GreenCape

ELECTRIC VEHICLES MARKET INTELLIGENCE REPORT

2021

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

This market intelligence report was produced in partnership with the Western Cape Government Department of Economic Development and Tourism. We thank Wilberforce Chege and Jack Radmore for the time and effort that they have put into compiling this market intelligence report.

Disclaimer

While every attempt has been made to ensure that the information published in this report is accurate, no responsibility is accepted for any loss or damage to any person or entity relying on any of the information contained in this report.

Cover image courtesy of Unsplash.com.

Subscribe to receive e-mail alerts or GreenCape news, events, and publications by registering as a member on our website: **www.greencape.co.za**

42 Hans Strijdom Ave, Foreshore, Cape Town, 8001

Author:	Wilberforce W. Chege
Editorial and review:	Jack Radmore, Cilnette Pienaar, Lauren Basson, and Nicholas Fordyce
Images:	GreenCape, Jaguar South Africa, BMW South Africa, uYilo, Green Scooter, Hiten Parmer, Pxhere, City of Cape Town and Global District Watch
Layout and design:	Tamlin Lockhart

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

AASA	Automobile Association of South Africa
AC	Alternating current
AEM	Automotive Export Manual
AfCFTA	African Continental Free Trade Area
AIS	Automotive Investment Scheme
Al	Aluminium
APDP	Automotive Production and Development Programme
AU	African Union
AV	Autonomous vehicles
BEV	Battery electric vehicle
BFP	Basic fuel price
BMS	Battery Management System
BMW	Bayerische Motoren Werke
BRT	Bus Rapid Transit System
BYD	BYD Co Ltd (Build Your Dreams)
CaF_2	Calcium fluoride
CBT	Carbon Tax
CCS	Combined Charging System
CHAdeMO	CHArge de MO
CPI	Consumer Price Index
CO_2	Carbon dioxide
Co	Cobalt
CoCT/CCT	City of cape Town
CPUT	Cape Peninsula University of Technology
CSIR	Council for Scientific and Industrial Research
Cu	Copper
DC	Direct current
DER	Distributed energy resource
DMEA	Department of Mineral and Energy Affairs
DMRE	Department of Mineral Resources and Energy
DoE	Department of Energy
DoT	Department of Transport
DST/DSI	Department of Science and Technology/ Department of Science and Innovation
dti	Department of Trade and Industry
dtic	Department of Trade, Industry and Competition
E-buses	Electric buses
EC	Eastern Cape
E-MBT	Electric minibus taxi
E-mobility	Electric Mobility
ES	Energy storage
EU	European Union
EV	Electric vehicle
FCEV	Fuel Cell Electric Vehicle
FDI	Foreign Direct Investment
Fe	Iron
GABS	Golden Arrow Bus Services
GERPISA	Le Réseau International de l'Automobile (International Automobile Network)
GHG	Greenhouse gases
GM	General Motors
GMA	Gautrain Management Agency
GP	Gauteng Province
GTS	Green Transport Strategy
HEV	Hybrid electric vehicle
HFCEV	Hydrogen Fuel Cell Electric Vehicle
Hp	Horsepower
HySA	Hydrogen South Africa

ICE	Internal combustion engine
IDC	Industrial Development Corporation
IDZ	Industrial Development Zone
I & F	Infrastructure and facilities
IFC	international Finance Corporation
IPP	Independent Power Producer
ITAC	International Trade Administration Commission
Km/a	Kilometres per annum
KWh	Kilowatt-hour
KZN	KwaZulu-Natal
LCT	Low-Carbon Transport
LCT-SA	Low-Carbon Transport South Africa Project
LCV	Light commercial vehicles
LDV	Light duty vehicle
LEDA	Limpopo Economic Development Agency
LFP	Lithium iron phosphate
LIB	Lithium-ion battery
MaaS	Mobility-as-a-Service
MBT	Minibus taxi
Mg	Magnesium
MIR	Market Intelligence Report
Mn	Manganese
NAACAM	National Association of Automotive Component and Allied Manufacturers
NAAMSA	National Association of Automobile Manufacturers of South Africa
NCA	Lithium nickel cobalt aluminium oxide
NCCRP	National Climate Change Response Policy
NEC	Nippon Electric Company
NEV	New energy vehicle
NHTS	National Household Travel Survey
Ni	Nickel
Nm	Newton metres
NMC	Nickel manganese cobalt oxide
OEM	Original equipment manufacturer
OES	Original equipment supplier
OPEC	Organization of the Petroleum Exporting Countries
PAYD	Pay as You Drive
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
SAAM	South African Automotive Masterplan
SADC	Southern African Development Community
SAIAMC	South African Institute for Advanced Materials Chemistry
SEZ	Special Economic Zone
SOV	Single occupancy vehicle
SSA	Sub-Saharan Africa
SUV	Sports Utility Vehicle
THRIP	Technology and Human Resources for Industry Programme
TIA	Technology Innovation Agency
TRP	Taxi Recapitalisation Programme
UNEP	United Nations Environmental Programme
UNIDO	United Nations Industrial Development Organization
USA	United States of America
USGS	U.S. Geological Survey
UWC	University of the Western Cape
V2G	Vehicle to grid
V2H	Vehicle to home
V2X	Vehicle to everything
VAA	Vehicle assembly allowance
VALA	Volume assembly localisation allowance
Veh	Vehicle
WC	Western Cape
YTD	Year to date

Exchange rate used: 1 US Dollar = R15

EXECUTIVE SUMMARY

This market intelligence report is written for investors, original equipment manufacturers (OEMs), equipment suppliers, project developers, and technical advisers. It highlights current investment opportunities in the electric vehicles market in South Africa.

Globally, the momentum for electric mobility has increased exponentially as evidenced by the number of sales over the period 2013 to 2020. This global shift has been primarily driven by national emission reduction commitments stemming from the Paris Agreement on climate change, growing urban air pollution concerns, and continued crude oil price volatility. In 2019 a year-on-year decrease in Electric Vehicle (EV) sales figures was seen for the first time after China halved its subsidies for new energy vehicles (NEVs), including EVs. Many countries across the world have now shifted their policies towards accelerating EV uptake — also as part of their Covid-19 recovery strategies — which is likely to drive up the global demand for EVs.

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

South Africa already has a strong market for the assembly of internal combustion engine (ICE) vehicles. The automotive sector is a key player in the country's economic landscape, contributing 6.4% of GDP and 27.6% of manufacturing output. Total revenue from this sector was more than R500 billion (US$35.6 billion) in 2019, with the industry employing up to 900 000 people directly and indirectly — including downstream in wholesale, retail trade, and maintenance.

South Africa is considered a second-tier market, having produced more than 600 000 ICE vehicles, predominantly for the export market. SA is, therefore, a net exporter of vehicles.

When the COVID-19 case rate increased in South Africa, the national government implemented national restrictions (lockdown regulations) to reduce the spread of the virus. This included the limiting of active business activity, also affecting the automotive industry. The lockdown, coupled with reduced international trade, saw the South African gross domestic product (GDP) shrink by 51% in quarter two of 2020. By November 2020, the total domestic production by the automotive sector had decreased by 32%. Total vehicle exports from South Africa by the end of November 2020 had decreased by 33% (NAAMSA, 2020). For SA, a thriving EV market supported by local manufacturing holds the promise of sustainable economic development, job creation, and advance in the development of the local green economy.

A thriving EV market in SA will also result in increased economic resilience to some of the economic impacts of climate change mitigation measures through, for example, counteracting the economic impact of the inevitable decline in demand for ICE vehicles globally.

There are substantial environmental, economic, and social opportunities for South Africa in the transition to a low-carbon trajectory, enabled by a green energy transition. Consequently, there are several emerging opportunities in SA's nascent EV market:

- **Local manufacturing and electrification of public transport:** Public transport presents the best business case for electrification. This is especially true for the bus market that 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, Industry and Competition (dtic) for public procurement.

The assembly of buses further enjoys the benefit of duty-free importation of all driveline components. While this is a flat market in SA, there is scope to revitalise this space. Incorporating e-bus manufacturing for public transportation is a more economically viable way of achieving this revitalisation than private vehicles, because as per the last National Household Travel Survey (NHTS, 2013), over 80% of South Africans use public transportation as their primary means of mobility.

- **Local lithium-ion battery (LIB) production:** South Africa is an attractive assembly and possibly future manufacturing destination for lithium-ion batteries because of its existing battery assembly 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 about 78% of the world's manganese.

Also, other raw materials required in the cathode are mined in Sub-Saharan Africa. The logistical advantages of closer geographical proximity coupled with improved regional free trade policies, such as the African Continental Free Trade Area (AfCFTA) and the African Union (AU) Agenda 63, could provide a range of advantages in accessing and utilising these raw materials.

- **Local passenger vehicle manufacturing:** There is a medium- to long-term opportunity building on South Africa's existing significant automotive manufacturing capability to develop a manufacturing hub for electric passenger vehicles for the export market. Manufacturing for the domestic market is a longer-term opportunity as local demand increases and a more supportive policy environment is developed.

SUMMARY OF MARKET OPPORTUNITIES

EV use in construction, retail, and in underground mining: There is a medium- to long-term opportunity for battery-powered EVs and machinery in underground and opencast mining in South Africa, where mining is a key sector of the economy. This is because one of the highest costs for mining operations is getting air underground, and temperature regulation.

Electric mining equipment produces no fine particular matter (PM2.5) from diesel and other tailpipe emissions, thereby necessitating fewer ventilation requirements, and therefore lower costs, and safeguarding health for miners. Additionally, EV mining equipment produces less heat because of the higher efficiency of the conversion from electric energy compared to diesel. This saves on ventilation and heat regulation underground.

The electric mining equipment also produces less noise and vibration, and requires less maintenance — further saving on mining costs and operational expenditure.

Since EVs produce no tailpipe emissions, they are increasingly being touted as a remedy for use in underground mining.

Additionally, the demand for lithium-ion-powered forklifts is increasing locally, owing to companies wanting to reap the benefits of energy efficiency, reduced air pollution for public health benefits, and cost-effectiveness, as well as to prepare for changing legislation regarding emissions, such as the recently enacted Carbon Tax Act 15 of 2019 (SARS, 2020).

Table 1 provides an overview of the major drivers and barriers that are discussed in this report, and highlights the market opportunities in the EV market.

Table 1: Overview of the market opportunities, drivers, and barriers within the EV Market

Opportunity	Key drivers	Barriers	Term
Local manufacturing and electrification of public transport	• The need to meet climate obligations and greenhouse gas reduction targets • Public transport demonstrates the best business case for alternative fuel applications. • Reduced fleet operational costs, including reduced fuel and maintenance costs. • Decreasing battery prices • Increase in renewable energy usage and the clean energy transition • Local content requirements for manufacturing, such as the designation of over 70% local content requirements for bus manufacturing in South Africa.	• Slow local uptake due to high upfront cost • Rigid public procurement system • The poor precedent created by the City of Cape Town's unsuccessful 2017/18 electric bus pilot • Lack of innovative and cost-effective financing mechanisms and access to capital • Insufficient skills throughout the value chain	Medium – Long

Table 1 continued...

Opportunity	Key drivers	Barriers	Term
Lithium-Ion batteries (LIB) production	• An increasing need for lithium-ion batteries (LIB) in renewable energy and stationary storage, EVs, consumer electronics and other sectors, both in SA and globally • Availability of nickel, manganese (Mn), and other key raw materials in South Africa and the Sub Saharan Africa region • Availability and relative ease of access to lithium and cobalt. • Emerging need of Mn-rich electrodes that can compete with 'in vogue' nickel-rich compositions (security of supply) • Local content requirements for the procurement of utility-scale Renewable Energy and energy storage facilities from Independent Power Producers	• Establishing strong public-private partnerships that extend beyond South Africa • A better understanding of global manganese-oxide demand • Policy support • Lack of existing local supply chain • Falling LIB prices that may diminish the feasibility of local manufacturing of LIBs	Medium – Long
Local passenger vehicle manufacturing	• Government efforts to increase local content, volume outputs, and jobs in SA's automotive manufacturing industry • The potential loss of existing trade markets through the planned phasing out of ICE vehicles in many of SA's current export markets for ICE vehicles • Increasing international demand for EV's • South Africa already has a strong automotive industry that could potentially pivot to EV manufacturing.	• Insufficient local demand for EVs • Lack of innovative and cost-effective financing mechanisms and access to capital • Insufficient skills throughout the value chain • Lack of a public charging infrastructure network	Medium – Long
EV use in construction, retail, and in underground mining	• Cost-saving since one of the highest costs in underground mining operations is getting air underground. EVs produce no tailpipe emissions and less heat compared to emissions from using ICE vehicles underground. • Demand for lithium-ion-powered forklifts increasing locally, owing to companies wanting to reap the benefits of energy efficiency and cost-effectiveness, as well as to prepare for changing legislation regarding emissions, such as the recently enacted carbon tax regulation.	• Lack of local manufacturing industry for construction, retail, and mining vehicles • Lack of innovative and cost-effective financing mechanisms and access to capital • Insufficient skills throughout the value chain	Medium – Long

WHAT'S NEW?

CLICK HERE TO WATCH A SUMMARY OF THE 2021 ELECTRIC VEHICLES MIR OPPORTUNITIES

Since the publication of the 2020 Electric Vehicles Market Intelligence Report, there have been several important developments in the sector. Readers of last year's MIR are encouraged to read this year's report in full, as the market intelligence has been updated substantially.

Among the additions to this year's report are the following sections:

- The local lithium-ion battery (and solid-state battery) manufacturing opportunity and the potential boost to the mining sector;
- The opportunities EVs provide in the construction, retail, and in underground mining;
- The disruptions and impacts of the Covid-19 pandemic and subsequent lockdowns on the automotive and EV sector, including the positive impacts that may be caused by the post-Covid-19 recovery plans;
- New models of vehicle ownership and the role that commercial banks can play in the market;
- Local EV market developments and new vehicle models launching in South Africa within the next year;
- The grid impacts of EVs;
- The potential loss of South Africa's vehicle export markets due to impending restrictions on ICE vehicle importation in South Africa's key export markets that are shifting towards e-mobility;
- South Africa's transport emissions (and emission intensity), and the environmental, economic, and social opportunities in the transition to a low-carbon trajectory, enabled by a green energy transition;
- Most recent, updated statistics on the size of the automotive industry in South Africa;
- Legislation, regulations, and policies guiding energy provision, to cater for the increased energy demand from the projected increase in EVs in SA;
- Results of the 2020 National EV Perception Survey.

Enabling, mobilising and facilitating the South Africa e-mobility ecosystem.
©uYilo

INTRODUCTION AND PURPOSE

This market intelligence report is written for investors, OEMs, equipment suppliers, project developers, and technical advisers. It highlights investment opportunities in the EV market in South Africa.

Globally, the electric vehicle (EV) market has been growing steadily since 2010, supported by financial and non-financial incentives to make EVs an attractive purchase for private consumers. EVs have gained a lot of attention globally as a lever in attaining emission reduction targets. China currently has the largest share of the EV market (UNCC, 2020).

It is projected that by 2030, 40% of all new car sales in the European Union will be electric, and this is projected to grow to 80% by 2040 (European Commission, 2020). Despite this market growth, government support and subsidies are still vital to allow EVs to compete with the ICE market. This is because the upfront capital cost of purchasing an EV remains high, primarily driven by the cost of batteries. Still, the total cost of ownership over the lifecycle of the EV is significantly less than for ICE vehicles. The importance of support and subsidies was shown in 2019, when China's reductions in subsidies for new energy vehicles (NEVs) caused the first disruption in the trend of continuous growth in EV sales. This is evident from the change in 2019 sales after June 2019, shown in **Figure 1** below.

China cut subsidies on new EVs (and other energy vehicle types) by 10% as of April 2020. However, the subsidies and tax exemptions, which were initially scheduled to terminate in 2020, have now been extended to 2022 but will be subject to a further 20% cut in 2021 and 30% in 2022. Global EV sale volumes were drastically affected by the COVID-19 pandemic and subsequent lockdowns.

Figure 1: Global EV sales in recent years

Source: (InsideEVs, 2020)

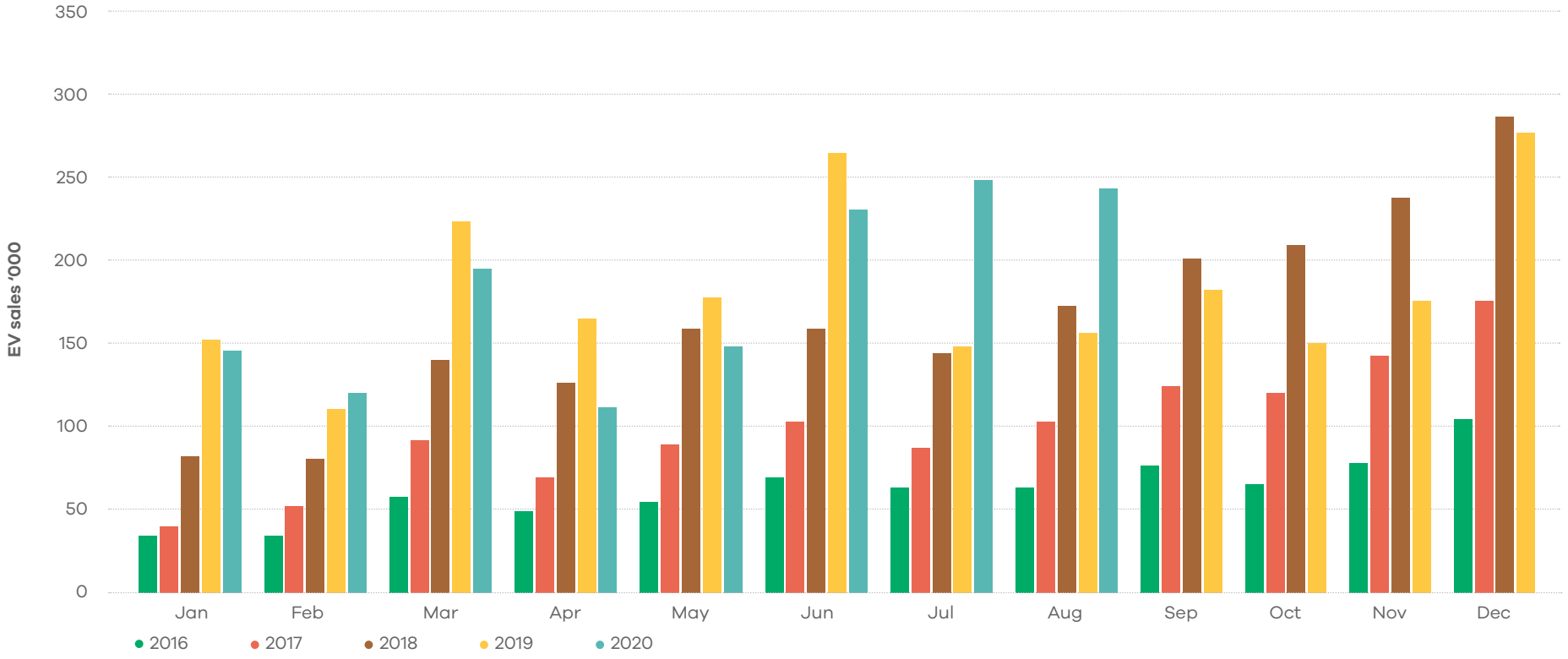
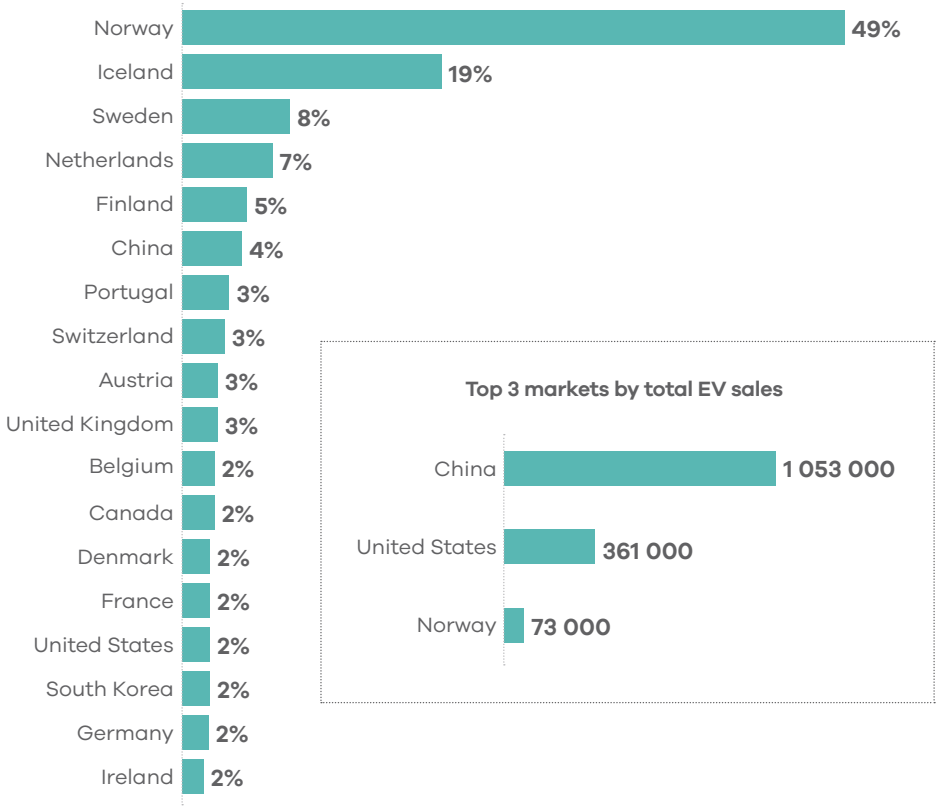


Figure 2 below illustrates a year-on-year increase in global electric car sales.

