TRADE & INDUSTRIAL POLICY STRATEGIES

INDUSTRY STUDY

SUSTAINABILITY REPORT: SOUTH AFRICA'S AUTOMOTIVE INDUSTRY

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This study on sustainability in the South African automotive industry examines the current vehicle market and its contribution to emissions. It analyses the value chain to identify areas where emissions are most concentrated and also assesses the policy landscape.

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ABBREVIATIONS

A-PACT	Automotive Partnership for Carbon Transparency
BEV	Battery Electric Vehicle
CBAM	Carbon Border Tax Adjustment
DoT	Department of Transport
EPA	United States Environmental Protection Agency
EPRS	European Parliamentary Research Service
EU	European Union
EV	Electric Vehicle
FCEVs	Fuel Cell Vehicles
GHG	Greenhouse Gas
GTS	Green Transport Strategy
HEV	Hybrid Electric Vehicle
ICE	Internal Combustion Engine
ICEV	Internal Combustion Engine Vehicle
IEA	International Energy Agency
LIBs	Lithium-ion Batteries
LPG	Liquefied Petroleum Gas
MBSA	Mercedes-Benz South Africa
NBI	National Business Initiative
NDC	Nationally Determined Contribution
PHEV	Plug-In Hybrid Electric Vehicles
UN	United Nations
UNEP	United Nations Environment Programme
UNFCC	United Nations Framework Convention on Climate Change

1. INTRODUCTION

The global automotive industry, affected by a myriad of short-term and long-term international factors, has changed significantly in recent years. The COVID-19 pandemic has disrupted the industry, reducing production and sales. Further, a semiconductor shortage disrupted supply of computer chips supply, an essential input for enhancing vehicle fuel efficiency. Also a broader long-term shift towards electric mobility, driven by government regulations, is changing consumer preferences, and technological advancements are a factor as well.

Dealing with the climate crisis is increasingly urgent, and the transport sector,[1] which includes the automotive industry, is a major contributor to air and noise pollution and a significant source of greenhouse gas (GHG) emissions. This pollution intensity has prompted greater demand for more sustainable practices across transport value chains. In South Africa, the transport sector is the second largest contributor to GHG emissions, accounting for approximately 12% of national energy-related carbon emissions (DFFE, 2022). This carbon intensity means reducing pollution and emissions in the transport sector is crucial for South Africa to meet its climate goals and its commitment to the Nationally Determined Contribution (NDC) under the Paris Agreement [2] by 2030 (UNFCCC, n.d.; NBI, 2023). The Department of Transport (DoT), through the Green Transport Strategy (2018–2050), aims to cut greenhouse gas emissions from the transport sector by 5% by 2050. To thoroughly evaluate the carbon footprint and environmental impact of vehicles and the broader automotive industry, the entire life cycle of a vehicle, from raw materials to manufacturing and vehicle use, must be considered.

This report on sustainability in the South African automotive industry examines the current vehicle market and its contribution to emissions. It analyses the value chain to identify areas where emissions are most concentrated. The policy landscape is also assessed, highlighting the measures implemented to support sustainability in the industry and the emerging risks associated with the transition towards sustainability, particularly looking at how to align with global sustainability trends and with the country's net-zero goals.

2. HOW THE VEHICLE MARKET HAS SHAPED SOUTH AFRICA'S EMISSIONS

South Africa ranks as the 22nd largest vehicle producer globally, manufacturing 633 332 units in 2023 (naamsa, 2024, p5). In 2023, South African manufacturers sold over 531 787 new vehicles domestically and exported 399 594 units (naamsa, 2024, p.4). Europe is the leading destination of all South African automotive exports, accounting for 77% of all exports in 2023, or nearly four out of every five vehicles. This export-reliance means that the policy direction for automotive imports pursued in Europe has important implications for South African automotive production and competitiveness. As a highly export-driven industry, the transition to electric vehicles (EVs) is inevitable in South African production to maintain access to key markets and avoid losing exports (naamsa, 2023a). Domestic protection of local manufacturing is enforced through banning used vehicle imports, and the growth in the vehicle population is thus primarily driven by new vehicle sales.

The country's transport sector is the second largest contributor to carbon emissions, accounting for 12% of the total, following the energy sector, which accounts for approximately 60% of national

[1] Transport sector includes transport by road, rail, air and sea.

