

# Driving Change: How Electric Vehicles Can Rise in the Global South

*Unlocking the economic potential from vehicle electrification*



## About Carbon Tracker

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The Carbon Tracker Initiative is a team of financial specialists making climate risk real in today's capital markets. Our research to date on unburnable carbon and stranded assets has started a new debate on how to align the financial system in the transition to a low carbon economy.

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## Acknowledgement

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### **Power Shift Africa**

This report is published in association with Power Shift Africa. Power Shift Africa is a think tank providing cutting-edge analysis, solution-focused policy ideas, and up-to-the-minute media engagement from an African perspective, both within the continent and internationally. Carbon Tracker would like to acknowledge their overall contribution to the report, peer review and case studies section. The contributors from Power Shift Africa are:

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# 1 Key Findings

1. **The Global South's reliance on ICE vehicles, and the dependency on fossil fuels, is not benefitting the region economically.** The Global South fleet is dominated by ICE (Internal Combustion Engine) vehicles, most of which are used car imports from the Global North and China. Despite having net zero ambitions, **most automakers aim to continue ICE vehicle sales in regions with no/limited vehicle emissions policy i.e. the Global South.** This will exacerbate the Global South's dependency on fossil-fuels for transportation.
2. Unless positive policy action is taken, there is a **risk the Global South will become indefinitely locked into this fossil fuel path dependency.** In the short- to mid-term, the Global South will import even more ICE vehicles as the Global North substitutes its fleet with BEVs (Battery Electric Vehicles). In the longer term, used BEVs will stay within the Global North region and recycled for critical battery materials circularity. This means the Global South will not have access to used BEVs, rather instead a dwindling pool of used ICE vehicles.
3. **The Global South can leapfrog to BEVs: BEVs lower barriers to entry for domestic manufacturing, for market and country participants, and opens other opportunities across the value chain.** Electric vehicle technology has already progressed to a stage where the **Global South can remove its dependency on fossil fuels** and effectively leapfrog to BEVs.
4. **Taking advantage of BEV technology improvements now means Global South countries can reap financial/ economic rewards, as well as lower costs for consumers (vehicle purchase price and operating costs).** Delaying the switch to BEVs would be detrimental to Global South countries and a missed opportunity that could be lost indefinitely if swift action is not taken.
5. For the leapfrog to BEVs to occur (point 3) and for the Global South to benefit from the transition to zero emission mobility, first **there needs to be a policy environment conducive to enable widespread adoption of BEVs.** Policy actions include an emissions policy to phase out ICE vehicle sales, both new and used, alongside a comprehensive industrial strategy to facilitate involvement in the BEV value chain and infrastructure, including incentivisation of domestic BEV manufacturing and sales.

## 2 Executive Summary

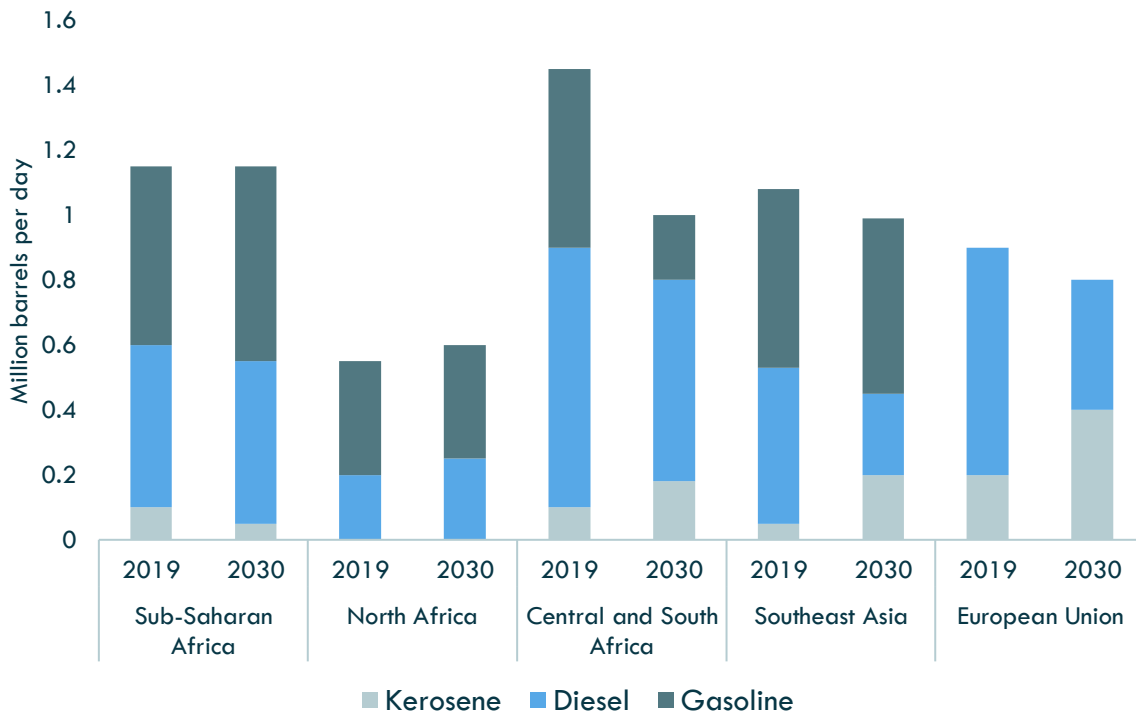
### Stuck in first gear: The Global South’s Dependence on Fossil Fuels for Transport

The global deployment of Battery Electric Vehicles (BEVs) is geographically divided; the passenger vehicle fleet in the Global North is rapidly decarbonising through deployments of zero tailpipe emission vehicles. Conversely, new and used BEV sales volumes in the Global South are insignificant. This is largely expected as most new vehicle sales are in developed countries, while the Global South is predominantly an export destination for used internal combustion engine (ICE) vehicles from the Global North.

Approximately three million used vehicles are imported into the Global South annually after they have reached the end of their useful life in the Global North. Reliance on ICE vehicles is not economically benefitting the Global South and has:

- **Transformed the region into a net importer of transport fuels** (Figure 1), a significant capital and foreign exchange outflow, despite the presence of sizable oil producing nations in the Global South. For instance, Africa’s annual expenditure on transport fuels equates to approximately \$80bn or 2.5% of the continent’s GDP. The Global South is expected to be a net importer of transport fuels beyond 2030.
- With some exceptions, **reduced the Global South to a mostly passive role** in the automotive sector, offering limited economic opportunities.

FIGURE 1: NET IMPORTS OF TRANSPORT FUELS IN SELECTED REGIONS

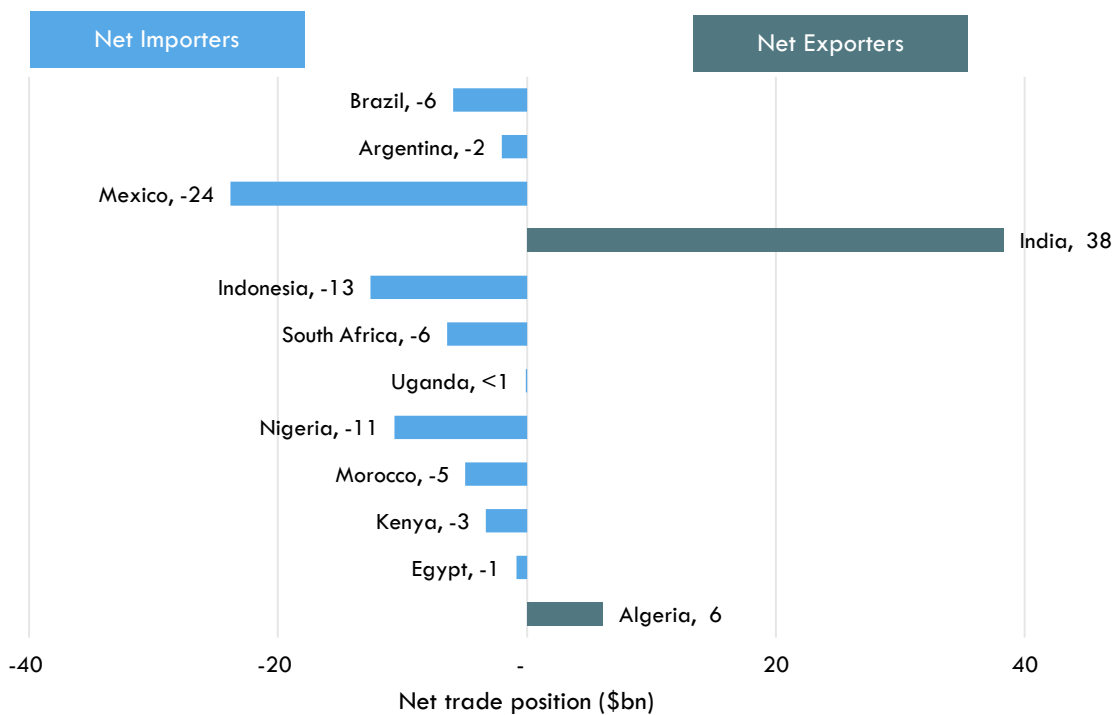


Source: Sustainable Africa Scenario, IEA Africa Energy Outlook 2022

For many countries in the Global South, there is trade deficit for refined petroleum products to meet demand for road transportation. As domestic oil refining capacity cannot meet fuel demands in many countries in the Global South, net fuel imports are likely to remain a significant expenditure and an on-going dependency. The Global South net importers are a price-taker of transport fuels, with prices dictated by market factors outside of their control (global oil prices, OPEC, etc.). In Figure 2, Carbon Tracker shows the net imports/exports of refined petroleum products for use in road transport in 12 Global South countries (countries chosen based on economic size).

Eventually the ICE vehicle fleet in export destinations (in the Global North and Global South) for transport fuel net exporters of refined petroleum products will be substituted by BEVs. This is a significant risk for these transport fuel exporting nations and diversifying to opportunities in the Battery Electric Vehicle Value Chain is recommended as oil refining assets could quickly become economically stranded.

**FIGURE 2: NET IMPORTS/EXPORTS OF REFINED PETROLEUM PRODUCTS FOR USE IN ROAD TRANSPORT IN SELECTED GLOBAL SOUTH COUNTRIES (2021)**



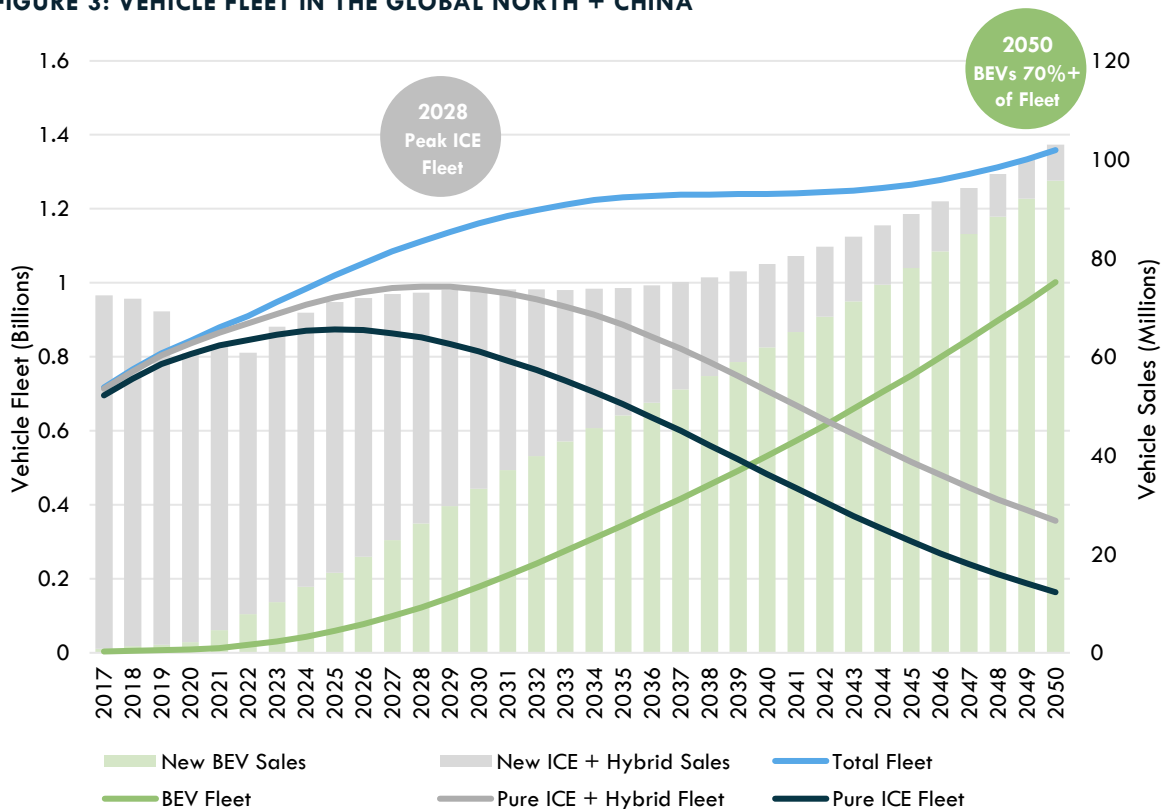
Source: The Observatory of Economic Complexity, Carbon Tracker

**Risk of fossil fuel lock-in: Changes in the Global North Fleet will exacerbate Global South’s dependence on fossil fuels**

The Global North fleet is gradually substituting ICE vehicles for BEVs (Figure 3), as policy, reducing costs (vehicle purchase price and operating costs), and changing consumer sentiment increases adoption of zero emission vehicles. The evolution of the Global North fleet will likely follow two phases, impacting the Global South:

1. **Short to mid-term:** as the transition to BEVs gains momentum, the Global North could have a glut of used ICE vehicles for export to the Global South. This increasing supply will lower the equilibrium price of used ICE vehicles and increase the quantity of ICE vehicles demanded. This supply of used vehicles could lock the Global South into the path dependency of fossil fuels into perpetuity.
2. **Long term:** the pool of vehicles available for export from the Global North to the Global South may dwindle. The proportion of ICE vehicles in the Global North fleet will decrease, replaced by a growing share of BEVs. Furthermore, Global North governmental policies promoting circularity/ recycling could restrict the supply of used electrified vehicles to the Global South market.