China and the EU, particularly Norway, lead in the proportion of the overall car sales being EVs.

Figure 2: Leading countries with the highest proportion of EVs in new passenger car sales

Source: (Statistica, 2020)



There are various reasons governments across these markets have chosen to support the EV market. These include:

- **Air quality concerns in cities:** Increasing motorisation in cities has resulted in increased air pollution concerns, which has a knock-on effect on health, visibility, and the natural environment. Because EVs produce zero direct emissions, they can assist in improving air quality in cities.

- **Emission reduction commitments:** The transport sector has been identified as a key contributor to global greenhouse gas (GHG) emissions because of its reliance on fossil fuels. Of global greenhouse gas emissions, 15% can be attributed to the transport sector. It is the fastest-growing source of GHG emissions in South Africa, accounting for 91.2% of the increases over the past decade (NAAMSA, 2020). It is also the biggest consumer of energy in Cape Town (64% of energy in Cape Town).

South Africa contributes about 1.1% of overall global emissions according to the Department of Transport's Green Transport strategy. Road transport accounts for 91% of direct emissions across the transport sector, primarily from the combustion of fossil fuel and the fuel quality in South Africa that is at a Euro 2 level.

As of November 2020 the Paris Agreement, obliging signatories to reduce their emissions[1], has been signed by 194 countries (including South Africa) and the European Union (EU), and ratified by 187 countries and the EU. EVs provide an alternative to traditional ICE vehicles, as they can be powered by renewable energy. South Africa has the highest emission intensity in the G20 group of industrialised and developing countries as of 2019, according to the Climate Transparency Organisation (Cunliffe et al., 2018). The transport sector is the second-largest source of GHG emissions, at about 10.8%; second only to the energy sector, making the economy one of the most carbon- and energy-intensive in the world.

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

According to the Department of Transport, fossil fuels at 92% are the largest source of primary energy in South Africa (DoT, 2018). This is the highest in the G20, and SA's emission intensity is almost double the average of the G20 countries.

To achieve our current environmental and climate commitments and targets, South Africa has to reduce emissions by at least 32% in the next ten years. Reductions from energy generation and supply alone are not enough to achieve this.

The climate targets that have been set for the automotive sector by 2030 cannot be met without EVs being incorporated in the transport system. ICE improvements alone are insufficient to achieve these targets.

Additionally, EVs are only as green as the energy source used to charge them, i.e. due to upstream emissions. Powering EVs using electricity from coal sources is counterproductive. Renewable energy sources like wind and solar are more ideal and in line with the global clean energy transition.

Figure 3: South Africa's total final consumption (TFC) of energy by sector, 1990-2018

Source: (IEA, 2020)

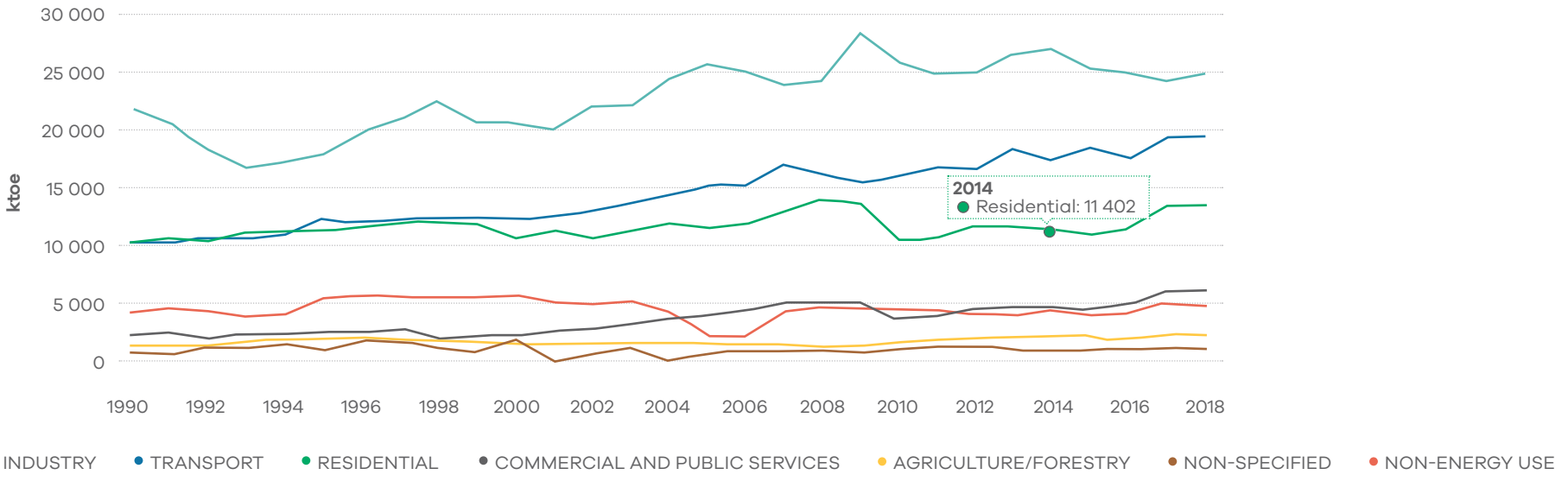


Figure 3 illustrates the gradual increase in energy use in South Africa expressed in kilo tonnes of oil equivalent. The transportation sector has been the second-largest energy consumer in the country since 1994.

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 and exposure to oil price volatility. Because local electricity production derived from a variety of sources can power EVs, they are becoming increasingly attractive in this respect.

South Africa has not implemented any form of incentives or policies to accelerate the growth of the EV market.

It 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. In due course, EVs might not require government subsidies to be financially viable, making it likely that SA could follow the global trends in time.

This report provides potential investors with an overview of the state of the EV market in South Africa. It highlights emerging investment opportunities in the EV market and notes barriers and risks in the market. Although the market can be segmented in several ways, based on the context of the South African market, the key market segments discussed in this report are private, public, and industrial. A definition for each segment is provided in Table 2, as well as the types of vehicles included in each category.

Table 2: 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.	• Single occupancy vehicles (SOV) • Micromobility e.g., scooters and bikes
Public transport	It refers to the transportation of passengers by group travel systems available for use by the public. They are typically scheduled, have dedicated routes, and charge a fee for each trip.	• City/Municipal bus services • Commuter buses • Minibus taxis (MBT) • Metered taxis • Ride-hailing services
Industrial transport	This refers to vehicles used in the commercial industry to move heavy goods and materials.	• Forklifts • Trucks / Vans • Mining vehicles

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

- Local manufacturing and electrification of public transport;
- Local lithium-ion battery manufacturing;
- Local passenger vehicle manufacturing; and
- EV use in construction, retail, and underground mining.

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 EVs on liquid fuel dynamics;
- policy mechanisms for incentivising investment in EVs and EV infrastructure;
- the role of EVs in energy storage — vehicle to grid (V2G), vehicle to home (V2H), and vehicle to everything (V2X); and
- autonomous EVs;

In what follows:

Section 2 gives an overview of the global EV market and describes the market size.
Section 3 provides potential investors and businesses with an overview of the state of the South African EV market.
Section 4 outlines the relevant policies and regulations.
Section 5 highlights emergent opportunities, barriers, and market uncertainties that may affect the growth of the EV industry in South Africa.
Section 6 focuses on funding and incentives.
Section 7 gives an overview of the Western Cape as Africa's growing greentech hub.
Section 8 focuses on the services that GreenCape provides to its members.

CLICK HERE TO CONTACT GREENCAPE'S SUSTAINABLE TRANSPORT SECTOR DESK

There are a growing number of charging ports around the country.
©Jaguar, South Africa

GLOBAL INDUSTRY OVERVIEW

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

Global EV sales continue to rise, with a number of European countries placing a future ban on ICE vehicles between 2030 and 2040.
©BMW South Africa

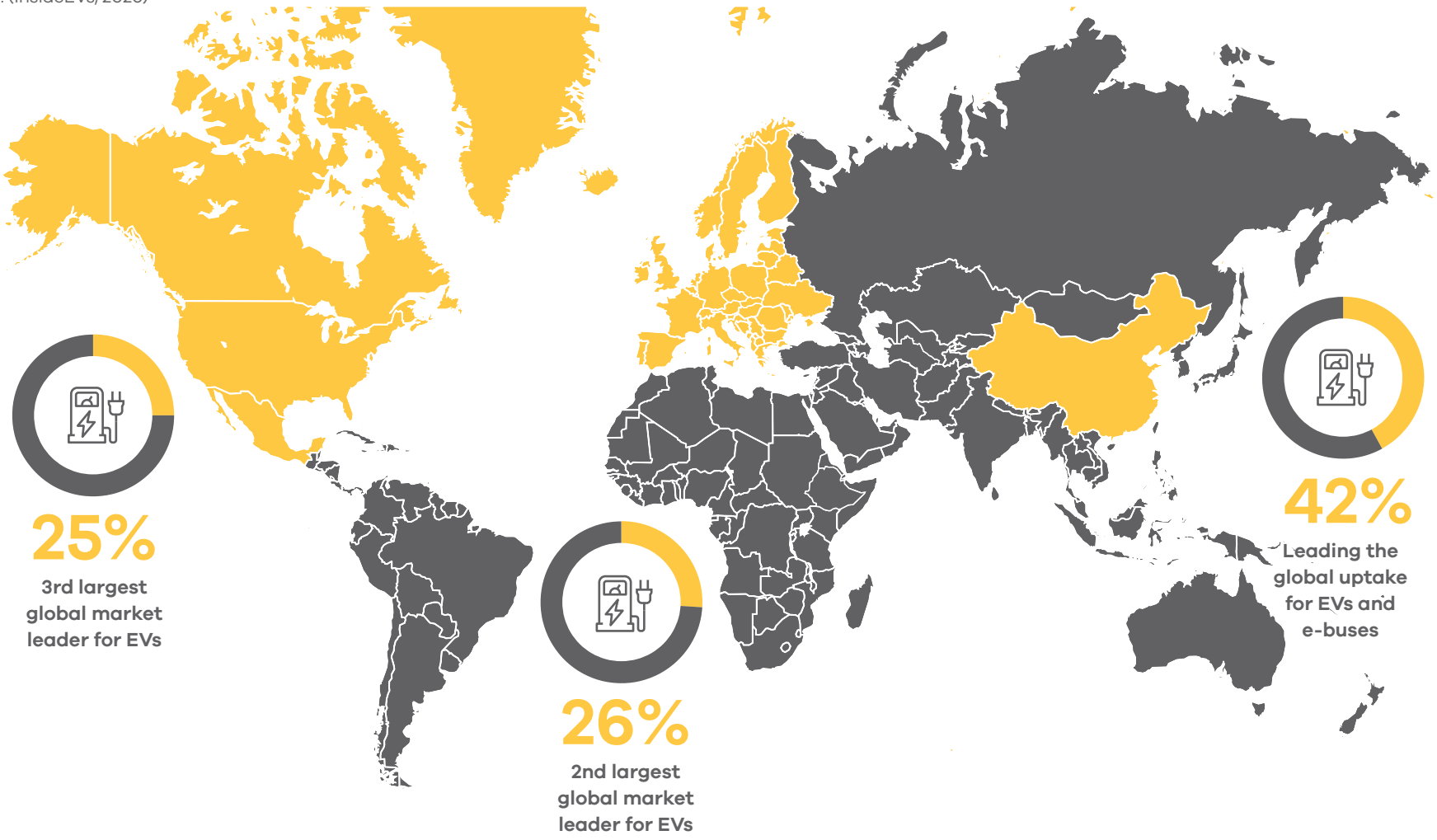
The leading markets in terms of EV sales between 2013 and 2020 are summarised in Figure 4 below.

The growth can be attributed largely to governments' commitments to emission reduction targets such as the Paris Agreement on climate change.

As a result, many governments have put in place enabling policy frameworks and mechanisms, and created generous incentives to encourage the uptake of EVs.

Figure 4: Leading EV markets globally

Source: (InsideEVs, 2020)



As indicated in Section 1, in 2019 there was a slightly reduced growth trajectory for EVs, linked to the reduction of incentives. Global car (ICE and EV) production was 91.8 million. Sales declined to 91.3 million, primarily because of reduced demand from China.

However, EV sales in 2019 increased to 2.21 million units (2.5% market share of new vehicle sales), with Europe as the main driver of EV growth. This increase has been driven by government policies such as the European Green Deal that aims for Europe to be climate neutral by 2050, emission and fuel economy regulations, and financial and non-financial incentives (European Commission, 2020).

As indicated in Section 1, China currently has the largest share of the electric vehicle market. It is also projected that by 2030, 40% of all new car sales in the European Union will be electric, and this is projected to grow to 80% by 2040.

According to Global EV Outlook 2019/20, the global EV market was valued at ~R1.6 trillion (USD 118.9 billion). Although only accounting for 2.1% of the automotive industry, the compound annual growth rate for EV sales 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 electricity charging points worldwide was estimated to be 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. In their respective territories, BYD, Nissan and Tesla are the leading brands.

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.

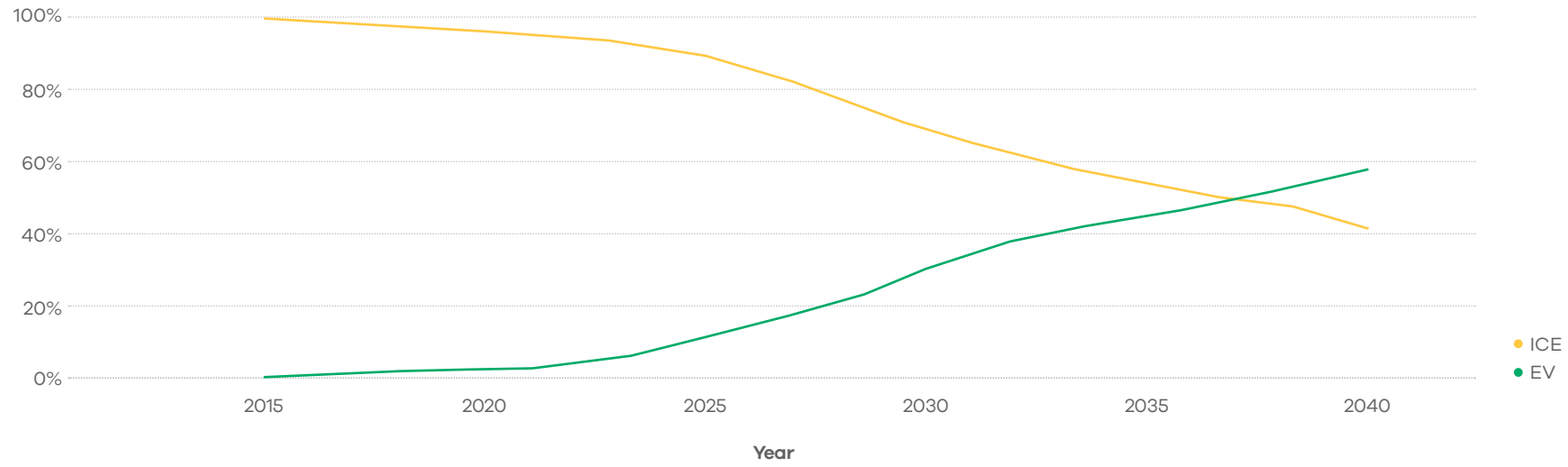
Although the market is seeing rapid growth, there are key factors that could slow down the growth of the EV market. These include:

- battery prices not decreasing as expected;
- a lack of, or inadequate/ insufficient enabling policy environment;
- China's reduction and elimination of some EV incentives;
- oil prices decreasing further instead of increasing due to lower demand for oil in Europe and China, coupled with a steady supply of oil from OPEC; and
- limited range and charging infrastructure networks.

Without incentives and subsidies, the barriers would result in delayed EV and ICE vehicle cost parity, thereby limiting rapid adoption. However, Bloomberg forecasts that EV passenger vehicle sales will exceed ICE vehicle sales around 2037 (Figure 5).

Figure 5: Forecast of global EV sales

(Source: Bloomberg)



There is a growing business case for the use of EVs in the taxi industry.
©Green Scooter

Green mobility: Electric vehicles powered through renewable energy.
©Hiten Parmar

SOUTH AFRICAN INDUSTRY OVERVIEW

The emerging EV market represents a small share of the SA automotive industry but presents substantial opportunities for businesses and investors active and/or interested in the sector.

There is a strengthening business case for the use of EVs in the private security industry.
©District Watch Group

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

3.1. South African automotive market supply

South Africa already has a strong market for the assembly[2] and future manufacturing of internal combustion engine (ICE) vehicles. The automotive sector is a key player in the country's economic landscape, contributing 6.4% of the Gross Domestic Product (GDP) and 27.6% of manufacturing output in 2019. According to the Automotive Export Manual (AEM), the revenue from the automotive sector in South Africa was more than R503 billion (US$35.6 billion) in 2018, with the industry employing ~900 000 skilled, semi-skilled and unskilled workers – including in wholesale, retail trade, and maintenance. Approximately 600 000 ICE vehicles were assembled in 2019, predominantly for the export market and R10.8 billion in foreign direct investment (FDI). SA is a net exporter of vehicles.

Exports of automotive products, which reached a record R178.8 billion, were shipped to a record 155 export destinations, up from 149 in the previous year (Cision, 2019).

When the COVID-19 case rate increased in South Africa, the national government implemented national restrictions (lockdown regulations) to reduce the spread of the virus. This included the limiting of business activity, also for the automotive industry. The lockdown, coupled with reduced international trade, saw the South African GDP shrink by 51% in quarter two of 2020.

There has been a 32% reduction in total domestic vehicle production, and a 33% reduction in vehicle exports as of November 2020, attributable to the COVID-19 pandemic and subsequent lockdowns. Local vehicle sales also decreased by 31% by November 2020, compared to the same time in the previous year (NAAMSA, 2020). This is detailed in **Table 6** later in this report.

Table 3 provides an overview of known original equipment manufacturers (OEMs), importers, and distributors in each private transport market segment in South Africa.

