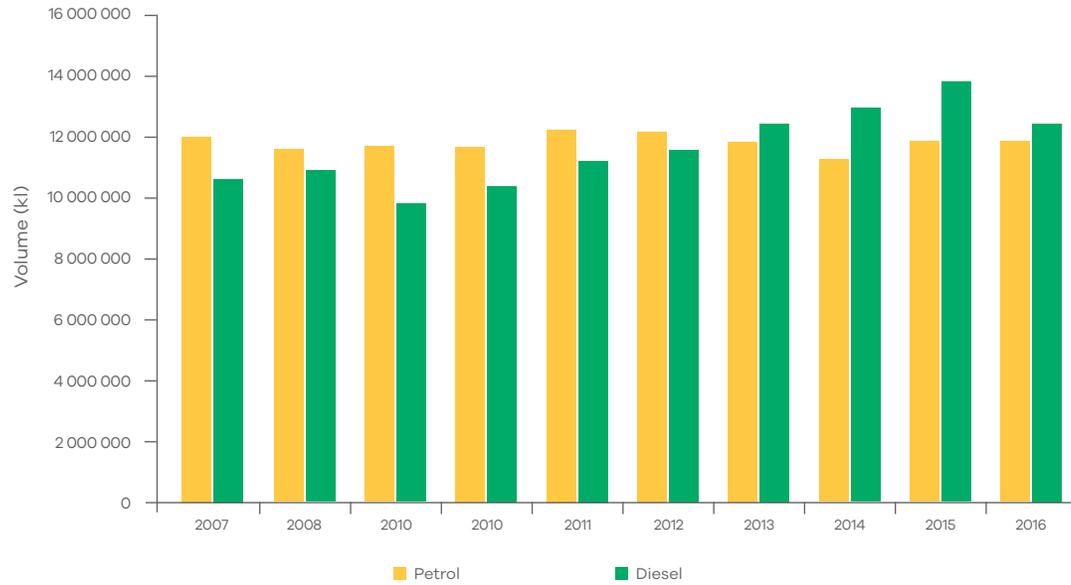


Figure 9: Petrol and diesel consumption from 2007 to 2016

Source: DOE 2017

If South Africa were to introduce one million electric vehicles that all drive 20 000 km/a, it would collectively reduce the importation of oil by 58 PJ/a (Petajoules per annum). It is an oil import reduction of more than 6%, representing a potential R8.1 billion (\$580 million per year) balance of trade saving for the South African economy.

South African consumers also pay a pre-determined fuel levy on all liquid fuels consumed. The levy increased in 2019 by R0.29 and R0.30 per litre for petrol and diesel respectively, further improving the case for switching to electric vehicles.

However, for the national government, the fuel levy represents an important and efficient revenue stream. Falling liquid fuel sales on the back of increased EV uptake could put this revenue stream at risk.

The macroeconomic benefits and drawbacks of a growing EV market are outlined in Table 6.

Table 6: Benefits and drawbacks of EV market growth and fewer oil imports

Benefits	Disadvantages
<ul style="list-style-type: none"> The country has an increased ability to meet emission reduction targets. Decreasing the expense on oil import. Increased energy security. Better price control on electricity than oil. 	<ul style="list-style-type: none"> Balance of trade saving on the back of decreased oil importation is not proportional to the revenue generated through the fuel levy. There is a high likelihood of reduced contributions to the Road Accident Fund (RAF).

3.6. Market sizing and dynamics

Table 7 provides a snapshot of SA's ICE vehicle market for 2017/18, showing EV penetration in different vehicle segments. The private car segment has seen the most market activity in both the ICE and EV markets.

Table 7: Overview of South Africa's conventional ICE vehicle market: 2017/2018

Vehicle segments		Number of ICE units sold	Availability of EV equivalent	Penetration rate
Private transport	Passenger	557 701	Yes	<1%
	Light commercial vehicles			
Public transport	Minibus taxi	14 100	Yes	0%
	Buses	1 131	Yes	<1%
Industrial transport	Forklifts	Unknown	Yes	Unknown
	Heavy duty vehicles	26 153	Yes	0%

Source: eNaTIS. 2019 (etc., if stats are adjusted accordingly)

3.6.1. The EV passenger vehicle market

Figure 10 provides a breakdown of electric passenger vehicle sales from 2013 to 2018. There is a notable decrease in sales from 2015 onwards. This speaks to the need for a market step change for any significant growth to be recognised.

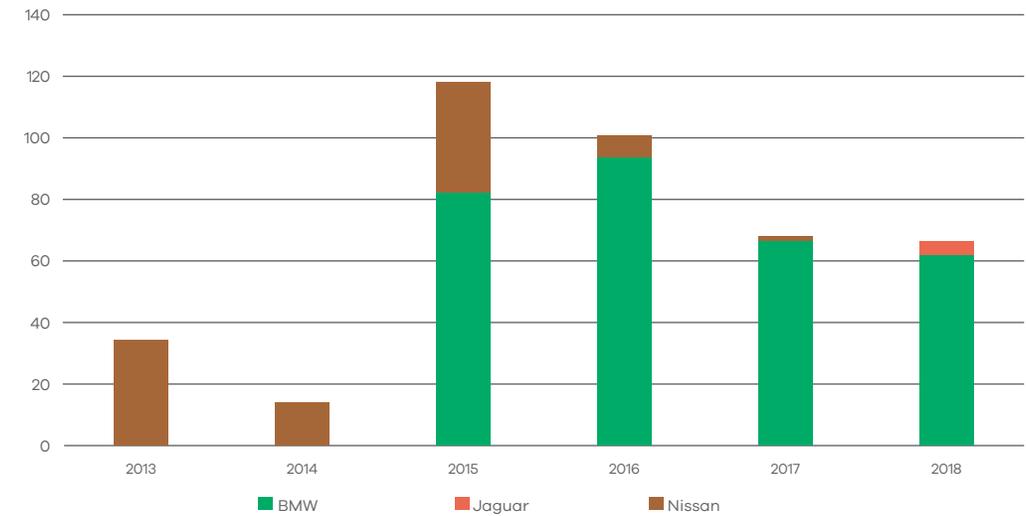


Figure 10: Passenger electric vehicle sales in South Africa: 2013 – 2018

3.6.2. The public and industrial EV market

It is expected that public transport will soon follow a similar trend to the one seen in passenger vehicles. The bus industry, bus rapid transit (BRT), local municipal buses in particular, and the minibus taxi industry present a good business case for electrification.

This potential business case is driven by:

- Peak travel patterns (when and where people travel).
- Long standing/idle times that coincide with current AC charging times.

The challenge in this market, as is with all EVs in SA at present, is financing for the significant capital price difference between ICE vehicles and EVs, and charging infrastructure investment.