**FIGURE 3: VEHICLE FLEET IN THE GLOBAL NORTH + CHINA**



*Note: Model of how the overall fleet of cars in the Global North and China will electrify based on forecast car sales by powertrain and assumed vehicle life. We anticipate that ICE vehicle lives will start to shorten from mid-2020s as electrification of the overall fleet accelerates and car ownership preferences increasingly shift towards electric vehicles.*

Source: Carbon Tracker Estimates, GlobalData



### **Flick the switch for BEV democratisation: Leapfrog to BEVs for Economic/ Financial Benefits, but swift action required**

As the adoption of BEVs gathers pace and the associated electric vehicle technology moves down the cost curve, the Global South has an opportunity to leapfrog the incumbent ICE regime to BEVs and play an active role in the automotive market. BEVs lower barriers to entry for domestic manufacturing, for market and country participants, and opens other opportunities across the value chain. BEV technology has already progressed to a stage where the Global South can remove its dependency on fossil fuels to effectively leapfrog to BEVs, improving accessibility to these vehicles, and reap the financial/economic rewards, as well as lower costs for consumers (vehicle purchase price and operating costs). The financial and economic benefits include:

- **Reduction of Fuel Imports and Foreign Exchange Outflow**
  - A reduction in transport fuel imports (and used ICE vehicle imports) and the associated foreign exchange outflow.
  - Countries could save 50% in refuelling costs by switching from an ICE fleet to a BEV fleet (>\$100bn annually across the twelve countries assessed in this report).
- **Active participation in the Battery Electric Vehicle Value Chain and leveraging renewable power potential**
  - The leapfrog to BEVs opens investment, employment, and trade opportunities across the value chain from materials, manufacturing, infrastructure, and mobility. This could happen in tandem with the Global South's domestic deployment of renewable power.
- **Economic Diversification**
  - Pivoting away from the risks associated with fossil-fuel to higher value BEV involvement, potentially in collaboration with automakers from the Global North or China.

Delaying the switch to BEVs would be detrimental to Global South countries and a missed opportunity that could be lost indefinitely if swift action is not taken.

### **Automakers with limited climate/ emissions goals may want to maintain the status quo of fossil fuel dependence in the Global South**

Automakers with a high market share in the Global South used car fleet may target the region to continue selling ICE vehicles. As their traditional markets in the Global North phase out ICE vehicle sales, Original Equipment Manufacturers (OEMs) may look to the Global South with no/ limited emissions policy to continue business as usual. This will exacerbate the Global South's dependency on fossil-fuels for transportation.

Table 1 below highlights the contradictions of OEM net-zero greenhouse gas (GHG) emissions goals and the continuation of ICE vehicle production and sales. The lowest-ranked OEMs are those who are more likely to continue ICE vehicle sales in the Global South.

**TABLE 1: LEADING OEMS' NET ZERO COMMITMENTS AND PROGRESS TOWARDS NZE SCENARIO**

Rank	OEM	Net Zero Target	COP26 ZEV D Signatory	ICE Sales Beyond 2050	2022 Sales % ZEV vs NZE 2022 Target 16.8%	2030 Sales Forecast % ZEV vs NZE 2030 Target 64%
1	BYD	No explicit corporate NZ pledge	Yes	No ICE sales from 2040 globally, and by 2035 in leading markets	49.1%	74.7%
2	Geely	2045	Yes (Volvo, Polestar)	No firm commitment to end ICE sales by 2050	19.2%	59.8%
3	GM	2040	Yes	End ICE Sales 2035	2.5%	37.5%
4	Ford	2050	Yes	2030 Target BEV 100% sales in Europe and 50% of total sales	3.2%	35.8%
5	Honda	2050	No	End ICE sales 2040	0.7%	24.3%
5	Mercedes-Benz	2039	Yes	No firm commitment to end ICE sales by 2050	6.8%	44.2%
5	Stellantis	2038	No	2030 target 100% of car sales in Europe and 50% in US BEV	5.1%	43.3%
8	Tata Motors	2045	Yes (JLR)	No firm commitment to end ICE sales by 2050	4.7%	38.0%
9	BMW	2050	No	No firm commitment to end ICE sales by 2050	8.7%	59.7%
10	Renault	2050 (2040 Europe)	No	No firm commitment to end ICE sales by 2050	8.8%	40.6%
11	Hyundai	2050	No	No firm commitment to end ICE sales by 2050	6.3%	34.5%
11	Mazda	2050	No	No firm commitment to end ICE sales by 2050	0.8%	21.0%
11	Nissan	2050	No	No firm commitment to end ICE sales by 2050	3.4%	22.1%
11	SAIC	No Net Zero Target	No	No firm commitment to end ICE sales by 2050	29.3%	40.1%
11	Subaru	2050	No	No firm commitment to end ICE sales by 2050	0.3%	25.0%
11	VW	2050	No	No firm commitment to end ICE sales by 2050	8.1%	46.3%
11	Toyota	2050	No	No firm commitment to end ICE sales by 2050	0.4%	20.3%

Notes: NZE = International Energy Agency Net-Zero Emissions by 2050 Scenario (NZE Scenario). See Appendix for details.  
Source: Public Company Information, IEA, GlobalData

### Policy Action required to facilitate the transition to BEVs

By setting stringent vehicle emissions policy for used and new vehicles and incentivising domestic production and sales of BEVs, the Global South can reap the financial and economic rewards of vehicle electrification and break free of the constrained path dependency set by the incumbent fossil fuel system. Developing assets such as oil [refineries](#) and pipelines (to reduce imports of transport fuels) or plants producing ICE vehicles are at risk of obsolescence in the mid to long term.

### 3 Introduction and Background

*The scope of this report centres around the region of the 'Global South', namely Latin America, parts of Asia and Oceania, but with a core focus on Africa. The 'Global North' is defined as Europe, North America, South Korea, and Japan. China, while traditionally not included in the Global North, is the single largest passenger vehicle market in the world and has leadership in the transition to electric vehicles and battery technology. For this reason, in this report China is likened to a 'Global North' country.*

*While multimodal electric transport options are needed globally in the transition to zero emission mobility, this report focusses on the 4-wheel 'passenger car' market.*

The global deployment of Battery Electric Vehicles (BEVs) is geographically bifurcated; the passenger vehicle fleet in the Global North is rapidly decarbonising through deployments of zero tailpipe emission vehicles. Conversely, new and used BEV sales volumes in the Global South are insignificant. This is largely expected as most new vehicle sales are in developed countries, while the Global South is predominantly an export destination for used internal combustion engine (ICE) vehicles from the Global North. This continued reliance on developed countries for passenger vehicles has been reinforced by the path dependency set by the incumbent fossil fuel system.

When a new car is sold in the Global North, the vehicle remains in the region typically for 10-20 years, until there is no local demand for that car. An economic decision is made to either scrap or export the vehicle to the Global South. As such, there is a lag between a new car sale in the Global North, to that vehicle appearing in a Global South market. These antiquated ICE vehicles entering the Global South vehicle fleet are often unreliable, inefficient, and highly polluting. New vehicle sales in the Global South are limited to companies operating in the region and wealthy private individuals. Reliance on ICE vehicles has reduced the Global South to a mostly passive role in the automotive sector, offering limited economic opportunities.

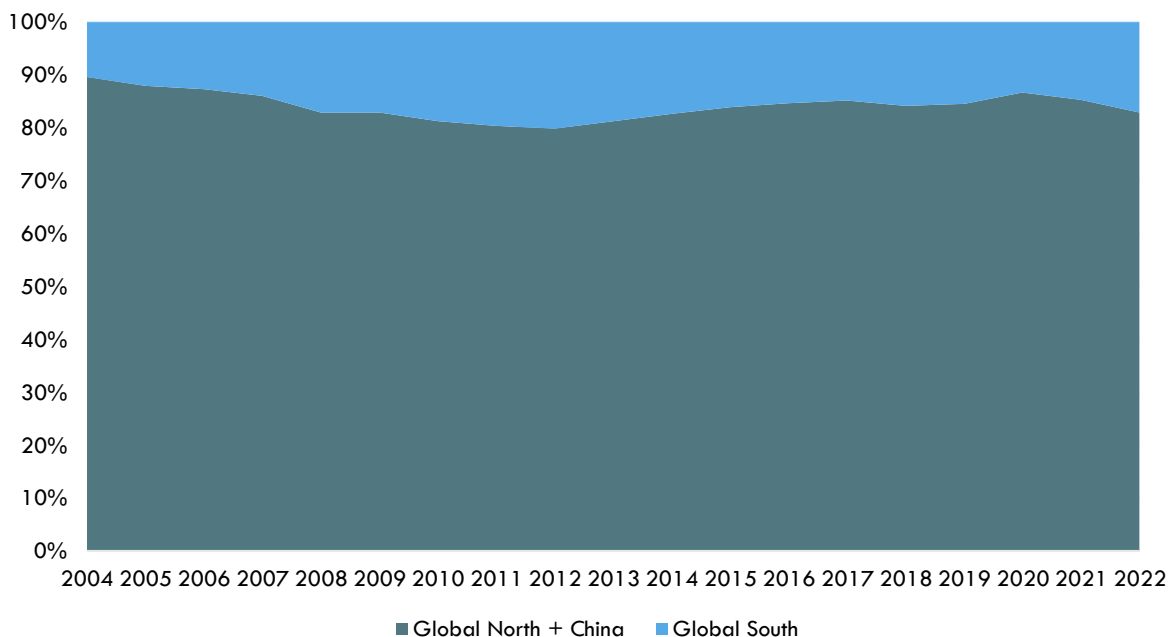
As the adoption of BEVs gathers pace and the associated electric vehicle technology moves down the cost curve, the Global South has an opportunity to leapfrog the incumbent ICE regime to BEVs and play an active role in the automotive market.

Most vehicle manufacturers have corporate climate goals to reduce Scope 1, 2, and 3 GHG emissions with a view to carbon neutrality, however some plan to continue selling ICE vehicles beyond 2040. As the Global North moves away from ICE vehicles due to emissions legislation and consumer demand for EVs, these manufacturers may target the Global South as a key market for **new** ICE vehicle sales, because of limited vehicle emissions policies in the region. It is these manufacturers who want to maintain the status quo and path dependency of a fossil fuel-based transport system.

### 3.1 The Flow of New and Used Vehicles to the Global South

Most new passenger car sales are in the Global North because of higher income per capita and a more robust banking infrastructure (for automotive loans and leases). By contrast, in the Global South new vehicles are only affordable for the wealthy or for companies operating in the region. As such only ~15% of new passenger vehicle sales are in the Global South (Figure 4).

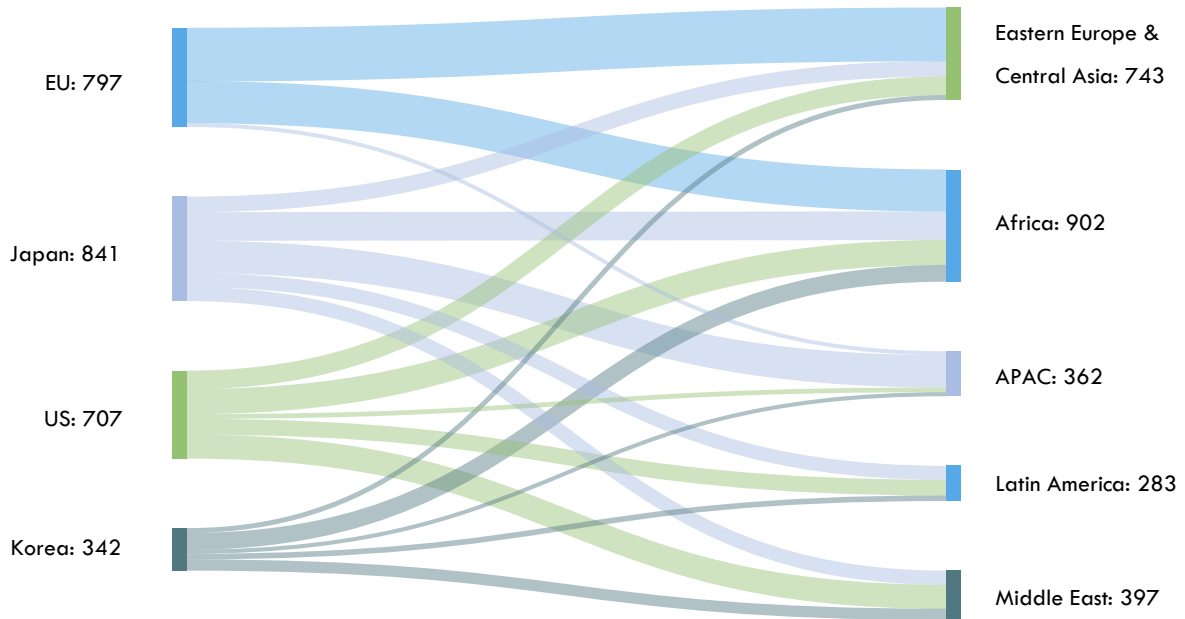
**FIGURE 4: GLOBAL NEW PASSENGER VEHICLE SALES BY REGION**



Source: *MarkLines*

Price sensitivity in the Global South has meant that the region has become predominantly an export destination of older used vehicles from the Global North imported from five main markets: Europe, US, Japan, South Korea, and China (Figure 5). These vehicles are often older, more polluting/ inefficient, and less reliable especially as the imported vehicles are built for different conditions. As most of the vehicle fleet is imported into the Global South, this means there is large trade deficit for countries in the region, which is not sustainable for growing economies.