Table 3: Private transport representation in SA

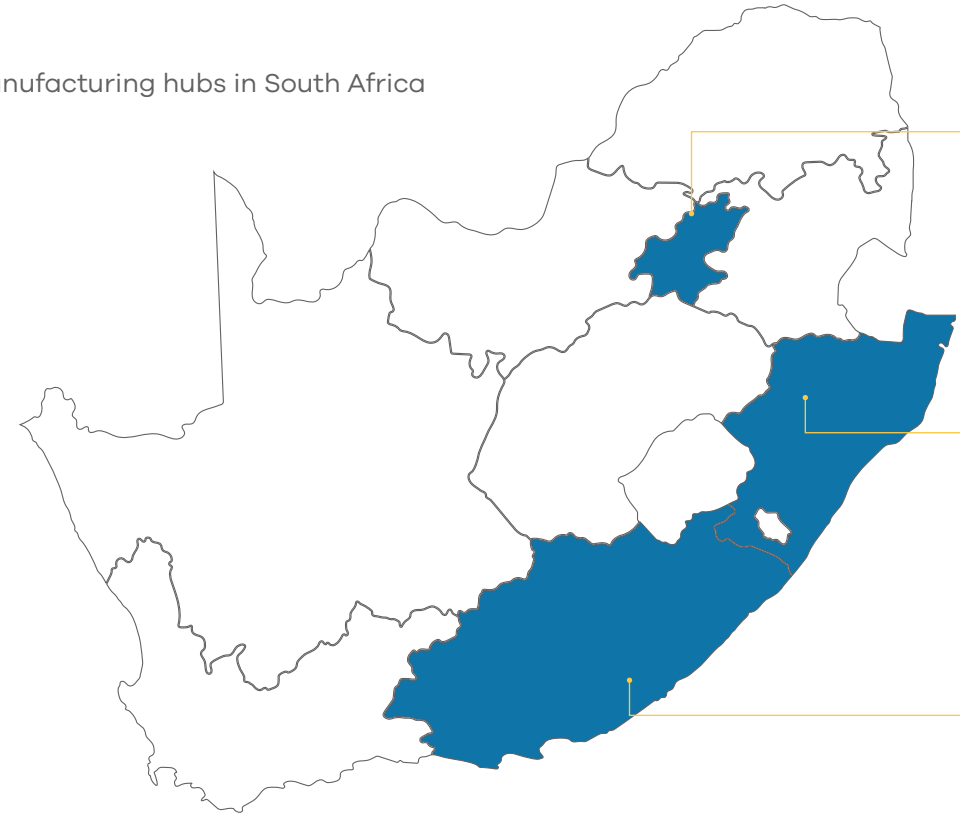
Original equipment manufacturers (OEMs)	Importers and distributors
BMW South Africa (Pty) Ltd	Audi (VW Group)
Ford Motor Company of Southern Africa (Pty) Ltd	European Automotive Imports South Africa (EAISA) (Pty) Ltd (Maserati)
Mercedes-Benz SA Ltd	FCA South Africa (Pty) Ltd (Fiat Chrysler Automobiles Group)
Volkswagen Group South Africa (Pty) Ltd	Jaguar Land Rover
Nissan South Africa (Pty) Ltd	Mini South Africa
Toyota South Africa Motors (Pty) Ltd	Porsche
Isuzu South Africa (Pty) Ltd	Volvo Car South Africa
	Honda
	Mahindra and 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

[2] Technically, South Africa currently assembles vehicles rather than manufacturing them, because the batteries are imported and not made locally. This is the reason for the low local content in the automotive industry.

Table 3 continued...

Original equipment manufacturers (OEMs)	Importers and distributors
	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 6: Manufacturing hubs in South Africa



GAUTENG

OEM

BMW (South Africa (Pty) Ltd
Nissan South Africa (Pty) Ltd
Ford Motor Company of Southern Africa (Pty) Ltd

Commercial vehicles & bus companies

Babcock, Eicher Trucks, Fiat Group, Ford, Hyundai, Iveco, JMC, MAN Truck & Bus, MarcoPolo, Peugeot Citroen, Powerstar SA, Scania, Tata Trucks, VDL Bus & Coach and Volvo Group Southern Africa

KWAZULU-NATAL

OEM

Toyota South Africa Motors (Pty) Ltd

Commercial vehicles & bus companies

Bell Equipment, MAN Truck & Bus and Toyota (Hino)

EASTERN CAPE

OEM

Volkswagen Group South Africa (Pty) Ltd
Mercedes-Benz SA Ltd
Isuzu South Africa

Commercial vehicles & bus companies

FAW Trucks, Isuzu Truck, Mercedes-Benz SA (Freightliner and Fuso) and Volkswagen Group SA

Figure 6 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 Western Cape (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.

South Africa started exporting locally produced vehicles in 1995, and has to date exported 4.7 million vehicles. Table 4 below shows South Africa's percentage share of global vehicle production in recent years. South Africa's market share of global vehicle production was at its highest in 2019, standing at 0.69% of global vehicle production.

Locally, Toyota and Volkswagen produce the most vehicles, holding 24% and 16% local market share respectively, according to the National Association of Automobile Manufacturers of South Africa (NAAMSA). The other local OEMs each holds less than 10% market share, as shown in Table 5.

Table 4: South Africa's market share of global vehicle production

Year	2013	2014	2015	2016	2017	2018	2019
South African market share of global vehicle production	0.63%	0.63%	0.68%	0.63%	0.62%	0.64%	0.69%

EVs are being used locally in the private security sector.
©District Watch Group

Table 5: Vehicle production market share of the top OEMs in South Africa
Source: NAAMSA (2020)

Top OEMs in South Africa	Market share (2019) (%)	Location (province)
Toyota SA	24	KwaZulu-Natal
Volkswagen AG	16	Eastern Cape
Ford Motor Co of SA	9	Gauteng / Eastern Cape
Nissan	9	Gauteng
Hyundai SA	6	Gauteng
Renault	5	Gauteng
Mercedes Benz SA	4	Eastern Cape
Isuzu Motors SA	4	Eastern Cape
BMW SA	3	Gauteng
Other	20	

3.2. The impact of COVID-19

The COVID-19 pandemic and subsequent lockdowns have had a drastic impact on the automotive sector in South Africa. The sector experienced a 25% decline in the second quarter of 2020 (Q2) compared to the same time last year.

As of November 2020, 404 991 vehicles have been produced, which is a 32% reduction from the same time last year (596 253 vehicles were produced as of November 2019).

Table 6: The impact of COVID-19 on South Africa's vehicle production, exports, sales, and imports

Source: (NAAMSA, 2020)

	2020 YTD (by November 2020)	2019 YTD (by November 2019)	% Change
Total domestic production	404 991	596 253	-32.08
Total vehicle exports	250 394	373 532	-32.97
Total local sales	343 037	494 929	-30.69
Total vehicle exports	188 440	272 208	-30.77

As illustrated in **Table 6**, there has been a 33% reduction in total vehicle exports as of November 2020, compared with a similar period the previous year. Local vehicle sales stand at 343 037 as of November 2020, which is a 31% reduction compared with the 494 929 vehicles sold locally by November 2019. Vehicle exports have decreased by 33% compared to the same time last year.

Asset finance was greatly affected, as sales slumped, and 42% of consumers asked for vehicle payment relief – for three months at least.

Buying a car is, for most South Africans, their second-biggest acquisition, but most people do not have much disposable income due to the economic impacts of the COVID-19 pandemic.

South Africa's car dealerships were also affected by the pandemic. These are very asset-intensive businesses with a lot of debt, and are heavily reliant on sales. During the 'hard' lockdown, dealerships were not allowed to re-open (hence vehicles could not be sold) even when automakers were permitted to resume operations.

NAAMSA anticipates that 2021, while better, is also going to be a difficult year for the automotive sector. If the local vehicle and parts manufacturers are unable to deliver their products, their international customers may take their business elsewhere – opening the way for upcoming rivals such as Morocco and more established centres like Thailand to take global vehicle export market share from South Africa.

3.3. 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.

3.3.1. Commuter behaviour and travel patterns

There are currently 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 higher purchasing power in these provinces.

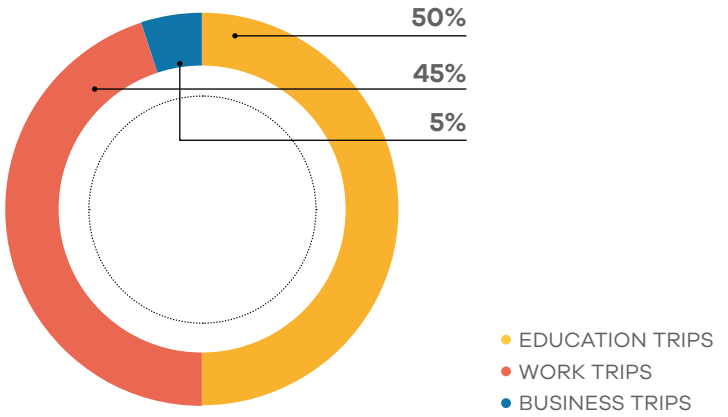
Figure 7 (NHTS 2013) shows commuter travel patterns in South Africa, based on data obtained from the National Household Travel Survey (NHTS) conducted in 2013. The survey revealed that education was the dominant reason for increased commute time in SA, with work trips being the secondary driver. However, this trend has been disrupted during the Covid-19 lockdown period as more people were required to work and study from home instead.

Private transport holds a dominant modal share of 62.1%. This pattern of modal share is expected to continue. The consistently high private transport modal share indicates that the EV sales growth will likely be led by private transport as well. This bears similarities to how EV uptake has grown in the three leading global markets (see **Section 2**).

Education trips account for the highest percentage of travel patterns indicated by trip type.
©District Watch Group

Figure 7: Commuter travel patterns indicated by the number of annual travel trips by trip type

Source: National Household Travel Survey (NHTS, 2013)

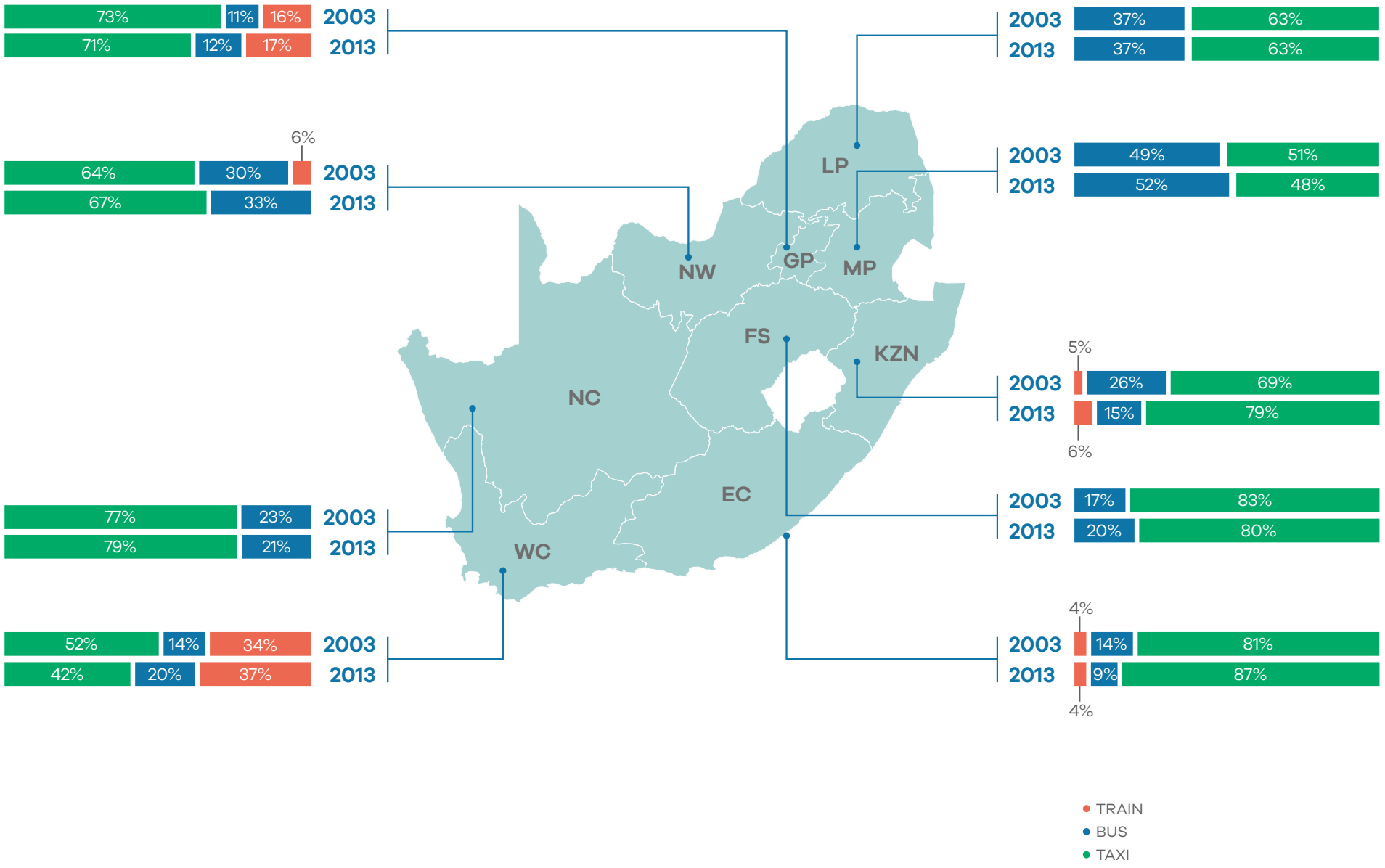


The public transport share of the total market has increased marginally since 1995. Minibus taxis have been the dominant mode of choice for public transport users, marginally increasing their market share at the expense of trains and buses.

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

Figure 8: Modal split of work travel in South Africa by province

Source: National Household Travel Survey (NHTS, 2013)



Bus usage has marginally increased in almost all provinces.
©City of Cape Town

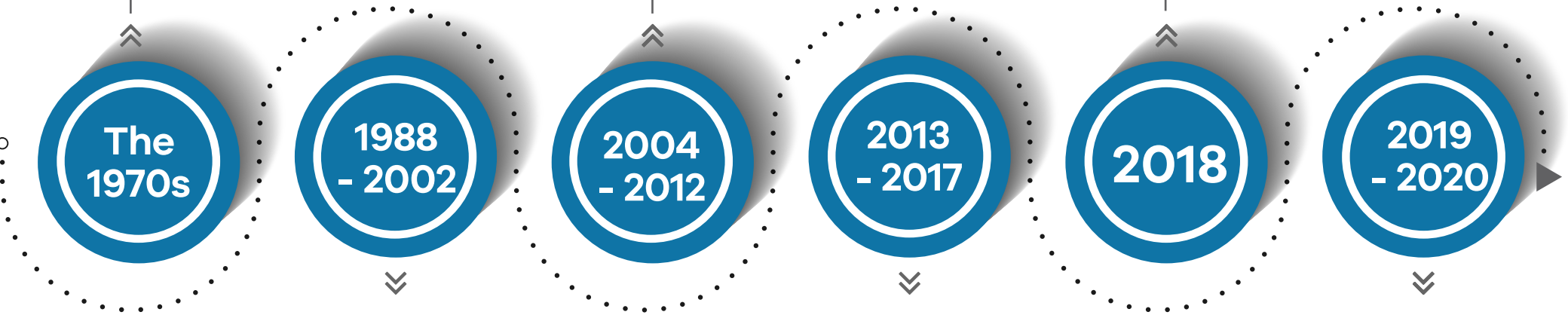
Figure 8, on the previous page, shows is a comparison of how commuters have used public transport for work trips in 2003 and 2013 (NHTS 2013) — the year the last National Household Travel Survey was conducted (once every decade). The figure shows that in the case of public transport:

- **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, scheduling, and travel efficiency for many commuters; and
- **trains**, despite being the most cost-effective mode of travel, are 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.

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

The early foundations of the EV market in SA date as far back as the early 1970s as a response to the first oil crisis hitting SA. **Table 7** details the developments from these early foundations until 2013.

Table 7: The history of the EV market development in South Africa: 1970s to 2020



The 1970s

In response to the first oil crisis, the Department of Mineral and Energy Affairs (DMEA) and the Council for Scientific and Industrial Research (CSIR) conducted research that highlighted EVs as an alternative to oil. This led to the development of the ZEBRA and LIB technologies.

1988 - 2002

Triggered yet again by high oil prices, the NEC was formed to look at alternatives. In 1992, Eskom took over the research, and various vehicles were piloted. These include:

- two VW shuttle buses
- a utility vehicle
- an electric game viewer in the Kruger National Park.

It was also during the Eskom programme when Denel developed a hybrid electric combat vehicle.

A decrease in oil prices saw the Eskom programme halted in June 2002.

2004 - 2012

Kobus Meiring, CEO of the SA company Optimal Energy based in Cape Town, and his team started developing the Joule – a local, all-electric family car. This was funded jointly from the Sovereign Innovation Fund of the Department of Science and Technology (DST) and the Industrial Development Corporation (IDC), with a combined investment of approximately R300 million.

The car needed R9 billion for commercialisation. The venture failed to demonstrate any economic merit or sustainability.

2013 - 2017

The uYilo eMobility Technology Innovation Programme, initiated by the Technology Innovation Agency (TIA) in 2013, is the custodian of Optimal Energy's assets. uYilo fast-tracks the development and commercialisation of key technologies that will primarily support the EV industry, such as lithium-ion batteries.

EV industry roadmap. Led by the dtic, it proposes incentives for vehicle manufacturers to locally produce EVs. The incentive was a 35% cash-back in investment over three years, on the condition that manufacturers produce a minimum of 5 000 volumes annually to qualify for the incentive. The status of this subsidy is pending.

TIA launched the National Electric Vehicle Technology Innovation Programme in March 2013. It was intended to create a collaborative environment for entrepreneurs, academia, equipment manufacturers, technology companies, and science councils to accelerate the development and commercialisation of the EV industry in SA. The Nissan Leaf EV was introduced in the South African market

2018

The City of Cape Town implemented an e-bus pilot of 11 electric buses, procured from BYD, for the MyCiTi Integrated Rapid Transit (IRT) system in Cape Town.

2019 - 2020

OEMs and service providers throughout the value chance announced ground-breaking e-mobility plans for the South African market. Some of these are detailed in **Table 8**.

With the development and anticipated growth of the EV industry in South Africa, industry players, including the OEMs and vehicle service providers throughout the value chain, have announced plans for new developments in the next few months. **Table 8** below summarises some of these exciting plans.

Table 8: Recent EV developments and near-future plans by EV sector role players in South Africa

Key role player	Recent EV developments and near-future plans
Toyota SA	• Producing Toyota's first hybrid vehicle in 2021 at the Automotive Supplier Park KZN SEZ (Special Economic Zone). • Toyota SA will produce the all-new hybrid Toyota Corolla Cross SUV- sport utility vehicle later in 2021, which will be sold locally and be exported to 43 countries in Africa. This R4.28-billion investment is projected to generate about R2.85bn in additional component purchases and create 1 500 new jobs – about 500 of these at Toyota's Prospection plant in Durban, and 1 000 in the wider supply chain. • As of 2019, 36% of Lexus vehicles sold in South Africa were hybrids.
BMW SA	• Launching an electric Mini Cooper in January 2021. The Mini SE will be the most affordable battery electric vehicle (BEV) in the local market, with pricing starting at R642 000, moving up to R722 000 for the top-spec model. It will be available for sale in South Africa from the first quarter of 2021. • BMW is working on a new fifth-generation electric drivetrain, due in 2021, that does not require any rare earth metals, and plans to double the energy density of its battery cells for an increased range. The BMW battery-powered iX crossover – iX Sport Activity Vehicle, has been announced to arrive in the South African market in 2022. The vehicle will have a 100kWh high-voltage battery allowing for a range of more than 600km between charges – powered by two electric motors producing a combined output of 370kW that is sufficient to accelerate from 0-100km/h in less than five seconds. The battery could be charged from 10% – 80% in under 40 minutes when plugged into a DC fast charger. When plugged into a normal wall box, it will take less than 11 hours to charge from 0 to 100% capacity. • The BMW Group is also working on a new fifth-generation Electric Vehicle (EV) drivetrain due in 2021 that does not require any rare earths and plans to double the energy density of its battery cells for increased range. The group has also taken control of its raw material supply, signing a supply contract with Ganfeng for sustainable lithium from mines in Australia, and a contract with the Managem Group for cobalt from Morocco.
Daimler/ Mercedes Benz SA	• Already offers two plug-in hybrid models in South Africa. • Unveiled South African-made C-Class plug-in hybrid EV. The vehicle will be produced at the Daimler facility in East London • Mercedes EQC battery EV to be launched in South Africa in 2021. • Daimler will bring electric trucks to the South African market when the local infrastructure can accommodate the new technology. Daimler anticipates this happening within the next five years.
Volkswagen SA	• Launching an electric VW Golf pilot in Gauteng in late 2020. • Six EV models to be tested by motoring and lifestyle media. • The second phase will be expanded to include a fleet of fully electric Volkswagen ID.3 vehicles from 2021. • The third and last phase will see the first fully electric Volkswagen EVs available for sale to customers in South Africa from 2022. • The newly announced ID.4 electric SUV will also be available for sale in South Africa in 2022.
Shell SA	Launching the first EV charging stations in their retail network in 2020.

Table 8 continued...