Electrification of the forklift market is also expected to improve based on “fit for purpose” technology improvements. Where heavy-duty vehicles are concerned, the push for freight to rail

is a more immediate need, and is expected to take precedence over electrification.

Despite the barriers, automakers see value in SA's nascent EV market and expect a diversified electric vehicle mix as passenger vehicles continue to be purchased year-on-year.

Forklifts and 2- and 3-wheeled EVs gain traction within the industrial segment, and interest in the electrification of public transport is increasing.

3.6.3. Charging infrastructure and network

It is widely accepted that having charging stations in locations that commuters can easily access is key to the adoption and growth of the electric vehicle market. In South Africa the network currently consists of ~143 publicly accessible charging stations. Many of these are found in Gauteng. They are largely AC charging stations that take up to six hours to arrive at full charge. Figure 11 shows active and incoming charging infrastructure stations in the country.

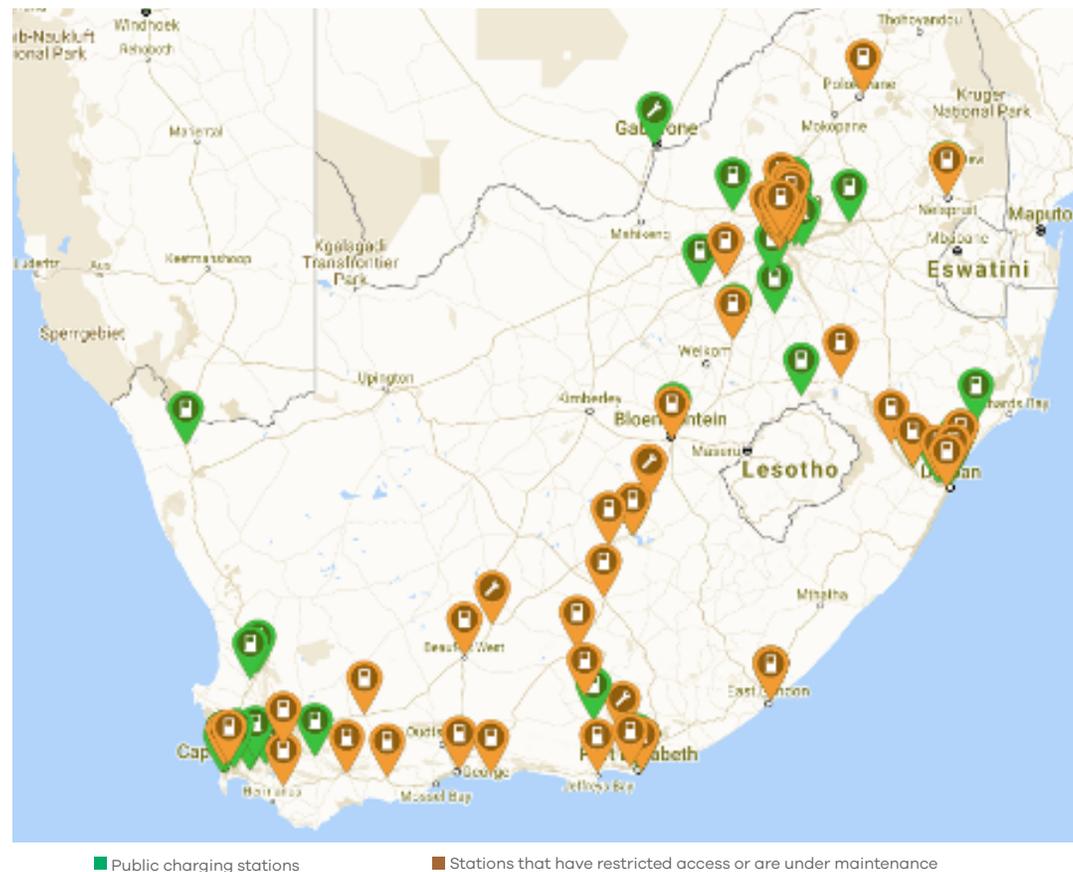


Figure 11: Active & incoming charging infrastructure stations in SA

Source: PlugShare, 2020

The market is segmented based on the connector type: CHAdeMO and Construction Computer Software (CCS), with Nissan using the former and BMW the latter. A broader breakdown of the charging standards employed by automotive companies in SA is shown in Table 8.

Table 8: OEMs, industry & distributors' DC charging technology

CCS charging technology	CHAdeMO charging technology	CHAdeMO/ CCS charging technologies	TBA charging technologies
Original Equipment Manufacturers			
<ul style="list-style-type: none"> ■ BMW (South Africa (Pty) Ltd ■ Ford Motor Company of Southern Africa (Pty) Ltd ■ Volkswagen Group South Africa (Pty) Ltd ■ Mercedes-Benz SA Ltd 	<ul style="list-style-type: none"> ■ Nissan South Africa (Pty) Ltd ■ Toyota South Africa Motors (Pty) Ltd 	N/A	<ul style="list-style-type: none"> ■ Isuzu South Africa
Importers & distributors			
<ul style="list-style-type: none"> ■ Audi (VW Group) ■ European Automotive Imports South Africa (EAISA) (Pty) Ltd (Maserati) ■ FCA South Africa (Pty) Ltd (Fiat Chrysler Automobiles Group) ■ Jaguar Land Rover ■ Mini South Africa ■ Porsche ■ Volvo Car South Africa 	<ul style="list-style-type: none"> ■ Honda ■ Mahindra & Mahindra South Africa (Pty) Ltd ■ Mazda Southern Africa (Pty) Ltd ■ Mitsubishi Motors South Africa (MMSA) ■ Peugeot SA (Pty) Ltd ■ Renault South Africa (Pty) Ltd ■ Subaru ■ Suzuki Auto South Africa 	<ul style="list-style-type: none"> ■ Hyundai Auto South Africa Pty Ltd (MOTUS Group) ■ KIA Motors South Africa (Pty) Ltd 	<ul style="list-style-type: none"> ■ Haval Motors South Africa (Pty) Ltd (HMSA) ■ TATA Motors South Africa

The private sector has up until now been driving the roll-out of charging infrastructure in South Africa with limited support from government.

Alternating current (AC) chargers are expected to hold a significant share of the market. This is qualified by the potential increase in demand from the residential (multi-dwelling units), and to a larger extent, the retail (shopping malls, dealerships) and fuel (filling stations) sectors.

Growth for direct current (DC) chargers is also expected to increase over time, driven by the growth of commercial vehicles for use in the public transport segment and a limited group of consumers looking to travel further than 400 km.

Metropolitan cities, where there is a noticeable uptake in electric vehicles, are expected to drive the majority of the initial infrastructure growth, followed by major highways.

