THE NEED FOR SOUTH AFRICA TO ADOPT STANDARD SIGNAGE AND SYMBOLS FOR LOW AND ZERO EMISSION VEHICLES (LZEVs)

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ABSTRACT

South Africa currently has the 15th highest carbon dioxide emissions in the world (Worldometer, 2022). In 2018, the country introduced the Green Transport Strategy, a long-term plan that aims at decarbonising the transport sector. This is in support of the national climate change strategy amongst others. One of the objectives of the green transport strategy is to engage the low carbon transition of the sector, to assist with the aligning and developing of policies which promote energy efficiency and emission control measures in all transport modes (NDoT 2018). With current strides in policymaking and developments in introducing more electric vehicles in the market, it therefore remains imperative to ensure that road users are safe.

Currently there are no national standardised signs, symbols, or pavement markings in South Africa to identify Low and Zero Emission Vehicles (LZEVs) charging infrastructure or charging locations. Some stakeholders and agencies have commenced installing some signage without a clear national standard and this can potentially cause frustration amongst drivers and consequently pose a risk for road users. This research will study current rollout of LZEV signage in South Africa, the need to standardise this rollout and learning from other countries on what the trends are.

1. INTRODUCTION

South Africa is Africa's most industrialised economy, and one of the biggest economies in the continent (AFDB, 2022). According to eNATIS (2017), there was a total of 12 128 088 registered vehicles on South Africa's roads at the end of 2017. This figure increased to 12 963 139 by the end of 2021 (eNATIS, 2021), a 6.5% increase in 4 years. Due to the past and current dependence on fossil fuels, this development inevitably comes with a lot of challenges, including carbon emissions. Currently, South Africa is ranked 15th in the world in terms of the highest carbon dioxide (Worldometer, 2022).

It, therefore, remains incumbent upon the country to introduce ways of reducing carbon omissions, particularly with fossils fuels, one of the highest contributors. In 2018, South Africa introduced the Green Transport Strategy, a long-term plan that aims at decarbonising the transport sector. This is in support of the national climate change strategy amongst others. One of the objectives of the green transport strategy is to engage the low carbon transition of the sector, to assist with the aligning and developing of policies which promote energy efficiency and emission control measures in all transport modes (NDoT, 2018).

Currently there are no national standardised signs, symbols, or pavement markings in South Africa to identify Low and Zero Emission Vehicles (LZEV) charging infrastructure or charging locations. Some stakeholders and agencies have commenced installing some signage without a clear national standard and this can potentially cause result in:

- signage that confuses road users.
- increase in the risk of vehicles running out of charge - becoming a potential traffic hazard.
- difficulty in enforcement of parking violations.
- difficulty in access to dedicated parking areas.

2. CURRENT IMPLEMENTATION AND PROGRESS

Electric vehicles were first reported in South Africa in the 1970s. Development of the industry in the country was not sufficiently promoted, however, and faded away until it was revived in 2013 with the introduction of the Nissan Leaf (Toloane & Moeletsi, 2021). Since then, EV uptake has slowly increased, with SA currently having the most advanced e-mobility market in Africa (Statista, 2023). The EV market in the country has reached around 1 332 vehicles on local roads by the end of February 2021, up from 1 119 at the end of 2019 (Malinga, 2021). South Africa is also ranked fifth globally in the ratio of public EV charging stations, with only Korea, Chile, Mexico, Indonesia, and the Netherlands having more chargers per EV than the Southern African state (Malinga, 2021). In 2021, SA managed to sell a total of 218 EVs. A breakdown of different models sold in that year is shown in Table 1. This number is higher compared to other developing countries, but substantially low against markets in Europe, Eastern Asia, North America, and Australia. The Department of Transport has also developed a strategy that aims at ensuring that up to 5% of the vehicle fleet of government and state-owned enterprises will be electrified by 2030 (Department of Transport, 2018). The direction and trajectory of EVs in SA is indicative of a gradual but steady adoption of EVs and therefore leaves the country with the responsibility of ensuring that there is enough infrastructure to meet this demand.