[2] The NDC is a plan for reducing emissions and adapting to climate change. Countries in the Paris Agreement must develop an NDC and update it every five years (UNFCCC, 2023). South Africa's updated NDC targets are 398–510 MtCO2e by 2025 and 350–420 MtCO2e by 2030 (UNFCCC, 2023). South Africa does not specify quantitative targets for its transport sector.

emissions and is heavily reliant on coal (DFFE, 2022). While other sectors have managed to reduce emissions, the transport sector's emissions have continued to rise. The International Energy Agency (IEA) reports that global transport emissions grew at an average annual rate of 1,7% from 1990 to 2022, matching the growth rate of the industrial sector. This growth was temporarily interrupted in 2020, mainly by reduced travel and trading during the COVID-19 lockdown restrictions (UNFCCC, n.d.; IEA, 2023). Reducing emissions from transport requires strong regulations, fiscal incentives, and significant investment in infrastructure in low-carbon technologies (IEA, 2023).

Road transport is the largest contributor to emissions in the transport sector, accounting for 90% of the sector's total emissions[3] and 90% of total fuel consumption in transport (DoT, 2018; Climate Transparency, 2020). Most of these emissions are discharged by internal combustion engine (ICE) vehicles during vehicle operation, but manufacturers must also consider the emissions produced during the vehicle manufacturing process.

To effectively reduce emissions, the automotive industry must decrease its carbon footprint by both reducing the carbon intensity in vehicle production, and also encouraging consumers to switch from ICE vehicles to lower-carbon and more fuel-efficient vehicles. Technological advancements are making vehicle manufacturing greener, sustainable, and improving production processes. Several technological routes can lower the carbon footprint of vehicles. One strategy evaluates the potential of different low-carbon technologies, such as plug-in hybrid electric vehicles (PHEVs), battery electric vehicles (BEVs), and fuel cell vehicles (FCEVs).[4] Another strategy focuses on improving the overall efficiency of vehicles to reduce fuel consumption. The NBI's 2023 report on decarbonising South Africa's transport sector emphasises that without deliberate and coordinated local efforts involving key stakeholders in transport, the sector risks deviating from its climate commitments.

2.1. Fuel selection trends in South Africa's automotive market

Selecting lighter, fuel-efficient vehicles is a highly effective strategy for reducing carbon emissions from vehicles and saving on fuel costs. These vehicles not only generate fewer carbon emissions to contribute to a cleaner environment, but also require less resource use in their maintenance, compared to traditional ICE vehicles (Climate Action Accelerator, 2024). Unfortunately, the market for low-carbon fuel-efficient vehicles in South Africa is small.

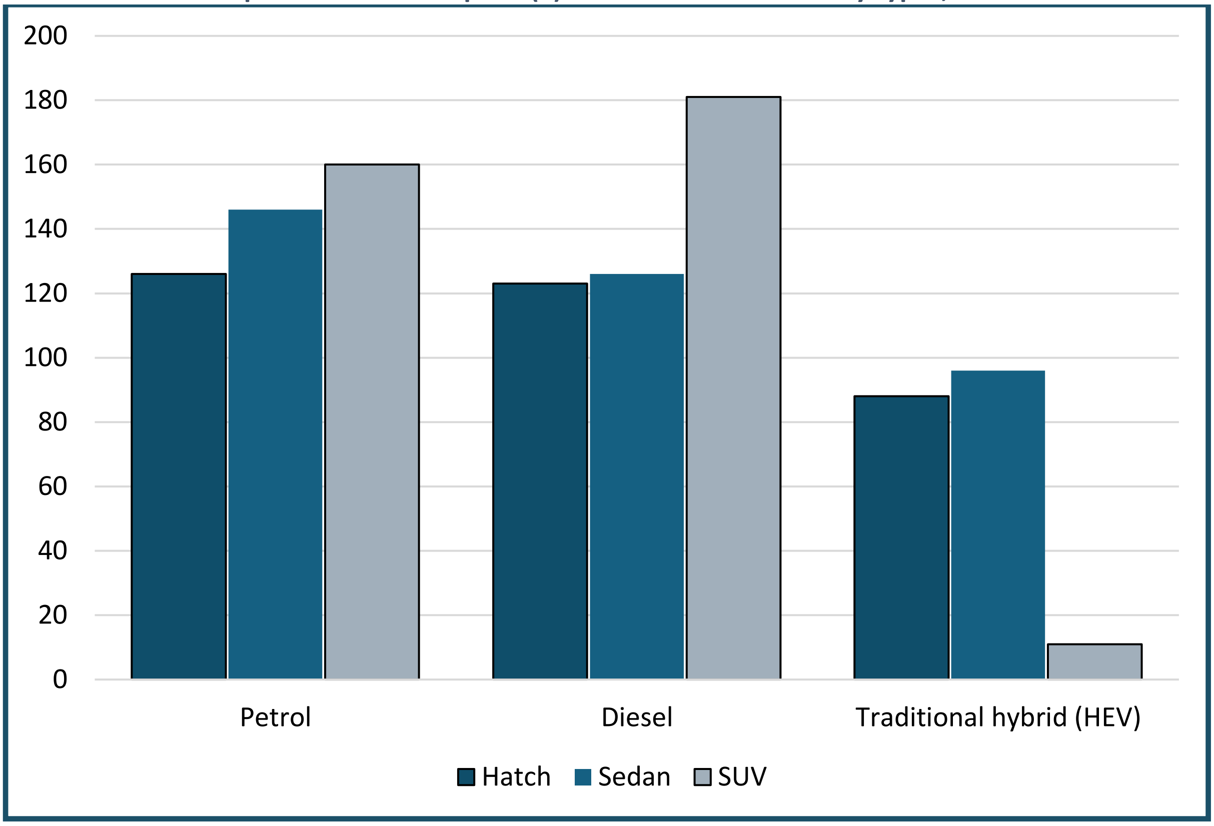
ICE vehicles, encompassing both gasoline and diesel models, remain the predominant choice among South African consumers, making up 99% of the new vehicle market in 2022 (naamsa, 2023b). Of this percentage, petrol vehicles represented 69% of the market, while diesel vehicles were the second-most popular option, accounting for 30% of sales. In contrast, EVs held a market share of just 0.9% in 2022, despite being the most fuel-efficient option available (naamsa, 2023b).