Key role player	Recent EV developments and near-future plans
Gautrain	The Gautrain network will include electric buses powered by micro-grids. The Gautrain Management Agency's (GMA) Urban Mobility Programme is considering buses with a range of 270 km since Gautrain buses run an average of 200 km per day.
Scania SA	Scania South Africa has partnered with the Limpopo Economic Development Agency (LEDA) and the Thulamela municipality to develop the R15-million Scania Thohoyandou auto-workshop. This is in line with Scania's global goal to drive the shift towards a sustainable transport system for business and society.
Nissan SA	The new 40 kWh Nissan Leaf and 62 kWh Nissan Leaf e+ to be launched in 2020/1.
Volvo	Volvo is set to launch its first EV in the South African market, the Volvo XC40 Recharge, in 2021. The vehicle will have a range of over 400 km and can be charged from 0% to 80% in 40 minutes using a DC fast charger. The twin electric motors deliver 304 kW (408 hp) of power and 660 Nm of torque allowing it to go from zero-to-100 km/h in 4.9 seconds. Volvo South Africa is rolling out a network of charging stations at its dealerships and will launch 4 additional models over the next 5 years. The company plans to exclusively only produce electric vehicles from 2030 (no hybrids either).
Hydrogen fuel cell electric bus pilot in 2020	South Africa's first homegrown hydrogen fuel cell electric bus to be piloted later in 2020. The bus has been developed by Busmark, several universities, government departments, the Council for Scientific and Industrial Research (CSIR), and Hydrogen South Africa (HySA), which is an initiative of the Department of Science and Innovation (DSI).
Hydrogen fuel cell factory	CHEM ENERGY, a subsidiary of Taiwanese conglomerate CHEM Corporation, has opened its $200 million fuel cell production factory in KwaZulu-Natal at the Dube Tradeport Special Economic Zone.
Ford SA	• Building one of the world largest solar carports in Tshwane (31 000 solar panels = 4 200 parking bays) • Ford SA announced it is set to invest $1.05 Billion (R 15 billion) in South Africa's Automotive Industry and locally produce a new Ford Ranger pickup truck starting in 2022, both for domestic sales and exports. The company will also upgrade the Silverton plant in Pretoria, to boost the site's annual vehicle production capacity by 20% to 200 000 units and create about 1,200 direct jobs.
Electric mining trucks	Anglo-American, with design assistance from Williams Advanced Engineering, will build the world's largest hydrogen-powered hybrid mining truck in 2020. Test runs are scheduled to take place later in 2020 at Anglo-American's Mogalakwena open-pit platinum mine in Limpopo.
Construction	The demand for lithium-ion powered forklifts is increasing locally, owing to companies wanting to reap the benefits of energy efficiency and cost-effectiveness, as well as to prepare for changing legislation regarding emissions.
Uber, Lyft, and Bolt	• Uber wants 100% of their rides to take place in EVs by 2030 in the US, Canada, and Europe, and by 2040 for the rest of the world. Uber commits to becoming a 'zero-emission platform' by 2040, with all rides taking place in zero-emission vehicles, on public transport or via micro-mobility. • Lyft also announced it would commit to electrifying 100% of its largest privately owned fleet by 2030. Bolt announced that all their rides in Europe are now carbon-neutral (through carbon offsetting) and they plan the same for their other markets globally. The company is committed to having climate positive e-scooter operations by the end of 2020.

Table 8 continued...

Key role player	Recent EV developments and near-future plans
Electric micro-mobility – scooters	Several local electric scooter companies have launched in 2020, including Electric Life Rides and GoLectric.
Tshwane Automotive Special Economic Zone (TASEZ)	Work has begun on the R3.4 billion Tshwane Automotive Special Economic Zone (TASEZ) — the first automotive city in Africa. When announced in 2019, expressions of interest were received from nine supplier companies. As of August 2020, 12 suppliers have committed to setting up operations within the SEZ with an anticipated investment of over R4.3 billion in the economy. Another 10 have shown a keen interest.
Golden Arrow Bus Services	GABS has kicked off its electric bus pilot project (e-bus pilot) and is going green with several initiatives including the installation of a solar carport at its central engineering complex, Multimech, as part of its ongoing sustainability and carbon footprint reduction initiatives.
Metrobus	Johannesburg's Metrobus has committed to only purchasing electric buses from 2030 onwards.
Lithium-ion batteries	• Geological exploration work will soon restart at the Zebediela nickel project on the northern limb of the Bushveld Complex in Limpopo, South Africa. The Bushveld Complex hosts an estimated 11.9 million tons of nickel and ranks third in terms of nickel sulphide content globally. (Class 1 nickel is sought after for EV lithium-ion batteries, whilst Class 2 nickel is mainly used in nickel pig iron and the steel industry.) • Metair will partner with the South African Institute for Advanced Materials Chemistry (SAIAMC), located at the University of the Western Cape (UWC) — it houses the only pilot scale li-ion battery cell assembly facility in Africa — which will see the company invest R3 million over three years to pilot a prototype lithium production project from January 2021. Production will focus on mining cap lamp cells, 12V li-ion automotive batteries, 48V lithium-ion batteries for energy storage applications, and solar panel recharge technology. • The Megamillion Energy Company intends to be Africa's first large-scale producer of lithium-ion batteries by launching a pilot Gigafactory in late 2020.
ABSA Bank SA	Absa announced in October 2020 that they would soon be rolling out a green finance mechanism for EVs. They intend to provide an all-in-one finance package to consumers that could incorporate a solar PV home installation for charging the EV. The solar PV home installation would increase upfront costs, but the combined green finance deal could still deliver a lower total cost of ownership compared with an ICE vehicle.
City of Cape Town	The CCT has launched two public EV charging stations with associated carport solar PV systems installed at the Bellville and Somerset West Civic Centre sites. The United Nations Industrial Development Organization (UNIDO) donated these systems as part of UNIDO's Low-Carbon Transport South Africa (LCT-SA) Project with the aim of promoting the uptake of EVs and collect detailed data on charger usage and customer experience, to assess the impact of EV charging on the electricity grid.
General Motors (GM)	GM aims to fully embrace EVs and sell all its new cars, SUVs, and light pickup trucks, with zero exhaust emissions by 2035. The company plans to become carbon neutral by 2040 and will also source 100% renewable energy to power its US sites by 2030, and global sites by 2035.

Table 8 continued...

Key role player	Recent EV developments and near-future plans
Electric Safari Vehicles (ESV)	Mpumalanga-based Electric Vehicle company, Electric Safari Vehicles (ESV), is converting their nature and wildlife-viewing vehicles from diesel to electric propulsion. The vehicle conversions have helped the company reduce their emissions and carbon footprint, as well as the maintenance costs since the EVs have better efficiency and provide a smoother and quieter game-viewing experience for their clients and tourists.
MellowVan	MellowVans has conducted several large-scale proof-of-concept projects in South Africa, with retailers such as DHL, Takealot, and Checkers, for their last-mile delivery service. The company's lithium-ion battery cells are imported from Asia, then assembled at their Western Cape plant. The company has also developed its own battery management system, and the government's Industrial Development Corporation is one of the major shareholders in the business.

3.5. The South African EV value chain

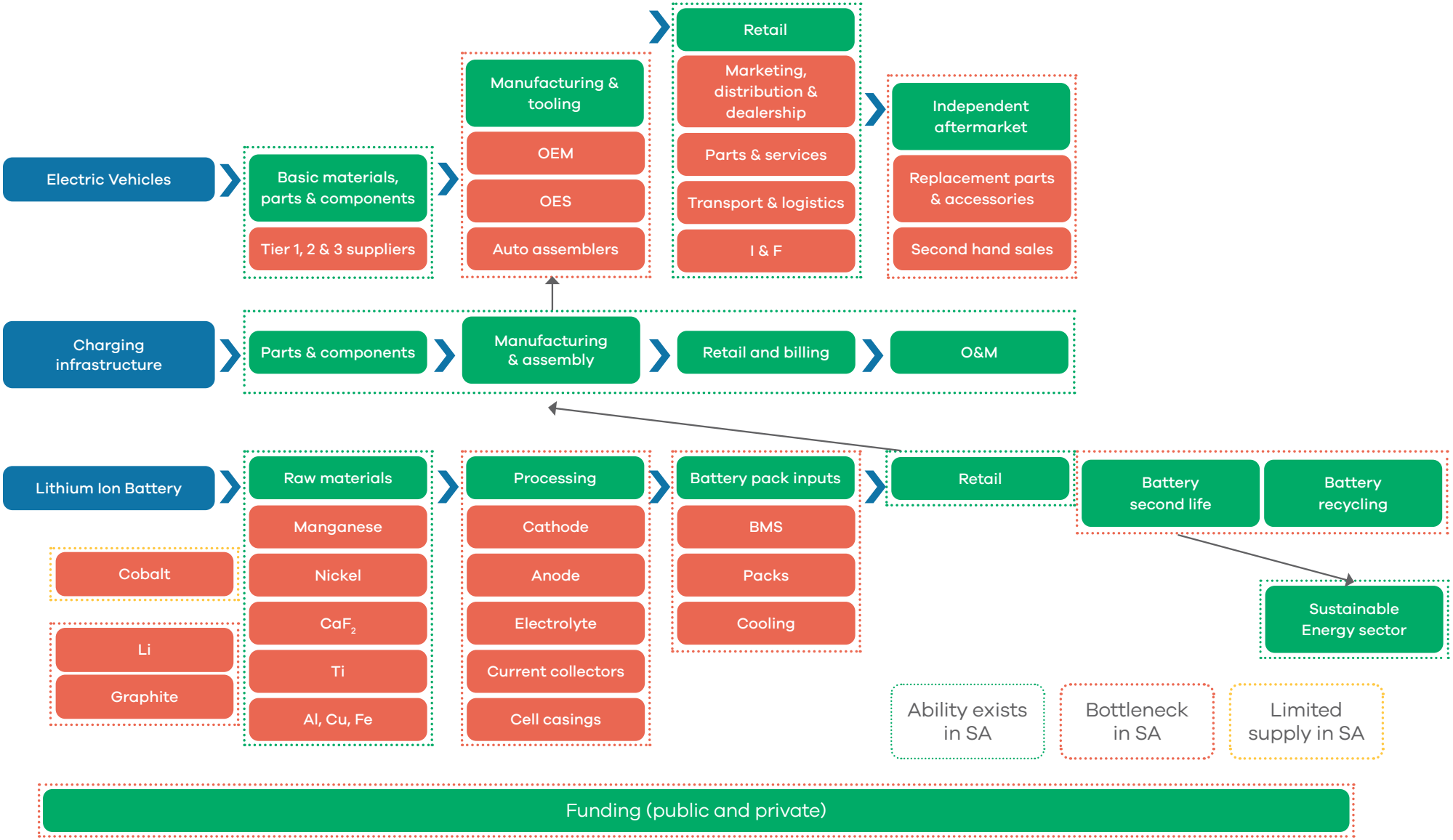
A variety of key players are competing to shape the South African EV market. The exact dynamics of the industry are still emerging, and the timing of key tipping points are unknown.

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 9**).

MellowVan has conducted several large-scale proof-of-concept projects in SA. **©Mellowcabs**

Figure 9: EV value chain in SA

(source: GreenCape Analysis)



The BMW i3.
©BMW South Africa

As the EV market grows and local manufacturing is established, there will be an impact on the traditional 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 gains and losses through the value chain as outlined below. This makes the need to realise opportunities presented by the move to electric mobility more important, as they hold the potential to offset some of the losses that may be experienced.

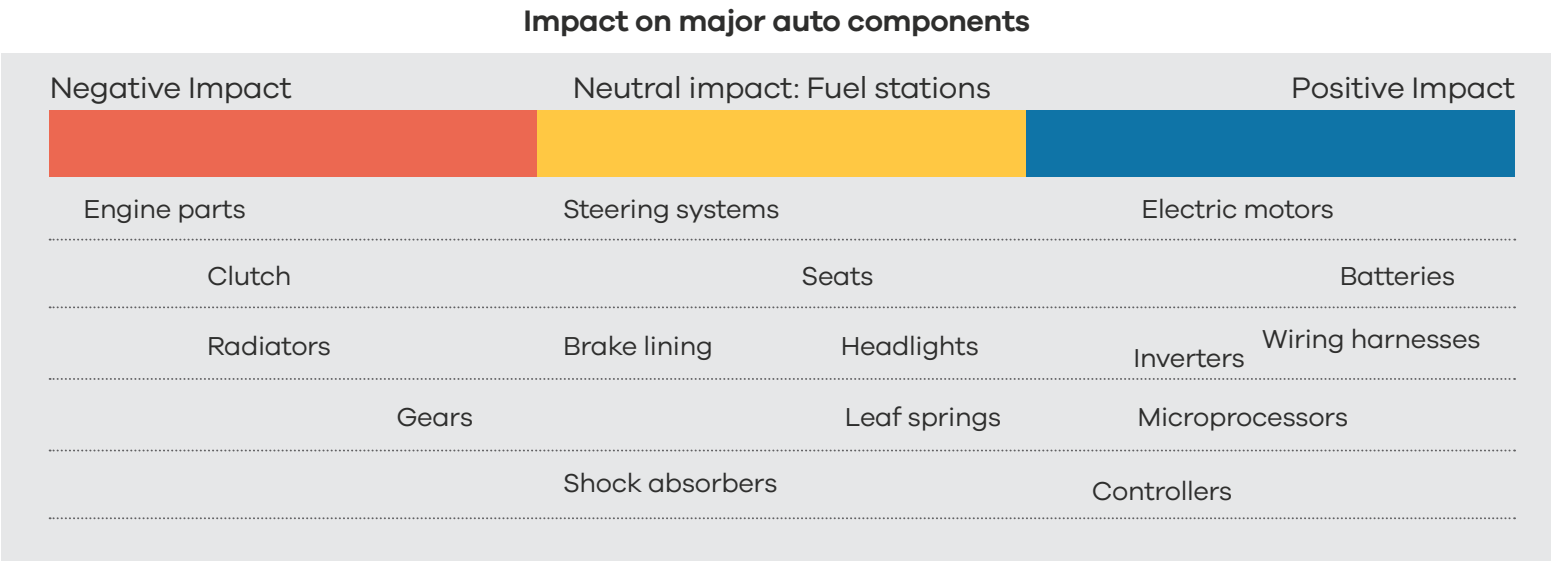
3.6. Potential impacts of EV market growth on the ICE value chain and economy

Figure 10 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.

Figure 10: Illustration of gains and losses in the ICE value chain due to EV uptake

Source: (GreenCape, 2019)



Where there will be a notable impact is on fuel levies. Fuel levies are the 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.

However, there are various ways in which this revenue loss can be offset, including the potential expansion of the current carbon tax regime. In its current form and with its current limited scope, it offers much potential for expansion.

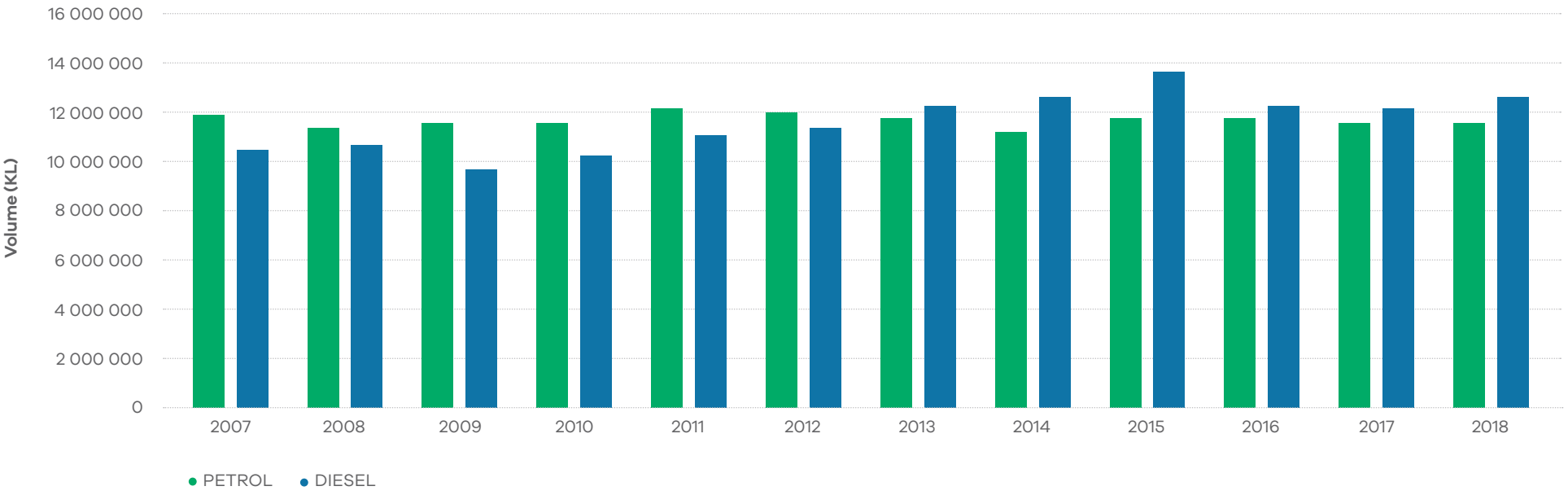
3.6.1. The effect of EVs on oil imports, the balance of trade, and Government revenue

According to the Department of Energy (DOE), the South African transport sector consumes ~26 billion litres of liquid fuels per year, with additional oil used in the chemicals sector (for non-energy uses).

Of South Africa's liquid fuels consumption, 60% is met through crude oil imports, with an additional eight billion litres per year produced from coal and natural gas. **Figure 11** below is an illustration of South Africa's petrol and diesel consumption (DOE 2020).

Figure 11: Petrol and diesel consumption from 2007 to 2018

Source: (DOE, 2020)



If South Africa were to introduce one million EVs that all drive 20 000 km per annum, 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 (US$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. According to the Road Accident Fund (RAF) in 2018, the RAF Fuel Levy represented 12% of the total fuel price at the pump. The levy increased in 2019 by R0.29 and R0.30 per litre for petrol and diesel respectively (RAF, 2020), further improving the case for switching to electric vehicles.

However, for the national government, the fuel levy represents an important and efficient revenue stream. The yearly fuel levy income is shown in **Figure 12** below. Falling liquid fuel sales on the back of increased EV uptake could put this revenue stream at risk.

Figure 12: Fuel levy collected in South Africa between 2008 and 2020

Source: Road Accident Fund

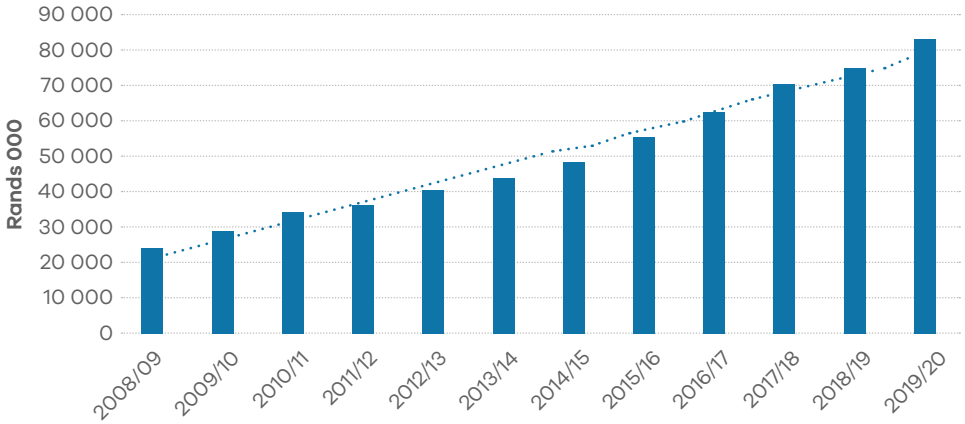


Table 9 summarises the macroeconomic benefits and drawbacks of a growing EV market considering the potential impact on the fuel levy.

Table 9: Benefits and drawbacks to South Africa of EV market growth and fewer oil imports

Benefits	Disadvantages
• The country has an increased ability to meet emission reduction targets • Decreased expenditure on oil imports • Increased energy security • Mitigating against the economic risk for the SA automotive sector posed by planned reductions in ICE demand by importers of SA ICE vehicles • Better price control on electricity than oil • Job creation opportunities across a potential local EV manufacturing value chain	• Balance of trade saving on the back of reducing spending on oil importation is not proportional to the revenue generated through the fuel levy • There is a high likelihood of a reduction in contributions to the Road Accident Fund (RAF)

3.7. Market sizing and dynamics

3.7.1. The EV passenger vehicle market

Table 10 shows the live vehicle population in South Africa broken down by province and the class of vehicle for September 2020 – which is the latest published statistic on the eNaTIS database. The EV penetration rate in each vehicle class currently stands at less than 1% as of 2020.