Table 1: EV Sales in SA by end of 2021 (My Broadband 2022)

EV Sales in SA in 2021	
Model	**Number Sold**
Mini Cooper SE	68
BMW iX	63
Porsche Taycan	33
BMW i3	20
Jaguar I-Pace	19
Audi E-Tron	15
TOTAL	**218**

With current strides in policymaking and developments in introducing more electric vehicles in the market, implementation of infrastructure therefore becomes imperative to ensure that South Africa does not lag, but most importantly, that road users are safe. Currently, albeit gradually, different, non-standardised, signage is being installed in different cities, across a variety of land uses such as airports, petrol services and some public facilities and as shown on Figure 1, 2 and 3 below.

Figure 1: Nissan SA and BMW Group joint electric vehicle & plug-in hybrid electric vehicle (PHEV) charging stations in Western Cape (Oudtshoorn Courant 2016)

Figure 2: Blue-Painted EV Charging Bay at OR Tambo International Airport (BMW Group 2019)

[1]**Figure 3: Green-Painted EV Charging Bay in Gauteng (March 2022)**

Figure 4: Parking for EVs in Cape Town (Oudtshoorn Courant 2016)

[2]**Figure 5: Parking for EVs at CSIR Premises (By Author 2022)**

3. CHALLENGES WITH CURRENT IMPLEMENTATION OF INFRASTRUCTURE

The gradual but steady adoption of EVs in South Africa is fast outpacing implementation of its related infrastructure. This is mostly the case for charging stations and signage. For the latter, it becomes even more imperative to address the gap as it could potentially frustrate road users, directly impact the economy, and can even lead to crashes. Currently, South Africa has no standardised road signage for EVs and LZEVs. Different authorities, agencies and companies that are currently installing signage related to EVs, use their own

[1]Figure 2 and 3 show contrast between colours used on parking bay. Figure 2 uses blue paint to demarcate EV bay while Figure 3 uses green.
[2] Figure 4 and 5 show contrast between colours and symbols, with the former having a *"charge now"* text and an electric cord while the latter shows a liquid fuel pump that incorporates 'EV' text.

discretion with regards to colours and symbols and texts depicting parking bays for electric cars, charging stations and in some cases, access lanes for LZEVs.

There is a lot of available literature to suggest that this lack of uniformity or standard in signage is a risk to vehicle drivers. Mitchell (2010) puts emphasis on the appropriateness of road sign characteristics in influencing driver attention as shown on figure 6. Mitchell also points out that drivers do not attend to every sign as it is not cognitively manageable or safe to do so. Lastly, this research by Mitchell affirms that signs must be designed well, and authorities should avoid anything that could confuse drivers. The lack of standard colour, symbols, or markings as part of road signage is a risk as it opens itself up to possibly confusing signage by different authorities.

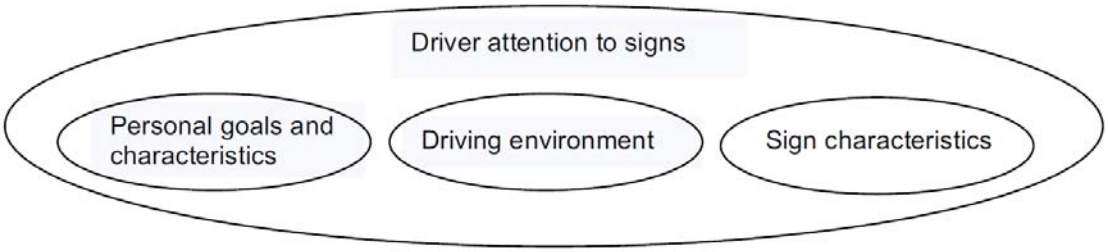

Figure 6: Variables affecting attention to road signs (Mitchell, 2010)

4. METHODOLOGY

In attempting to find solutions to the problem of South Africa having no standardised signage for Low and Zero Emission Vehicles (LZEVs), this paper will study current signage used by countries that are far more advanced in the implementation of LZEV infrastructure. The aim of this research is therefore, to recommend some uniformity in the use of colours, symbols and details used in the signage of various countries. This research will, however, not propose specific signage to be adopted for use in South Africa.

