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EMPOWERING SUSTAINABLE URBAN MOBILITY:

Factors Influencing the Adoption of EVs in Nigeria

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Introduction

Transportation is one of the significant contributors to climate change, accounting for about 25% of global energy-based greenhouse gas emissions. According to the International Energy Agency's (IEA) Global Energy & CO2 Status Report of 2019, there is an expected increase in these emissions, majorly from passenger vehicles, freight trucks, ships, and aeroplanes, if concrete actions are not taken to mitigate the emissions. Most of these emissions are caused by the combustion of fossil fuels, such as gasoline and diesel, in the engines of these vehicles. The transportation sector also contributes to local air pollution, negatively impacting public health and the environment. These pollutants, such as nitrogen oxides (NOx), particulate matter (PM), and sulphur dioxide (SO2), can cause respiratory illnesses, cardiovascular disease, and other health problems for humans.

At the rate of global urbanisation and migration to city centres, combined with increased economic activities, transportation needs are only expected to increase. This means more vehicular carbon emissions, except the systems of the engines become powered by clean energy in various forms. One way to mitigate these emissions is the use of electric mobility. Electric mobility refers to using electric power in vehicles, such as cars, buses, scooters, and bicycles, as an alternative to traditional fossil fuel-powered engines. The shift towards electric mobility has been driven by concerns over the environmental impact of fossil fuels and the need to reduce greenhouse gas emissions to mitigate climate change.

Electric vehicles (EVs) do not release any exhaust pollutants when they are in operation. EVs use electric motors instead of traditional internal combustion engines, which burn fossil fuels and emit pollutants into the atmosphere through their exhaust. Instead, EVs are powered by rechargeable batteries, which can be charged at charging stations or at home using a charging cable. The batteries store energy used to power an electric motor, which propels the vehicle. EVs produce zero emissions, making them a cleaner alternative to traditional gasoline or diesel-powered vehicles.

The absence of a tailpipe means that there are no direct emissions of pollutants, as is the case for internal combustion engine (ICE) vehicles or other harmful substances during the driving phase of an electric vehicle. This characteristic makes EVs a cleaner and more environmentally friendly option than traditional vehicles, particularly in urban areas where air quality is a significant concern.

There are several EV types, including battery electric vehicles (BEVs), which are solely powered by electric motors and rely on batteries for energy storage, and plug-in hybrid electric vehicles (PHEVs), which combine a traditional ICE with an electric motor and rechargeable battery. Hybrid electric vehicles (HEVs) use both an internal combustion engine and an electric motor to power the vehicle, but the battery cannot be recharged from an external power source.

Significance of electric mobility in reducing greenhouse gas emissions and promoting sustainable transportation.

Electric mobility has significant potential to reduce greenhouse gas emissions and promote sustainable transportation. This shift towards electric mobility has been driven by concerns over the environmental impact of fossil fuels and the need to reduce greenhouse gas emissions to mitigate climate change. A major benefit of electric mobility is its zero tailpipe emissions, which can significantly lower greenhouse gas emissions and air pollution, particularly in urban areas where air quality is a major concern. Electric vehicles are more energy-efficient than traditional gasoline or diesel-powered vehicles, which can help reduce overall energy consumption and dependence on fossil fuels. In addition, electric vehicles can be charged using renewable energy sources such as solar and wind power, which can help reduce greenhouse gas emissions and promote sustainable energy systems. The shift towards electric mobility can also promote sustainable transportation systems by reducing reliance on fossil fuels and promoting the use of public transportation and active modes of transportation such as

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United Nations Department of Economic and Social Affairs. (2019). World Urbanization Prospects 2018: Highlights. https://www.un.org/development/desa/publications/2018-revision-of-world-urbanization-prospects.html

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National Renewable Energy Laboratory. (2021). Electric Vehicle Basics. https://www.nrel.gov/transportation/electric-vehicle-basics.html. Please note that the Zero emissions referenced here is only applicable when a Life Cycle Analysis is not considered.