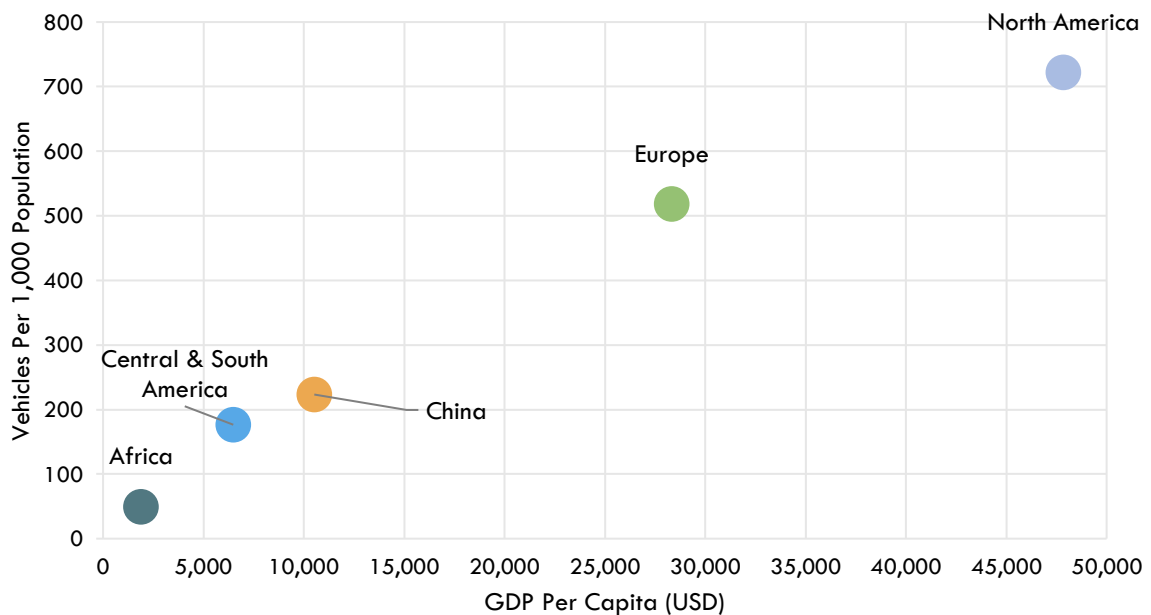
**FIGURE 5: USED VEHICLE EXPORT FLOW TO THE GLOBAL SOUTH FROM GLOBAL NORTH (VEHICLE UNITS, 1,000s)**



Source: UNEP (2021), Carbon Tracker

Considering new and used vehicle sales in the Global South, motorisation rates (a term used to quantify the extent to which motor vehicles are in use in a country) remain low at typically <200 vehicles per 1,000 people (Figure 6).

**FIGURE 6: MOTORISATION RATES IN GLOBAL NORTH AND GLOBAL SOUTH**



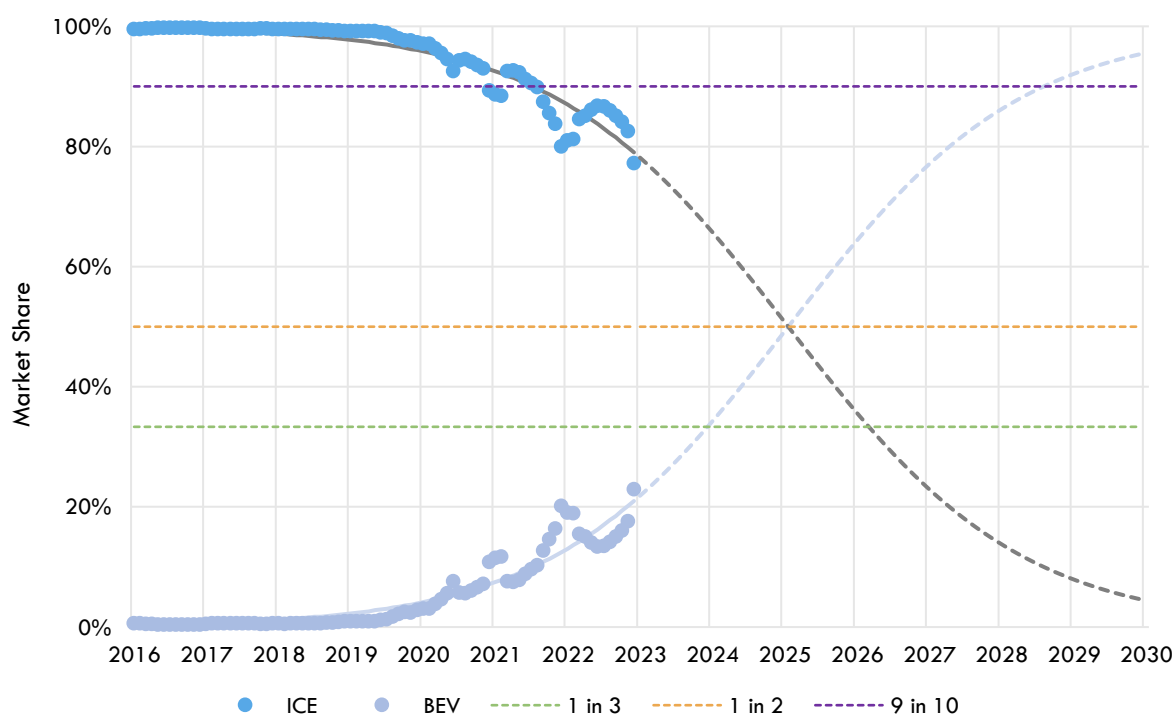
Source: International Organization of Motor Vehicle Manufacturers (OICA), IMF, Carbon Tracker

## 3.2 Electrification of the Vehicle Fleet in the Global North and Global South

The shift to pure battery electrification of the vehicle fleet in the Global North is well underway and continuing at pace. The electric vehicle market has been legitimised by supportive vehicle tailpipe emissions policy and country-level emissions reduction targets.

With the right conditions, the wider adoption of BEVs will be rapid and non-linear. Analysis between New AutoMotive and Carbon Tracker shows that adoption of BEVs in the UK is following an S-Curve (Figure 7); initial slow growth to the market which then rapidly increases, slowing only to plateau at 100% adoption. The UK market is in the early phase of the almost exponential growth of BEV adoption, meaning more of these zero tailpipe emission vehicles will enter the fleet in the coming years. Other markets are further along the adoption curve and passed the point of near exponential growth, such as Norway, where BEVs make up ~80% of new car sales.

**FIGURE 7: UK NEW VEHICLE SALES – BEV AND ICE MARKET SHARE – ADOPTION S-CURVES**



Note: The individual data points show actual new sales market share. Sales are averaged over a 3-month rolling period. The S-Curves are plotted using a logistic function with the projection shown with a dashed line. 'ICE' is defined as all vehicles with an internal combustion engine, including hybrids.

Source: New AutoMotive, Carbon Tracker

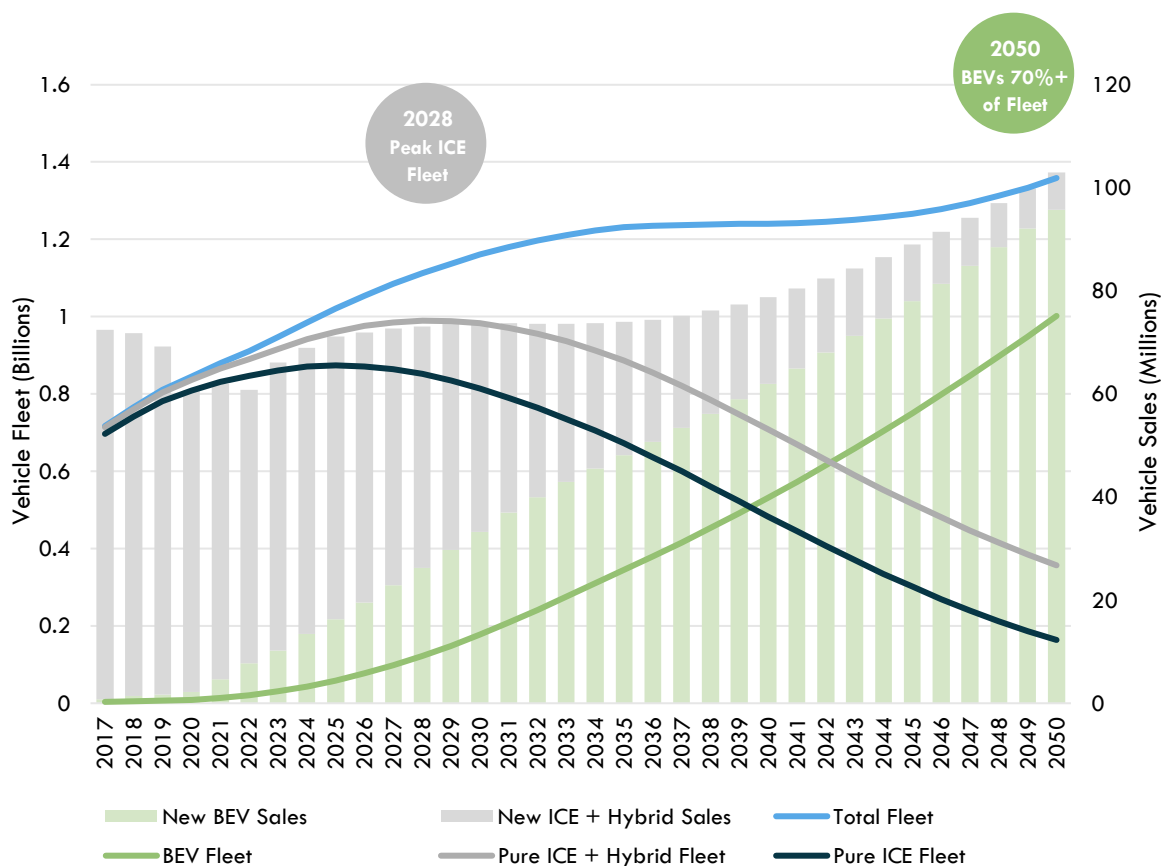
By contrast, electrification of the passenger vehicle fleet in the Global South has been sluggish. Used BEVs have only recently been exported to the Global South, because of the lag from when the vehicle was first sold in the Global North (the BEV market is still nascent, with volume sales only beginning in the early 2010s). Like new car sales in general, new BEV sales are limited to the wealthy and companies operating in the Global South.

Without policy action, BEVs are set to play an insignificant role in the Global South fleet and imports of used ICE vehicles from the Global North could grow in the short to mid-term (deepening the region's reliance on fossil fuels) for 2 reasons:

1. **Increasing Supply of Used ICE Vehicles:** As the transition to BEVs gains momentum, the Global North could have a glut of used ICE vehicles for export to the Global South. This will lower the equilibrium price of used ICE vehicles and increase the quantity of ICE vehicles demanded.
2. **China's emerging role as an exporter of used vehicles:** Since 2019, China is emerging as an increasingly significant player in the used vehicle export market. Annual exports of used Chinese vehicles to the Global South is currently around 40,000, but with a domestic fleet size of 300 million vehicles, and a Chinese government pushing to spread and proliferate its car industry, there will be ample supply of used vehicles available to export. The supply of used vehicles from China could lock the Global South into the path dependency of fossil fuels into the long term.

However, over a longer time horizon, the dynamics may shift as the pool of vehicles available for export from the Global North to the Global South may dwindle. The proportion of ICE vehicles in the Global North fleet will decrease, replaced by a growing share of BEVs. Furthermore, governmental policies aimed at promoting circularity/ recycling and safeguarding of critical materials needed for EV battery production (e.g. EU Commission's 2023 proposal to enhance the circularity of the automotive sector) could restrict the supply of used electrified vehicles to the Global South market.

**FIGURE 8: VEHICLE FLEET IN THE GLOBAL NORTH + CHINA**



Note: Model of how the overall fleet of cars in Global North and China will electrify based on forecast car sales by powertrain and assumed vehicle life. We anticipate that ICE vehicle lives will start to shorten from mid-2020s as electrification of the overall fleet accelerates and car ownership preferences increasingly shift towards electric vehicles.

Source: Carbon Tracker Estimates, GlobalData, OICA

Carbon Tracker has modelled the passenger car fleet in the Global North & China as sales of BEVs increases and sales of ICE vehicles decline, as consumer preference shifts to BEVs ahead of mandated ICE vehicles sales bans (Figure 8).

We estimate that peak ICE vehicles (including hybrids) in the Global North & China fleet will occur by 2028 at 900m vehicles, with peak pure ICE vehicles occurring four years earlier; the end of the ICE Age in the Global North. This also signals the end of the ICE Age in the Global South, considering the time lag between vehicle imports from the Global North.

It is worth noting that we estimate that there will still be ICE vehicles in the Global North & China fleet even by 2050 but most of these vehicles will be in China and Japan. By 2050, the Global North & China ICE fleet including hybrids will decline 60% from its peak in 2028 to 350m vehicles (<30% of the vehicle fleet). The pure ICE fleet in the Global North & China is expected to decline by 78% from its peak in 2024 to 170m vehicles by 2050 (around 14% of the vehicle fleet).

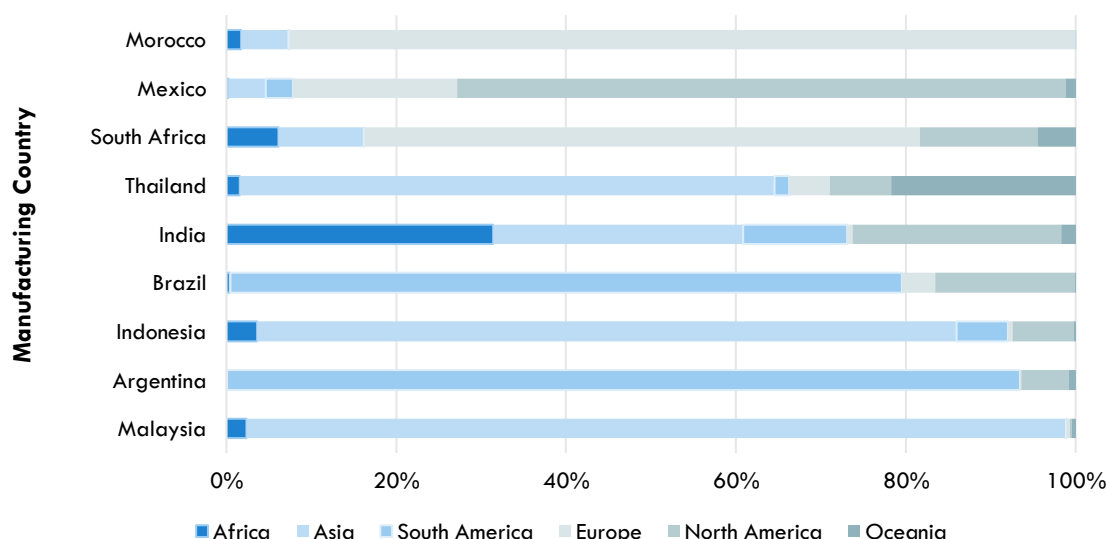


Although new car sales are expected to increase, we foresee that the overall size of the passenger car fleet in the Global North will plateau in the 2030s. This is because consumers are increasingly opting for BEVs, making ICE vehicles less attractive. Consequently, ICE vehicles will exit the Global North’s fleet at an accelerated pace. These vehicles, with potentially fewer buyers in the used market of the Global North could potentially be dumped into the Global South. We expect that the total fleet of passenger cars in the Global North will start growing again in the 2040s as the accelerated impact of ICE vehicles leaving the fleet wanes.