GreenCape's engagements highlight that potential investors in this space are adopting a 'wait and see' approach because they believe the market is still too small and does not yet merit investment. That being said, the market for charging infrastructure is expected to grow as the market for electric vehicles grows, but the timing of this is speculative. What remains unclear is who is responsible for incurring the high costs of rolling out infrastructure. It could be the government, electric vehicle manufacturers, or others.

3.7. Market drivers: EV and charging infrastructure

3.7.1. Macroeconomic drivers

The potential loss of automotive trade markets if manufacturing does not adapt

South Africa has trade agreements in place with the EU, US and SADC that sustain the country's automotive industry. The EU agreement allows for vehicles and components to be exported custom-free to 28 countries. This is a significant enabler of South Africa's export market that makes a marked contribution to the national Gross Domestic Product (GDP). Many of these countries have announced the ban of new-sale ICE vehicles starting from 2030 onwards. This presents a potential risk of trade market losses, should the South African automotive industry not transition towards electric vehicle manufacturing in order to satisfy the new international demand in core export markets.

3.7.2. Local demand drivers

Although the South African EV market is tracking international trends, there are four particular drivers that accelerate the demand for electric vehicles in South Africa.

Climate conscious consumers

On a well-to-wheel³ basis, greenhouse gas (GHG) projected emissions from EVs will continue to be lower than for conventional internal combustion engine (ICE) vehicles. SA's EV market is currently driven by a small percentage of high-income customers that are able to prioritise the cost to the environment in purchase decisions. As the climate change and renewable energy narrative becomes the norm, and the efficiency and affordability of electric vehicles improve, it is expected that the market will shift from consumers that are primarily climate conscious to a much broader base.

Rising fuel costs

Price security concerns are highlighting that electric vehicles are an attractive alternative to ICE vehicles for commuters.

Consumers feel the impact from oil price increases more so than other commodities. As the price increases, it also becomes noticeable that consumers have very little flexibility in the short term to change consumption patterns in response to changes in fuel prices. Most commuters are captive users and are therefore locked into the market.

SA's dependency on oil from high risk regions that are predisposed to geopolitical instability exposes the country to economic and energy security challenges. Figure 12 shows the volatility in fuel prices over the past 10 years.

Factors that affect the SA fuel price

SA's fuel prices are heavily influenced by trends in the global oil market and the local exchange rate. These can be typically seen as domestic and international factors. The Basic Fuel Price (BFP), which constitutes ~40% of the retail price of fuel in SA, is determined by taking into account the movement of petroleum product prices, as well as the United States dollar/rand exchange rate. The domestic factor (~60%) is subject to Government's control and includes fuel tax, RAF levy, customs, excise levy, and transport costs.

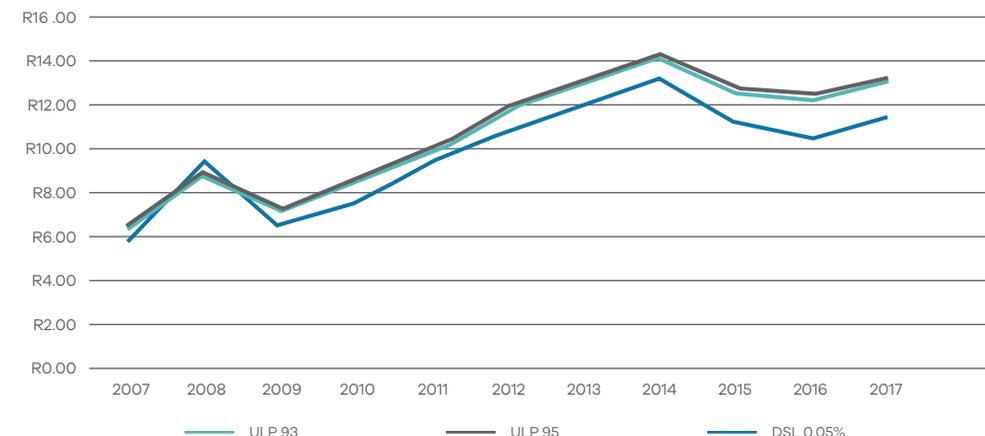


Figure 12: Year-on-year fuel prices from 2007 – 2017

Source: GreenCape analysis

Energy storage innovations

The growth of the distributed generation market and increasing global demand for EVs are driving the demand for lithium ion batteries (LIBs), as seen in Figure 13 (Bloomberg New Energy Finance 2018). Economies of scale and technical advances have seen battery prices fall by more than 70%

since 2010. When the first mass-market EVs were introduced in 2010, the batteries cost more than US\$1 000/kWh. In 2018, Tesla's Model 3 battery pack cost \$190/kWh and the Chevrolet Bolt battery pack ~\$205/kWh. Prices are expected to continue to fall as demand rises for LIBs in other sectors.



Figure 13: LIB price/kWh over time

³ well-to-wheel also known as a lifecycle assessment

Falling cost of electric vehicles

Currently batteries make up between 40% and 50% of the total cost of an electric vehicle. Falling battery prices mean that EVs will be cost-comparable with ICE vehicles by 2022 (~\$125–\$150 is the range in which price parity may be achieved). It is at this point that the business case for owning EVs moves from operational cost savings to include capital price savings.

Reduced range anxiety

The limited driving range of EVs is one of the key reasons for prospective buyers not to buy them. While most of the charging happens at home for private vehicles, consumers want the comfort of knowing they can safely travel on a single charge. Improvements in battery management systems have resulted in batteries with a significantly higher driving range, approximately 150 km to 400 km.

As the South African EV market continues to develop, the following drivers will start playing a part:

- Technology advances are delivering substantial cost cuts. Key enablers are developments in battery chemistry and expansion of production capacity in manufacturing plants.
- Policies play a critical role. Leading countries in electric mobility use a variety of economic measures to bridge the cost gap between electric and conventional vehicles, and support the deployment of charging infrastructure.
- Renewed focus on raw materials supply. The EV uptake and related battery production requirements imply bigger demand for new materials in the automotive sector.
- Changes to the tax revenue base derived from vehicle and fuel taxes.

3.8. Market barriers

As is the case with many new markets, there are more barriers to economic growth than drivers. This represents an exciting opportunity for intervention and focus areas for government and private sector support over the next 10 years.

3.8.1. Products not fit for the South African market

Current EVs cannot compete with ICE vehicles for the following reasons:

- In general, South Africans have a high ability and willingness to pay for vehicles. However, electric vehicles currently cost more than R450 000 in the same price range.
- Unlike the conventional car market, the electric vehicles currently available in the market do not cater for the emerging middle class and middle-income group. These are individuals who purchase vehicles that cost between R150 000 and R350 000, and constitute a larger portion of the market compared to the high-income group.

In light of the high purchase costs of EVs compared to ICE vehicles, there is a need for original equipment manufacturers (OEMs), dealerships, and commercial banks to develop innovative vehicle ownership models, such as mobility, as a service and/or enabling finance terms specifically tailored for EVs.