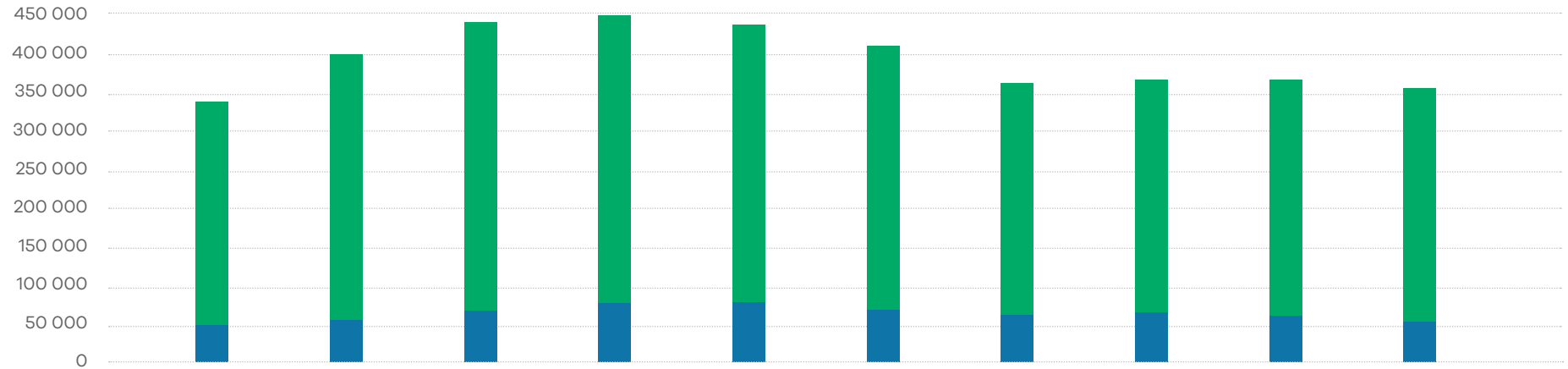
Table 10: Overview of South Africa's conventional ICE vehicle market: September 2020 (Source: eNaTIS. 2020)

Vehicle Class	Province									Total	% of total self-propelled
	GP	KZ	WC	EC	FS	MP	NW	L	NC		
Motor cars and station wagons	3 125 499	1 028 828	1 297 502	474 118	320 424	447 337	330 565	354 285	131 739	7 510 297	65,37%
Minibuses	129 813	57 688	37 450	25 620	12 979	25 779	20 557	25 918	5 957	341 761	2,97%
Buses, bus trains, midibuses	20 468	8 326	7 160	4 654	3 405	8 315	4 099	7 010	1 809	65 246	0,57%
Motorcycles, quadrucycles, tricycles	140 143	30 117	85 126	21 300	17 914	17 458	12 522	8 767	7 556	340 903	2,97%
LDV's, panel vans, other light load veh's GVM <= 3500kg	853 389	373 990	340 309	210 074	133 018	226 723	157 534	241 692	81 646	2 618 375	22,79%
Trucks (Heavy load vehicles GVM > 3500kg)	140 166	50 283	46 331	22 563	22 518	44 246	17 286	26 955	9 055	379 403	3,30%
Other self-propelled vehicles	35 984	31 635	39 993	16 845	34 395	27 125	20 797	17 369	9 497	233 640	2,03%
Total self-propelled vehicles	4 445 462	1 580 867	1 853 871	775 174	544 653	796 983	563 360	681 996	247 259	11 489 625	% of total tow vehicles
Provincial % of total	38,69%	13,76%	16,14%	6,75%	4,74%	6,94%	4,90%	5,94%	2,15%	100,00%	
Caravans	36 894	6 813	18 401	5 083	7 160	9 762	6 078	5 464	2 698	98 353	8,23%
Light load trailers GVM <= 3500kg	337 764	82 006	151 514	58 525	63 131	66 328	54 159	44 033	29 920	887 380	74,27%
Heavy load trailers GVM > 3500kg	65 254	24 514	24 597	7 438	19 745	39 536	11 108	10 999	5 894	209 085	17,50%
Total trailers	439 912	113 333	194 512	71 046	90 036	115 626	71 345	60 496	38 512	1 194 818	
Total provincial % of total	36,82%	9,49%	16,28%	5,95%	7,54%	9,68%	5,97%	5,06%	3,22%	100,00%	
All other and unknown vehicles	4 486	2 822	4 313	3 015	3 695	3 543	4 089	2 301	1 354	29 618	–
Total number	4 889 860	1 697 022	2 052 696	849 235	638 384	916 152	638 794	744 793	287 125	12 714 061	
Provincial % of total	38,46%	13,35%	16,15%	6,68%	5,02%	7,21%	5,02%	5,86%	2,26%	100,00%	

The EV market remains minuscule compared to ICE vehicle sales.
This is illustrated in **Figure 13** below.

Figure 13: ICE and EV Passenger car sales in South Africa since 2010

Source: (TIPS, 2020)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Petrol	289 911	343 489	373 022	370 392	360 122	340 982	297 019	302 227	302 440	299 408
Diesel	48 598	56 317	68 260	79 357	78 155	70 908	63 765	65 516	62 605	55 563
PHEV	–	–	–	–	–	124	168	121	89	72
BEV	–	–	–	34	14	117	100	68	58	154
HEV	430	627	766	513	646	266	213	182	55	181

3.7.2. 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, and the minibus taxi industry present a good business case for the electrification of transportation in South Africa (See **Section 5** for details on this opportunity).

As shown in **Table 10** above, as of September 2020, there are 341 761 minibuses, and 65 246 buses, minibuses and bus trains in South Africa. This adds up to a total of 407 007 public transport vehicles in SA, representing 3.54% of the total self-propelled vehicles in the country. This represents the potential market for public transport 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
- reduced operation and maintenance costs across bus/minibus fleets over ICE technology.

The challenge in this market, as is the case 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.

The 19C-1E excavator in the UK is the world's first volume-produced fully electric digger that has shown it is possible to make powerful construction machinery without an internal combustion engine. To date, the current fleet has saved the equivalent of 15 100 kg in CO_2 emissions across 5 616 hours of work.

Electric micromobility such as electric scooters (e-scooter) are witnessing high growth over the past year. As outlined in **Table 8**, several local electric scooter companies have launched in 2020. Last-mile delivery LDV is similarly experiencing a surge in market demand, particularly during the Covid-19 lockdown periods.

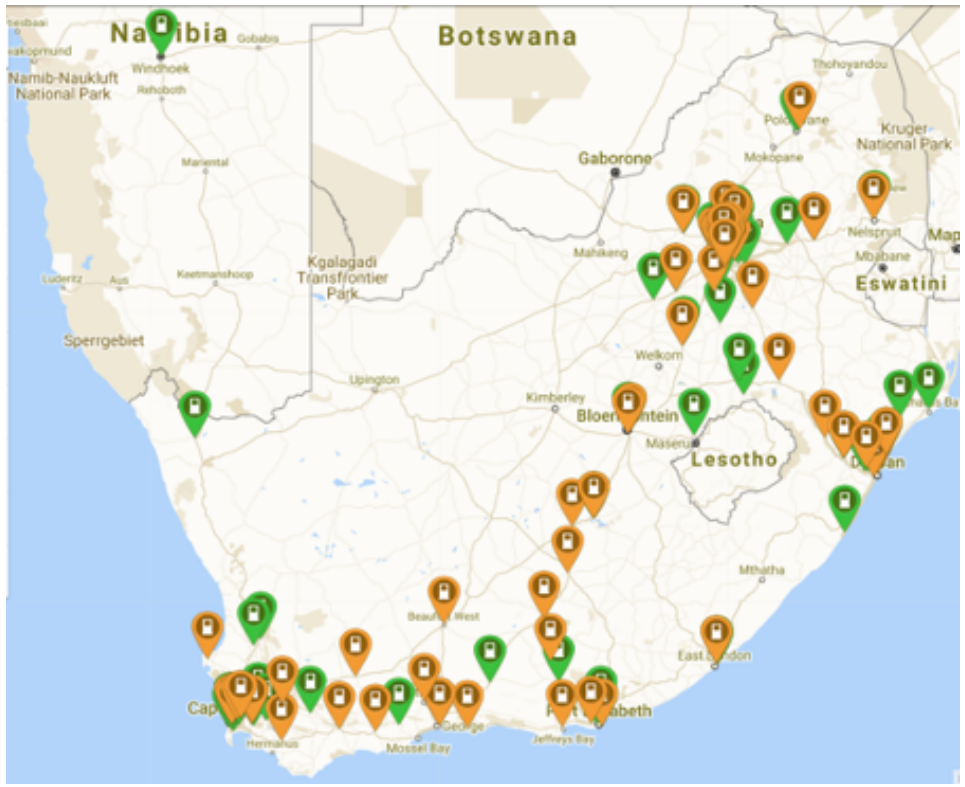
Despite the barriers, automotive vehicle manufacturers see value in SA's nascent EV market and expect a diversified EV mix as passenger vehicles continue to be purchased year-on-year. Forklifts and two- and three-wheeled EVs gain traction within the industrial segment, and interest in the electrification of public transport is increasing.

3.7.3. 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 EV market. In South Africa, the network currently consists of ~250 publicly accessible charging stations. This means that there is one public charging station for four EVs in the country. Thus the charging infrastructure is ahead of the demand. South Africa also has a vast fuel station network that could potentially be modified to integrate EV charging; they then become hybrid fuel/charging stations.

Many of these charging stations are found in Gauteng. They are largely AC charging stations that take up to six hours to arrive at full charge. **Figure 14** shows active and incoming charging infrastructure stations in the country.

Figure 14: Active and incoming charging infrastructure stations in SA
(PlugShare, 2020)



Battery electric vehicles (BEVs) would create extra demand for energy on the electricity grid, especially if the charging is uncoordinated. For instance, a 2015 study done by the CSIR projected a gradual increase in the uptake of EVs in Cape Town.

According to the study, by 2050 EVs are projected to account for almost half of all vehicles in Cape Town, as illustrated in **Figure 15**. The study found that this projected uptake in EVs would lead to an 11% increase in the total energy consumption in the City of Cape Town by 2050, as shown in **Figure 16** (CSIR, 2015).

Figure 15: Projected uptake of EVs in Cape Town
Source: (CSIR, 2015)

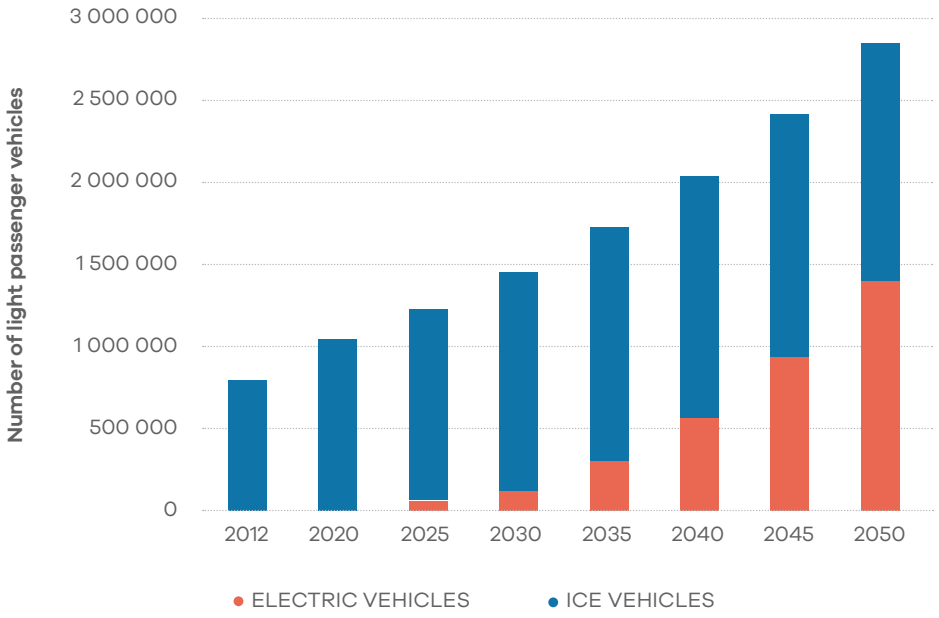
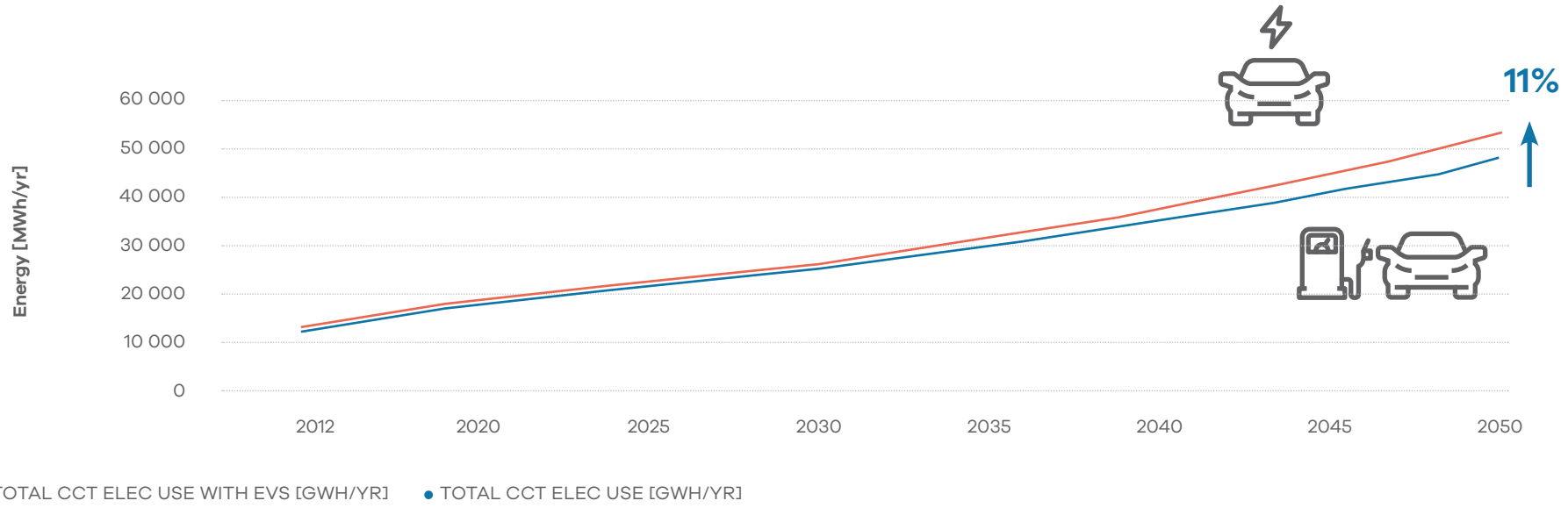


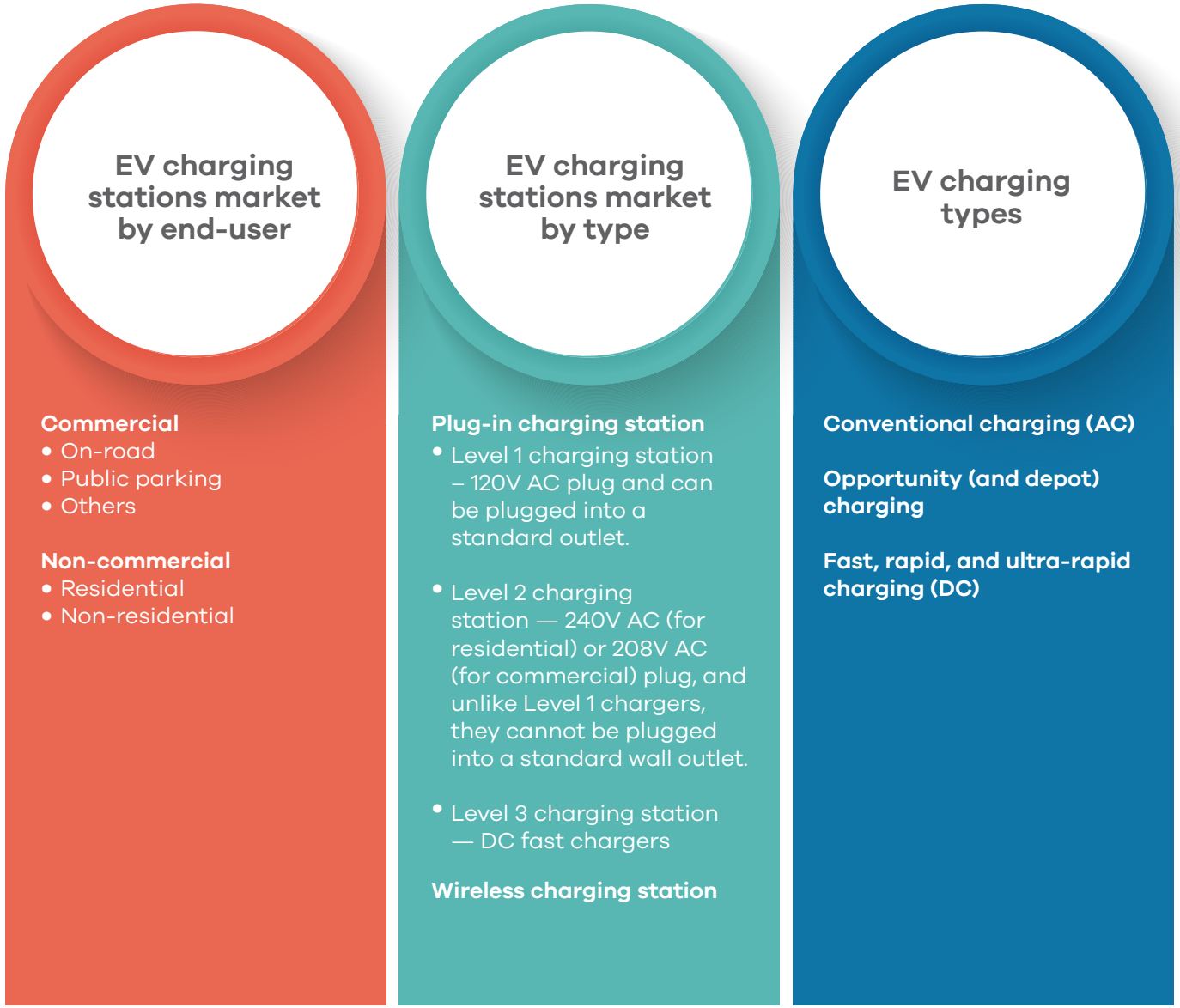
Figure 16: Projected increase in energy consumption in Cape Town

(Source: CSIR, 2015)



As illustrated in **Figure 15** on the previous page, the number and coverage of EV charging station infrastructure in South Africa have both grown significantly. Major major highways and national roads have charge points spaced within +-200Km of each other.

In the metropolitan cities of Cape Town, Johannesburg, and Durban, EV drivers should be able to locate a charge point within an ~20 kilometre radius.



Most EV charging in other countries typically occurs at night and during the weekends, when passenger vehicles are often not being used. However, public transport would need to charge during the day and even during peak demand periods, which could create a strain on the electricity system.

Therefore, special planning and interventions are needed to be ready for this additional demand, especially if the energy is to be drawn from renewable sources. The main challenge is that it is difficult to plan for such additional generation, distribution, and transmission capacity; for the utility services, and the investment into grids with the uncertainty and limited projections of the pace of EV uptake in the next few years, in South Africa.

To supplement this, smart grid and distributed storage technology might need to be adopted by installing distributed energy resources (DERs), including embedded generation, and storage downstream from the identified congestion points, to serve the added on-peak demand.

This distributed storage can then be recharged at night when demand is low, which has the added benefit of smoothening demand and lowering peaks in the electricity demand profile. GreenCape's **2021 Energy Services Market Intelligence Report** explores DERs in great detail.

The charging market is segmented on the connector type: CHArge de MOve (CHAdeMO) and Combined Charging System (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 11**.

Globally, however, as of October 2020, the number of EVs sold that are equipped with the international CHAdeMO charging standard crossed the one million mark. This makes CHAdeMO the second most popular DC fast-charging system globally, after China's GB/T system.

A third of all EVs sold in Europe are fitted with the CHAdeMO technology. It is available in 90 countries with 20 EV manufacturers around the world producing CHAdeMO-equipped and capable vehicles (uYilo, 2020). South Africa does not yet have any locally available CHAdeMO charging standard manufactured EVs.