[3] Since 2010, DoT has reported that road transport contributes to 90% of emissions within the sector, demonstrating that emissions in the sector have remained stable over the years.

[4] The report on South Africa's automotive industry explores how emerging technologies, such as electric vehicles, autonomous driving, and smart manufacturing, are transforming the sector. It also discusses the integration of digital technologies like AI and IoT in optimising production and improving vehicle performance. The report can be accessed here: Industry Study: Technological Change in South Arica's Automotive Industry.

Graph 1 shows carbon emissions across different vehicle types including hatch, sedan, and SUV, classified by three fuel categories: petrol, diesel, and traditional hybrid vehicles (HEV). For petrol vehicles, SUVs are the highest emitters, accounting for 37% of emissions, followed by sedans at 34% and hatchbacks at 29%. Similarly, for diesel vehicles, SUVs lead with 39% of emissions, sedans contribute 33%, and hatchbacks make up 28%. In contrast, emissions from HEVs are significantly lower across vehicle types. This data highlights that while petrol and diesel SUVs are the highest carbon emitters, traditional hybrid technology significantly reduces emissions across all vehicle types, especially for SUVs. HEVs' fuel economy, regenerative braking, and their combined use of an ICE and electric motor cut pollutants and reduce GHG emissions, explaining this difference shown in Graph 1 (Veza *et al.,* 2023). The strong preference for larger vehicles, particularly SUVs, in South Africa, is a barrier to achieving carbon-emission-reduction targets in road transport.

Graph 1: Carbon footprint (a) of different vehicle body types, 2023



Data source: naamsa, 2023c. (a) Average grams of CO_2 per kilometre (gCO_2/km) per vehicle body type.

Adopting alternatives such as ethanol, compressed natural gas (CNG), and liquefied petroleum gas (LPG) to conventional fossil remains limited in South Africa. This can be attributed to the gas cliff [5] and the growing reliance on imported LPG to meet the shortfall, making new offtake agreements challenging. Instead, the country's automotive market can improve fuel efficiency and lower carbon emissions by promoting adoption of small and lighter vehicles and EVs. By focusing on these areas, the market can better integrate greener and more sustainable transport solutions.

[5] Gas cliff refers to the anticipated sharp decline in the LPG supply from Mozambique to South Africa (ESI Africa, 2024).

3. ASSESSING CARBON EMISSIONS IN VEHICLE MANUFACTURING: A VALUE CHAIN ANALYSIS

According to the United Nations (UN), the transport sector is a major contributor to global GHG emissions, accounting for approximately one-quarter of the total emissions worldwide. In 45% of countries, transport is the largest source of energy-related emissions, while in the remaining countries, it ranks as the second-largest source (UN, 2021).

In 2022, the top six GHG emitters China, the United States, India, European Union (EU27)[6], Russia and Brazil were responsible for about 62% of total global GHG emissions. These six regions represented 50% of the global population, 61% of the global Gross Domestic Product (GDP), and 63% of fossil fuel consumption (Crippa *et al.*, 2023). Notably, in 2022, China, the United States, and India all saw increases in their emissions, with the biggest rise, 5% compared to the previous year, in India (Crippa *et al*., 2023). In both the United States and China, the transport sector is the leading source of GHG emissions, contributing 28% to total GHG emissions in the United States and around 7% in China,[7] based on 2019 data (EPA, 2021; EPRS, 2022).