United States Department of Energy. (2022). Types of Electric Vehicles. https://www.energy.gov/eere/electricvehicles/types-electric-vehicles

International Energy Agency. (2020). Global EV Outlook 2020: Entering the decade of electric drive?. Paris: IEA. https://www.iea.org/reports/global-ev-outlook-2020

walking and cycling. This can help reduce traffic congestion, improve air quality, and promote healthy, active lifestyles. Electric mobility is a transformative solution at the forefront of global initiatives to combat climate change. By eliminating tailpipe emissions, EVs play a crucial role in reducing the transportation sector's contribution to the overall carbon footprint. This aligns directly with international efforts to mitigate climate change, recognising vehicle emissions as a significant environmental concern.

Furthermore, EVs exhibit higher energy efficiency than traditional internal combustion engine vehicles. Embracing electric mobility contributes to reducing greenhouse gas emissions and aligns with global agendas focused on enhancing energy efficiency and decreasing dependence on non-renewable energy sources.

Integrating renewable energy sources, such as solar and wind power, into the charging infrastructure of electric vehicles is a pivotal aspect of the energy transition agenda. This emphasises the imperative to shift towards sustainable and renewable energy systems, thereby diminishing reliance on fossil fuels and lessening environmental impact. Electric mobility fosters the development of sustainable transportation systems by diminishing dependence on fossil fuels, promoting public transportation, and encouraging active modes like walking and cycling. These efforts collectively contribute to creating more sustainable, efficient, and environmentally friendly urban transportation infrastructures.

The emphasis on zero tailpipe emissions in electric mobility directly addresses concerns about local air pollution, especially in urban areas. This focus resonates with global agendas striving to enhance air quality for the betterment of public health and environmental well-being.

Moreover, the transition towards electric mobility can also create economic opportunities in areas such as advanced manufacturing, battery technologies, and charging infrastructure, which can help support local economies and job creation. Electric mobility has significant potential to reduce greenhouse gas emissions, promote sustainable transportation, and support the transition to a low-carbon, sustainable energy system. Governments, businesses, and individuals can all play a role in promoting electric mobility through policies and initiatives that support the development and adoption of electric vehicles, charging infrastructure, and renewable energy sources. Working together to promote electric mobility can help build a cleaner, healthier, and more sustainable future for all.

Electric Mobility in Nigeria

Electric mobility in Nigeria is still at its nascent stage. With several challenges still being encountered with the energy access rate in the country, there are only a few electric vehicles on Nigerian roads. Two significant ones champion these challenges: the bad state of the roads and low electricity access. Despite these, there is considerable growing interest in adopting EVs to reduce the country's dependence on imported fossil fuels and address the issue of air pollution in urban areas, championed by the Nigerian government.

In 2018, the Nigerian government announced plans to phase out the use of petrol and diesel vehicles by 2040 and to promote the use of electric and other alternative fuel vehicles. This was part of a broader strategy to reduce greenhouse gas emissions and promote sustainable development in the country. In 2019, the Nigerian Electric Mobility Policy was launched to provide a framework for developing electric mobility in the country. The policy aims to promote the use of EVs for public transportation, such as buses and taxis, and personal use. In 2020, Nigeria's Federal Ministry of Transportation, Department of Road Transport and Mass Transit Administration and, Federal Ministry of Environment, Department of Climate Change filed a technical request for assistance from the Climate Technology Centre and Network (CTCN) in the development of a "National E-Mobility Policy and Framework for Deploying and Scaling up E-Mobility in Nigeria". In 2022, the Nigerian government signed a memorandum of understanding (MOU) with Israeli and Japanese companies to start manufacturing EVs in Nigeria.

Moreover, some private companies and organisations have introduced EVs into their fleets. For example, in 2020, the ride-hailing company Bolt, launched a pilot program in Lagos to provide electric car rides to customers. Similarly, the

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CTCN. (n.d.). Developing a National e-Mobility Policy and Framework for Deploying and Scaling Up the Use of Electric Vehicles in Nigeria. Retrieved from https://www.ctc-n.org/technical-assistance/projects/developing-national-emobility-policy-and-framework-deploying-and.