### 3.3 Global South Automotive Industrial Base

While there is some vehicle production in the Global South (~20% of global vehicle production), the automotive industrial base is relatively small compared to the Global North & China. With some exceptions, most vehicles produced in the Global South are exported to the Global North, with few for domestic consumption (Figure 9).

**FIGURE 9: EXPORT DESTINATIONS OF LARGEST GLOBAL SOUTH CAR PRODUCERS BY EXPORT VALUE**



Source: *The Observatory of Economic Complexity, Carbon Tracker*

The remainder of this report will analyse:

- **Section 4:** the economic rationale of making the leapfrog to BEVs from ICE vehicles.
- **Section 5:** Automaker contradictory aims to meet climate goals, yet continuing ICE vehicle sales, and the potential impact on the Global South.

## 4 The Road to Electrification of the Vehicle Fleet in the Global South

The global transition to electric vehicles presents unique economic benefits to the Global South. While the incumbent fossil-fuel based passenger vehicle market has provided some automotive sector opportunities in the Global South (e.g. Asia: China, Africa: South Africa, Morocco) the prospects have been limited to a handful of countries. Vehicle electrification represents a structural change within the automotive industry that opens further opportunities in the Global South to become an active participant in the sector, leapfrogging ICE to EVs.

Policy in the Global South will be critical to unlock the economic potential from an electric automotive sector. EV technology exists today and will get cheaper but there needs to be a policy environment conducive to encouraging localised EV production and sales in the Global South.

Table 2 shows current legislation against the ICE vehicle, but more progressive policy is needed to accelerate the transition to BEVs, replacing the incumbent ICE vehicle fleet.

**TABLE 2: GLOBAL SOUTH LEGISLATION ON USED CAR IMPORTS**

<b>Used Car Imports Ban</b>	Algeria, Bhutan, Egypt, Morocco, South Africa, Sudan, India, Chile
<b>Age Restriction</b>	< 3 Years – Chad, Mauritius, Seychelles < 4 Years – Gabon < 5 Years – Bahamas, Libya, Tunisia, Cote d'Ivoire < 6 Years – Kazakhstan < 7 Years – Bangladesh, Congo < 8 Years – Guinea, Kenya, Maldives, Mauritania, Namibia, Reunion, Senegal < 10 Years – Barbados, Benin, Burundi, DRC, Eritrea > 10 Years – Liberia, Ethiopia, Nigeria, Swaziland, Uganda
<b>Emission Standards</b>	Euro 4 – Morocco, Sri Lanka Euro 3 – Algeria, Botswana, Nigeria, Rwanda Euro 2 – Egypt
<b>Age Based Excise Duties</b>	< 3 Years – Kenya < 4 Years – Cape V., Sierra L < 5 Years – Ghana, Tunisia, Uganda, Zimbabwe < 7 Years – Mozambique < 8 Years – Tanzania > 10 Years – Liberia, Mali, Rwanda
<b>BEV Import Duty Removed</b>	Mauritius, Seychelles

Source: UNEP, Carbon Tracker

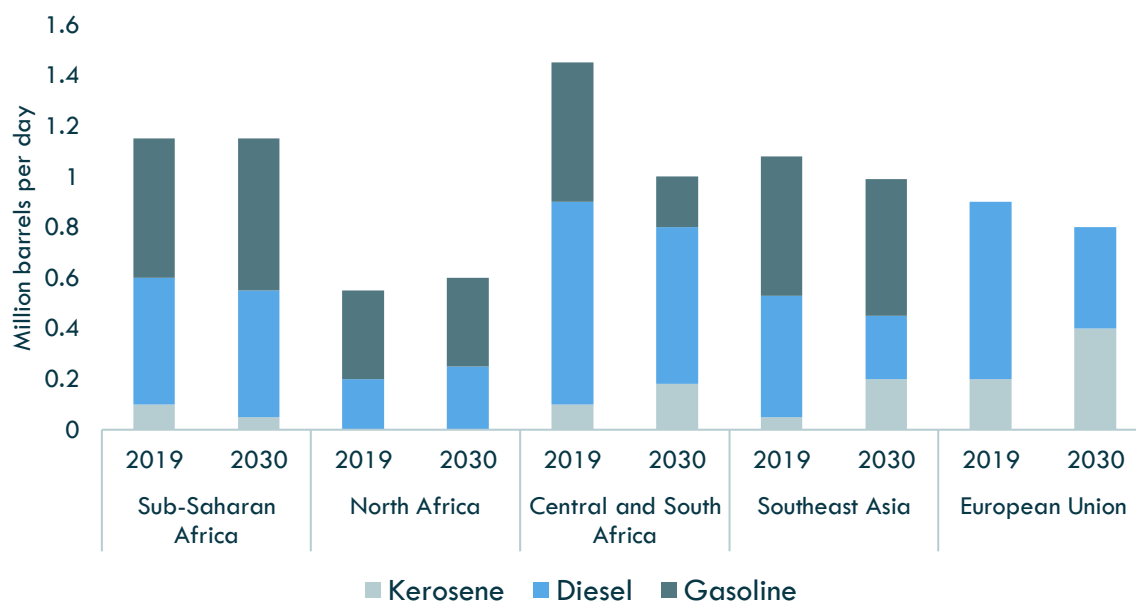
## 4.1 Economic and Financial Benefits to an Electric Vehicle Fleet in the Global South

### 4.1.1 Reduction of Fuel Imports and Foreign Exchange Outflow

As long as there is an ICE vehicle fleet in the Global South there will be demand for transport fuels, namely diesel, gasoline, and kerosene (aviation only). In most Global South countries demand cannot be met with domestic refining of oil and therefore transport fuels must be imported. This is a large financial burden for numerous developing countries and is a significant foreign exchange outflow. According to the IEA Africa Energy Outlook 2022 under the Sustainable Africa Scenario, sub-Saharan Africa becomes the world’s largest importer of transport fuels (Figure 10) by 2030, overtaking Central & South America, with net imports of 1.2 million barrels per day. While investment in domestic refining and pipelines could be an option to meet demand for fuels, there is a risk of assets becoming economically stranded due to difficult business environments and ample refining capacity elsewhere in the world, as noted by the IEA. There are limited financial incentives to invest in mid-stream assets in the Global South due to high costs and diminishing returns.

Despite growing domestic demand in Africa for transport fuels, several refineries in South Africa, Zambia and Nigeria have closed due to inefficiencies and being unable to produce high quality fuels, therefore this dependency on fuel imports for transportation is likely to grow. It is estimated that an investment of \$16bn across Africa would be required to upgrade refineries, according to African Refiners and Distributors Association. Carbon Tracker views this as wasted capital that could otherwise be used to electrify transportation, including electric vehicle infrastructure, and making that jump to BEVs, thus avoiding investment in a declining industry.

**FIGURE 10: NET IMPORTS OF TRANSPORT FUELS IN SELECTED REGIONS**



Source: Sustainable Africa Scenario, IEA Africa Energy Outlook 2022

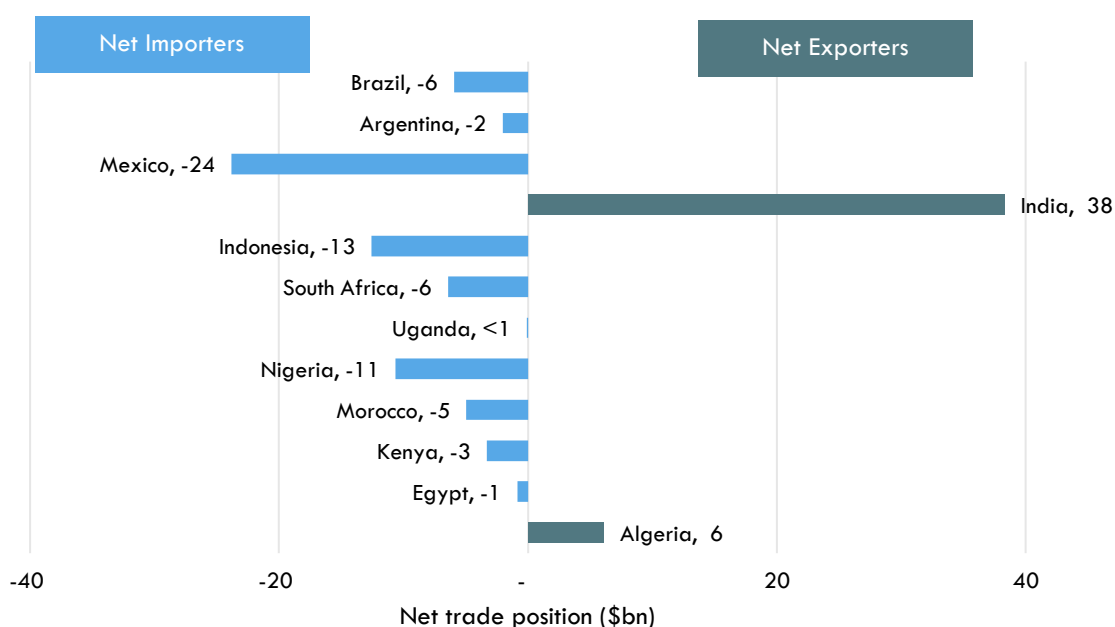
Africa is dependent for over 80% of its transport fuels through imports. As Africa imports around 1.7 million barrels per day of transport fuels (2019 and forecasted in 2030), this equates to approximately \$80bn per year expenditure or 2.5% of Africa’s GDP.

### Nigeria Fuel Subsidies

In Nigeria, fuel subsidies which were introduced in the 1970s keep prices low for consumers, however they are estimated to cost the Nigerian Government ~\$10bn per year. In May 2023, these subsidies were removed causing fuel prices at the pump to more than double, cutting demand by 30%. Import dependency and consumer vulnerability will likely grow on a ‘business as usual’ scenario of fossil-fuel based transportation. BEVs offers a path away from this dependency quickly for individual consumers, and ultimately for the state finances.

For many countries in the Global South, there is trade deficit for refined petroleum products to meet demand for road transportation. As domestic oil refining capacity cannot meet fuel demands in many countries in the Global South, net fuel imports are likely to remain a significant expenditure and an on-going dependency, but this could change if Global South importers shift to BEVs. The Global South net importers are a price-taker of transport fuels, with prices dictated by market factors outside of their control (global oil prices, OPEC, etc.). In Figure 11, Carbon Tracker shows the net imports/exports of refined petroleum products for use in road transport in 12 Global South countries (countries chosen based on economic size). Algeria and India are significant refined petroleum exporters, but combining these countries equates to an imported fuel dependency of \$13.3bn.

**FIGURE 11: NET IMPORTS/EXPORTS OF REFINED PETROLEUM PRODUCTS FOR USE IN ROAD TRANSPORT IN SELECTED GLOBAL SOUTH COUNTRIES (2021)**



Source: The Observatory of Economic Complexity, Carbon Tracker

Eventually the ICE vehicle fleet in export destinations (in the Global North and Global South) for transport fuel from Algeria, India and others will be substituted by BEVs. This is a significant risk for these transport fuel exporting nations and diversifying to opportunities in the Electric Vehicle Value Chain (discussed in Section 4.1.2) is recommended as oil refining assets could quickly become economically stranded.

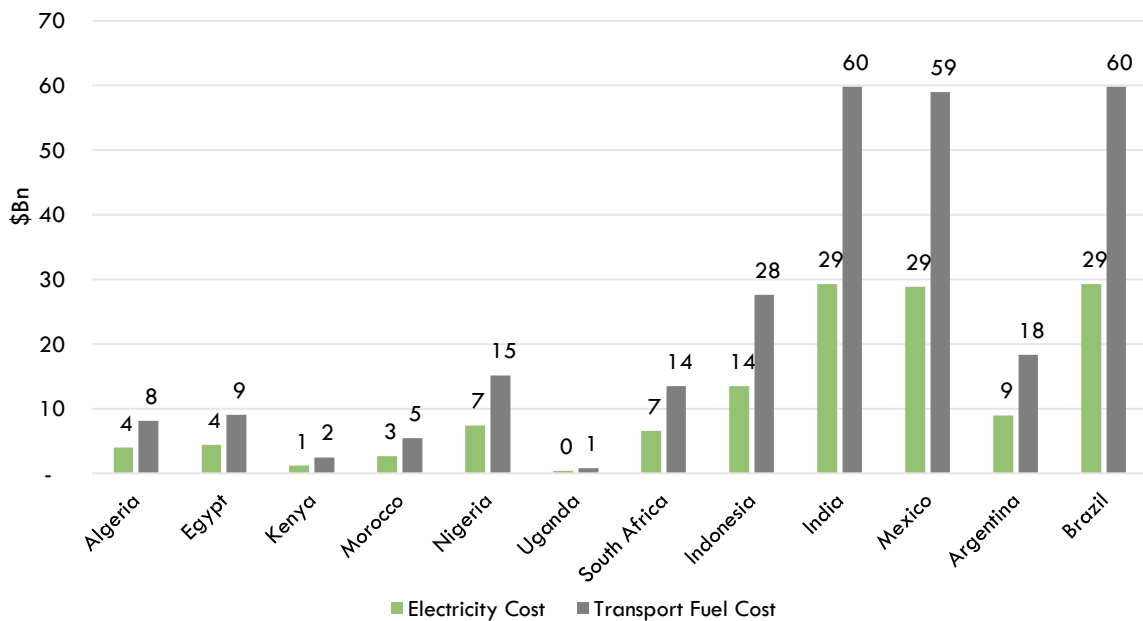
**Tax Revenues: Switching from Transport Fuels to Electricity**

Countries importing transport fuels will then sell that fuel to consumers at the pump, earning a margin on the sale (unless subsidised by the Government – see Nigeria example). Moving to BEVs is potentially removing a revenue stream for Governments as demand for transport fuels declines. However, there will likely be a gradual shift to BEVs as the ICE fleet is replaced and taxation could be applied differently to BEVs once they become widespread. Taxation on BEVs could be applied to electricity (for vehicle recharging), vehicle weight, driver annual mileage etc.