3.1. Greenhouse gas emissions in vehicle production

For the analysis of GHG emissions in automotive manufacturing, the United States, China, India, and the EU will be analysed. Data for South Africa is limited.[8] However, parallels can be drawn between South Africa and the countries assessed in market structure and dependence on fossil fuels for both vehicle production and consumption.

To effectively reduce the carbon footprint in the automotive industry, a value-chain approach is required, to cut emissions across the entire lifecycle of vehicles, including production, usage, and energy sourcing. Certain materials and components used in car manufacturing are highly carbon-intensive, and vehicle manufacturers are increasingly obligated to minimise carbon emissions both during the manufacturing process and in the use of vehicles. Graph 2 illustrates the lifecycle GHG emissions, measured in grams of CO_2 equivalent per kilometre (gCO_2 eq/km) for ICE vehicles and BEVs across four regions: Europe, India, the United States, and China. The emissions are categorised into several categories, such as vehicle production, battery production, maintenance, fuel/electricity production, and fuel consumption.

Across the four regions, fuel consumption is the most significant contributor to GHG emissions for ICE vehicles, as BEVs produce no tailpipe emissions. This underscores the importance of reducing reliance on fossil fuels and enhancing fuel efficiency in conventional vehicles. According to Troskie (2024), the lower emissions during the use phase of BEVs compensate for the initial carbon footprint associated with battery production, resulting in a reduced overall carbon footprint for EVs over their lifetime. Typically, an EV reaches "carbon parity" with an ICE vehicle within at least one year of operation. However, if the EV is powered by electricity from a coal-fired grid, this catchup period extends to over five years, as is the case in South Africa (Troskie, 2024; iPoint, 2024).

While the shift to EVs is a positive move toward achieving net zero emissions, it is anticipated that by 2040, 60% of a vehicle's emissions will come from the production of materials (Hannon *et al.,* 2020).

[6] In the EU27, all sectors except for the transport and power industries saw a reduction in their GHG emissions in 2022 (Crippa *et al.*, 2023).

[7] According to the EPRS 2022 report, the transport sector in China experienced the fastest growth in GHG emissions, increasing by 127% between 2005 and 2019.

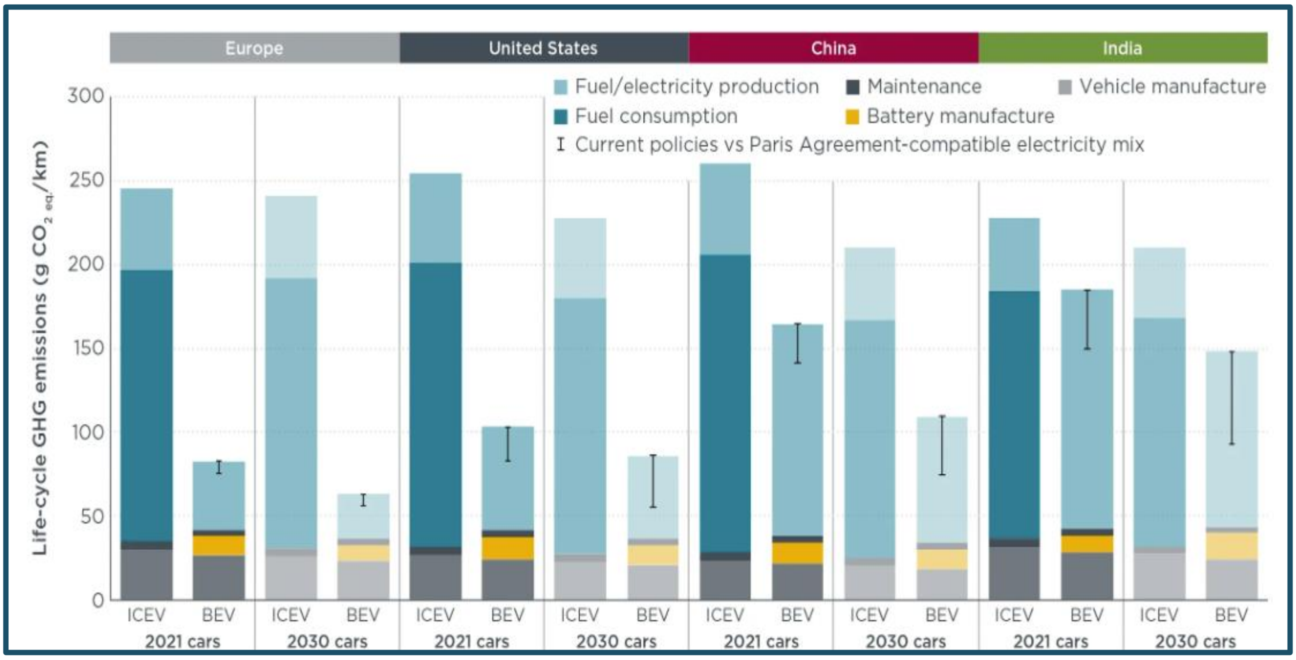
[8] Locally based vehicle manufacturers submit CDP reports, however access to these reports is limited. This report includes only Toyota, as it provides sustainability data specific to its Durban-based plant.