Nigerian energy company, Ardova Plc, has partnered with Shell to provide EV charging stations in the country. MAX NG, Think Bikes, and Phoenix Renewables, among others, are some players in the country's local assembling of electric vehicles. However, the common EV types in Nigeria are cars, bikes, and tricycles (Keke Napep). As of 2022, electric vehicle charging infrastructure in Nigeria is still in its infancy, with limited public charging stations available. However, several initiatives are underway to increase the number of charging stations and promote electric mobility in the country. For instance, the Nigerian government has announced plans to install charging stations in public places such as airports, malls, and hospitals. According to a report by Clean Technology Hub, as of 2022, there are about 20 public EV charging stations across Nigeria, most located in Lagos, the country's commercial capital. According to the report, there is a huge need for increased investment in charging infrastructure, including fast-charging stations and battery swap stations, to support the growth of electric mobility in Nigeria.

Investing in Nigeria's Energy Transition Opportunity. Retrieved from https://www.energytransition.gov.ng/wp-content/uploads/2022/05/Investing-in-Nigeria-Energy-Transition.pdf

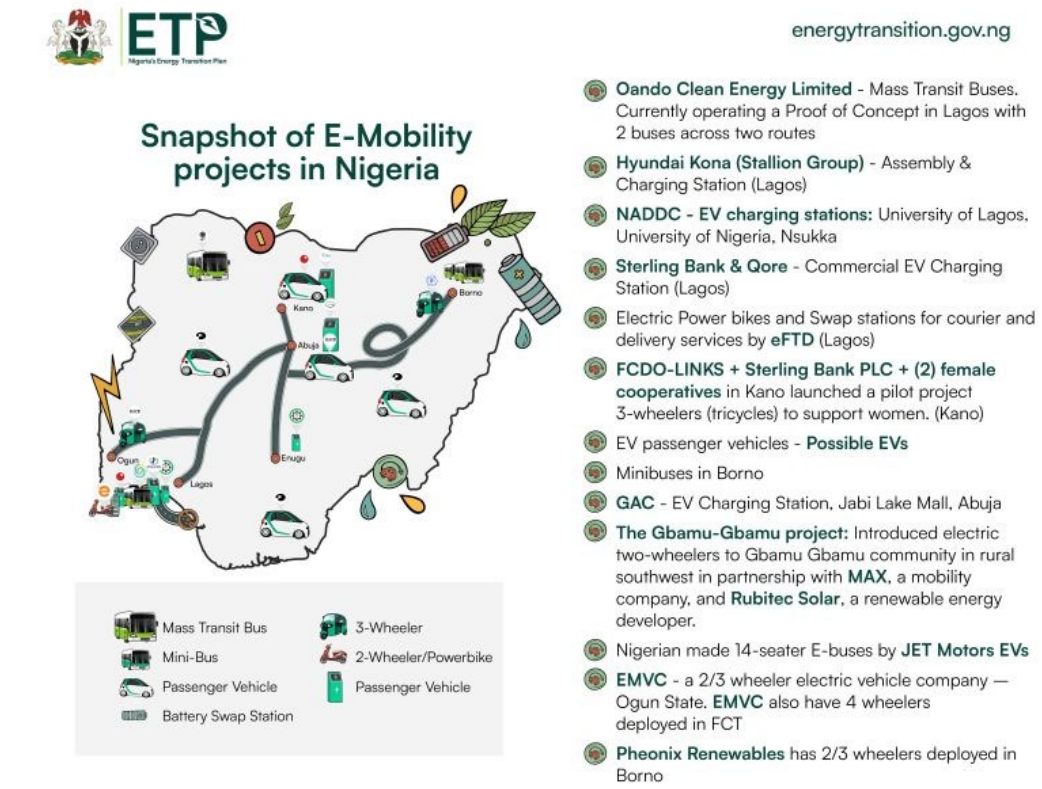

Figure 1: Snapshot of E-Mobility Projects in Nigeria

Nigeria is taking the first steps towards achieving net zero by 2060 after creating its energy transition strategy. Still, much more work must be done before the idea can be implemented. However, progress on the Nigerian energy transition plan (ETP) and its implementing stakeholder office, the energy transition office, shows that EVs can really thrive in the country. The plan has the implementation of E Mobility as a core part of its details as it means to engage Original Equipment Manufacturers (OEMs) towards commencing a local manufacturing/ assembly of key technologies, including electric vehicles, by 2025. The plan also hopes to Implement technical assistance for skill development and knowledge transfer for the deployment of EVs, the establishment of a carbon market, and the development of a just transition pathway beyond oil and gas in the country. This shows the critical role that sustainable mobility, especially through the use of electrification, plays in the government plans and policies to support the plan, which is now being put in place.