Various countries have their own pictogram or symbols representing EVs and EV charging stations. The US has developed a specific road sign for EV charging stations that looks like a standard liquid fuel pump with the letters “EV” and with an electric cord and plug replacing the typical liquid fuel nozzle (California Department of Transportation, 2013). Sweden has adopted signage showing a silhouette of a car with an electric cord pointed to a device showing an electric bolt. Belgium has advocated EV charging signage based on other existing international signage for alternative fuels that shows a black silhouette of a fuel pump with an electric cord and plug in front of a blue “shadow” fuel pump that represents other fuel availability. France is using a stylized car logo with an electric plug trailing away from the body of the car (Ausroads, 2022). These and other signs are also being used to identify designated public parking places designed for EV plug-in charging. Some cities use symbols, while others – such as London (UK) – have longer descriptive statements about allowed times and conditions for using dedicated EV parking places with recharging capability (AFDC, 2012). The research focused on the UK, Germany, France, USA, Australia and New Zealand as these are advanced in the implementation of LZEVs and its related infrastructure. With regards to signage, the study considered the following:

- Parking bays for electric vehicles.
- Parking while charging.
- Charging stations for electric vehicles.
- Access lanes for electric vehicles (where applicable).
- Parking for hydrogen fuel-cell powered vehicle (where applicable).

Table 2: Typical EV and LZEV signage used in the UK (Adapted from Ausroads 2022, UK Department of Transport 2019, PR0667 CamCycle 2020)

Sign/Symbol	Type of sign and Source	Description and considerations
 	**Parking** UK Department of transport (2019)	• Different symbols are in use to identify light vehicles (cars) and motorcycles/scooters • Symbols also show specific plug type (3-prong UK-type plug) rather than a generalised 2-prong plug
 	**Parking while charging** UK Department of transport (2019)	• Electric-powered vehicle symbols (car and motorcycle, see Table 2.1) are used in addition to regular parking symbol (capital 'P') and text
	**Access to lanes and roadways for EVS and HFPV** PR0667 CamCycle (2020)	• Green zero-emission vehicle (ZEV) symbol on main transit lane sign • Experimental text-based additional information sign allowing ZEVs to use bus lanes (Cambridgeshire)

Table 3: Typical EV and LZEV signage used in Germany (Adapted from Ausroads 2022, ADAC 2021, VZKAT 2019)

Sign/Symbol	Type of sign and Source	Description and considerations
	**Parking** ADAC (2021), VZKAT (2019)	• Symbol used to identify EVs • Symbol can be used in conjunction with existing parking sign (capital 'P') to indicate electric-powered vehicle only parking
	**Parking while charging** VZKAT (2019)	• EV parking while charging sign • Text based restriction 'electric vehicle while charging' is used as an add-on to the parking sign/symbol ('capital P')
	**Charging Station for EVs** ADAC (2021)	• German EV charging station
	**Charging for Hydrogen fuel-cell powered vehicles** ADAC (2021)	• German hydrogen charging station

Table 4: Typical EV and LZEV signage used in France (Adapted from Ausroads 2022, NADEM 2016, ITC 2011)

Sign/Symbol	Type of sign and Source	Description and considerations
 	**Parking** National Association for the Development of Electric Mobility (2016)	• Sign with symbol used to identify an electric-powered vehicle • The same EV symbol is also used in other European jurisdictions (e.g. Portugal)
 	**Parking while charging** Inland Transport Committee (2011b), National Association for the Development of Electric Mobility (2016)	• EV parking while charging only sign (according to the French Road Rules M6i and CE15i) • Electric-powered vehicle symbol (see Table 2.1) and text 'forbidden except for' are used in addition to regular no-stopping sign (red and blue circle with red diagonal slash)
	**Charging Station for EV** National Association for the Development of Electric Mobility (2016)	• Information signage for a petrol station and charging location depicting a petrol bowser and EV symbol