As the adoption of EVs increases, focus needs to shift to the materials used in their manufacturing, including the extraction of raw minerals and the production of components. The emissions profiles of BEVs vary by region, influenced by differences in energy sources, raw materials and manufacturing processes. For example, Europe benefits from a cleaner energy mix, leading to lower GHG emissions for BEVs, whereas the heavy reliance of China and India on fossil fuels results in higher emissions. Similarly, due to South Africa's high dependence on coal for energy generation, the country is also likely to experience higher GHG emissions compared to other countries. EVs play a key role in the shift towards sustainable transportation, especially when combined with renewable energy technologies to ensure clean production. The extent to which renewable electricity sources are available for charging varies by country, shaping how environmentally friendly operating an EV is, compared to a PHEV, a HEV, or an ICE vehicle.

Currently, South Africa does not produce BEVs, but two hybrid models — a Plug-in HEV (PHEV) and an HEV, are manufactured domestically, using chiefly coal-generated electricity. To reduce the carbon footprint associated with EV manufacturing, South African auto producers need to invest in a cleaner energy mix for their production processes.

BEVs also produce significant GHG emissions from the raw materials required for both vehicle and battery manufacturing. Steel and aluminium, for example, are key materials for EV production, but both are highly carbon intensive and unless these metals are produced using renewable energy sources, their carbon footprint will remain high, thereby increasing the emissions associated with EV production (Boston University, 2021; Maimele, 2024). In addition, battery manufacturing is highly resource-intensive, often requiring large amounts of water, energy, and land. China, the world's largest battery producer, relies heavily on coal for its production processes. According to Troskie (2024) and iPoint (2024), nearly half of the emissions linked to battery production could be reduced by relocating manufacturing to regions with a low-carbon energy mix.

Graph 2: Lifecycle GHG emissions of average medium-size gasoline ICE and BEVs registered in Europe, US, India, and China in 2021 (b)



Source: Troskie, 2024. (b) Lifecycle GHG emissions of average medium-size ICE vehicles and BEVs registered in Europe, the United States, China, and India in 2021 and projected to be registered in 2030. The error bars indicate the difference between the development of the electricity mix according to stated policies (the higher values) and what is required to align with the Paris Agreement.

Box 1: Toyota South Africa's sustainability reporting

The Toyota plant in Durban manufactures the Corolla Cross Hybrid alongside petrol models. Toyota's data shows its commitment to sustainability, focusing on efficiency, reduced emissions, and resource management aligned with global goals. While production emissions rose to 119 kilotons of CO_2 in 2021, up from 104 kilotons in 2020, carbon intensity per vehicle improved, falling to 860 kg CO_2 from 986 kg CO_2 in 2020 and 905 kg CO_2 in 2019. Water intensity also declined to 3 kilolitres per vehicle, and waste intensity saw a notable reduction to 17 kg per vehicle in 2021 from 22 kg in 2020, reflecting Toyota's sustained and strategic approach to sustainability.

Table 1: Toyota South Africa's Environmental Stewardship

	2019	2020	2021
Production emissions (kilotons CO2)	117	104	119
Carbon intensity (kg CO2/vehicle manufactured)	905	968	860
Water intensity (kl/vehicle manufactured)	4	4	3
Waste intensity (kg/vehicle manufactured)	20	22	17
Volatile organic compounds (VOCs) emitted (g/m2 body paint applied)	19	18	18

Source: Toyota South Africa Sustainability Report, 2021/2022

3.2. Investment in clean vehicle production and greening the automotive value chain

Suppliers in the automotive industry are often driven by requirements from vehicle manufacturer contracts and regulations, which may specify the need for carbon footprint assessments. While vehicle manufacturers and suppliers operate with different scopes, opportunity exists for alignment and collaboration, to ensure sustainability, transparency and uphold social responsibility across the supply chain (iPoint, 2024).