That said, with very limited product choice, even once someone is comfortable with the idea of owning an electric vehicle, they are unlikely to find one that fits their lifestyle. As a result, some brands that currently have a high market share in the ICE vehicle market have a much lower share of the electric vehicle market.

3.8.2. High import duties

Even with the overall cost of the electric vehicles falling due to decreasing battery prices, the cost of electric vehicles remains high relative to ICE vehicles. In South Africa one of the key reasons for this is the high import duties imposed on EVs.

Currently, electric vehicles are subjected to 25% import duties, while buses and trucks carry a 20% duty. In comparison, ICE vehicles incur 18% import duties. Electric vehicles are also more likely to incur ad valorem tax based on the vehicle price, because the battery price increases the overall cost of vehicles. Ad valorem tax ranges from 0.75% to 20%, based on the vehicle price (current EV products on average work out at around 17%). This means that in practice the total taxes on electric vehicles and hybrids average around 42%.

The dti is in negotiations with the EU to reduce the import tariff on electric vehicles down from 25%. In return, South Africa will increase the import tariff on vehicles with an engine size smaller than 1 000 cc, which currently stands at 0% to 18%. These vehicles hold a large segment of the new vehicle market and are not produced in South Africa. The timelines of an outcome from these negotiations are as yet unknown.

BMW has also submitted an application to the International Trade Administration Commission (ITAC) for the reduction of import duties to stimulate vehicles sales. The application was for a reduction in duties on imported electric vehicles to 0% for a period of three years, with a subsequent increase to 10%. The outcome of this application was unsuccessful.

3.8.3. Lack of policy certainty and support for EVs

The incumbent automotive sector works effectively because investors have the comfort of longstanding policy certainty and government support, as outlined in the Automotive Production and Development Programme (APDP). While there are enabling policy frameworks in place to support ICE vehicle manufacturing, those policies have not been adapted to incorporate EV manufacturing. As such, the current lack of policy directives on local EV manufacturing presents an investment risk to the country.

3.8.4. Lack of local skills to facilitate market growth

There are currently insufficient skills in the automotive market and ancillary services to adapt to the growth of the EV manufacturing section. There is a need to upskill existing technicians to facilitate the transition towards electric mobility. This training is also important for first-level emergency responders, dealerships, and aftermarket services as these sectors also play an important role in a functioning transport sector.

4

Policy and regulation

This section pays attention to the policy and legislative framework relevant to the SA transport sector. It also highlights policies and strategies that speak to alternative transport.

The regulatory framework for transport is governed by the Department of Transport (DoT) in SA. The Department of Trade & Industry (the dti) is key to ensuring the policy environment is conducive to investment and trade. There are a number of policies that are relevant to the automotive industry.

4.1. Automotive Production and Development Programme (APDP)

The APDP was implemented on 1 January 2013 and will be in place until 2020. It consists of four pillars that drive the programme:

- **Import duty** (tax) – these tariffs are meant to provide protection to support continued domestic vehicle manufacturing. Unlike traditional tax, this is non-revenue generating.
- **Production Incentives** (rebate mechanism) – this is to encourage increasing levels of local value addition along the automotive value chain, with positive spin-offs for employment creation.
- **Vehicle Assembly Allowance** (rebate mechanism) – this is targeted at doubling domestic vehicle production lines by providing lower duty rates for domestic vehicle manufacturers.
- **Automotive Investment Scheme** (cash grant) – effective from 2009, this support is available to encourage investments by OEMs and component manufacturers in a manner that supports productive capacity upgrading.

The APDP applies only to light vehicles (passenger cars and light commercial vehicles), although components produced for heavy commercial vehicles also qualify for the Production Incentive (PI).

While the automotive industry has not declined since the introduction of the APDP in 2013, it has not shifted SA's global position as a second tier player. Aggregated vehicle sales have increased, but production for the local and regional market has declined. The local market is far from having sufficient demand to attract local assembly exclusively for domestic market supply.

This policy does not make provision for EV manufacturing, but outlines taxes, rebate mechanisms, and incentives in the traditional automotive industry.

4.2. The South African Automotive Masterplan (SAAM) 2021 – 2035

The SAAM is under development at the time of writing, and will guide policy on growing and supporting the domestic automotive industry from 2020 to 2035. It will replace the APDP, addressing some of the latter's shortcomings.

Developed by government and the automotive industry, the SAAM will cover car and light commercial vehicle manufacturing, medium, heavy, and extra-heavy truck, and bus production (potentially including off-highway vehicles) yellow metals (a type of brass with about 60% copper and 40% zinc), motorcycles, and the South African component supplier industry. Vehicle importers and distributors will also be covered. The Masterplan will create a framework for securing even higher levels of investments and production.

SAAM's goals include:

- growing SA's **vehicle production** to 1% of global output (projected to reach 140 million units annually by 2035);
- increasing **local content** of vehicles assembled in South Africa to 60%, from a 38.74% base;
- doubling total **employment** in the automotive value chain from 112 000 to 224 000 jobs;
- improving automotive industry **competitiveness** levels to that of leading international competitors, such as Turkey and Thailand;
- achieving **transformation** of the South African automotive industry by employing black South Africans, upskilling black employees, empowering dealerships and authorised repair facilities, and substantially increasing the contribution of Black-owned automotive component manufacturers within the automotive supply chain; and
- deepen **value addition** within South African automotive value chains, across selected commodities/technologies.

Notable changes in the SAAM:

- Vehicle Assembly Allowance (VAA), which is a one of the four legs of the APDP, will be phased out and replaced by Volume Assembly Localisation Allowance (VALA). VALA will be phased in between 2021 and 2026 to ensure no disruptions to existing OEM investment models.
- By 2026, the VALA is set at 35% of local value-add for OEM volumes above 10 000 units, but in 2021 it is set at 40%. This is different from the VAA, which gave vehicle manufacturers component import allowances of 20% (2013) of the ex-factory vehicle price. This was reduced to 19% and 18% in 2014 and 2015 respectively for all light motor vehicles (LMVs) produced domestically. In short, the VALA advocates the use of local content in the components that manufacturers use by removing credits for imported contents.
- The Production Incentives (PI) benefit has been increased to 25% on components. The production rebate credit certificates (PRCCs) will be replaced by duty credits that are tied to local value addition. This is expected to help mop up the current surplus of PRCCs, which are used by OEMs and importers to bring new vehicles into South Africa duty-free.
- The Automotive Investment Scheme (AIS) cash grant for capital investments has been retained, but will be reduced by 5% in those instances where non-South African tooling and machinery is employed. Incentives for investment into new technologies such as EVs and hybrids will be covered under this scheme. These incentives are, however, still subject to approval by National Treasury.
- SA is seeking a one-tariff regime across all light vehicles, including EVs. This will potentially address the high import duty challenge.
- Previously, the APDP only applied to light vehicles (passenger cars and LCVs). The new-look APDP has been amended to also include medium and heavy commercial vehicles, as well as motorcycles, but the VALA formula would not be applied in either category.