Table 5: Typical EV and LZEV signage used in US (Adapted from Ausroads 2022, California Department of Transport 2013, PEV Collaborative 2012)

Sign/Symbol	Type of sign and Source	Description and considerations
	**Parking** PEV Collaborative (2012)	• EV Charging Symbol with FHWA Approval • EVs can park without necessarily charging
 	**Parking while charging** California Department of Transportation (2013)	• Text-based EV parking while charging signs • Options for expecting EVs from a no-parking restriction (red signs), or for specifically allowing EVs to park only while charging (green signs) • Green signs also include a charging time restriction applying to certain hours of the day
	**Charging Station for Evs and Hydrogen fuel-cell powered vehicles** (Freeway and charging station) California Department of Transportation (2020) PEV Collaborative	• Information sign for a hydrogen refuelling station • Letters 'EV' are used to refer to electric-powered vehicles

Table 6: Typical EV and LZEV signage used in Australia and New Zealand (Adapted from Ausroads 2022, AEVA 2020, Transport for New South Wales 2014)

Sign/Symbol	Type of sign and Source	Description and considerations
 	**Parking** National Association for the Development of Electric Mobility (2016)	• Sign with symbol used to identify an electric-powered vehicle • The same EV symbol is also used in other European jurisdictions (e.g. Portugal)
 	**Parking while charging** Queensland Department of Transport and Main Roads (2020), Department of Planning, Transport and Infrastructure (2021) Transport for New South Wales (2014)	• Example of sign in Qld to ensure that designated parking spaces are only occupied while charging • Ensures that designated spaces are only occupied by electric-powered vehicles while they are being charged (electric-powered vehicle parking only without charging or after charging is complete is not allowed)
	**Charging Station for EVs** Australian Electric Vehicle Association (2020)	• Yellow symbols are for pavement markings only • EV charging station symbol used for both motorist service signs and parking signs (at vehicle bays) • The letters 'EV' are used to refer to electric-powered vehicles
	**Access to lanes and roadways designated for low emission vehicles** Australian Electric Vehicle Association (2020)	• Transit lane for use by zero emission cars (until 2023)

5. CONCLUSION

Although there is no general global standard on EV signage, most countries have a standard for EVs and LZEVs as shown in this paper. Even if each of the respective countries studied in this paper have different standards, there appears to be similarities in terms of key details of the symbol or text, i.e., EV text, a cord, or car symbol. Most use symbols over texts or letters, and only add text where required. A lot of countries make the key details of the symbol as large and clear as possible. South Africa will be implementing a lot of LZEV-related infrastructure in the form of charging stations, signs to illustrate parking bays only reserved for EVs, road signs depicting distances to nearest charging stations and other key signage related to EVs.

In conclusion, the intention of this paper is not to prescribe specific signage or symbol but to merely propose what is widely in use and this will still need to be within the guidelines of the Road Traffic Signs Manual under the jurisdiction of the Department of Transport. Currently, as shown on the literature above, most countries use two colours, blue and white for EVs and green and white for LVEZs respectively, and some, such as London use both for their zones demarcated for Ultra Low Vehicle Emission Zone. An example of a Blue (and white) EV text, and cord for EVs is shown on Figure 7. An example of the LZEV symbol is also shown on Figure 8.

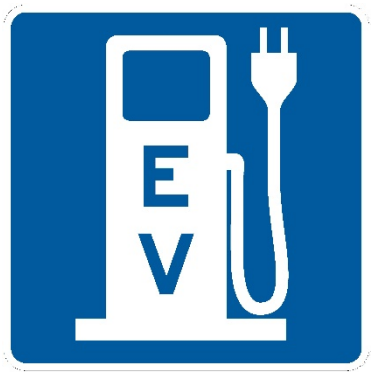

Figure 7: Typical EV parking sign

Figure 8: Typical LZEV parking sign

This paper therefore recommends that the Department of Transport adopts standard signage and symbols for the use of LZEVs. The two predominant colours are blue and green, with minimal writing and communicative, clear symbols. This should also be used in privately-owned infrastructure for uniformity purposes.

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