Switching to BEVs would mean less dependency on imports and other nations, if power can be produced domestically through renewables, with no effect on the ability to generate tax revenues.

One of the benefits of BEVs is lower refuelling costs. If a Global South country can replace its existing ICE fleet with BEVs, there are significant costs savings. Lowering the operating costs for drivers will improve motorisation rates. As shown in Figure 12, countries could save 50% in refuelling costs by switching from an ICE fleet to a BEV fleet (>\$100bn annually across the twelve countries assessed).

**FIGURE 12: COMPARISON OF ANNUAL REFUELLING COSTS OF ICE FLEET VERSUS BEV FLEET IN SELECTED GLOBAL SOUTH COUNTRIES**



Note: Estimation of the annual cost to refuel the fleet of road vehicles based on estimated fleet size in 2020

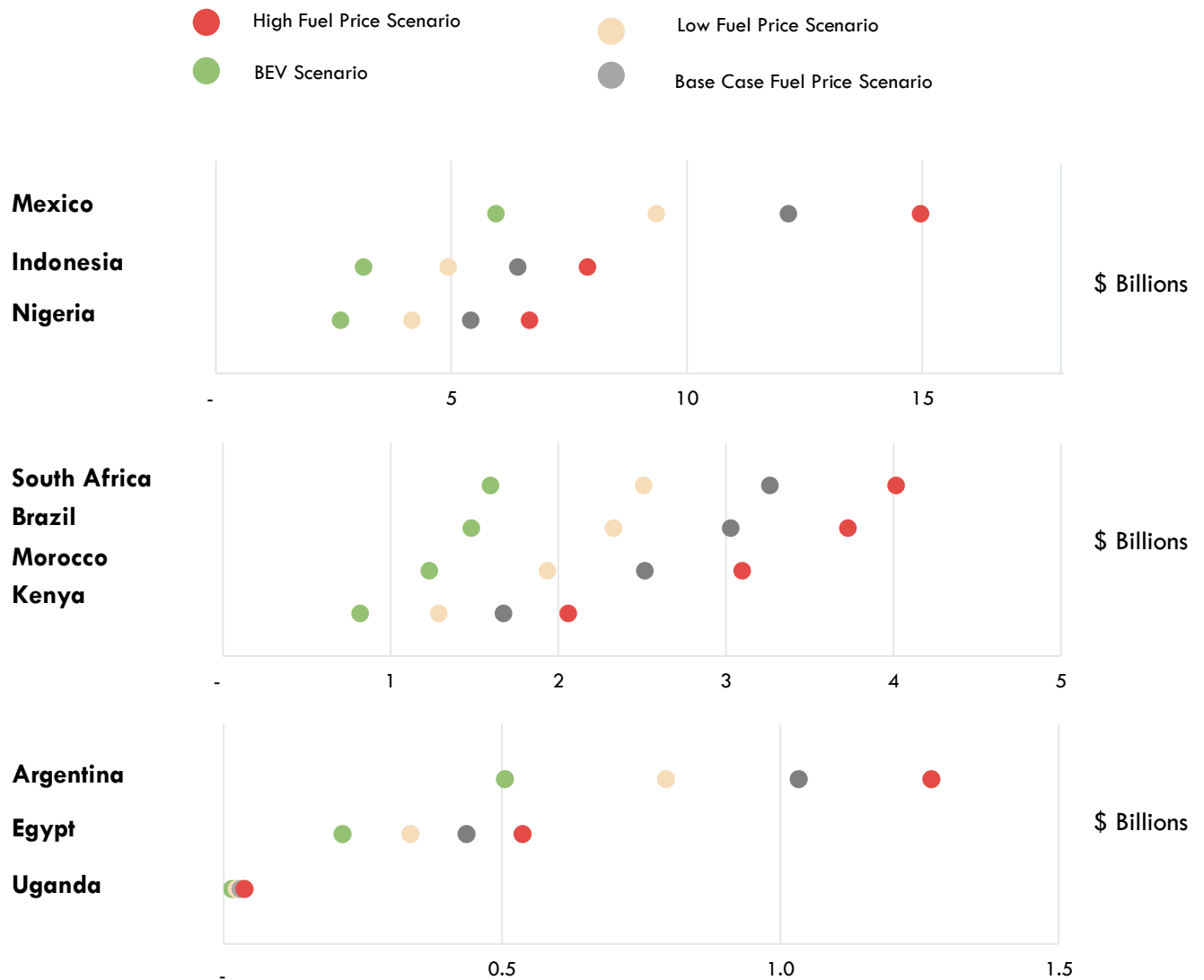
Source: The Observatory of Economic Complexity, IEA, Electric Vehicle Database, GlobalPetrolPrices, Carbon Tracker

As shown in Figure 11, many Global South countries are dependent on imports to meet road transport fuel demand. This is a major foreign exchange outflow which is not sustainable for developing nations. In Figure 13, Carbon Tracker has modelled scenarios of foreign exchange outflow for Global South countries with a transport fuel trade deficit. In addition, if instead that proportion of the vehicle fleet which requires those net fuel imports were instead BEVs, Carbon Tracker calculates the cost to recharge/ refuel those. Of course, BEVs could be recharged/refuelled using domestically produced renewable electricity, instead of a dependency on foreign currency and fossil fuel imports. Reducing foreign exchange outflow and the import of fossil fuels would contribute to the de-dollarisation of the Global South, especially in Africa.

### **Economic Impacts of Foreign Exchange and Capital Outflow**

A nation's currency supply increases as individuals sell currency to other nations; the resultant increase in supply of the domestic currency decrease its value. Capital outflows affect the domestic currency's exchange rate, which leads to depreciation in the domestic currency and in turn leads to inflation.

**FIGURE 13: FOREIGN EXCHANGE OUTFLOW FROM REFINED PETROLEUM FUEL TRADE DEFICIT FOR USE IN ROAD TRANSPORT VERSUS BEV REFUELLING COSTS IN SELECTED GLOBAL SOUTH COUNTRIES**



Note: Estimation of the comparative annual cost to charge EVs with electricity to travel the same distance that could be travelled by ICE vehicles using the volume of fuel represented by each country's trade deficit in refined petroleum. Scenarios based on Carbon Tracker estimates.

Source: The Observatory of Economic Complexity, IEA, Electric Vehicle Database, GlobalPetrolPrices, Carbon Tracker

In developing countries, foreign exchange currency is hard-earned. By using these foreign exchange reserves to import transport fuel, this currency is literally being burnt. Considering a country's finances, any type of expenditure should be used in the most efficient way. Purchasing transport fuel using foreign currency is effectively wasting ~75% for every \$ spent, due to the inherent inefficiencies of ICE vehicles i.e. a tank-to-wheel efficiency of only 25%. On the other hand, a BEV has a tank-to-wheel efficiency of ~90%, and therefore a more cost-effective solution.

In addition to fuel imports, the importation of used ICE vehicles is a foreign exchange outflow for the Global South. If the Global South imports approximately 3 million ICE vehicle annually, this equates to a \$21bn foreign exchange outflow per year, which is not sustainable for developing

countries. To encourage the local production and sale of inexpensive BEVs is a way of stemming this capital outflow, while creating jobs and foreign direct investment opportunities (discussed in Section 4.1.2).

### 4.1.2 Opportunities in the Electric Vehicle Value Chain and ICE Risks

The adoption of BEVs has opened a value chain and opportunities not previously offered by the incumbent ICE vehicle value chain. BEVs lower the barriers to entry for market and country participants and Table 3 below illustrates some of those opportunities for the Global South.

**Table 3: BEV Value Chain and Opportunities for the Global South**










BEV Value Chain	Description	Investment		Employment	Trade	
		Foreign Direct Investment	Local Investment	Skill Development Opportunity	Export Opportunity	Import Reduction
 <b>Materials</b>	Mining raw materials and base minerals	✓	✓	✓	✓	✓
	Materials processing	✓	✓	✓	✓	✓
 <b>Manufacturing</b>	Vehicle assembly and sub-assembly, including knock-down kits.	✓	✓	✓	✓	✓
	Vehicle components and integrating components from suppliers. Component manufacture networks.	✓	✓	✓	✓	✓
 <b>Logistics</b>	Transportation of components and assembled cars to local and regional markets		✓	✓		
 <b>Sales</b>	Local dealers providing sales and service of new and used cars		✓	✓		
 <b>Financial Services</b>	Financing vehicle purchase or lease		✓	✓		



Table 3 continued

BEV Value Chain	Description	Investment		Employment	Trade	
		Foreign Direct Investment	Local Investment	Skill Development Opportunity	Export Opportunity	Import Reduction
 EV Infrastructure	Manufacture, installation and maintenance of charging infrastructure	✓	✓	✓	✓	✓
 Mobility	Ride Sharing & Mobility Services		✓	✓		
 Servicing	Vehicle maintenance & replacement parts		✓	✓		
 End of Life	Recovery, processing and recycling of critical minerals and materials	✓	✓	✓	✓	✓

Source: Carbon Tracker

While it is not expected that every country will adopt every stage of the BEV value chain, there are opportunities for Global South countries to play an active role in the adoption of BEVs in the region. Alliances and regional partnerships will be important to help develop a network which will enable a sustainable BEV value chain.

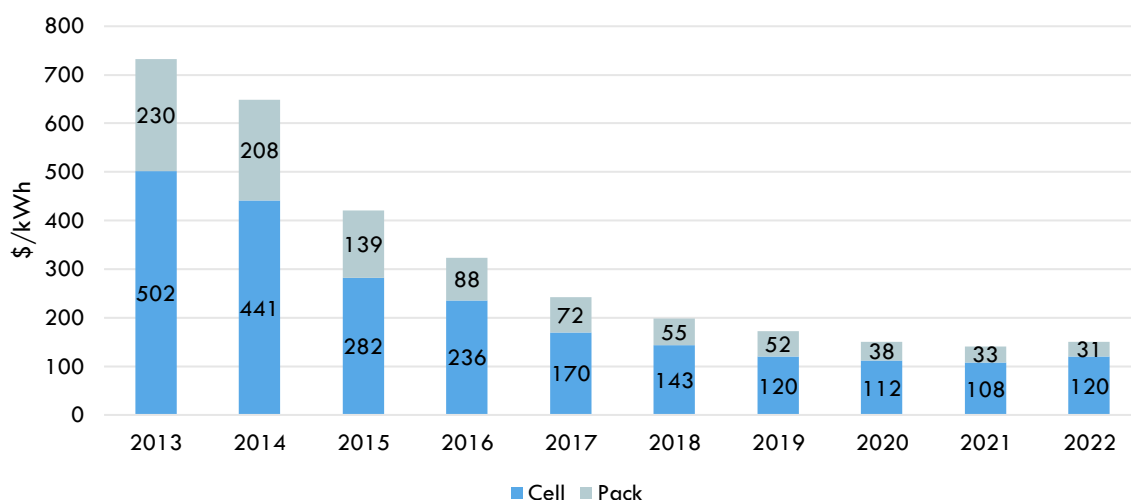
### Materials

The Global South has access to various critical materials including lithium, cobalt, manganese, and nickel which are required in the manufacture of various EV components such as batteries, motors, and wire harnesses. While mining of these critical materials in the Global South is in operation and demand is likely to increase, most of the minerals mined are exported unprocessed (70% in Africa). Localising mineral processing is a way of enhancing the worth of raw materials, increasing export value, or those materials can be used in the domestic production of EVs and components.

### Manufacturing, Sales & Logistics

Domestic manufacturing and sales of **new** BEVs are a large opportunity for the Global South. BEVs are becoming less expensive, especially as battery prices fall which make up to one-third of the total cost of a BEV. As observed in Figure 14, battery prices have fallen ~80% since 2013. While prices have levelled off in recent years due to raw material price volatility, continued investment, R&D, and the emergence of new battery chemistries will continue to reduce costs.

**FIGURE 14: VOLUME-WEIGHTED AVERAGE LITHIUM-ION BATTERY PACK AND CELL PRICE SPLIT**



Note: Real 2022 \$/kWh

Source: BloombergNEF

Industrial strategy in the Global South should be conducive to encouraging manufacturers to set up local EV/EV technology manufacturing which is scalable and exportable. Creating hubs of local or regional electric vehicle and components manufacture will require a significant logistics network. The local assembly also lowers the cost of new BEVs, improving accessibility for domestic new car purchases. Global South countries could partner or form Joint Ventures with established BEV manufacturers to assemble these vehicles within the region, including full or sub-assembly or vehicle knock-down kits. Knock-down kits are a collection of vehicle parts required to assemble a product. The parts are typically manufactured in one country or region, then exported for final assembly in another country or region. Vehicle knock-down assembly in the Global South would create local jobs, improve access to new vehicles, and reduce dependency on fossil-fuels. As these kits are not complete vehicles, this should lower or negate any import tariffs.

### Thailand

Thailand is an example of how a package of incentives offering corporate income tax and excise tax benefits can encourage significant investment in EV production. Since 2017, 16 different OEM have invested THB 75bn (US \$2billion) in 23 projects with an annual production capacity of 710,000 EVs. The package has positioned Thailand as a hub for EV manufacturing in ASEAN and has been taken up by OEMs including Chinese based GAC Aion, Changan, and BYD, the world's largest EV manufacturer.

### Nigeria

Several new manufacturers are entering Nigeria's electric vehicle industry with domestically assembled vehicles. SAGLEV, a US-based EV manufacturer, expects to begin EV assembly in Nigeria in December 2023, with a target to produce 2,500 EVs annually, increasing to 5,000 with the addition of a second shift. Possible Electric Vehicle Solution (Possible EVS), a Nigerian electric

mobility firm, targets production of up to 10,000 electric vehicles annually. EVs are expected to offer buyers a lower total cost of ownership (TCO) and more predictable operating costs, compared to imported used ICE cars, which historically have met a large proportion of the demand for cars in Nigeria. Vehicle TCO has become a higher priority in Nigeria after the removal of fuel subsidies in May 2023.