One path to green manufacturing involves using renewable energy technologies in production. Vehicle manufacturers are increasingly adopting solar and battery storage in their manufacturing processes. Various global stakeholders in the automotive industry, led by BMW, Toyota, Volkswagen and the World Business Council for Sustainable Development, have jointly launched the Automotive Partnership for Carbon Transparency (A-PACT). A-PACT aims to publish a methodology to help companies calculate the total emissions generated by automotive parts over their life cycle. This consequently pushes suppliers to green their components and processes to meet producer requirements for products to qualify as green. BMW has also committed to sourcing batteries and a significant portion of its steel and aluminium from suppliers using renewable energy (Reuters, 2022).

South African manufacturers need to green their operations to remain competitive in international markets due to several factors including the adverse effects of historical and unpredictable load shedding on the industry and economy, mandates from their global headquarters, carbon border adjustment taxes, and the global shift towards sustainable and clean energy production. Component manufacturers also need to align with vehicle manufacturers' green platforms to remain competitive across the chain

Local manufacturers, including Ford, Toyota, and Mercedes-Benz South Africa (MBSA), are at the forefront of investing in renewable energy to reduce the automotive industry's dependence on coal-generated electricity and foster greener manufacturing practices. These investments align with their global strategies to minimise the carbon footprint from vehicle manufacturing. Ford's "Project Blue Oval," in collaboration with SolarAfrica, produces 13,5 MW of solar power, meeting 35% of the plant's electricity requirements (Ford, 2022). This project aligns with Ford's global objectives to use 100% carbon-free electricity by 2035 and achieve carbon neutrality by 2050. MBSA has announced an investment of R100 million to install 22 847 solar panels at its East London plant, targeting over 70% of its production energy needs to be met by renewable sources under its Ambition 2039 strategy[9] (Mercedes-Benz, 2022). Toyota plans to fully transition to renewable energy by 2028, backed by an announced investment of R800 million (Venter, 2023). These efforts demonstrate the industry's commitment to sustainability and reducing its carbon footprint, representing a significant step forward for a country and industrial base that relies heavily on coal.

3.3. Automotive circular economy

The adoption of EVs presents opportunities for auto component manufacturers to contribute to a degree of circularity in the economy. The circular economy could help minimise carbon emissions and associated negative externalities in autos, while also creating employment opportunities in the industry. The core principles of a circular economy include eliminating waste and pollution and keeping critical materials circulating in supply chains, potentially reducing raw materials costs (TIPS, 2024). Reducing the carbon footprint in vehicle manufacturing involves implementing various strategies aimed at minimising emissions and enhancing energy efficiency throughout the production process, and these can include incorporating more sustainable materials such as bio-based plastics, sustainable composites, and recycled materials. This could be achieved by establishing closed-loop systems in the automotive manufacturing process, which would enable the recycling of materials like steel, aluminium, and plastics, thereby minimising waste and reducing the demand for virgin raw materials.

Tyres and EV powertrain components, specifically lithium-ion batteries (LIBs) are among auto components that can become a crucial part of the circular automotive economy. Batteries can be recycled or used in second-life applications. Recycling, reuse and repurposing battery materials can minimise waste and reduce the environmental footprint of disposal. In South Africa, initiatives focus on tyre recycling and repurposing second-life batteries, particularly in the storage market (TIPS, 2024).

Achieving circularity for both tyres and batteries requires collaboration and coordinated efforts from all automotive stakeholders across the value chain to work together in decarbonising the industry and making circularity a reality. For both components, South Africa must carefully consider who would be responsible for the recycling mandate and to assess how to ensure a consistent supply of waste.

[9] Mercedes Benz has a global strategy for all Mercedes-Benz production plants globally to run 100% on renewable energy with zero carbon emissions by 2039 (Mercedes-Benz, 2022).

3.3.1. Sustainability in automotive retail

According to the Retail Motor Industry Organisation (RMI), South African automotive manufacturers are heavily investing in research and development (R&D) to promote sustainability. Functional vehicle parts are salvaged and sold a s spare parts, while unusable parts are recycled or disposed of by licensed waste management providers to minimise their environmental impact (Formex, 2019). Additionally, vehicle manufacturers are increasingly using recycled plastics in new vehicle interiors (Formex, 2019).

4. THE POLICY LANDSCAPE IN SOUTH AFRICA'S AUTOMOTIVE INDUSTRY AND THE TRANSITION TO SUSTAINABILITY

Governments worldwide have introduced measures to discourage the use of ICE vehicles and disincentivise consumers from buying them. Policymakers frequently use vehicle and fuel taxes to reduce emissions in the transport sector. These are primarily fiscal tools, with vehicle taxation being a primary strategy to encourage adoption of less-polluting cars. Taxes are imposed at different stages, including at the point of purchase (such as sales taxes, feebates[10], and tax incentive programmes), during ownership (for example annual license renewal fees and one-time excise taxes), and on fuel consumption (in the form of carbon taxes based on carbon emissions and engine capacity) (OECD, 2022). Additional methods to lower emissions include improving fuel standards and improving public transport and infrastructure to reduce dependence on private vehicles.