Incentives for investment into new technologies such as EVs and hybrids are expected to be covered under the Automotive Investment Scheme (AIS). The potential of a single tariff for all light vehicles, including EVs, is expected to be covered in this masterplan as well.

4.3. Green Transport Strategy (GTS) for South Africa: (2018 – 2050)

To address the significant contribution of transport to national greenhouse gas (GHG) emissions, the Department of Transport (DoT) has developed a green transport strategy. The GTS, which is based on sustainable development principles, aims to minimise the impact of transport on the environment, and meet current and future transport demands. It promotes green mobility and is the first national government-led strategy that makes provision for sustainable transport.

In order to radically grow the uptake of EVs in South Africa, in conjunction with dti (now Department of Trade, Industry and Competition – dtic)⁴ and National Treasury, the DoT will:

- offer producers of EVs manufacturing incentives to both produce and sell affordable EVs in South Africa, for both the local and export markets;
- work with local research institutions to conduct research on EV batteries;
- work with national, provincial and local government departments and authorities, and the automobile industry to set annual targets for the uptake of EVs and hybrid electric vehicles (HEVs) in the government vehicle fleet, as well as monitoring the local content of the manufacturing of cars locally, in line with the Industrial Policy Action Plan (IPAP);

- introduce the conversion of old technology vehicles with higher emission factors to be retrofitted with EV technology;
- consider providing incentives related to the beneficiation of using local resources in the manufacturing of key machineries and/or components (e.g. fuel cell); and
- assist in establishing and developing local EV OEMs.

4.4. Procurement Policy Framework Act (PPFA)

The revised regulations came into effect on 7 December 2011 to empower the Department of Trade and Industry (DTICdti) to designate industries, sectors and sub-sectors for local production at a specified level of local content. Buses are one of the industries that have been designated for local production with minimum local content thresholds.

As such, the Preferential Procurement Regulations under the Preferential Procurement Policy Framework Act 5 of 2000, prescribe ~80% local content of the bus body for city and commuter buses respectively (the dti, 2016). In case of electrical vehicles, the regulations are not clearly excluding the battery from the bodywork, creating an import barrier.

⁴ The Department of Trade, Industry and Competition (the dtic) was established in June 2019 by the incorporation of the Department of Economic Development (EDD) into the Department of Trade and Industry (the dti) (dtic, 2019).

5

Market opportunities

There are a number of emerging opportunities in the South African EV market for local investors and investors looking to enter the South African electric mobility market.

South Africa has a very strong automotive market as a dominant player in the country's manufacturing sector. Under the Industrial Policy Action Plan (IPAP), the automotive industry is identified as a priority industry. This is all largely driven by strong government support and long-standing policy certainty that improves investor confidence.

Through the automotive production and development programme (APDP), Government aims to leverage higher private investment to make the sector more globally competitive, while also creating jobs. Key to this shift will be the growth and development of EV market opportunities.

The following are emerging investment opportunities identified in SA's EV market:

5.1. Manufacturing and increased uptake of electric buses

There is a medium-term opportunity for the uptake of electric buses in South Africa. This opportunity is relevant to both local investors and investors looking to enter the South African market. Based on the precedent set by China (Figure 14), it is predicted that electric buses will lead the growth of the EV market in terms of market share. The combination of the expectation that the global market share for electric buses will rise to 70% by 2040, and the designation of over 70% local content requirements for bus manufacturing in South Africa, represents a significant investment opportunity.

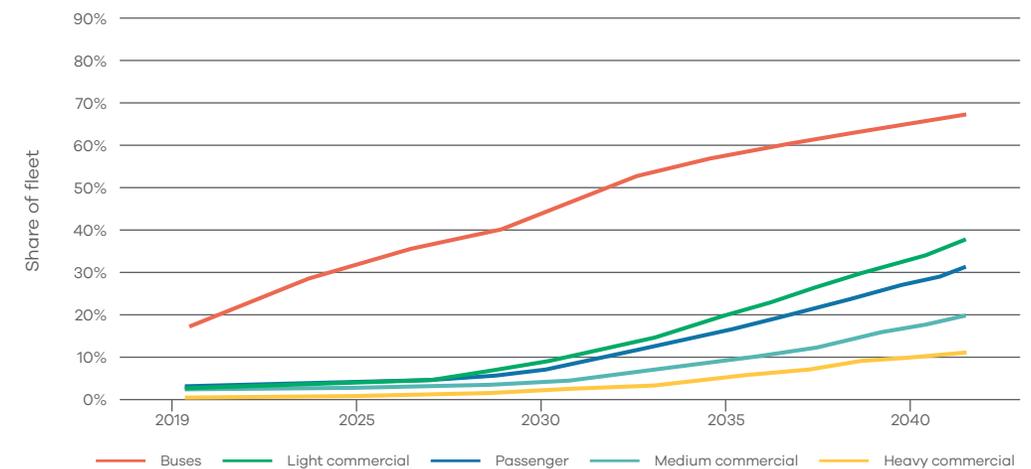


Figure 14: EV global market share forecast

Led by the aggressive e-bus growth rate in China, e-buses are surpassing the growth of every other EV segment globally. E-buses show a compound annual growth rate of 100% since 2013, compared to 60% for passenger vehicles. In the SA context, public transport presents the best business case for electrification. This is especially true for the bus market as it is already producing buses largely for the domestic market.

- Increasing urbanisation, failing rail networks that have pushed commuters onto the road network, and congestion, are factors that are forcing cities to expand their bus routes. Unlike private transport, buses are mass-based transit systems that are accessible across all income groups. Buses are also space, energy, and emissions efficient.
- Cities/municipalities are already looking at mechanisms to finance electric buses. Pay as You Save (PAYS) presents an attractive innovative finance approach that transit companies can employ to finance electric buses cost effectively.

5.2. Lithium ion batteries (LIB) production

Lithium ion batteries (LIB) manufacturing is a medium- to long-term opportunity for the global LIB market (including South Africa's domestic market), based on the diversification of the LIB market and increasing demand from the electric vehicle industry.

EV manufacturers use a number of different chemistries in batteries. Lithium Iron Phosphate (LFP), Lithium Nickel Cobalt Aluminium Oxide (NCA), and Nickel Manganese Cobalt Oxide (NMC) are the three leading cathode chemistry types. Of the three, NMC is the most prevalent and the fastest growing. This is due to its high specific energy and low internal resistance. NMC cathodes currently account for about 28% of global EV sales, which is expected to grow to 53% by 2027.