Figure 2: A snapshot of the ETP's incremental investments from 2021-60 to reach Net Zero by 2060

Through the ETP, the Nigerian Energy Transition Office has declared its goal to create the nation's EV charging infrastructure post-2030 strategy. The goal of this plan is to improve EV drivers' convenience and accessibility across the country. Approximately 3,000 EV charging stations are expected to be deployed annually under this scheme. This large-scale project is a reflection of the determination to hasten the shift to environmentally friendly transportation and encourage the widespread use of electric vehicles in Nigeria. The commitment of governments, companies, and stakeholders to support the shift to a low-carbon transport sector is reflected in this ambitious programme.

The ETP has plans to have the market for electric vehicles (EVs) grow at a compound annual growth rate (CAGR) of 1.5% annually after 2030. This growth rate indicates that the EV market will gradually but steadily expand over time. Technological improvements, environmental laws, and consumer preferences for sustainable transportation options are likely to propel the electric vehicle (EV) sector towards continuous growth, despite obstacles such as limited infrastructure and roadblocks to customer adoption. A gradual progression towards a larger market share for electric vehicles (EVs) in the automotive sector is reflected in the 1.5% CAGR. This has implications for lower greenhouse gas emissions, energy security, economic prospects in the shift to greener mobility options and the entire Nigerian economy.

Nigeria is embarking on an ambitious plan to expand electric mobility across the country. With an investment of $100 million, the initiative encompasses several key components aimed at accelerating the adoption of EVs and their supporting infrastructure.
According to an investment opportunity report by the Nigerian energy transition office, the procurement of electric fleet buses for a pilot program marks a significant step towards transitioning Nigeria's public transportation sector to cleaner and more sustainable alternatives. These electric buses will serve as a tangible demonstration of the viability and benefits of EVs in urban mobility, reducing emissions and improving air quality in congested city centres.

The pilot rollout of EV-supporting infrastructure will include the establishment of charging stations and other necessary infrastructure to facilitate the widespread adoption of electric vehicles. By strategically deploying charging infrastructure in high-traffic areas and along key transportation routes, the initiative aims to address range

Investing in Nigeria Energy Transition _final draft for consultation v2 09.03.2022.docx, Retrieved from https://www.energytransition.gov.ng/wp-content/uploads/2022/05/Investing-in-Nigeria-Energy-Transition.pdf

International Council on Clean Transportation. (2019). The role of financial incentives in promoting electric vehicles: an international review. https://theicct.org/publications/financial-incentives-promoting-electric-vehicles

anxiety and enhance the accessibility and convenience of EVs for both commercial and residential users.

Logistics costs associated with the implementation of the electric mobility expansion plan will also be accounted for, ensuring efficient project management and resource allocation throughout the process. The project seeks to serve as a proof of concept for the feasibility and scalability of electric mobility solutions in Nigeria. By demonstrating the economic viability and environmental benefits of EVs, the project aims to catalyse increased adoption across commercial and residential segments, driving further demand for electric vehicles and supporting infrastructure.

Moreover, financing mechanisms will be established to incentivise private sector participation in the expansion of electric mobility, providing support for vehicle procurement and charging infrastructure deployment. This collaboration between the public and private sectors underscores the commitment to sustainable development and the transition towards a greener, more resilient transportation ecosystem in Nigeria.

Policy Initiatives to Promote Electric Mobility in Nigeria

Government policies play an important role in fostering the development of the electric mobility sector in any country. A study by the International Council on Clean Transportation found that financial incentives such as tax credits and subsidies were critical in driving the adoption of electric vehicles in several countries, including the United States, China, and Norway. The study also noted that supportive policies such as emissions standards and vehicle electrification targets were essential in encouraging manufacturers to invest in electric vehicle technology and infrastructure. Therefore, in Nigeria's case, policies that accentuate increased research, financing, and incentives for manufacturers remain key to the growth of the sector.