The Global South could leverage its vast potential in renewables (see Carbon Tracker report 'Africa Sun') in the production of EVs and components. In the Global North, emissions legislation has mainly been aimed at reducing tailpipe emissions, but this is likely to change in the mid-term to encompass embedded Scope 1, 2 and 3 emissions across the entire lifecycle of the vehicle, including vehicle production and its components. If the Global South became a significant manufacturer and exporter of EVs to the Global North, the Global South would have an advantage if renewables were used to decarbonise vehicle lifecycles. This scenario would likely require partnerships or JVs with established automotive OEMs.

Existing ICE manufacturing assets in the Global South need to be converted to producing EVs as demand for ICE vehicles declines. New investment into increasing production of conventional ICE vehicles could lead to stranded assets and continued fossil fuel path dependency.

### **Servicing**

With an increasing BEV fleet in the Global South, there will be a growing industry for servicing vehicles with an electric powertrain, despite BEVs having fewer moving parts compared to ICE vehicles. New skills will be required to service BEVs (electronics, electric motors, software etc.) compared with servicing an ICE vehicle. A declining Global South ICE vehicle fleet in the long-term will mean a diminishing ICE vehicle service industry and fewer available parts, especially as OEMs pivot to focus only on electric powertrains. Due to the time lag of used ICE vehicle exports between the Global North and Global South, there will still be a substantial ICE fleet in the Global South at a time when the OEMs themselves may not have any ICE vehicles in their new product line-up. This will lower the useful lives of used ICE vehicles as parts become unavailable or unrepairable.

### **Financial Services & Mobility**

Vehicle financing options have helped drive new vehicle sales in the Global North. Carbon Tracker recognises that vehicle financing in developing nations is not as viable because of high interest rates on loans/leases which means that most consumers buy vehicles with cash. Government backed, economically attractive, BEV leases could enable widespread adoption of electric vehicles. Offering this type of vehicle finance options to ride-sharing drivers could be a way of bringing zero-emission mobility to more people, without everyone needing to own a car.

### **EV Infrastructure**

Carbon Tracker recognises that in many developing nations, being able to supply baseload power is challenging and there are larger power issues across much of the Global South, which are not discussed in this report. However, with the roll out of BEVs, there needs to be the deployment of electric vehicle charging infrastructure to power these vehicles, and this equipment could be manufactured locally.

Like in the manufacture of BEVs and components, the vast potential of renewable energy in the Global South could charge BEVs. BEVs also have the advantage of being able to store power and could be used in conjunction with Vehicle-to-Grid technology to help balance power demand in the grid.

**End of Life**

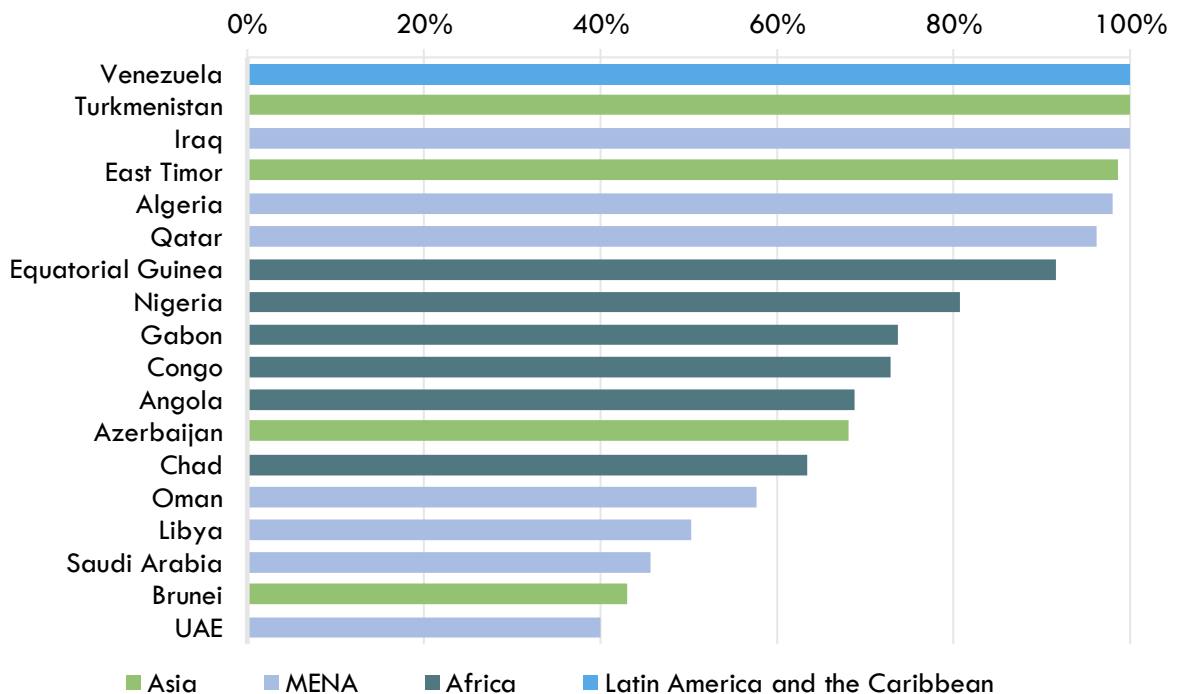
If there is a growing BEV fleet in the Global South, eventually these vehicles will reach the end of their useful lives. There will be opportunities in the nascent electric vehicle recycling industry to create circularity for critical materials.

The opportunities discussed above need to be considered alongside a comprehensive Industrial Strategy encompassing not only the BEV Value chain, but also a Power & Renewables Strategy.

**4.1.3 Economic Diversification**

Several countries in the Global South can be categorised under the term ‘petrostate’ i.e. countries with large fiscal dependence on oil and gas revenues, and are therefore the most at risk in the energy transition as demand for oil and gas falls. Figure 15 shows countries that are most reliant on oil and gas revenues.

**FIGURE 15: OIL & GAS REVENUE, % OF TOTAL COUNTRY REVENUE (ANNUAL AVERAGE 2011-2020)**



Notes: Only countries with >40% oil and gas revenue dependence shown. For full list, please refer to Carbon Tracker’s ‘Beyond Petrostates’ report.

Source: Carbon Tracker, ‘Beyond Petrostates’ 2023 Edition

Petrostates in the Global South could pivot and diversify their economies away from the risks associated with fossil-fuels and embrace vehicle electrification and the associated parts of the BEV value chain discussed in Section 4.1.2. The prospect to diversify their economies to higher value BEV involvement e.g. through collaboration with Global North / Chinese manufacturers is a growing opportunity, but the legacy of oil and gas dependence provides a barrier to change. Indeed, most of the large Global South oil and gas producers are members of OPEC, creating a further dependence on oil and gas investment, governmental oversight and managerial focus on fossil fuel production.

As oil and gas revenues begin to show sharper declines due to falling demand and commodity price, the incentives for Global South nations to diversify economies will intensify. At the same time, major BEV manufacturers such as China will look to diversify their BEV sales into export markets as they saturate their domestic sales volumes. This could offer opportunities for the import of BEVs that are decreasing in price to parity with ICE cars and/ or foreign investment deals for local manufacturing of Global North / China BEV brands – and so leapfrog a generation of technology development.

At current rates of change, these developments could happen sooner rather than later, with the Chinese brand BYD now the largest-selling BEV in the world, overtaking Tesla, and also one of the fastest growing at 50-60% pa – its market capitalisation of \$90bn is 50% higher than VW.

The ability of OEMs, for example BYD, to export BEVs in large numbers in the next few years or engage in Foreign Direct Investment (FDI) in the Global South is therefore increasing rapidly as an option as their domestic sales growth reaches a maximum and exports and international production in less competitive markets will attract capital.

The importation of BEVs is not a like-for-like import of ICE cars in three ways, and each increases economic diversification:

1. BEVs do not demand oil for fuel, so break the running dependency on fossil fuel imports over time.
2. Each BEV will need new electric infrastructure, manufactured, or installed locally creating local jobs with low complexity engineering.
3. It is far more likely Global South nations can be involved in the BEV value chain than the ICE value chain due to the less complex manufacturing process.

This gives the Global South overall a foothold in a fast-growing technology and infrastructure, rather than keeping a fiscal dependency on a declining industry and a negative-growth technology.

## 4.2 Case Studies

### 4.2.1 South Africa

South Africa has a large motor vehicle industry which makes an important contribution to the country's economy. The industry is estimated to contribute 4.9% of GDP, employ over 110,000 and contributes 14.3% of South Africa's exports. While the industry contributes significantly to the economy, the industry is primarily focused on producing ICE vehicles for export markets in the Global North where the sale of new petrol and diesel vehicles will increasingly be banned.

A world Bank survey in 2022 ranked South Africa as having the highest degree of wealth inequality globally. 10% of the population holds over 80% of its wealth which makes it incredibly difficult for South Africans to afford the upfront cost of a new BEV. BEV adoption faces an additional challenge as the country's charging infrastructure is still underdeveloped, particularly outside urban areas. South Africa's state-owned electric utility struggles to provide a reliable supply of electricity, with blackouts regular feature of daily life in South Africa meaning that the ability to charge an EV is further complicated.

In section 5.4 'Diverging Routes South' we highlight the recommendation made by the co-CEO of Mercedes-Benz Cars South Africa for the country to develop an EV policy that will help maintain the country's relevance in the global automotive industry as well as support the adoption of BEVs in South Africa through reduced import taxes for EVs, helping their affordability and the further development of EV charging infrastructure and investments in skills required for an EV ecosystem.

### 4.2.2 Uganda

Increasing urbanisation and population growth has contributed to an almost doubling in the number of registered vehicles between 2012 and 2018 which has led to worsening congestion and a deterioration in air quality and increased health risks in urban centres such as Kampala.

BEVs could play an important role in improving the air quality in urban areas however, like many African countries, BEV adoption is at a very low level, hampered by affordability and the absence of infrastructure necessary for charging a fleet of electric vehicles. The high initial cost of BEVs for the average Ugandan is a significant headwind to broad adoption however, more rapid adoption of electric two and three-wheeled vehicles has provided a more accessible route to e-mobility in Uganda and bypasses the need for larger scale investment and financing that will be required to enable an economy like Uganda to reap the benefits of broader electrification of motor vehicles.

Uganda has several innovative local companies that are involved in producing e-mobility solutions targeted at the local market.

- Zembo is targeting the boda-boda motorcycle taxi market with an electric motorcycle they supply to drivers through a lease-to-own scheme. In addition to the motorcycles, they lease and charge swappable batteries to drivers from 18 charging stations.
- Bodawerk converts petrol motorcycles to electric power and leases batteries to boda drivers.

- Kiira Motors manufactures battery electric buses in Uganda. Kiira is targeting to increase the locally manufactured proportion of its vehicles to 65%.

### 4.2.3 Morocco

Morocco is the second largest hub for the automotive industry in Africa. The country is home to several car manufacturing plants, including those of Renault and Stellantis.

Morocco has committed to ambitious renewable energy targets for its economy in its National Energy Efficiency Strategy 2030, setting the goal of renewable sources supplying 52% of its electricity by 2030 and 80% by 2050. The strategy also supports 'electromobility' initiatives to transition transportation in Morocco from fossil fuel-based vehicles to electric powered mobility. Morocco targets a reduction of energy consumption in the transport sector by 24% between 2017 and 2030. Morocco's energy plan is aligned with its industrial strategy to fully decarbonise the automotive supply chain which will support the net zero commitments made by OEMs operating in Morocco.

This strategy creates a favourable climate to support the adoption of electric vehicles through investment in charging infrastructure and for Morocco to increase local manufacturing of BEVs, which could lower the cost and increase local adoption in addition to providing a sustainable foundation for its automotive industry.

## 5 Automotive OEM ICE Vehicle Operations

Automotive OEMs will play an crucial role in how the Global South electrifies its fleet of motor vehicles, either as a provider of suitable vehicles that will allow the Global South to benefit from electrification that we discussed in section 4, or look to the Global South as a potential dumping ground for their ICE production.

The leading incumbent automotive manufacturers, responsible for 70% of global new car sales, have committed to align their operations with the goal of achieving net-zero emissions by 2050 at the latest. Producing zero and low-carbon vehicles is key to minimizing scope 3 emissions (accounting for 75%+ of a vehicle's emissions during its operational phase). In our October 2022 report, titled "[Slipped Gear](#)," we highlighted the disconnect between OEMs' pledges to achieve net-zero greenhouse gas (GHG) emissions and the absence of short to mid-term targets to end the sale of ICE vehicles.

Transition plans and industry sales forecasts for most manufactures point to a sales mix that includes ICE vehicles. Based on GlobalData sales forecasts for 2030, OEMs with a net zero commitment could be selling up to 64% passenger vehicles with tailpipe emissions, a total of over 39m vehicles with an ICE. This presents a contradiction within an industry that has committed to achieving net-zero emissions before 2050 while concurrently maintaining an ICE product line.

Table 4 below highlights the contradictions of OEM net-zero GHG emissions goals and the continuation of ICE vehicle production and sales. The lowest ranked OEMs are those who are more likely to continue ICE vehicle sales in the Global South.

**TABLE 4: LEADING OEMS' NET ZERO COMMITMENTS AND PROGRESS TOWARDS NZE SCENARIO**

Rank	OEM	Net Zero Target	COP26 ZEVD Signatory	ICE Sales Beyond 2050	2022 Sales % ZEV vs NZE 2022 Target 16.8%	2030 Sales Forecast % ZEV vs NZE 2030 Target 64%
1	BYD	No explicit corporate NZ pledge	Yes	No ICE sales from 2040 globally, and by 2035 in leading markets	49.1%	74.7%
2	Geely	2045	Yes (Volvo, Polestar)	No firm commitment to end ICE sales by 2050	19.2%	59.8%
3	GM	2040	Yes	End ICE Sales 2035	2.5%	37.5%
4	Ford	2050	Yes	2030 Target BEV 100% sales in Europe and 50% of total sales	3.2%	35.8%
5	Honda	2050	No	End ICE sales 2040	0.7%	24.3%
5	Mercedes-Benz	2039	Yes	No firm commitment to end ICE sales by 2050	6.8%	44.2%
5	Stellantis	2038	No	2030 target 100% of car sales in Europe and 50% in US BEV	5.1%	43.3%
8	Tata Motors	2045	Yes (JLR)	No firm commitment to end ICE sales by 2050	4.7%	38.0%
9	BMW	2050	No	No firm commitment to end ICE sales by 2050	8.7%	59.7%
10	Renault	2050 (2040 Europe)	No	No firm commitment to end ICE sales by 2050	8.8%	40.6%
11	Hyundai	2050	No	No firm commitment to end ICE sales by 2050	6.3%	34.5%
11	Mazda	2050	No	No firm commitment to end ICE sales by 2050	0.8%	21.0%
11	Nissan	2050	No	No firm commitment to end ICE sales by 2050	3.4%	22.1%
11	SAIC	No Net Zero Target	No	No firm commitment to end ICE sales by 2050	29.3%	40.1%
11	Subaru	2050	No	No firm commitment to end ICE sales by 2050	0.3%	25.0%
11	VW	2050	No	No firm commitment to end ICE sales by 2050	8.1%	46.3%
11	Toyota	2050	No	No firm commitment to end ICE sales by 2050	0.4%	20.3%

Notes: NZE = International Energy Agency Net-Zero Emissions by 2050 Scenario (NZE Scenario). See Appendix for details.