Assuming a mix of battery chemistry categories of 10% NCA, 40% NMC 622 and 50% NMC 811 for 2030 in the New Policies Scenario, i.e. analysis of future energy trends as detailed in the IEA 2019 Global EV outlook (IEA, 2019), the demand for cobalt increases to about 170 kilo tonnes per year (kt/year), lithium demand to around 155 kt/year, manganese to 155 kt/year and class I nickel (>99% nickel content) to 850 kt/year.

South Africa is an attractive manufacturing destination for lithium ion batteries because of its existing battery manufacturing (and recycling) industry. In addition, South Africa's mining sector is able to provide some of the raw materials required for the NMC cathode battery chemistry, especially manganese and cobalt. SA possess 78% of the world's manganese. Moreover, other raw materials required in the cathode are mined in sub-Saharan Africa. In light of the safety challenges of transporting LIBs, manufacturing in SA also represents a strong entry point to the wider African market.

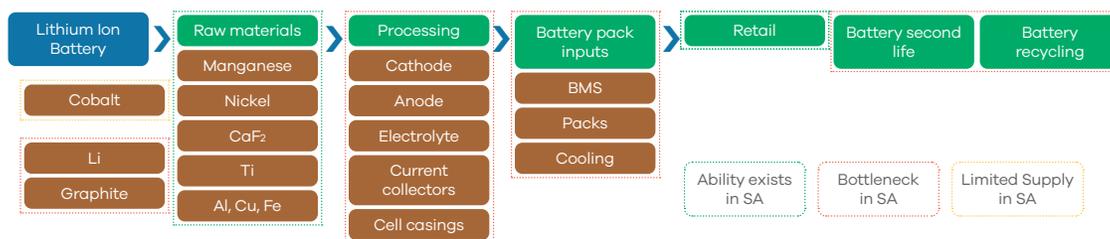


Figure 15: LIB manufacturing value chain

Be that as it may, the lead acid battery is the current dominant player in the country's battery market. This battery is typically used in motor vehicles and as a backup power source. With the uptake of EVs expected to happen at a slow but steady pace due to the absence of incentives and subsidies, the lead acid battery market is expected to continue dominating the motor vehicle market for the next three to five years.

In terms of activity in the country, the names listed below are partners in the Technology and Human Resources for Industry Programme (THRIP) of the dti, since restructured as the dtic, that is looking at SA's potential in the LIB manufacturing space:

- **University of the Western Cape (UWC)** is responsible for providing the lithium ion cell manufacturing facility with the best available lithium ion cell assembly process conditions and human resource skills, quality control protocols and processes to support the assembly of lithium ion cells in partnership with Zellow.
- **uYilo e-mobility programme** is responsible for defining the lithium ion cell testing protocol for the programme, and to execute testing in accordance with international standards for lithium ion cell testing.
- **Council for Scientific and Industrial Research (CSIR)** is responsible for providing cathode material manufactured, using South African intellectual property and raw materials, to be consumed in the lithium ion assembly process.
- **Zello Technology** is responsible for the development of a local lithium ion cell manufacturing competency, driving commercialisation of the final product by identifying customers and using cases through off-take agreements.
- **Metair** is responsible for providing a consumer use case for the final product and agreeing to utilise the product once all safety and quality standards have been met.

According to the **National Environmental Management: Waste Act 59 of 2008**: Effective from 23 August 2013, lead acid batteries disposal is banned from landfill. All "other batteries" will be banned from landfill by 2021.

The lead acid battery market has seen an increase in recycling capabilities (29 016 t) as a result of the Waste Act. The Act is also a key driver for the incorporation of LIB reuse and recycling by LIB manufacturing companies looking to set up in SA.

5.3. Passenger vehicle manufacturing

There is a medium- to long-term opportunity for SA to be used as a manufacturing hub for electric passenger vehicles for the export market. Manufacturing for the domestic market is a longer-term opportunity as demand increases.

SA has a very strong automotive market. It is a dominant industry in the country's manufacturing sector, backed by a relatively cheap labour force. The SA government is faced with the task of securing higher investments and increasing vehicle production volumes to stimulate the local market and remain internationally competitive. This manufacturing base, combined with the significant tax incentives offered, contributes to cheaper manufacturing costs. The trade agreements that SA has with the EU (which allow vehicles and parts to be exported custom-free to 28 countries) and SADC, coupled with cheaper manufacturing, position SA as a suitable manufacturing destination for companies targeting Africa, the US and countries in the EU.

The global trend towards electric vehicles and away from internal combustion represents a threat to the long-term viability of South Africa's automotive sector. This threat has not gone unnoticed by the South African government. Government recognises that a local EV market is not required for the shift in manufacturing sector towards EVs. and it is likely that the EV manufacturing industry will find strong support.



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6

Funding and Incentives

A range of general and sector-funding solutions and incentives is available to investors, manufacturers and service companies in the green economy.

It covers international sources, such as Development Finance Institutions (DFI), local funding pools including the public and private sector, and a considerable range of tax incentives.

6.1. General database web page

The GreenCape Finance Desk hosts a web page⁵ with a number of Green Finance resources that cover funding and incentives available to companies in the green economy. A few of the available database are highlighted below.

6.1.1. Green Finance Database

In conjunction with the South African National Energy Development Institute (SANEDI), GreenCape maintains a database of funding sources and primarily dti-driven incentives that may be relevant to green economy investors. The database contains information on more than 100 funding opportunities, including an overview of the opportunity and its contact details and links. It is ideal for any entity seeking a broad range of funding solutions and financial incentives, with South African institutions being the main source of opportunities. The database is available to view and download online⁶.

6.1.2. Government funding and incentives database

An updated document focused on South African government funding and incentives is available to view and download online⁷.

6.1.3. Finfind database

Finfind⁸ is an innovative online finance solution that brings together SME finance providers and finance seekers. With a focus on finance readiness, Finfind has more than 200 lenders and over 350 loan products available to SMEs. The database is ideal for South African SMMEs who are seeking funding and/or business advisory services, and those who want to improve their understanding of finance.

6.1.4. AlliedCrowds database

AlliedCrowds⁹ is the first complete aggregator and directory of alternative finance providers in the developing world. Sign-up is free and allows users to access a global database where one can filter for sector (including greentech, agriculture and social impact), type of capital (equity, lending, grant), and type of funding (crowdfunding, angel investing, venture capital, impact investing). In addition:

- Themed databases around the Sustainable Development Goals (SDGs) and the World Green Economy Organisation (WGEO) are available.
- Reports, including a number specifically about African funding sources, can also be downloaded for free.
- You can also contact Allied Crowds to create a customised funding database for you.

This resource is ideal for any entity seeking a broad range of financial solutions on a global scale.