With a high demand for sustainable and eco-friendly transportation options, the Nigerian government has implemented several policies and initiatives to promote electric mobility. Some key government policies and initiatives promoting electric mobility in Nigeria include

1. **National Automotive Industry Development Plan:** In 2013, the Nigerian government launched the National Automotive Industry Development Plan (NAIDP) to promote the development of the automotive industry in Nigeria. The policy provides for the development of electric vehicles and encourages local production of electric vehicle components.

2. **Import Duty Waivers:** The government provides import duty waivers on electric vehicles and their components to encourage importing electric vehicles and related parts into Nigeria.

3. **National Electrification Policy:** The National Electrification Policy aims to achieve universal access to electricity in Nigeria by 2030. The policy promotes the use of renewable energy sources for power generation. It supports the development of electric mobility infrastructure.

4. **Nigerian Electric Mobility Policy:** In 2019, the Nigerian government launched the Nigerian Electric Mobility Policy to promote the use of electric vehicles in the country. The policy provides for the development of electric vehicle charging infrastructure, local production of electric vehicles, and incentives for purchasing electric vehicles.

5. **Green Bond:** In 2017, the Nigerian government issued a green bond to fund projects to mitigate the effects of climate change. A significant portion of the bond was allocated to developing electric mobility infrastructure, including deploying electric vehicle charging stations.

These policies and initiatives have created a favourable environment for developing and adopting electric mobility in Nigeria.
Key Players in the Electric Mobility Sector in Nigeria

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Jet Motor Company. About Us. Retrieved May 5, 2023, from https://www.jetmotorcompany.com/about

Company Name	Activities
JET Motor Company	JET Motor Company is a Nigerian electric vehicle manufacturing company that produces electric tricycles and quadricycles. The company has a plant in Lagos state that can produce 7 daily. In 2021, the company got $9 million in research and development funding. Early adopters of the company's products include GIG Logistics, a Nigerian logistics company.
Stallion Group	Stallion Group is a Nigerian conglomerate that has ventured into the electric vehicle market with the launch of the Hyundai Kona electric vehicle in Nigeria. This product was birthed in partnership with the Lagos State government and unveiled in Abuja by the National Automotive Design and Development Council (NADDC).
Interswitch	Interswitch is a Nigerian financial technology company that has partnered with EVXpert to launch an electric vehicle financing platform.
Phoenix Renewables	This company, led by Mustapha Gajibo, is into retrofitting ICEs into electric ones and building electric vehicles from scratch.
Max.ng	In 2017, Max.NG, which began as a motorcycle-based logistics service provider, branched out into passenger transportation. To scale its mobility solutions, $7 million in investment was secured in June 2019 through grants and equity. The company made its first EV design and concept, the MAX E series M1, in 2019. Another recently created EV with improved performance is called the MAX E series M2. In Gbamu Gbamu, Ogun state, Nigeria, Max partnered with Rubitec Solar to provide battery charging and switching stations for bicycles powered by a Rubitec mini-grid.

Figure 2: A snapshot of the ETP's incremental investments from 2021-60 to reach Net Zero by 2060

Challenges Facing Electric Mobility in Nigeria

Several challenges must be addressed to accelerate EV adoption in Nigeria. These include the lack of infrastructure, such as charging stations, and the high cost of EVs compared to traditional petrol and diesel vehicles. In addition, there is a need to increase awareness and educate the public about the benefits of electric mobility. With continued efforts to address the challenges and promote the adoption of EVs, electric mobility has the potential to play an important role in Nigeria's transition to a more sustainable and low-carbon future.

The Infrastructure Problem

One of the biggest obstacles to the broad acceptance and efficient operation of electric mobility in Nigeria is the lack of suitable infrastructure for charging. This problem, however, is being seen as a chicken and egg situation as many investors believe that for them to capitulate in the electric mobility infrastructure market, there have to be enough electric vehicles that satisfy the requirement level of the charging infrastructure and, therefore, a return of investment based on the investment level required.