Source: Public Company Information, IEA, GlobalData



We have compared:

1. OEM announced Net-Zero Goals and Milestones
2. OEM sales forecasts (GlobalData) against a trajectory of an increasing proportion of zero emission implied by the International Energy Agency (IEA) Net-Zero Emissions Scenario (NZE) to achieve net-zero consistent with limiting the global temperature rise to 1.5 °C. See Appendix 'International Energy Agency Net-Zero Emissions by 2050 Scenario NZE Scenario' for detail.

## 5.1 OEM announced Net Zero Goals

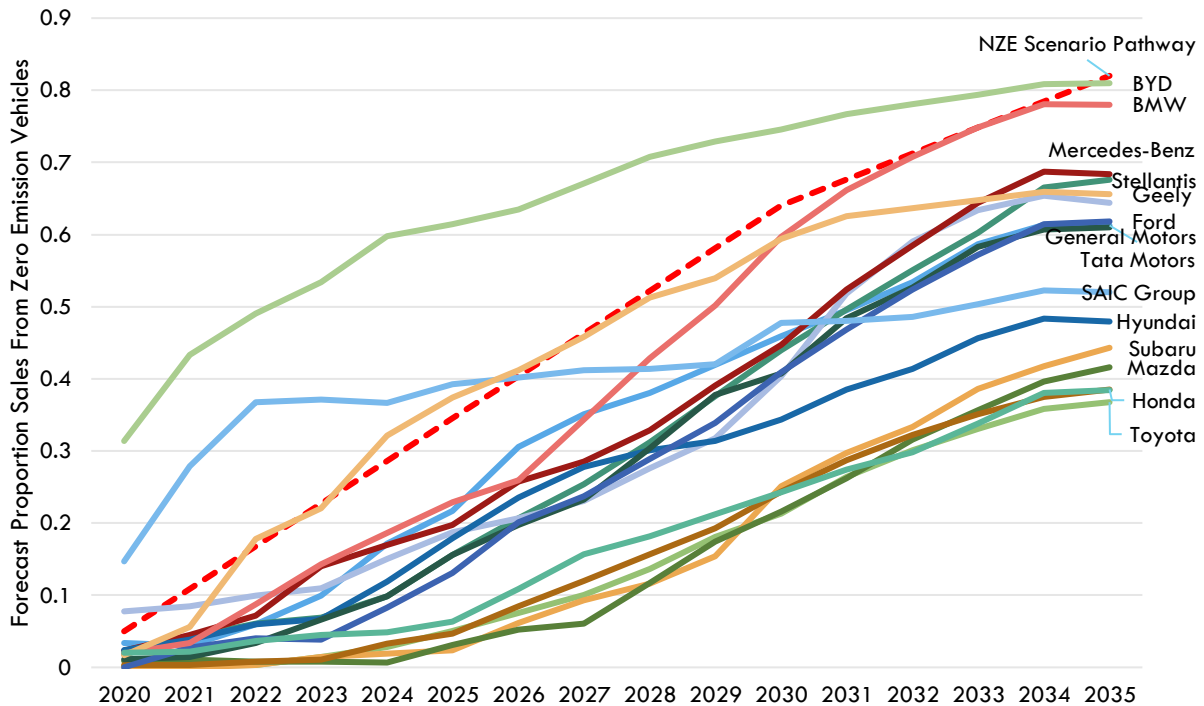
Apart from Chinese producers BYD and SAIC, all have pledged to transition their business to be net zero by 2050 at the latest. Mercedes-Benz has set the most ambitious goal of achieving net-zero by 2039, General Motors next by 2040, Geely and Tata Motors have targeted 2045 and the remainder 2050. As discussed in '[Slipped Gear](#)' OEM's provided scant detail as to how production of zero emission vehicles will be scaled up to enable them to meet their target. Out of all the milestones towards net zero provided by major OEMs, only two would put the manufacturer on a trajectory ahead of the IEA's NZE scenario.

- General Motors targets eliminating tailpipe emissions from new light-duty vehicles by 2035.
- Honda has targeted 100% of sales from BEV and fuel cell electric vehicles (FCEV) by 2040 and ending the sales of gasoline-powered cars globally.

That GM and Honda should have the most aggressive targets to decarbonise their sales is somewhat surprising as neither have led in the electrification of their vehicle sales to date.

## 5.2 OEM Sales Forecasts versus IEA NZE Scenario

**FIGURE 16: FORECAST PROPORTION OF SALES OF ZERO EMISSION VEHICLES COMPARED TO IEA NZE SCENARIO**



Source: GlobalData, IEA

In Figure 16, Carbon Tracker has compared the forecasted sales (GlobalData) for zero emission BEVs and FCEV to the trajectory implied by the NZE scenario. See Appendix 'International Energy Agency Net-Zero Emissions by 2050 Scenario NZE Scenario' for detail. This paints a different picture of the industry in which three Chinese OEMs initially lead the industry in zero emission vehicle sales. (Geely Group, BYD and SAIC) reflecting the strong influence of Chinese domestic policy to electrify passenger cars much earlier than the rest of the world. This momentum is forecast to stall beyond 2025, with Geely and SAIC's sales to include vehicles with ICE powertrains which would account for 40% and 59% of sales respectively in 2030. Only BYD is forecast to sell a sufficient proportion of zero emission vehicles that would put it on a path to meet the NZE scenario.

The sales mix forecast by GlobalData for BMW is the only other manufacturer where the current sales forecast of ZEVs is sufficient to put that OEM on a pathway by 2035 that is close to being consistent with the NZE scenario of carbon neutral by 2050 and limiting temperature rises 1.5°C.

## 5.3 Targeting new ICE Sales in the Global South?

For many OEMs, their product portfolio looks set to be dominated by their ICE powertrain vehicles well into the proposed transition. However, as we discussed in section 3.2 (Figure 8) sales of ICE vehicles in the Global North will be in decline in the approach to the phase out of ICE sales in the Global North. As the share of BEV sales continues to increase rapidly, the automotive industry will encounter a mounting challenge to find viable markets to sell ICE vehicles.

Table 5 below lists the announced regional bans and phase-outs of ICE vehicles representing around 70% of new car sales. As such, the automobile industry’s ICE manufacturing capacity will be focused on the remaining markets that have not implemented similar policies.

**TABLE 5: ANNOUNCED BANS AND PHASE-OUTS OF ICE VEHICLES**

Region	Date	Share of Global New Car Sales	Target
Europe	2035	16.2%	From 2025 Norway will lead Europe towards a ban of sales of all ICE vehicles. Austria, Greece, Denmark, Ireland, Netherlands and Sweden will follow in 2030 with the remaining EU countries and the UK following s in 2035.
North America	2035	17.4%	Canada targets 100% of passenger car sales will be ZEV by 2035. US states Washington, California, Massachusetts and New York target 100% of LDV sales will be zero emission by 2035. President Biden’s Climate Plan targets half of new car sales zero emission by 2030.
China	2035	35.1%	BEV, hybrid, and FCEV vehicles to account for 20% sales in 2025 and the majority of sales by 2035
<b>Total</b>		<b>68.7%</b>	

Source: IEA, GlobalData, MarkLines, Carbon Tracker

The global automobile industry is forecast to sell **798 million new passenger cars with an ICE (65% of total sales) between 2024 to 2035. In contrast, in the same period 425 million zero emission vehicles (BEV and FCEV)** (GlobalData estimates) **are forecast to be sold.** We anticipate that a growing portion of these ICE vehicles will be targeted at the Global South where regulations aimed at reducing carbon emissions from passenger cars are limited or inadequate. OEMs with significant ICE capacity could increasingly target markets which have not yet mandated an end to ICE vehicle sales.

In table 6 we show the markets with significant volume of new car sales where regulatory targets to phase out ICE vehicles are either absent or notably lax. Among these regions, the Global South stands out for its lack of concrete actions towards ending ICE vehicle sales.

**TABLE 6: MARKETS WITH WEAK OR NO TARGETS TO DECARBONISE PASSENGER CARS**

Market	Global Share (2022)	Annual New Sales (million)	Market	Global Share (2022)	Annual New Sales (millions)
India	3.0%	2.1	Philippines	0.4%	0.3
Australia	1.5%	1.0	Vietnam	0.4%	0.3
Thailand	1.2%	0.8	Colombia	0.3%	0.2
Turkey	1.1%	0.8	Pakistan	0.3%	0.2
Indonesia	1.1%	0.8	Taiwan	0.3%	0.2
Malaysia	1.0%	0.7	Egypt	0.2%	0.1
Russia	1.0%	0.7	Kazakhstan	0.2%	0.1
South Africa	0.5%	0.4	Uruguay	0.1%	<0.1

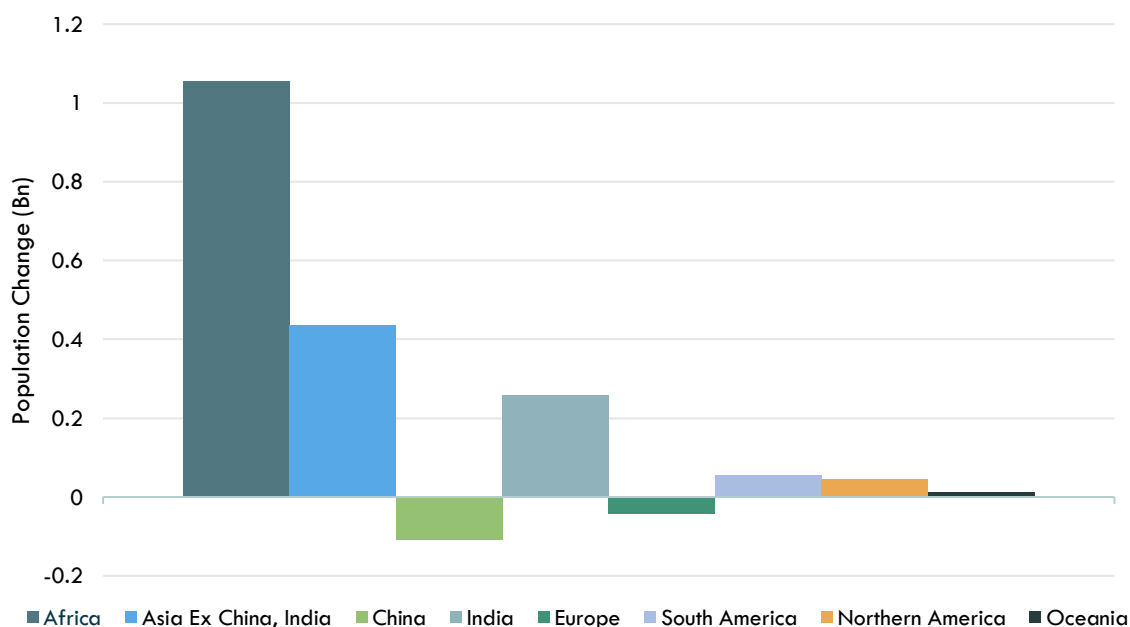
Source: MarkLines

In addition to remaining open to ICE sales, the Global South new car market is likely to grow faster than the mature markets of the global north. Faster population growth and lower motorisation rates mean that vehicle sales growth will outpace the Global North.

### 5.3.1 Africa

The population on the continent of Africa is forecast to grow at the fastest rate of all regions globally over the next 30 years. It has population of 1.4bn today and is forecasted to add an additional 1bn people over the next 3 decades, reaching 2.4bn by 2050 (Figure 17). If economic conditions permit, the African market stands out as having the potential to grow rapidly over the coming decades.

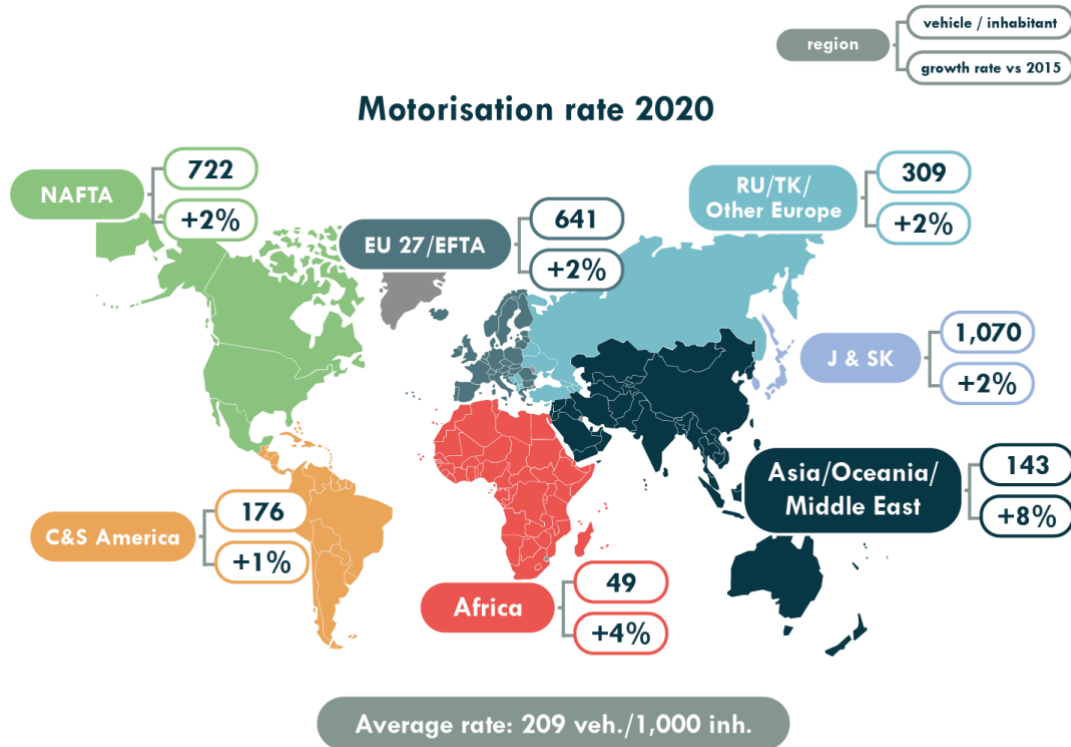
**Figure 17: UN Global Population Growth Forecasts (2022-2050)**



Source: UN World Population Estimates, Carbon Tracker

Motorisation rates in Africa are the lowest globally. Data from OICA points to a rate of only 49 vehicles (including commercial vehicles) per 1,000 population. Across the continent there is a wide variation in motorisation rates from 176 in South Africa and 144 in Algeria to rates in the 20's for the less developed economies (Figure 18).