⁵ <https://www.greencape.co.za/content/focusarea/green-finance-databases>

⁶ <https://www.greencape.co.za/assets/Uploads/GreenCape-Finance-Database-v6.xlsx>

⁷ <https://www.greencape.co.za/assets/Uploads/Government-Funding-and-Incentive-Booklet.pdf>

⁸ www.finfindeasy.co.za

⁹ <https://alliedcrowds.com/>



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(City of Cape Town)

7

The Western Cape: Africa's green economy hub

The Western Cape is a world-class investment destination.

The province provides businesses and investors with prime locations, modern infrastructure, a skilled workforce, low operational costs and an abundance of natural resources. It is also a sought-after place to live, with unrivalled natural beauty, vibrant culture, excellent schools and universities, and an outstanding quality of life. In 2017, Cape Town was ranked among the top 21 global investment destinations by Foreign Direct Investment (fDi) Intelligence, a division of the Financial Times.

A great place for green business

There are compelling reasons why the Western Cape Province is viewed by many as Africa's green economy hub. Coupled with a strong and rapidly growing market for green technology and services in South Africa and beyond, the Western Cape offers:

- Africa's renewable energy (RE) and cleantech hub, with a critical mass of leading companies present.
- Local presence of major professional services and financiers.
- Significant market opportunities for businesses and investors in agriculture, energy services, utility scale solar and wind, waste, water, bioeconomy and resource efficiency.
- A supportive government that has made ease of doing business and the green economy key priorities.
- Five universities with comprehensive R&D capabilities and dedicated green economy skills programmes.
- A range of investment incentives in the Atlantis Special Economic Zone (SEZ) for Green Technologies.

Supporting businesses and investors

The province also offers dedicated support for businesses and investors focusing on greentech and services, including:

InvestSA One Stop Shop: Offers convenient investor support on permits, licensing and registrations - all under one roof.

GreenCape: Provides dedicated support and market intelligence to green economy sectors.

Wesgro: The official investment and trade promotion agency for the Western Cape.

SAREBI: A business incubator providing non-financial support to green entrepreneurs.

SARETEC: Offers specialised industry-related and accredited training for the wind and solar industries.

Market opportunities in the province and South Africa

Some of the major market opportunity areas in the province and South Africa in the next five years are outlined in the graphic on the next page (see individual MIRs and the GreenCape website for more information).

R&D capabilities and skills

The region's five universities – University of Cape Town, Stellenbosch University, University of the Western Cape, the Cape Peninsula University of Technology and the George campus of the Nelson Mandela Metropolitan University – underpin all of this with comprehensive research and development (R&D) capabilities and dedicated green economy skills programmes.



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Atlantis Special Economic Zone for Green Technologies

The Atlantis SEZ is a zone dedicated to the manufacturing and provision of services in the green technology space - technologies that reduce or reverse the impact of people on the planet. Wind turbines, solar panels, insulation, biofuels, electric vehicles, materials recycling and green building materials are all examples of green technologies that will be welcomed to the zone.

The zone welcomes manufacturers, service providers, suppliers and other players in the value chains of different green technologies.

The SEZ is situated in the Atlantis industrial area north of Cape Town, south of Wesfleur, east of Dassenberg Road, and west of the Witsand community.

Why invest in the Atlantis SEZ?

There are strong and growing South African and African markets for greentech. The South African greentech manufacturing market is worth at least R30bn; with a growing greentech market in the neighbouring countries. South Africa has opportunities in energy, waste, agriculture, transport and other sectors and is a great entry point for the SADC market.

Atlantis is a great location and development ready. 93 hectares of zoned City of Cape Town land is available for leasing to investors. Bulk infrastructure is in place and Atlantis has new public transport and shipping links and fibre connectivity. Atlantis is also close to major ports, roads, universities and greentech markets.

Investors have access to extensive investment support through the One Stop Shop for investor support and the rest of the investor support ecosystem, which includes InvestSA, GreenCape, the City of Cape Town, and Wesgro. Together the ecosystem provides information and advocacy; market intelligence; facilitated access to permits and licenses, planning and development approval; and skills training.

Investors and tenants are accessing attractive incentives in the form of tax relief and allowances, employment tax incentives, fast-tracked development approvals, fee exemptions and subsidies.

There is an attractive, wide-ranging skills base to recruit from with 5 universities and many more colleges in the province, and a large range of unskilled, semi-skilled, technical and professional candidates.

For more information, contact the SEZ's interim Chief Executive Officer, Pierre Voges pierre@wesgro.co.za



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GreenCape's support to businesses and investors

GreenCape is a non-profit organisation that works at the interface of business, government and academia to identify and remove barriers to economically viable green economy infrastructure solutions. Our vision is a thriving prosperous Africa, mobilised by the green economy.

Working in developing countries, GreenCape catalyses the replication and large-scale uptake of green economy solutions to enable each country and its citizens to prosper.

We work with businesses, investors, academia and government to help unlock the investment and employment potential of greentech and services, and to support a transition to a resilient green economy.

We assist businesses by removing barriers to their establishment and growth and provide our members with:

- free, credible and impartial market information and insights
- access to networks of key players in government, industry, finance and academia
- an advocacy platform to help create an enabling policy and regulatory environment for green business

We assist local, provincial and national government to build a resilient green economy by providing:

- support on the development of standards, regulations, tools and policies
- expert technical knowledge on key sectors in the green economy
- access to networks of key players across business, academia, and internationally

Since inception in 2010, GreenCape has grown to a multi-disciplinary team of over 40 staff members, representing backgrounds in finance, engineering, environmental science and economics.

We have facilitated and supported R17bn of investments in renewable energy projects and manufacturing. From these investments, more than 10 000 jobs have been created. Through our WISP (industrial symbiosis) programme, by connecting businesses with waste / under- used resources, we have to date diverted nearly 63,000 tonnes of waste from landfill.

Our market intelligence reports form part of a working body of information generated by sector desks and projects within GreenCape's three main programmes – energy, waste and resources.

Figure 16 below shows the different focus areas within each of our programmes.

Benefits of becoming a GreenCape member

We currently have over 1100 members, and offer free membership. Becoming a member of GreenCape will give you access to the latest information regarding developments in the various sectors; access to tools, reports, and project information; and offer you the opportunity – through our networking events – to meet and interact with various stakeholders in the green economy.



① **Renewable Energy**

Utility-scale projects, localisation of component manufacturing, incentives & financing options, wheeling & energy trading.

② **Energy Services**

Energy efficiency & embedded generation, alternative basic electrification, incentives & financing options.

③ **Electric Mobility**

Electric vehicles and financing options.

④ **Alternative Waste Treatment**

Municipal decision-making & policy & legislative tools on alternative waste treatment options; small-scale biogas, recycling & reuse (dry recyclables, construction & demolition waste).