Jaguar i-Pace at charging station.
©Jaguar South Africa

Table 11: OEMs, industry, and distributors' DC charging technology

Original Equipment Manufacturers			
CCS charging technology	**CHAdeMO charging technology**	**CHAdeMO/CCS charging technologies**	**TBA charging technologies**
BMW (South Africa (Pty) Ltd	Nissan South Africa (Pty) Ltd	N/A	Isuzu South Africa
Ford Motor Company of Southern Africa (Pty) Ltd	Toyota South Africa Motors (Pty) Ltd	–	–
Volkswagen Group South Africa (Pty) Ltd	–	–	–
Mercedes-Benz SA Ltd	–	–	–
Importers and distributors			
Audi (VW Group)	Honda	Hyundai Auto South Africa Pty Ltd (MOTUS Group)	HAVAL Motors South Africa (Pty) Ltd (HMSA)
European Automotive Imports South Africa (EAISA) (Pty) Ltd (Maserati)	Mahindra and Mahindra South Africa (Pty) Ltd	KIA Motors South Africa (Pty) Ltd	TATA Motors South Africa
FCA South Africa (Pty) Ltd (Fiat Chrysler Automobiles Group)	Mazda Southern Africa (Pty) Ltd	–	–
Jaguar Land Rover	Mitsubishi Motors South Africa (MMSA)	–	–
Mini South Africa	Peugeot SA (Pty) Ltd	–	–
Porsche	Renault South Africa (Pty) Ltd	–	–
Volvo Car South Africa	Subaru	–	–
	Suzuki Auto South Africa	–	–

The private sector has up until now been driving the rollout of charging infrastructure in South Africa with limited support from the government. It is also foreseeable that with increasing uptake of EVs, landlords could seize the opportunity to install EV chargers at residential properties to attract tenants.

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) fast 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 EVs, are expected to drive much 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. The market for charging infrastructure is expected to grow as the market for EVs grows, but the timing of this is speculative. What remains unclear is who is responsible for incurring the high costs of rolling out charging infrastructure – which intersects both the transportation and energy sectors. It could be the national government, EV manufacturers, local governments, or road and transportation agencies.

3.8. Market drivers: EV and charging infrastructure

3.8.1. Macroeconomic drivers

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

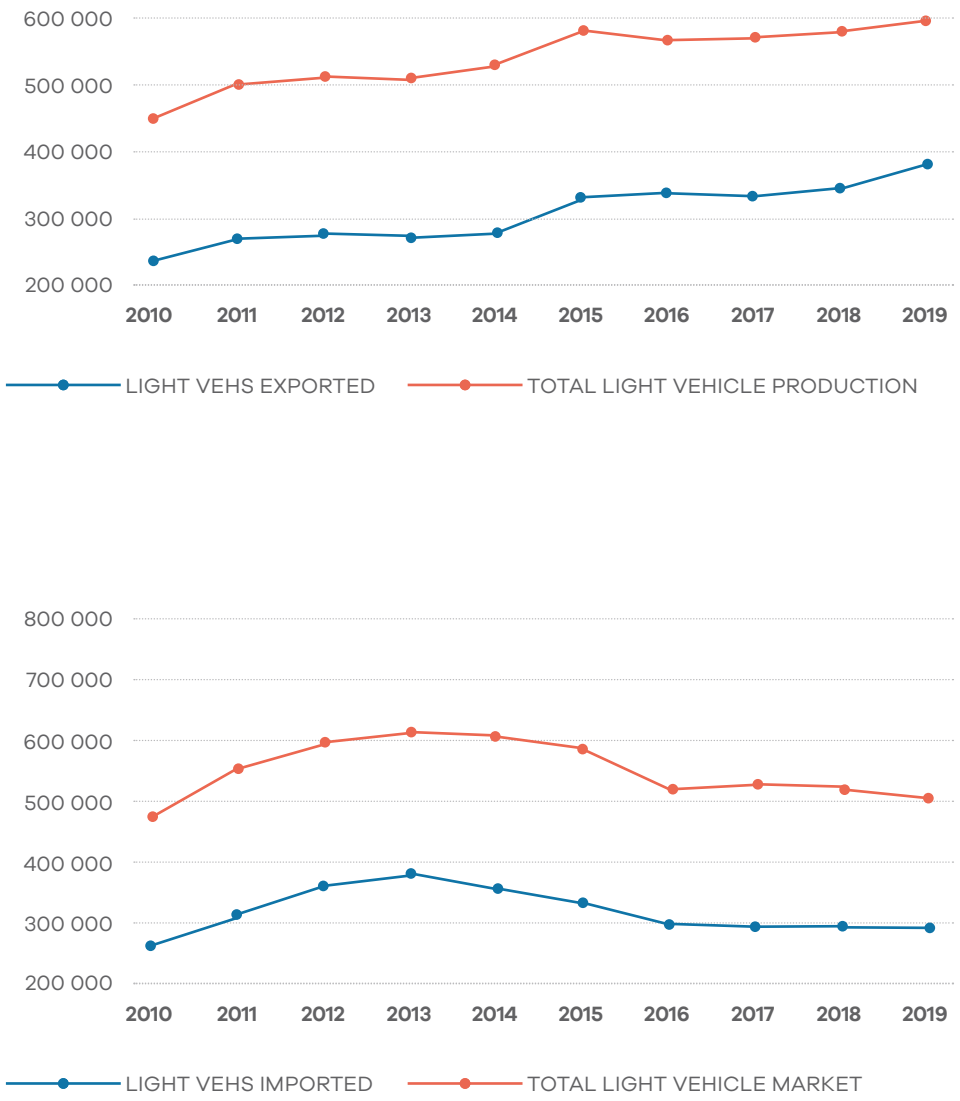
South Africa's automotive sector is the largest manufacturing sector in the economy and is classified as a priority industry under the Industrial Policy Action Plan.

According to The National Association of Automobile Manufacturers of South Africa (NAAMSA), in 2019, which is the last complete year on record before the COVID-19 lockdown, 64% of the vehicles produced in South Africa were exported to the European Union (74% of vehicles exported), Japan, Australia, the United States, and 131 other destinations.

Light vehicle exports from South Africa have increased steadily over the last decade, as shown in **Figure 17**.

Figure 17: Proportion of ICE light vehicles exported and imported over the last decade

Source: NAAMSA



Most of those export markets have recently announced policies against the importation of ICE vehicles, as shown in **Table 12**. These developments should steer the country towards adapting to the e-mobility transition seen globally by changing the automotive and industrial policy.

If not, South Africa could lose its key vehicle import and export markets and witness the collapse of this important industry.

Table 12: ICE restriction status for South Africa's top vehicle export markets

SA vehicle export markets	Percentage of SA vehicle exports	Announced restriction/ban on ICE sales
Germany	35	2030
UK	9	2030 on ICE and 2035 on Hybrids
Belgium	9	2026
USA	5	Several cities and states but no nationwide ban
Japan	4	2050
Spain	4	2040
Other	34	Varies

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 2026 onwards. This presents a potential risk of trade market losses, should the South African automotive industry not transition towards EV manufacturing to satisfy the new international demand in core export markets.

3.8.2. Local demand drivers

Although the South African EV market is tracking international trends, four drivers accelerate the demand for EVs in South Africa.

Climate conscious consumers
On a well-to-wheel[3] basis, greenhouse gas (GHG) projected emissions from EVs would continue to be lower than for conventional ICE vehicles. Also, EVs emit a decreasing amount of greenhouse gases over time as the grid they charge from benefits from increased deployment of renewable energy during their lifespans. SA's EV market is currently driven by a small percentage of high-income customers that can prioritise the cost to the environment in purchase decisions and value the improved sustainability and environmental benefits EVs offer. As the climate change and renewable energy narratives become the norm, and the efficiency and affordability of EVs improve, it is expected that the market will shift from consumers that are primarily climate-conscious to a much broader base.

[3] Well-to-wheel describes all steps along the value chain or 'life cycle' from oil extraction to driving.

Rising fuel costs

Concerns over fuel price stability are highlighting EVs as an attractive alternative to ICE vehicles for commuters.

Consumers feel the impact from oil price increases more so than with other commodities. As the price increases, it also becomes noticeable that consumers have little flexibility in the short term to change consumption patterns in response to changes in fuel prices.

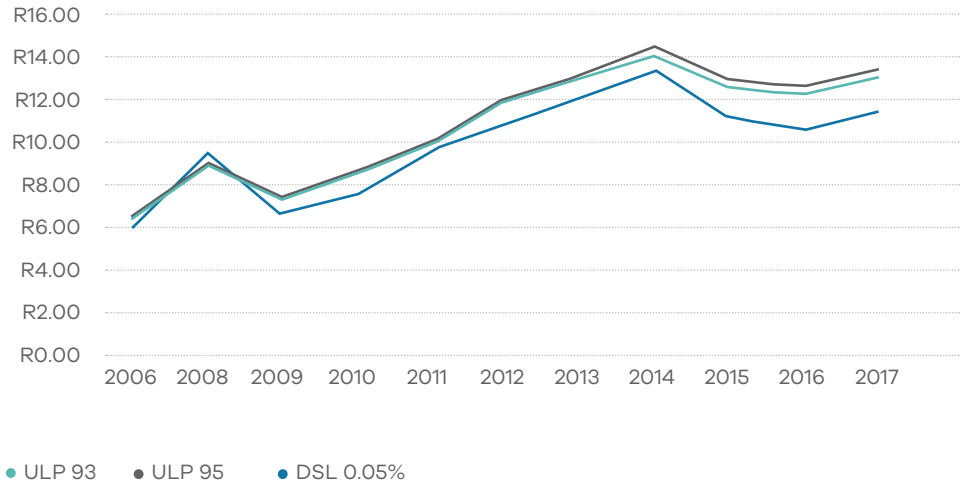
Most commuters are captive users and are therefore locked into the market.

SA's dependency on oil exposes the country to economic and energy security challenges.

Figure 18 shows the volatility in fuel prices over the past ten years, as recorded by the Automobile Association of South Africa (AASA, 2020).

Figure 18: Year-on-year fuel prices in South Africa

Source: Automobile Association of South Africa



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, Road Accident Fund levy, customs, excise levy, and transport costs.

Energy storage innovations and pricing

The growth of the distributed generation market and increasing global demand for EVs are driving the demand for lithium-ion batteries (LIBs). Economies of scale and technological advances have seen battery prices fall by more than 89% since 2010. When the first mass-market EVs were introduced in 2010, the batteries cost more than US$1 000/kWh.

This price now hovers around US$120/kWh. The raw material costs have also dropped in the last three years, as illustrated in **Figure 19**, on the next page.

Figure 20 illustrates the fluctuating price of graphite (used in the battery electrodes) since 2015. The prices of raw materials are still expected to continue to fall as demand rises for LIBs in other sectors.

Figure 19: LIB price/kWh over time

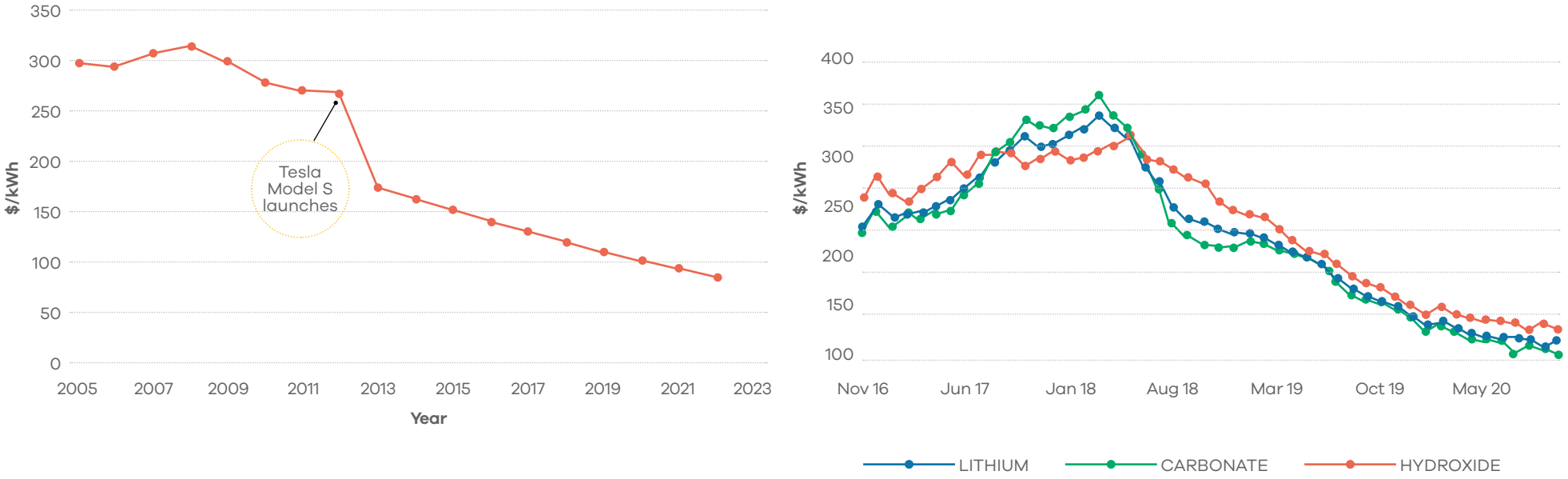
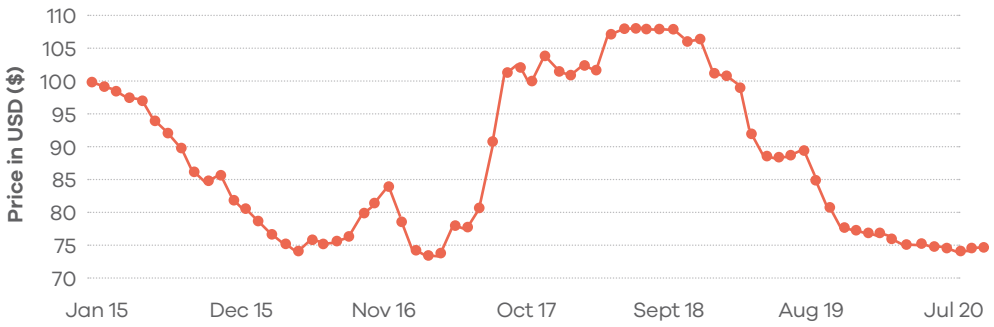


Figure 20: Graphite price over time

Source: Benchmark Minerals, 2020



Falling cost of EVs

Currently, batteries make up between 40% and 50% of the total cost of an EV. Falling battery prices, as discussed above, means that EVs may be cost-comparable with ICE vehicles by the middle of the decade (~$125/kWh to $150/kWh 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 will have to be considered with a view to growing the EV industry:

- Technology advances are delivering substantial cost cuts. Key enablers are developments in battery chemistry, and expansion of production capacity in assembly and manufacturing plants, locally and internationally.
- 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 a bigger demand for new materials in the automotive sector.
- Changes to the tax revenue base derived from vehicle and fuel taxes.

2020 National EV Perception Survey

A 2020 national EV perception survey conducted on over 3 000 car buyers on South Africa's biggest automotive marketplace over 12 months has found that 1.8% of the respondents have owned an EV, 13% have driven one, and 68% would want to own one in future. The majority of the respondents, 86%, would be open to using an EV as their primary vehicle, rather than as a second vehicle.

The unavailability of public and home charging infrastructure (61%), charging times (59.6%), and cost (55%), were cited by the respondents as the biggest barriers to EV ownership in South Africa.

Reduced emissions (80.5%), reduced noise pollution (63.9%), and cheaper running costs (54.7%) were the top three cited advantages of EVs.

An interesting finding was that most of the respondents aged 18-34 said they were more likely to purchase an EV in the next five years, while those aged 55+ were thinking of purchasing an EV within the next three years.

Figure 21: How much respondents were willing to spend on purchasing an EV

Source: Autotrader 2020

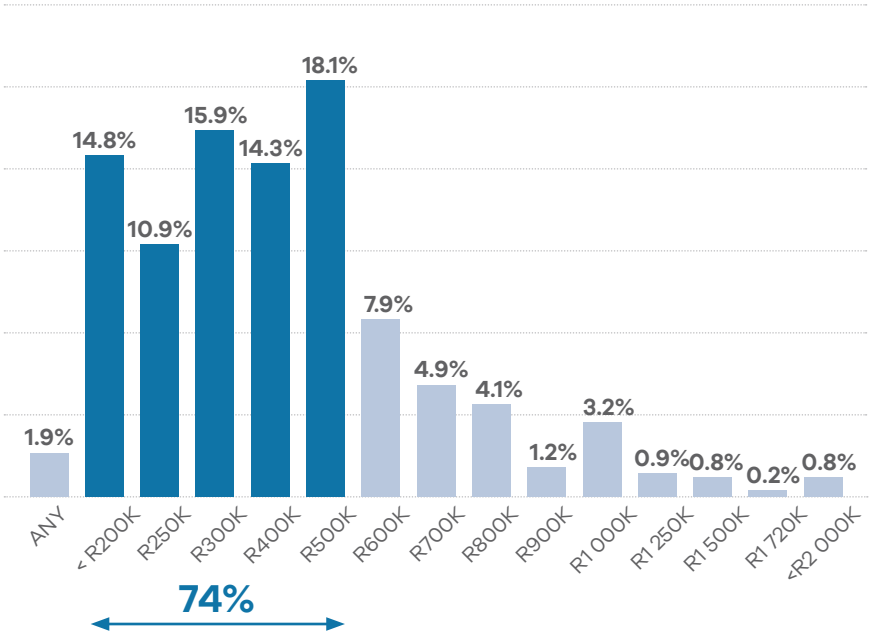


Figure 21 shows that there were progressively fewer people willing to spend more than R500 000 on an EV.

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[4].

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

- People identify and associate with premium brands, hence possibly 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 EVs to their lifestyle, hence the limited uptake.

3.9. Market barriers

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

3.9.1. Products that are not fit for the South African market

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

- All EV models currently in the SA market cost more than R450 000, which is out of reach of most SA vehicle buyers.
- Unlike the conventional car market, the EVs currently available in the market do not cater to 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 (MaaS), and/or enabling finance terms specifically tailored for EVs.

That said, with very limited product choice, even once one is comfortable with the idea of owning an EV, they might not find one that fits their lifestyle.

[4] https://www.wetpaint.co.za/wetpaint-strategic-marketing-insights-the-south-african-consumer/

As a result, some brands that currently have a high market share in the ICE vehicle market have a much lower share of the EV market. Ultimately, the production cost of EVs would reduce significantly with economies of scale volume increases. For this increased production to happen, there is a need to facilitate local demand for EVs.

3.9.2. High import duties

Even with the overall cost of EVs falling due to decreasing battery prices, the cost of EVs 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, EVs are subjected to 25% import duties, while buses and trucks carry a 20% duty. In comparison, ICE vehicles incur 18% import duties. EVs are also more likely to incur *ad valorem* [5] tax based on their classification as a luxury good, while their high price tag contributes to ad valorem being a large amount of money.

Ad valorem tax ranges up to a maximum of 30%, based on the vehicle price (SARS, 2020) (current EV products on average work out at around 17%). This means that in practice the total taxes on EVs and hybrids average around 42%.

In 2018, the International Trade Administration Commission (ITAC) rejected an application for a reduction in the general rate of customs duty applicable to EVs. The rationale was that this was meant to support local manufacturing of EVs, and vehicle manufacturers could already offset customs duty through the Automotive Production and Development Programme (APDP).

The dtic is in negotiations with the EU to reduce the import tariff on EVs 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 yet unknown.

BMW has also applied to the ITAC for the reduction of import duties to stimulate vehicles sales. The application was for a reduction in duties on imported EVs to 0% for three years, with a subsequent increase to 10%. The outcome of this application was unsuccessful.

To reduce the upfront cost of EVs, the only options are to either reduce VAT or the ad valorem excise duty - which is a tax based on the price of the product. It is however a complex balancing-act to justify reducing VAT on EVs, which still carry the perception of being targeted at middle and higher income segments of the population, on account of the high cost of EVs. One must also consider the opportunity cost of a reduction on VAT which would have been used for alternative purposes.

3.9.3. 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.

[5] An ad valorem tax is a tax whose amount is based on the value of a transaction or of property.

3.9.4. Lack of local skills throughout the value chain 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 industry.

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.