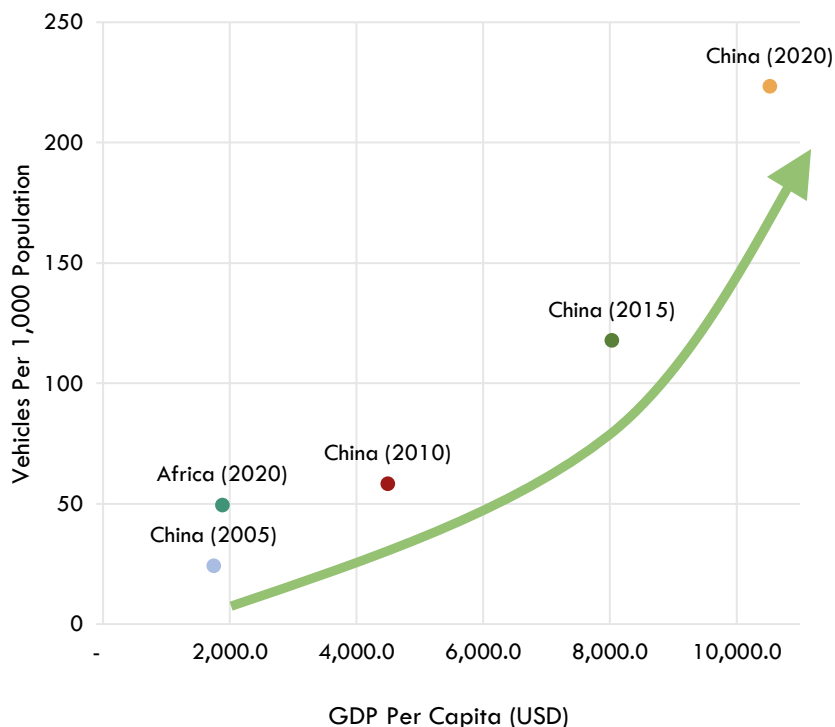
FIGURE 18: MOTORISATION RATES WORLDWIDE 2020



Source: OICA

If current motorisation rates for African countries are maintained, the number of passenger cars on the continent is expected to increase by approximately 16 million by 2050, a 46% increase. This growth rate lags the forecast growth in population for all of Africa (75%) over the same period, as the countries with the largest forecast growth in population have the lowest rates of car ownership. Under a more favourable economic backdrop, car ownership in Africa has the potential to at least double from current levels over the next 20 to 30 years. If we compare the IMF's estimate of GDP per capita for Africa in 2020 (\$1,890) to China in 2005 (\$1,750), we can see how rates of vehicle ownership in China increased almost tenfold over a 15-year period from 24 vehicles per 1,000 population in 2005 to 223 in 2020 (Figure 19). China's economic transformation over this period is unparalleled, however it does highlight how economic growth, starting from a level similar to Africa today propelled a massive growth in vehicles.

**FIGURE 19: AFRICA AND CHINA MOTORISATION RATES**



Source OICA, IMF

### 5.4 Diverging Routes South

Over the next decade new car sales in the Global North will increasingly shift to BEVs while most OEMs will continue to have ICE capacity, and some have no target date to end production of ICE vehicles at all. The absence of mandates to end ICE sales and imports to the Global South could make these markets dumping grounds for OEM’s ICE for decades, particularly in the medium term once the Global North’s fleet of vehicles has increasingly transitioned to BEV and circularity requirements limit the quantity of used vehicles that can be exported. This would further extend the Global South’s dependence on imported fossil fuels for an expanding fleet of vehicles.

As we noted at the start of section 5, OEM’s will play an important role in how the motor vehicles in the Global South electrify. The following 2 examples highlights how OEM’s have choices, either to maintain the status quo and remain reliant on fossil fuels or to work with states to develop an ecosystem that will support electrification.

In India, Toyota is actively lobbying the government to extend the use of ICE vehicles by reducing taxes on hybrid vehicles which are taxed at 43%, slightly lower than the 48% taxation imposed on petrol vehicles. In contrast, EVs are subject to a significantly lower 5% tax rate, aligning government policy towards sustainable transportation.

In contrast, the co-CEO of Mercedes-Benz Cars South Africa, is encouraging the government to accelerate the development of an EV policy for the country. To maintain the country’s relevance in the global automotive industry, given that a substantial portion of vehicles manufactured in South

Africa are exported to markets where the sale of new petrol and diesel vehicles will be banned, policy recommendations from the premium OEM include:

- Reductions in import taxes for EVs
- Development of EV charging infrastructure
- Investments in skills required for an EV ecosystem

## 6 Conclusions and Policymakers' Brief

### Background

The evidence is showing that the [tipping point](#) for electric vehicles is accelerating towards us.

However, **the global deployment of Battery Electric Vehicles (BEVs) is geographically bifurcated**; the passenger vehicle fleet in the Global North is rapidly decarbonising through deployments of zero tailpipe emission vehicles. Conversely, new and used BEV sales volumes in the Global South remain at present insignificant. This is largely to be expected in the short-term, as most new vehicle sales are in developed countries; while the Global South continues to be predominantly an export destination for used internal combustion engine (ICE) vehicles from the Global North.

This state of affairs has reduced the Global South – where new vehicle sales are limited to companies operating in the region and wealthy private individuals - to a passive role in the overall automotive market, with limited accessibility to affordable vehicles.

It's therefore a key question, which Carbon Tracker examines in the accompanying report, about whether - as the tipping point for BEVs approaches and the associated electric vehicle technology moves down the cost curve - **the Global South will have the opportunity to leapfrog the incumbent ICE regime to BEVs and play an active role in the automotive market.**

There are significant barriers standing in the way of this opportunity, in part because car manufacturers who have been grounded in a fossil fuel-based transport system (and as they see new ICE sales decline in the North) may transfer their target markets for new ICE products to the South.

### The Big Issues

Carbon Tracker has therefore considered the potential economic and financial benefits to countries in the Global South of the development of a domestic electric vehicle fleet. We factor into this analysis of sales forecasts from the major automotive manufacturers. There is a particular focus on Africa and, in co-operation with our partners Power Shift Africa, include case studies on Uganda, Morocco and South Africa

There is of course the **wider backdrop of the challenges posed by the energy transition to Global South countries**, some of which we covered in our November 2022 report African Sun: notably in relation to dependency on fossil fuel resources; having the necessary regional and local power sector infrastructure; and how investment in the clean energy economy can be mobilised and accelerated.

The **challenges to developing domestic BEV fleets in Global South nations lie primarily in the field of policy and regulation.** This brief is therefore directed at governments and policymakers, for whom we draw the main implications and suggest some principal actions.



## What are the Implications for Policymakers?

- Given the risk of the Global South becoming a dumping ground for Global North ICE “wastage”, we can see an **incentive for some countries in the region to become first movers on EVs** by setting end dates for ICE imports;
- in parallel, it will be crucial – arguably essential, if EVs are going to supplant ICE cars – for **developing nations to be incentivised to accelerate their domestic renewables market**, by building a supportive infrastructure and clean energy system;
- a domestic EVs strategy can also support the development of **domestic and regional green industrial strategies**. This is not a naïve argument for the Global South to replicate the breadth and scale of green industrial plans now being pursued in the US, Europe and China. But it is to lodge an important point for policymakers, that a pro-active green industrial policy can contribute to jobs, prosperity and regional free trade;
- the **co-benefits of the low-carbon economy to the developed world** have been consistently highlighted over the years: on air pollution; and increasingly so for energy security (cf our sister report, Beyond Petrostates, which analyses the economic and fiscal and risks for countries overly dependent on fossil fuel production);
- for those Global South countries who are resource-rich in **domestic minerals**, the development of a green industrial strategy is also an economic opportunity to maximise their relevant natural resources in this emerging sector;
- finally, and to take a step back when considering **impacts on the global carbon budget**. Early movement on EVs in the Global South (building on the EV take-up in the Global North which is underway) will contribute to overall fossil fuel demand destruction globally. This in turn can support a virtuous circle for the transition and the continuing fall in clean energy costs worldwide.

## 7 Appendix

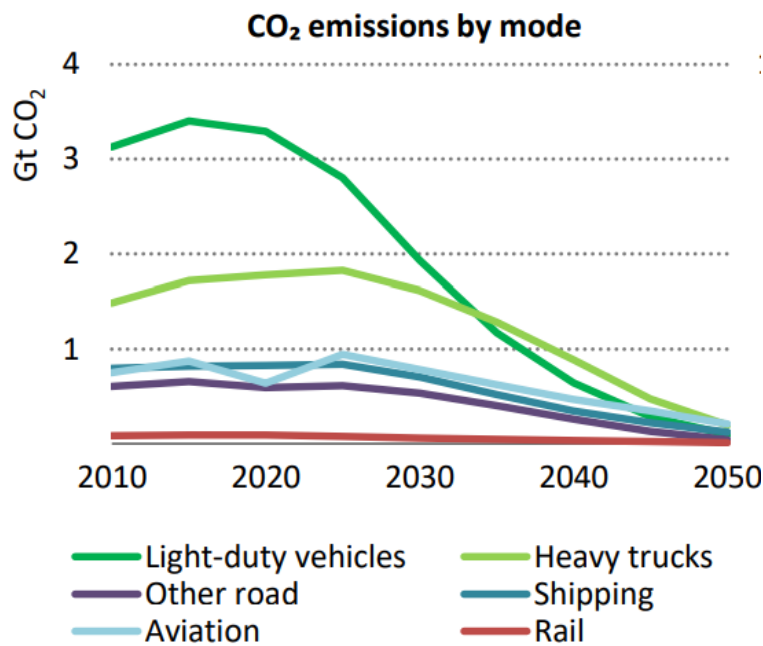
### International Energy Agency Net-Zero Emissions by 2050 Scenario (NZE Scenario)

In 2021 the International Energy Agency published a report 'Net Zero by 2050, A Roadmap for the Global Energy Sector', which set out pathways for energy users to meet pledges of achieving Net Zero by 2050 or earlier.

The report sets out milestone for sectors and technologies in its Net-Zero Emissions by 2050 Scenario (NZE) that would provide a pathway to achieving Net Zero consistent with limiting the global temperature rise to 1.5 °C without a temperature overshoot.

The report identifies a series of milestones for the proportion of electric vehicles in the global stock of passenger cars, increasing from 1% in 2020 to 20% in 2030 to 86% in 2050 that would be required to largely eliminate CO<sub>2</sub> emissions from passenger cars globally by 2050. The NZE scenario assumes an increase in the global passenger car fleet from 1.2 billion vehicles in 2020 to close to 2 billion in 2050.

**FIGURE 20: GLOBAL CO<sub>2</sub> TRANSPORT EMISSIONS BY MODE IN IEA NZE SCENARIO**



Source: IEA, *Net Zero by 2050, A Roadmap for the Global Energy Sector*

In a separate report by the IEA, 'World Energy Outlook 2021 October 2021' they presented milestones for the share of sales of new passenger cars required to enable the global stock of cars to be electrified (PHEV, BEV and FCEV), from 5% in 2020, 64% in 2030 and 100% in 2040.

## 8 Glossary

**Automotive OEM (Original Equipment Manufacturer)** – A vehicle manufacturer.

**BEV (Battery Electric Vehicle)** – A vehicle that propels itself only with an on-board battery and electric motor(s). There is no ICE on-board. The battery can be charged by connecting the vehicle to an external source e.g., an electric vehicle charger. The Tesla Model S is an example of BEV.

**EV (Electric Vehicle)** – An umbrella term for a vehicle that uses electrification (batteries and an electric motor) to propel itself. EV can include hybrid electric vehicles, plug-in hybrid electric vehicles and battery electric vehicles.

**Hybrid** – An umbrella term which includes PHEVs and conventional hybrid vehicles. Conventional hybrids use a motor, on-board battery, and ICE to propel itself, but with no means of externally charging the battery using a charging station. A Toyota Prius is an example of conventional hybrid vehicle.

**PHEV (Plug-in Hybrid Electric Vehicle)** – A vehicle that has an on-board battery, electric motor and ICE. The battery can be charged by connecting the vehicle to an external source e.g., an electric vehicle charger. The vehicle uses the motor, powered by the on-board battery, and ICE to propel itself. The BMW 330e is an example of a PHEV.

**ICE (Internal Combustion Engine)** – An engine that combusts a fossil-fuel derived liquid in a combustion chamber.

**FCEV (Fuel Cell Electric Vehicle)** – An electric vehicle that uses a hydrogen fuel cell to power an onboard electric motor.

**Global North** – the regions of Europe, North America, South Korea, and Japan.

**Global South** – the regions of Latin America, parts of Asia and Oceania, but with a core focus on Africa. In this study, we do not define China within the Global South. China is the single largest passenger vehicle market in the world and has leadership in the transition to electric vehicles and battery technology. For this reason, in this report China is likened to a 'Global North' country.

**Motorisation Rate** – a term used to quantify the extent to which motor vehicles are in use in a country. It is typically stated as the number of registered motor vehicles in a country per 1,000 inhabitants.

**NZE Scenario** – International Energy Agency Net-Zero Emissions (NZE) by 2050 Scenario. See Appendix for details.

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