⑤ **Western Cape Industrial Symbiosis Programme (WISP)**

The team matches businesses to share unused resources, cut costs & create value. They also support entrepreneurs to identify & realise new business opportunities in the waste industry.

⑥ **Water**

Water provision & economic development; greentech opportunities for water use efficiency, treatment & reuse, business water resilience.

⑦ **Sustainable Agriculture**

Precision-, conservation- and controlled environment- agriculture; valorisation of wastes to high value bio- products, including bio-energy.

Figure 16: GreenCape's focus areas

Support through the International Cleantech Network

GreenCape's membership of the International Cleantech Network (ICN) gives our members access to international business opportunities in countries where other cleantech clusters are based (mainly Europe and North America).

To become a member or to get your ICN passport, please contact GreenCape or visit our website: www.greencape.co.za





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References

Black, Anthony & Barnes, Justine, 2017. Developing a South African Automotive Masterplan to 2035 in the context of Global Value Chain drivers: Lessons for second tier automotive economies. Paper prepared for the GERPISA Colloquium, 14 to 16 June 2017, Paris, France.

Bloomberg New Energy Finance (BNEF). 2018. Cumulative Global EV sales hit 4 million. Available from: < <https://about.bnef.com/blog/cumulative-global-ev-sales-hit-4-million/> > [Accessed 29 January 2019].

Bloomberg New Energy Finance (BNEF). 2017. Bloomberg New Energy Finance (BNEF). Available from: < <https://data.bloomberglp.com/bnef/sites/14/2017/07/BNEF-Lithium-ion-battery-costs-and-market.pdf> > [Accessed 29 January 2019].

Businesstech 2017. How fuel prices have changed in South Africa over the past 10 years. Available from: < <https://businesstech.co.za/news/energy/176603/how-fuel-prices-have-changed-in-south-africa-over-the-past-10-years/> > [Accessed 11 February 2019].

BusinessWire 2018. Electric Vehicle Market by Type, and Vehicle Type – Global Opportunity Analysis and Industry Forecast, 2018-2025. Available from <<https://www.businesswire.com/news/home/20180827005257/en/Global-Electric-Vehicle-Market-2018-2025-567.3-Billion>> [Accessed 11 February 2019].

Cision PR Newswire. 2019 Study of the South African Motor Vehicle Industry – Size and State of the Industry, Key Influencing Factors, Competitive Analysis and Outlook. 27 December 2019. Available from <<https://www.prnewswire.com/news-releases/2019-study-of-the-south-african-motor-vehicle-industry---size-and-state-of-the-industry-key-influencing-factors-competitive-analysis-and-outlook-300979519.html>> [Accessed February 2020]

Department of Energy (DOE) 2017. Overview of the Petrol and Diesel Market in South Africa between 2007 and 2016. Pretoria, South African Government.

Department of Environmental Affairs (DEA) 2018. South Africa State of Waste. A report on the state of the environment. First draft report. Pretoria, South African Government.

Department of Trade and Industry (the dti). Industrial Procurement 2011. Available from: < http://www.dti.gov.za/industrial_development/ip.jsp > [Accessed November 2018].

Department of Trade, Industry and Competition (dtic). 2019. Technology and Human Resources for Industry Programme (THRIP). Available from: <<https://nationalgovernment.co.za/units/view/46/departement-of-trade-industry-and-competition-the-dtic>>

Department of Transport (DoT) 2018. Green Transport Strategy for South Africa: (2018-2050). Available from: <http://www.transport.gov.za/documents/11623/89294/Green_Transport_Strategy_2018_2050_onlineversion.pdf/71e19f1d-259e-4c55-9b27-30db418f105a> Pretoria, South African Government.

Engelbrecht, Lezette 2012. Optimal Energy closes its doors. 5 July. Available from: <<https://www.itweb.co.za/content/gxnklOvzzzv4Ymz>> [Accessed November 2018].

IEA 2019. Global EV Outlook 2019. 20 May. Scaling up the transition to electric mobility. Available from: <<https://www.iea.org/reports/global-ev-outlook-2019>> [Accessed November 2019].

Lamprecht, Norman 2018. Automotive Export Manual 2017. Available from: <<http://www.aiec.co.za/Reports/AutomotiveExportManual.pdf>> [Accessed 20 January 2019].

National Household Transport Survey (NHTS). February to March 2013. Revised July 2014. Statistics South Africa. Available from < <http://www.statssa.gov.za/publications/P0320/P03202013.pdf>. >

National Treasury 2012. Invitation and Evaluation of Bids Based on a Stipulated Minimum Threshold for Local Production and Content for the Bus

Sector. Available from: < http://ocpo.treasury.gov.za/Resource_Centre/Legislation/INote%20on%20a%20stipulated%20minimum%20threshold%20for%20the%20bus%20sector.pdf> Pretoria, South African Government.

National Treasury. 2019 Budget Report. Available from <<http://www.treasury.gov.za/documents/national%20budget/2019/review/Chapter%204.pdf>>

Nkomo, JC 2005. The impact of higher oil prices on Southern African countries. Energy Research Centre, 17(1): 10–17.

PlugShare 2019. Available from: <<https://www.plugshare.com/>> [Accessed 7 January 2019].

Preferential Procurement Policy Framework Act 5 of 2000. Preferential Procurement Regulations, 2017.

Randall, Tom 2016. Here's How Electric Cars Will Cause the Next Oil Crisis. Bloomberg New Energy Finance, 25 February. Available from: < <https://www.bloomberg.com/features/2016-ev-oil-crisis/>> [Accessed November 2018].

Rodrigue, JP 2017. The Environmental Impacts of Transportation. Available from: < https://transportgeography.org/?page_id=5711> [Accessed March 2019].

Santander TradePortal 2019. South Africa: Reaching the consumer. Available from: < <https://en.portal.santandertrade.com/analyse-markets/south-africa/reaching-the-consumers>> [Accessed November 2018].

UNIDO Low Carbon Transport Project in South Africa (LCT-SA). Unity in Sustainable Mobility: Roadmap towards building a unified electro mobility industry in South Africa. Available from: < <http://www.evia.org.za/EVIA2016Booklet.pdf> > [Accessed January 2019].

uYilo E-mobility Programme 2017. Sustainable Transport and Mobility for Cities Workshop -eThekweni Municipality. Available from: < https://www.sanedi.org.za/Cleaner%20Mobility/images/Presentations/uYilo_UNIDO_Sustainable_Transport_and_Mobility_for_Cities_workshop_HitenParmar_320170330.pdf> [Accessed 6 February 2019].

Wyman, Oliver 2005. What's Your Strategy for the Electric Vehicle Market? 19 June. Available from: < https://www.oliverwyman.com/content/dam/oliverwyman/global/en/files/archive/2005/OW_UTL_EN_2009_Electric_Vehicle_Market.pdf> [Accessed November 2018].