Table 2 shows various levies and taxes on transport fuels and vehicles aimed at regulating emissions. Vehicle taxation includes duties based on vehicle price and carbon emissions taxes for vehicles exceeding certain emission levels, alongside varying road licensing fees based on vehicle weight across provinces. The automotive industry is subject to three categories of carbon taxes aimed at influencing the composition of South Africa's vehicle fleet, promoting greater energy efficiency and environmental sustainability. The environmental taxes currently do not apply to EVs, and in some governments, changes have been made to promote EV adoption. This includes evaluating tax policies to encourage EV use, such as restructuring the ad valorem tax and excise duties, reducing registration and road licensing fees, and providing exemptions on consumption taxes.

Although taxes are widely used for environmental issues, they are not without problems. The ad valorem tax is the only carbon-based tax applied to the purchase, registration, or use of private vehicles in South Africa (Nkosi *et al*., 2021). However, its effectiveness has been limited, prompting carbon tax reforms in 2013. A study by Nkosi *et al*. (2021) analysed vehicle sales from 2013 to 2018 and found that the reforms significantly reduced emissions by shifting consumer preferences toward low-emission vehicles and away from larger, more powerful vehicles. Low-carbon vehicles rose to 31% of total sales in 2018, up from 13% in 2010. Despite these gains, the study found that the emissions reductions achieved by the tax were minimal compared to the increases in fleet emissions driven by the expanding vehicle market. The study concluded that to achieve a greater impact in effectively lowering emissions, further restructuring of the tax policy, alongside increasing the availability of affordable low-carbon and zero-carbon emission vehicles, is needed in the market.

[10] Feebates is a fee that is levied on the purchase of vehicles with high CO_2 emissions and then the revenue is used to incentivise the purchase of vehicles with zero or low CO_2 emissions in the form of a rebate (Wappelhorst, 2022).

The Electric Vehicle White Paper published in 2023, states that the carbon tax, which applies broadly across industries, is to increase over time. This progression is expected to help achieve price parity between ICE and EVs, particularly when factoring in the total cost of ownership (the dtic, 2023).

Table 2: Levies and taxes on transport fuels and vehicles.

SECTOR	LEVY	APPLICATION	TAX RATE
Transport fuels	General fuel levy	Petrol, diesel and biodiesel	322 cents per litre for petrol, 161 cents per litre for diesel and 337 cents per litre for biodiesel
	Road accident fund levy	Petrol, diesel and biodiesel	193 cents per litre
	Equalisation fund levy	Petrol, diesel and biodiesel	Zero
	Customs and excise levy	Petrol, diesel and biodiesel	4 cents per litre
Vehicle taxation	Ad valorem customs and excise duty	Light vehicles and commercial vehicles, passenger vehicles	Graduated rate based on vehicle price with an upper ceiling of 20%
	Carbon emissions of new passenger vehicles	All new passenger vehicles	R110/g CO_2/km for emissions exceeding 95g/km
	Carbon emissions of passenger double cabs		R176/g CO_2/km for emissions exceeding 175g CO_2/km
	Road licensing fees	All registered vehicles	Fees vary between different provinces, usually based on weight

Source: South African Revenue Service (SARS) in 2022 amended Part 3D of Schedule No.1 to the Customs and Excise Act, 1964: Environmental Levy on Carbon Dioxide (CO_2) Emissions of Motor Vehicles

In addition to taxation, South Africa has introduced several policies to reduce vehicle pollution, including a ban on second-hand vehicle imports. While this ban protects the local automotive industry, it also caters for environmental concerns by preventing the entry of older, high-emission vehicles. The African continent is often considered an attractive destination for outdated, polluting cars, but South Africa aims to limit their use and mitigate pollution. The EU introduced emission standards (Euro standards) to mitigate the environmental impact of pollutants from ICE vehicles. While all diesel-powered vehicles in the EU adhere to the stringent Euro 5 standard, this level of fuel quality is still not widely available in South Africa.[11] Since 2008, new passenger vehicles in South Africa are only required to meet Euro 2 emission standards, with dealerships mandated to display labels indicating fuel efficiency and carbon emissions to help consumers make informed choices based on emissions data (Vosper and Mecure, 2016; Focus on Transport, 2010). However, as noted by Focus on Transport (2010), plans to implement Euro 4 and Euro 5 standards have been delayed in South Africa due to challenges in producing and supplying the required higher-specification fuels. This delay limits the availability of highly fuel-efficient diesel vehicles in the local market. The introduction of carbon taxes

[11] The Euro 5 standard of fuel has a low sulphur content, which improves the combustion process in the engine, resulting in lower carbon and nitric oxide exhaust emissions.

on new vehicles should align with the availability of Euro 4 and Euro 5 fuels in South Africa (Focus on Transport, 2010).