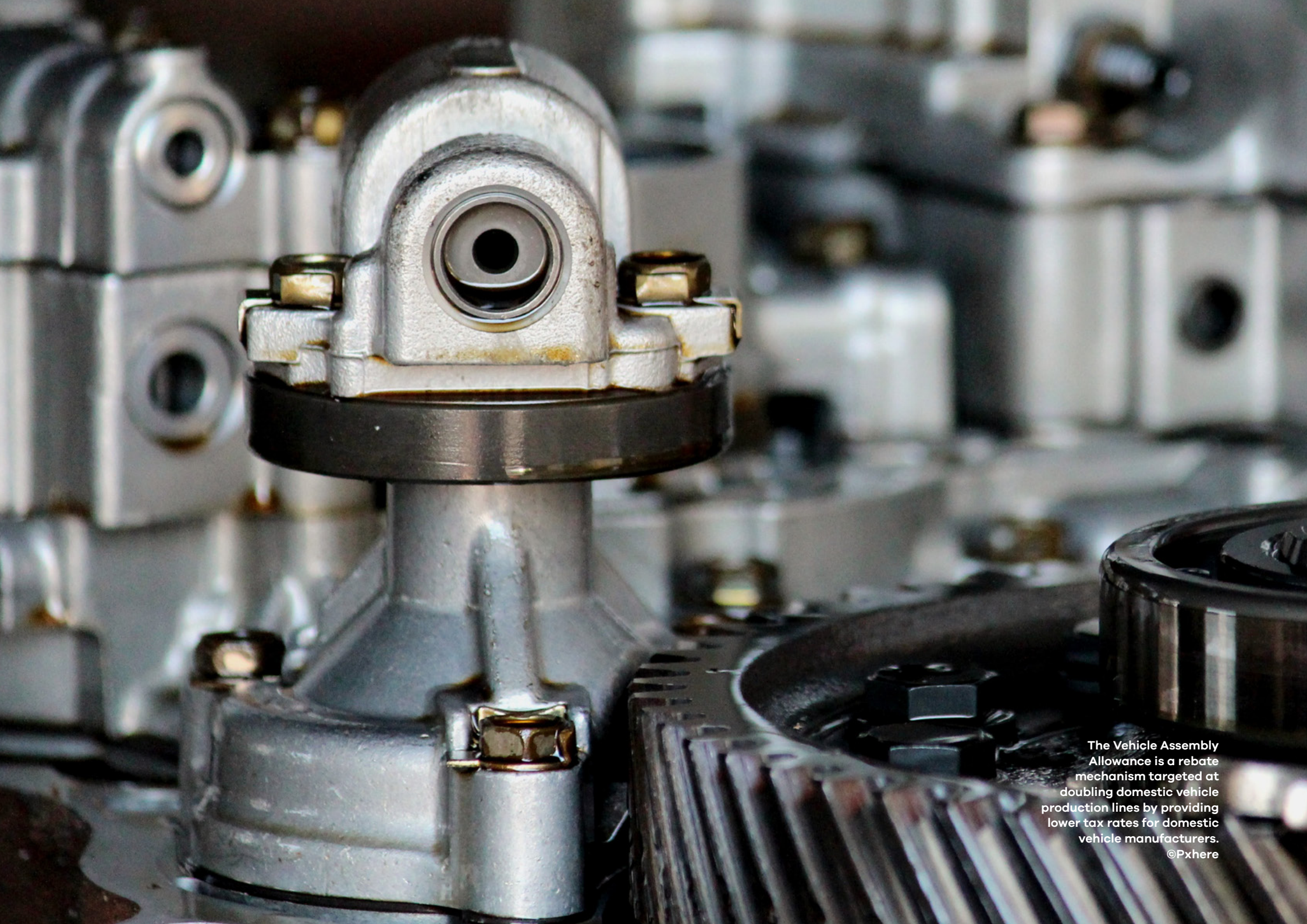
Table 13: Import taxes and total cost of importing a Tesla Model X Performance All-Wheel Drive from the UK to South Africa (My Broadband, 2021)

	Individual costs	Total in Rand (Exchange rate €1 = R20.87)
Purchase price of Tesla Model X Performance All-Wheel Drive in the UK	€ 96 900	R 2 022 303
+ 15% VAT of 10% mark-up	R 333 680	R 2 355 983
+ 25% duty tax	R 588 996	R 2 944 979
+ 30% Ad Valorem tax	R 883 494	R 3 828 472

People identify and associate with premium brands, hence possibly the higher uptake in EV sales for BMW in the country.
©Global District Watch

POLICY AND REGULATION

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



The Vehicle Assembly Allowance is a rebate mechanism targeted at doubling domestic vehicle production lines by providing lower tax rates for domestic vehicle manufacturers.
©Pxhere

The regulatory framework for transport is governed by the Department of Transport (DoT) in SA. The Department of Trade, Industry and Competition (dtic) is key to ensuring the policy environment is conducive to investment, assembly, manufacturing, and trade. Several policies are relevant to the automotive industry:

4.1. Automotive Production and Development Programme (APDP) (2013-2020)

The APDP was implemented on 1 January 2013 and will be in place until 2020, after which it will be replaced with the South African Automotive Masterplan (SAAM) in 2021 until 2035.

The current APDP (2013-2020) consists of four pillars that drive the programme:

- **Import duty (tax)** – these tariffs are meant to protect and support continued domestic vehicle manufacturing.
- **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. A higher production incentive valuation allows for a greater duty account reduction.
- **Vehicle Assembly Allowance (VAA)** (rebate mechanism) – this is targeted at doubling domestic vehicle production lines by providing lower tax 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 guides policy on growing and supporting the domestic automotive industry from 2020 to 2035. It replaces the APDP, addressing some of the latter's shortcomings. This masterplan, which comes into effect in 2021, has adapted the Vehicle Assembly Allowance (VAA) to the Volume Assembly Localisation Allowance (VALA). The difference is that VAA was based on the wholesale selling price of the vehicle produced in SA, irrespective of local content (whether parts were locally produced or imported). VALA, on the other hand, has changed this so that the incentive is no longer based solely on the wholesale selling price. Rather, OEMs have to deduct the value of imported content from the vehicle's wholesale selling price. The figure is then multiplied by the applicable VALA percentage as specified in the updated APDP (the VALA percentage starts at 40% in 2021 and drops progressively to 35%).

Developed by government and the automotive industry, the SAAM covers car and light commercial vehicle manufacturing, medium, heavy, extra-heavy truck, and bus production (potentially including off-highway vehicles), motorcycles, and the South African component supplier industry. Vehicle importers and distributors are also covered. The Masterplan creates a framework for securing even higher levels of investments and production (Barnes & Black, 2017).

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 38.7% 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 the **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
- deepening **value addition** within South African automotive value chains, across selected commodities/technologies.

Notable changes in the SAAM:

- The Vehicle Assembly Allowance (VAA), which is one of the four legs of the APDP, is phased out and replaced by the 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. However, it will be reduced by 5% from current levels 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 SAAM, however, now also includes 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).

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.

To radically grow the uptake of EVs in South Africa, in conjunction with dti (now Department of Trade, Industry and Competition – dtic) [6] and National Treasury, the DoT will:

[6] 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).

- 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 research EV batteries;
- work with national, provincial, and local government departments and authorities; government purchases in 2019 accounted for 2.9% (15 423 vehicles) of total vehicle sales in the country, while corporate industry fleets accounted for 3.5% (18 695 vehicles), which could be two areas to start the EV transition;
- introduce the conversion of old technology vehicles with higher emission factors to be retrofitted with EV technology – this is, however, an expensive exercise;
- consider providing incentives related to the beneficiation of using local resources in the manufacturing of key machinery and/or components (e.g., hydrogen fuel cell electric vehicles); and
- assist in establishing and developing local EV OEMs.

4.4. Preferential Procurement Policy Framework Act (PPPFA) of 2000

The revised regulations came into effect on 7 December 2011 to empower the dtic 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 PPPFA prescribe ~80% local content of the bus body for city and commuter buses (dti, 2016). In the case of EVs, the regulations are not excluding the battery from the bodywork, thereby creating an import barrier as at this stage there is no local manufacturing of EV batteries.

4.5. The National Climate Change Response Policy (NCCRP) (2011)

This policy is the key policy document guiding climate change response across all government departments. It recognises that response should be of a departmental, cost-effective, and integrated nature. As discussed previously, EVs have a role to play in climate change mitigation, particularly in mitigating the emissions from the transportation sector.

The plan aims to address both mitigation and adaptation in the short, medium, and long term (up to 2050), with strategies covering the following areas:

- Carbon pricing
- Water
- Agriculture and commercial forestry
- Health
- Biodiversity and ecosystems
- Human settlements
- Disaster risk reduction and management

4.6. The 2019 Integrated Resource Plan (IRP 2019)

The Integrated Resource Plan from the Department of Mineral Resources and Energy (DMRE) aims to provide a clear indication of South Africa's electricity demand and how this demand will be supplied, and at what cost. It provides 1) an overall plan indicating the quantities of various electricity sources to meet the country's electricity demand in the next 20 years (the current plan runs up to 2030), and 2) guidance for future energy infrastructure investments. Thus, it largely determines the country's generation mix.

In May 2011, the then Department of Energy (now Department of Mineral Resources and Energy) released the Integrated Resource Plan 2010-2030 (IRP 2010) in respect of South Africa's forecast energy demand for the 20 years from 2010 to 2030. The IRP 2010 was intended to be a 'living plan' that would be reviewed by key stakeholders at least every two years. However, this was never done and resulted in an energy mix that failed to adequately meet the constantly changing supply and demand scenarios in South Africa.

Since 2010/11, there have been several draft revisions of the IRP that have been distributed for public comment. In 2018, the latest IRP was released for public comment. In October 2019, the final IRP 2019 was gazetted to provide policy certainty to the market.

For the period ending 2030, several policy adjustments are proposed to ensure a practical plan that will be flexible to accommodate new, innovative technologies that are not currently cost-competitive, minimisation of the impact of decommissioning coal power plants, and the changing demand profile.

Some of these adjustments include increased build limits to correct the rollout of renewable energy, which will help sustain the industry. Inclusion of 1 500 MW of coal-to-power is aimed at minimising the impact of job losses resulting from the decommissioning.

These policy adjustments will be retained, pending a report on the just transition strategy expected in 2020/21.

Provision has been made for the following new additional capacity by 2030:

- 1 500 MW of coal;
- 2 500 MW of hydro;
- 6 000 MW of solar PV;
- 14 400 MW of wind;
- 1 860 MW of nuclear;
- 2 088 MW for storage;
- 3 000 MW of gas/diesel; and
- 4 000 MW from other distributed generation, co-generation, biomass, and landfill technologies.

More details on the 2019 IRP are provided in GreenCape's Energy Services Market Intelligence Report 2021 (GreenCape, 2021).

4.7. The Carbon Tax Act 15 of 2019

The Carbon Tax Act No 15 of 2019 was gazetted in May 2019 and came into effect on 1 June 2019. The carbon tax will be applied over two phases: Phase 1 will be from 1 June 2019 to 31 December 2022, and phase 2 will be from 2023 to 2030. In Phase 1 it will not have an impact on electricity prices. The rate of the carbon tax will be imposed at an amount of R120 per tonne of carbon dioxide equivalent (tCO2e) emitted. However, taking the tax-free thresholds into account, this rate will range closer to R6 and R48 per tCO2e. This rate will increase by Consumer Price Index (CPI) +2% per year until 31 December 2022.

The Act has assumed a 'polluter pays principle' to the tax. This relatively low tax rate and range of tax-free allowances in Phase 1 are designed to incentivise large emitters to transit to a low carbon profile before Phase 2. Once the results of the tax have been reviewed at the end of Phase 1, changes to rates and tax-free thresholds will be applied before the next phase begins. This would especially affect businesses with high fuel and electricity consumption.

The impact of the carbon tax on the uptake of solar and other renewable forms of energy (which present an opportunity to meet the energy demand from broad EV uptake in the country) is still to be determined and will be monitored.

MARKET OPPORTUNITIES

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

Lithium-ion batteries manufacturing is a medium- to long-term opportunity for the global LIB market (including South Africa's domestic market).
©Pxhere

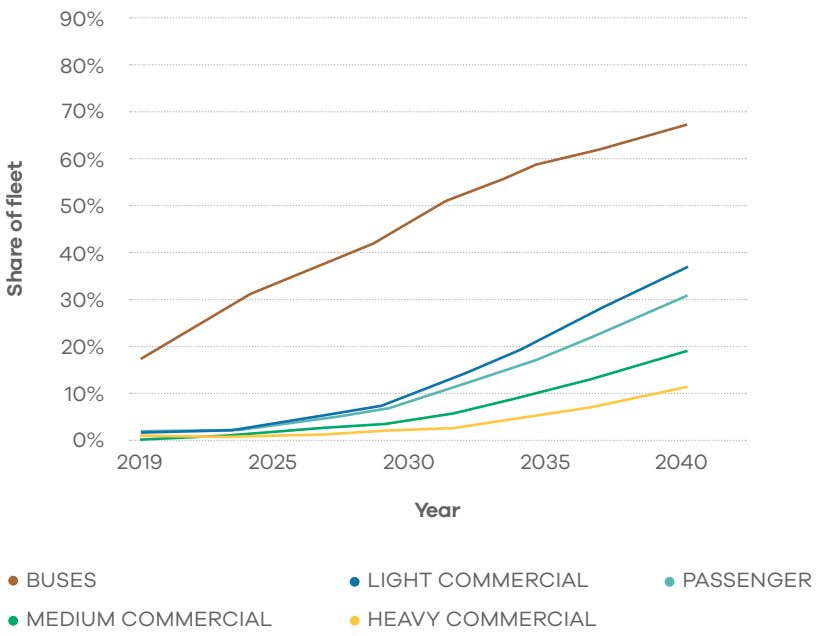
The following are emerging investment opportunities identified in SA's EV market:

5.1. Local manufacturing and electrification of public transport

There is a medium-term opportunity for the uptake of electric buses in South Africa. This opportunity is relevant to both local investors and international investors looking to enter the South African market. Based on the precedent set by China (**Figure 22**), it is predicted that electric buses will lead to 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, presents a significant investment opportunity.

Figure 22: EV global market share forecast

Source: Bloomberg NEF



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) and Pay as You Drive (PAYD) present attractive, innovative finance approaches that transit companies could employ to finance electric buses cost-effectively.

Electric public transport

Buses are designated in SA and subject to the dti's ~80% local content requirements for public procurement. The assembly of buses further receives the benefit of duty-free importation of all driveline components. 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 goal.

Also, because of the high upfront capital cost in purchasing EVs, and the high interest rate associated with vehicle finance in South Africa, PAYS and other financing mechanisms could be considered in improving the business case and bankability — including financial instruments that diversify and reallocate costs and risks (demand, credit and finance, operational risk, and technology). Traditional models concentrate the risk on the municipality and the operator, who may not be well equipped to manage these risks or may be a credit risk.

Newer alternative models try to separate the asset owner from the operator, through unbundling and the separation of responsibilities (C40 Cities, 2018).

The manufacturing of EVs is correlated with their demand, and it is unlikely to materialise domestically until the demand for EVs increases significantly. Fleets, both public and private, account for about 40% of the energy use in the transport sector. From a life cycle assessment perspective through the entire value chain, it is more efficient to electrify public transport as compared to single-occupancy vehicles (SOV). According to the United Nations Environmental Programme (UNEP), most African countries, including South Africa, will face massive vehicle fleet growth in the next ten years. Thus there is an opportunity to do it right and channel that growth into low emission transport, and avoid air pollution in the process.

When renewing bus contracts, municipalities could propose to or require operators to progressively start incorporating electric fleets, at least partially, or replace ageing fleets with electric variants when their useful life is complete. Renewable energy sources, either procured from IPPs on a larger scale, or distributed embedded generation on a smaller scale by municipalities, the energy utility, Eskom, bus company operators or others, could support the increased energy demand by ensuring the grid and the transport that relies on it is more sustainable and lower carbon.

The Department of Transport's relaunched Taxi Recapitalisation Programme (TRP) could provide an opportunity to start transitioning the local transport industry towards e-mobility. There is potential to align the taxi-scrapping allowance with a shift from ICE minibus taxis to electric variants. There is still no e-MBT (electric minibus taxi) currently available in South Africa, even though the maintenance cost of MBT in South Africa is very high due to the distances travelled and the driving style. The taxi market share represents 67% of all daily trips in South Africa, and it is rising.

Transitioning this manufacturing to EVs, powered by renewable energy sources, is buoyed by the fact that there are many similarities and overlaps between EV and ICE drivetrains and components. Local OEMs have gone from barely registering the possibilities of EVs, just a few years ago, to fully embracing them. Now every major manufacturer has an EV strategy, and the shift is accelerating rapidly.

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 EV industry. Lithium-ion battery manufacturing has the potential of creating jobs throughout the value chain, as it is very labour-intensive.

Battery recycling is, however, not yet viable in South Africa because the number of EVs is still very low, and those available have not yet reached their end-of useful life point.

As indicated in **Section 3.8.2**, EVs have a high upfront capital cost which is directly linked to the high production cost of batteries. These batteries still account for between 30% and 50% of the cost of the EV. As most people make their vehicle purchase decision based on price, this remains one of the biggest barriers to the uptake of EVs in the country. The increased demand for lithium-ion batteries from consumer electronics, stationary storage, and EVs, together with improved technology, has reduced the price of lithium-ion batteries by 89% since 2010, with the volume-weighted average hitting US$156/kWh. This is because the costs depend much less on raw material cost than on economies of scale, in terms of the production volumes of the batteries.

Besides powering the vehicle, EV batteries have two other potentially useful applications: (1) mobile storage while they are installed in the vehicle; and (2) as second-life storage after the vehicle batteries are retired.

EV manufacturers use several 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.

Copper ore is an available raw material in South Africa. ©Pxhere

Of the three, NMC is the most prevalent and the fastest growing for the EV industry. 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.

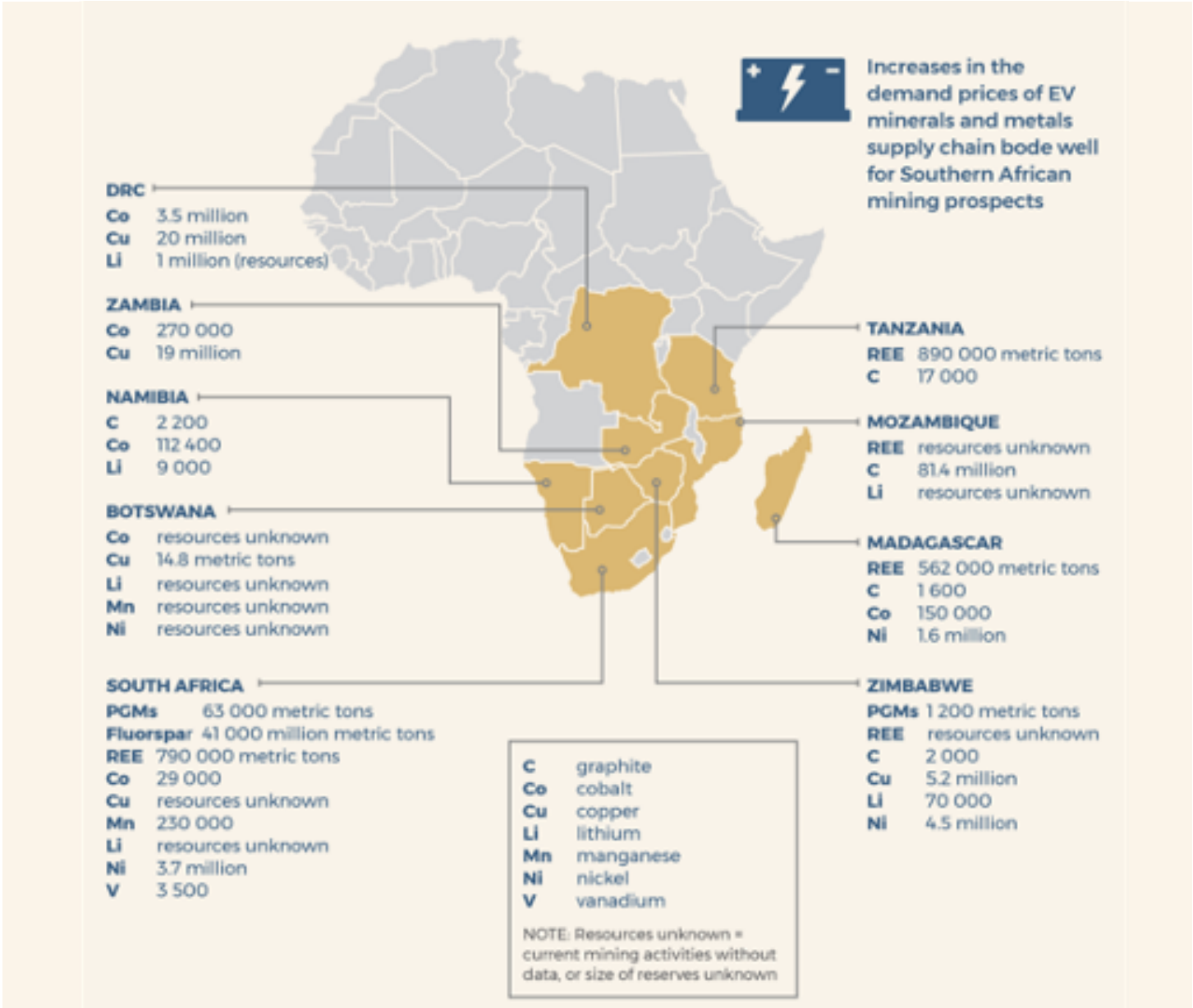
The Southern Africa region is fortunate enough to possess various mineral ores, which can be useful in the local production of lithium-ion batteries, as shown in **Table 14** and **Figure 23**. The African Continental Free Trade Area (AfCFTA) and the SADC Programme on Climate Change Adaptation and Mitigation could thus aid in accessing these raw materials. AfCFTA, enacted in May 2019, is the largest free trade area in the world. It aims to create a single market for easy movement of capital and goods, eliminate tariffs, and create a customs union.