The EV White Paper emphasises the important role of the South African automotive industry in reducing the country's total GHG emissions. Its vision and strategy focus on adopting sustainable manufacturing practices across the automotive value chain including lowering GHG emissions and improving environmental sustainability. However, the pace of South Africa's transition to sustainable transport is influenced by its current energy mix, which is dependent on coal, with a high carbon footprint. The White Paper also underscores the importance of greening the energy grid, not only to tackle climate change and diversify energy sources but also to maximise the benefits of transitioning to EVs (the dtic, 2023). On reduction of GHG emissions, the EV White Paper is complemented by the Green Transport Strategy (GTS), which is founded on sustainable development principles. The GTS aims to promote green mobility, ensuring that the transport sector contributes to green economic growth targets while protecting the environment (the dtic, 2023). A key strategic pillar of the GTS emphasises promoting EVs as a crucial step toward decarbonising the transport sector by 2050.

5. ALIGNING WITH GLOBAL EV TRENDS: IMPLICATIONS FOR SOUTH AFRICA'S AUTOMOTIVE INDUSTRY

The South African automotive industry is export-oriented, with over 70% of the country's vehicle exports going to Europe, with the United States and Japan also key destinations (naamsa, 2023a). The global shift towards fuel-efficient vehicles is growing, with governments, particularly in advanced economies, adopting policies to promote low-carbon vehicles and decarbonise their automotive industries. The EU and the UK have set ambitious emissions reduction targets and policies to limit fossil fuel use in the automotive sector. Measures include the planned 2035 ban on new petrol and diesel vehicles. Japan aims to phase out the sale of new petrol, diesel, HEVs, and PHEVs by 2030 (Climate Action Tracker, 2023). For South Africa's major export markets, both the UK and the EU have introduced carbon border tax adjustments (CBAM), which aim to price the carbon emissions of imports in line with the EU's carbon pricing (Monaisa, 2021). This is especially concerning, as a TIPS study reveals that South African exports, including automotive products, are significantly more carbon-intensive than those from other countries (TIPS, 2023).

Automotive-related exports, such as passenger vehicles, trucks, and catalytic converters, will face significant challenges due to the global shift toward electric mobility. The impact on these automotive trade products is evident in TIPS' international trade report, which highlights components at risk from this transition. While catalytic converters and ICE components are particularly vulnerable, others, like tyres, leather seats, and tooling, will continue to be essential for both ICE and electric vehicles (Moshikaro-Amani and Mahlangu, 2024). Reducing carbon emissions is important for maintaining access to export markets, especially in regions like the EU, the UK, and the United States, where CBAM and other trade measures are increasingly being used to meet climate and industrial policy goals. To ensure the automotive industry's long-term success, sustainability, and competitiveness, adopting green manufacturing practices is essential. South Africa's drive toward EV production and investment in renewable energy technologies is motivated more by the need to align with key export markets and by the global strategies of vehicle producers, than by domestic climate change policies.

6. CONCLUSION

The transition to sustainable transport, including both automotive manufacturing and vehicle usage, must align with the country's broader energy transition goals. South Africa's heavy reliance on coal presents a major challenge to producing green vehicles, even if they are electric. Additionally, if South Africa aims to localise battery production, it must reduce the resource-intensive nature of mineral extraction and prioritise recycling practices. Achieving sustainable manufacturing would require a cleaner energy mix. The EV White Paper emphasises supporting South Africa's manufacturing capacity to facilitate transition to EVs. However, the lack of a clear strategy to drive demand for EVs, not only for passenger vehicles but also for medium and heavy commercial vehicles and public transport, is hindering the progress of this rollout. A shift toward a more sustainable transport sector is essential, including transitioning to more efficient transport modes such as reducing car use, shifting road freight to rail, and expanding public transport options. Additionally, a rapid shift to renewable energy is vital for EV transition, and subsequently, reducing the transport sector's environmental footprint.

Meeting sustainable goals in the transition will be challenging and it will require integrated policy support, coordinated infrastructure investment, and strong collaboration among key stakeholders. Policy plays a vital role in promoting transport sustainability by setting emission standards, encouraging adoption of EVs, and investing in supporting infrastructure to reduce emissions and enhance the overall efficiency of the transport sector.

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