Table 14: Availability of raw materials in the sub-Saharan region for lithium-ion battery production

Minerals and metals	Source Country
Nickel	South Africa (9th largest global producer) and Zimbabwe
Manganese	South Africa (70% of the world's manganese reserves), DRC, Gabon, and Ghana
Cobalt	DRC (>60% of world supply, of which 85% is exported to China), and Zambia
Lithium	Zimbabwe (5th largest producing country), South Africa, and Namibia
Graphite	Mozambique (20-40% of global reserves), Tanzania, Zimbabwe, and Madagascar
Copper	South Africa, DRC, Namibia, Zambia, and Zimbabwe

Figure 23: Reserves of EV minerals in the Southern Africa region

(Source: U.S. Geological Survey 2020)

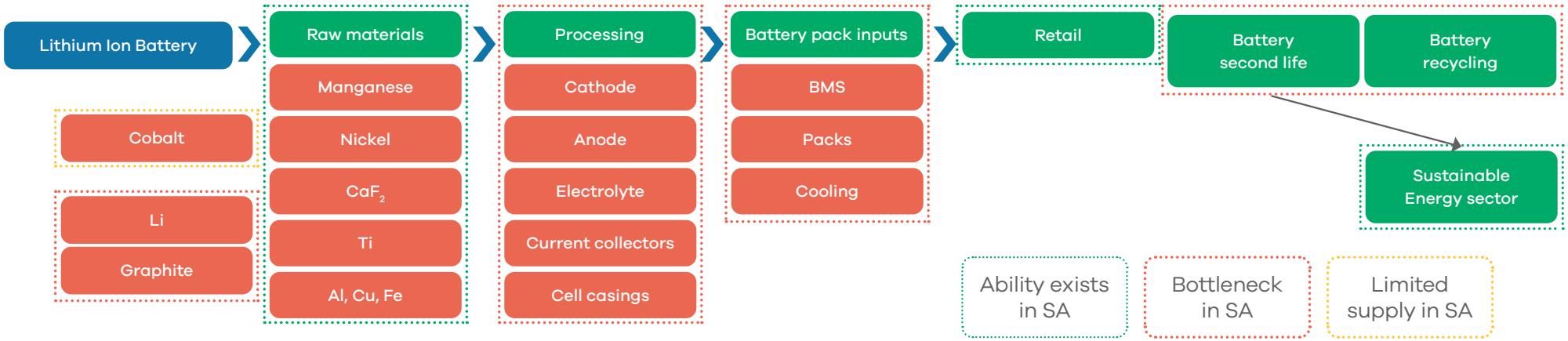


South Africa is an attractive manufacturing destination for lithium-ion batteries because of its existing battery manufacturing (and recycling) industry. Besides, South Africa's mining sector can provide some of the raw materials required for the NMC cathode battery chemistry, especially manganese and cobalt. SA possess 78% of the world's manganese. Moreover, other raw materials required in the cathode are mined in sub-Saharan Africa. The increasing global demand and prices for these minerals could provide a boost to South Africa and the region's mining industries.

Considering the safety challenges of transporting LIBs, manufacturing in SA also represents a strong entry point to the wider African market.

Figure 24: LIB manufacturing value chain

(Source: GreenCape)



The fire risk of lithium-ion batteries is, however, quite high due to the high heat occasioned by overcharging, excessive currents, or faults in the assembly process leading to short-circuits. That is why solid-state batteries could provide an additional opportunity for local use and production due to their reduced fire risk. These solid-state batteries can even be integrated into the structure of the vehicle. They do not use a liquid/pasty electrolyte, but instead use solid glass, ceramic, or another solid material, reducing the flammable risks and allowing for thinner and smaller battery packs.

They also typically have higher energy densities.

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 organisations 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 Technology.
- **uYilo e-mobility programme** is responsible for defining the lithium-ion cell testing protocol for the programme, and for executing testing under international standards for lithium-ion cell testing. It is the only battery testing laboratory in Southern Africa to be accredited for the testing of lithium-ion cells and batteries.

In terms of 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.

- **Council for Scientific and Industrial Research (CSIR)** is responsible for providing cathode material manufactured, using South African intellectual property and raw materials, to be utilised in the lithium-ion assembly process.
- **Zellow Technology** is responsible for the development of a local lithium-ion cell manufacturing competency, driving the 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.

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. As discussed in Section 3, this is imperative if SA is to maintain its vehicle export markets and the revenues drawn from the automotive industry. 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 automotive industry has overtaken the mining industry in South Africa in terms of contribution to the GDP.

The automotive sector could also support the mining sector in terms of creating demand for Platinum Group Metals (PGM), nickel, manganese, etc. 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.

As shown in **Table 10** previously, as of September 2020 there are 7 510 297 passenger vehicles in South Africa, representing 65% of the total self-propelled vehicles in the country. This represents the potential market for passenger vehicle electrification.

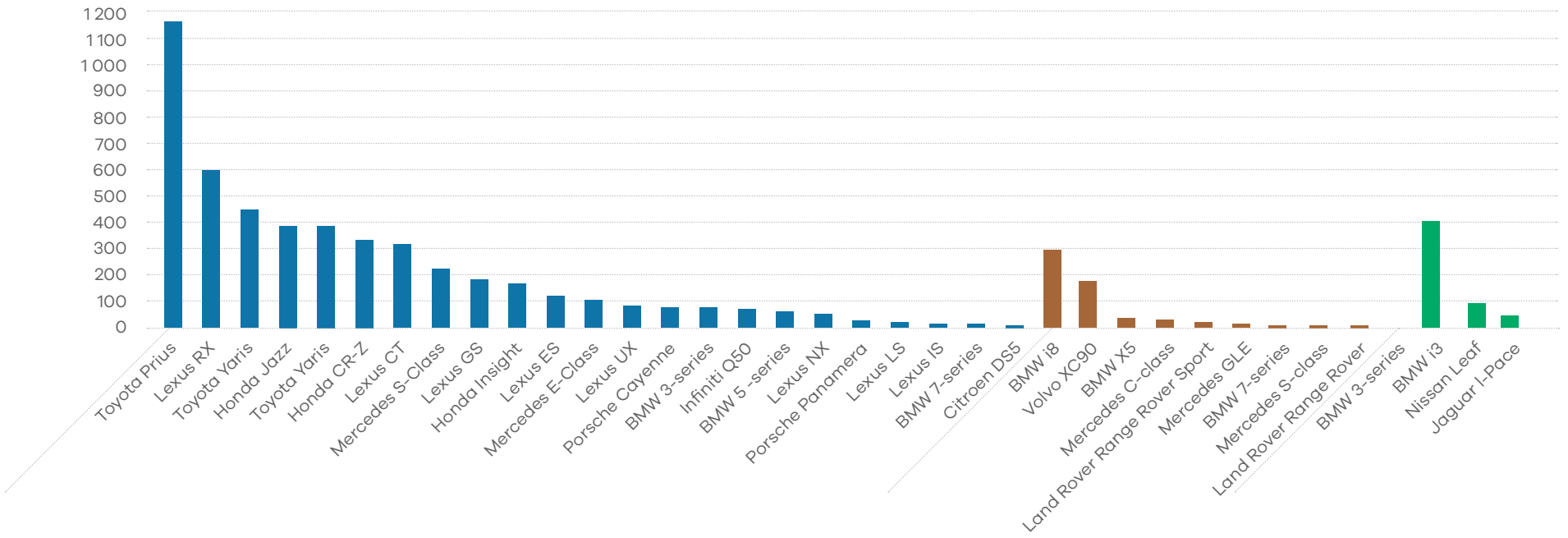
Figure 25, on the next page, further provides a breakdown of electric passenger vehicle sales by vehicle model over the last decade. This market has seen a slow growth path since Nissan entered the market in 2013, with BMW and Jaguar following in 2015 and 2018, respectively.

There is a notable decrease in sales from 2015 onwards. This speaks to the need for a market step change towards creating an enabling environment for any significant growth to be recognised.

EVs accounted for a meagre 0.04% of vehicle sales in South Africa in 2019. Hybrid EV sales comprise the largest number of EV sales in South Africa, followed by plug-in hybrid EV (PHEV) and battery EV (BEV).

Figure 25: Passenger EV sales in South Africa since 2010

(Source: TIPS, 2020)



The global trend towards EVs 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.

The government recognises that a local EV market is not required for a shift in the manufacturing sector towards EVs, and the EV manufacturing industry will likely find strong support.

5.4. EV use in construction, retail, and underground mining

According to the Department of Mineral Resources, the mining industry contributed 8.1% (R360.9 billion) of South Africa's GDP in 2019 and employed 454 861 people throughout the mining value chain.

One of the highest costs for mining operations is getting air underground, and temperature regulation. Transport, including underground transportation provision, and storage costs contributed R71.6 billion (32%) of the mining input costs in 2019 alone, according to the Minerals Council of South Africa (MCSA, 2020).

Electric mining equipment produces no fine particular matter (PM2.5) from diesel and other tailpipe emissions, thereby necessitating fewer ventilation requirements, and therefore lower costs, and safeguarding health for miners.

Additionally, EV mining equipment, including battery electric LHDs (load, haul, dump machines), loaders, and drill rigs, produce less heat because of higher efficiency of the conversion from electric energy compared to diesel.

This saves on ventilation and heat regulation underground. The electric mining equipment also produces less noise and vibration, and requires less maintenance — further saving on mining costs and operational expenditure.

Table 15: Live heavy vehicle load population in South Africa: September 2020

Vehicle Class	Province									Total	% of total self-propelled
	GP	KZ	WC	EC	FS	MP	NW	L	NC		
Trucks (Heavy load vehicles GVM > 3500kg)	140 166	50 283	46 331	22 563	22 518	44 246	17 286	26 955	9 055	379 403	3,30%
Heavy load trailers GVM > 3500kg	65 254	24 514	24 597	7 438	19 745	39 536	11 108	10 999	5 894	209 085	17,50%

Table 15 shows that there is a total of 379 403 heavy load vehicles (> 3 500 kg), and 209 085 heavy load trailers (> 3 500 kg) in South Africa as of September 2020. This only represents the road-going vehicles.

It does not account for the mining equipment that would not register on the e-Natis database, as they are not road-going and do not need vehicle licences. Electrification of this vehicle class therefore portends a vast opportunity.

Anglo-American, with design assistance from Williams Advanced Engineering, is building the world's largest hydrogen-powered EV hybrid mining truck in 2020. Test runs are scheduled to take place later in 2020 at Anglo-American's Mogalakwena open-pit platinum mine in Limpopo.

The demand for lithium-ion powered forklifts has also been increasing locally, owing to companies wanting to reap the benefits of energy efficiency and cost-effectiveness, as well as to prepare for changing legislation regarding emissions, such as the recently enacted carbon tax regulation (outlined in Section 4.8)

FUNDING AND INCENTIVES

A range of general and sector-specific funding solutions and incentives is available to investors, manufacturers, and service companies in the green economy. It covers Development Finance Institutions (DFIs), local public and private sector financiers and investors, and a considerable range of tax incentives.

The BMW battery-powered iX crossover – iX Sport Activity Vehicle, has been announced to arrive in the South African market in 2022.
©District Watch Group

South Africa ranks as one of the top 15 nations in the world in terms of driving the green growth agenda (ahead of Australia, Singapore, and Finland). This drive is on the back of a range of funding solutions and tax incentives available to green technology manufacturers and service companies, as well as those who use or procure such goods and services.

The South African Climate Finance Landscape looks at detailed project-level data, understanding in detail the source, disbursement, instrument and use. The insights can support public and private role-players with information to shape sectoral strategies and selected policies and improve coherence and coordination between public and private level spending in the sectors. The South African Climate Finance Landscape has tracked R62.2 billion in annual climate finance invested in SA. Find out more here.

6.1. General database web page

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

The Green Finance Desk (GFD) primarily acts as a facilitator in the financing of green projects and green business. The GFD works across all sector desks at GreenCape. For more support please visit https://www.greencape.co.za/content/sector/green-finance

ACCESS THE SOUTH AFRICAN CLIMATE FINANCE LANDSCAPE

6.1.1. Green Finance Database

In conjunction with the Western Government Department of Economic Development and Tourism, GreenCape maintains a database of funding sources and incentives that may be relevant to green economy investors. The database contains information on more than 150 funding opportunities, including an overview of the opportunity and relevant 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 online[7].

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 online[8]. These incentives cover local manufacturing, critical infrastructure grants, small enterprise development and a diverse set of sector specific incentives (i.e. Aquaculture Development and Enhancement Programme).

[7] https://www.green-cape.co.za/content/focusarea/green-finance-databases

[8] https://www.greencape.co.za/assets/Uploads/Government-Funding-and-Incentive-Booklet.pdf

6.1.3. Finfind database

Finfind[9] is an innovative online finance solution that brings together SMME 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.

Wesgro has partnered with Finfind to assist local companies seeking finance for their business. See more here: https://wesgro.finfind.co.za/quiz/disclaimer/wesgro

6.1.4. AlliedCrowds database

AlliedCrowds[10] 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.
- Businesses / organisations can also contact Allied Crowds to create a customised funding database. This resource is ideal for any entity seeking a broad range of financial solutions on a global scale.

Click the buttons below to access the relevant content

GREENCAPE'S GREEN FINANCE WEB-PAGE

GREEN FINANCE DATABASE

GOVERNMENT FUNDING AND INCENTIVE BOOKLET

FINFIND WEBSITE

ALLIED CROWDS WEBSITE

[9] https://www.finfindeasy.co.za/

[10] https://alliedcrowds.com/

THE WESTERN CAPE: AFRICA'S GREEN ECONOMY HUB

The Western Cape is a world-class investment destination.

MellowCabs is a delivery company based in Stellenbosch, Western Cape which uses electric vehicles for delivery.
©MellowCabs

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 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:

Western Cape Department of Economic Development & Tourism: Driving the green economy policy landscape in the Province.
InvestSA One Stop Shop: Offers convenient investor support on permits, licensing and registrations - all under one roof.

City of Cape Town Enterprise and Investment: Creates an enabling environment to attract investment that generates economic growth and job creation in Cape Town
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 nonfinancial 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.

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.

CLICK TO VIEW THE ATLANTIS SEZ WEBSITE

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 whole of Africa, in particular the SADC region.

Atlantis is a great location and development ready. 94 hectares of zoned development-ready land is available for leasing to investors. Bulk infrastructure is in place and Atlantis has new public transport and shipping links, whilst boasting fibre connectivity too. 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 INFO, CLICK TO EMAIL THE ATLANTIS SEZ BUSINESS DEVELOPMENT EXECUTIVE

atlantis
special economic zone
cape town

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

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.

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, circular economy and resources.

Benefits of becoming a GreenCape member

We currently have over 2 500 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.

CLICK HERE TO BECOME A GREENCAPE MEMBER

We have facilitated and supported ~R41bn of investments in renewable energy projects and manufacturing. From these investments, more than19 000 jobs have been created.

Through our WISP (industrial symbiosis) programme, by connecting businesses with waste / under-used resources:

309 200 fossil GHG emissions saved (equivalent to the electrical usage of 39 800 households in SA);

Over R120 million generated in financial benefits (additional revenue, cost savings and private investments);

69 permanent jobs in member companies, as well as 25 temporary positions, and 218 economy-wide jobs in supply chains have been created.

REFERENCES

Aerial view of the Foreshore Bridges.
©City of Cape Town

AASA 2020. Road Accident Fund. Available from <https://www.aa.co.za/fuel-pricing>. [Accessed November 2020].

Autotrader 2020. Electric Vehicle buyers survey. Available: https://reports.autotrader.co.za/industry/2020-EV-buyers-survey/. [Accessed November 2020].

Barnes, Justine & Black, Anthony, 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.

Benchmark Mineral Intelligence 2020. Price reporting agency & market intelligence for lithium-ion battery, electric vehicle & energy storage supply chains. Available: https://www.benchmarkminerals.com/. [Accessed November 2020].

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].

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].

C40 Cities 2018. How the FSCI is Helping Cities Rethink Bus Procurement. Available: https://www.c40.org/blog_posts/how-the-fsci-is-helping-cities-rethink-bus-procurement. [Accessed November 2020].

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]

CSIR 2015. Cape Town: State of Energy Report. Pp 11-95.

Cunliffe, Guy et al. 2018. Brown to Green. Available: https://www.climate-transparency.org/g20-climate-performance/g20report2018#1531904263713-04b62b8d-e708. [Accessed November 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 (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/department-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.

eNaTIS 2020. Live vehicle population as per the National Traffic Information System. Available: http://www.enatis.com/. [Accessed November 2020].

European Commission 2020. A European Green Deal. Available: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en. [Accessed November 2020].

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].

IEA 2020. Data and statistics. Available: https://www.iea.org/data-and-statistics?country=SOUTHAFRIC&fuel=Energy% 20consumption &indicator= TFCShareBySector. Last accessed November 2020.

InsideEVs 2020. Global Plug-In Electric Car Sales August 2020: Close To 241,000. Available: https://insideevs.com/news/446657/global-plugin-electric-car-sales-august-2020/. [Accessed November 2020].

Labuschagne, H., 2021. How much it costs to import a Tesla to South Africa. [online] Mybroadband.co.za. Available at: <https://mybroadband.co.za/news/motoring/388258-how-much-it-costs-to-import-a-tesla-to-south-africa.html> [Accessed 6 March 2021].

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

Mineral Council of South Africa (2019). Fact and Figures 2019. Pretoria: MCSA. Pp 4-43.

National Association of Automobile Manufacturers of South Africa (2020). Auto Dashboard. Available: https://NAAMSA.net/. [Accessed November 2020].

National Household Travel Survey (NHTS) 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>

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].

Road Accident Fund 2020. Fuel Levy. Available: www.raf.co.za. [Accessed November 2020].

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

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

SARS 2020. Carbon Tax. Available: https://www.sars.gov.za/ClientSegments/Customs-Excise/Excise/Environmental-Levy-Products/Pages/Carbon-Tax.aspx. [Accessed November 2020].

Statistica 2020. Electric Mobility: Norway Races Ahead. Available: https://www.statista.com/chart/17344/electric-vehicle-share/. [Accessed November 2020].

TIPS. 2020. Harnessing electric vehicles for industrial development in South Africa. Available: https://www.tips.org.za/research-archive/sustainable-growth/green-economy/item/3876-harnessing-electric-vehicles-for-industrial-development-in-south-africa. [Accessed November 2020].

UNCC. 2020. The Paris Agreement. Available: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement. [Accessed November 2020].

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

US Geological Survey (USGS) 2020. Mineral Commodity Summaries 2020. Available: https://pubs.usgs.gov/periodicals/mcs2020/mcs2020.pdf. [Accessed November 2020].

Venter, I., 2021. Volvo to launch its first electric car in South Africa. [online] Engineering News. Available at: <https://www.engineeringnews.co.za/article/volvo-to-launch-its-first-electric-car-in-south-africa-2021-03-09/rep_id:4136> [Accessed 9 March 2021].

Wetpaint The Little Big Agency 2021. Wetpaint Strategic Marketing Insights: The South African Consumer. Available: https://www.wetpaint.co.za/wetpaint-strategic-marketing-insights-the-south-african-consumer/ [Accessed 25 March 2021]

uYilo E-mobility Programme 2017. Sustainable Transport and Mobility for Cities Workshop -eThekwini 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].

GreenCape

The writing of this MIR was made possible with the generous support of the Western Cape Government of South Africa.

Western Cape Government
Economic Development and Tourism
BETTER TOGETHER.