Considering this challenge more closely, it is evident that the country has comparatively few electric vehicle (EV) charging facilities, especially in light of its growing preference for electric transportation. Finding suitable and timely charging stations is hard for electric vehicle users due to inadequate infrastructure, especially in areas outside of large cities. Another aspect of his challenge that possibly peeps into the future is the possible uneven geographic distribution as rural and peri-urban areas are generally underserved by charging infrastructure primarily centred in urban areas. This regional mismatch limits the accessibility of electric mobility (especially public transport solutions) to a wider population and

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ibid.

impedes its smooth integration across the nation.

A critical factor in this conundrum is the country's electricity access level. According to the World Bank (2021), electricity access stands at 59.5% in Nigeria. Infrastructure for charging can become unreliable in some parts of Nigeria due to irregular and unstable power supplies. Frequent power fluctuations and interruptions can cause charging sessions to be disrupted and, in certain situations, may even cause damage to EV batteries.
Also, Nigeria is confronted with substantial financial obstacles when it comes to the construction of electric car charging infrastructure. One of the biggest of these is the initial setup expenditures, which include the purchase and installation of charging stations. Due to this financial limitation, businesses and individual investors become less interested in growing the charging network. A major factor in the underutilisation of electric vehicle charging stations is a lack of public knowledge about their availability and benefits. Campaigns to raise awareness about the locations and advantages of the current infrastructure for charging electric vehicles are essential in order to address this problem and inform both the general public and prospective owners of these vehicles.

Furthermore, a significant obstacle to the private sector's participation in the creation of charging infrastructure is the lack of explicit and encouraging government rules and incentives. To incentivise companies to participate in and grow the charging network, incentives like tax breaks and subsidies must be put in place. Financial stakeholders, governmental organisations, and awareness campaigns must work together to overcome these obstacles and establish an atmosphere that supports the expansion and broad use of electric mobility in Nigeria.

The Cost of EV Problem

One major obstacle to the widespread adoption of electric mobility in Nigeria is the high cost of electric cars (EVs). The high prices are caused by various causes, which preclude a larger portion of the population from having access to EVs. Looking at the economics of purchasing an electric vehicle for an average Nigerian, it makes little sense based on the financial earnings of most car users in the country. As of December 2020, Nigeria had 11,605,207 registered motor vehicles, according to the International Organisation of Motor Vehicle Manufacturers. Looking at the kind of vehicles used in the country, an ODI assessment claims that Nigeria has a sizable and expanding middle-class population of between 50 and 100 million people who may be interested in purchasing cars. With over 203,136 used automobiles imported in 2018, Nigeria is Africa's largest importer of used cars, according to research published by the United Nations Environment Programme (UNEP). The research also notes that used automobile imports account for more than 60% of the new vehicles introduced to Africa annually. According to UNEP data, 203,136 used automobiles were imported into Nigeria in 2018, making it the third-highest importer of used cars worldwide, which does not provide the precise percentage of used cars imported into the nation. Given these statistics, it can be inferred that the cost of electric vehicles, averaging $53,376 as of 2023, is still far from being affordable for most Nigerians. This cost does not reflect the cost of transport and other import duties that must be met before the car becomes operational on a Nigerian road. Nigeria imposes significant import tariffs and taxes on vehicles, including EVs. These additional costs substantially inflate the overall price of electric vehicles, making them less competitive than traditional internal combustion engine vehicles.

An excessive reliance on imports is the result of the lack of local assembly or manufacturing facilities for electric vehicles. The cost of shipping, taxes, and tariffs increases when fully assembled electric vehicles are imported; these costs are then passed on to the final customer. This can be resolved by Nigeria establishing itself as an upstream producer of intermediate goods by utilising the abundance of raw materials on the continent.

A large amount of the expense of an electric car is related to the battery. Although battery technology is advancing and becoming less expensive over time, the initial high cost of advanced battery systems adds significantly to the total cost of electric vehicles. Large reserves of lithium ore are available for commercial use in several states in the country. This is the main raw material source utilised to manufacture electric car lithium-ion batteries.

The fact that most of the raw resources needed to make intermediate products

Nigeria Registered Motor Vehicles, 2005 – 2023 | CEIC Data Retrieved from https://www.ceicdata.com/en/indicator/nigeria/motor-vehicle-registered

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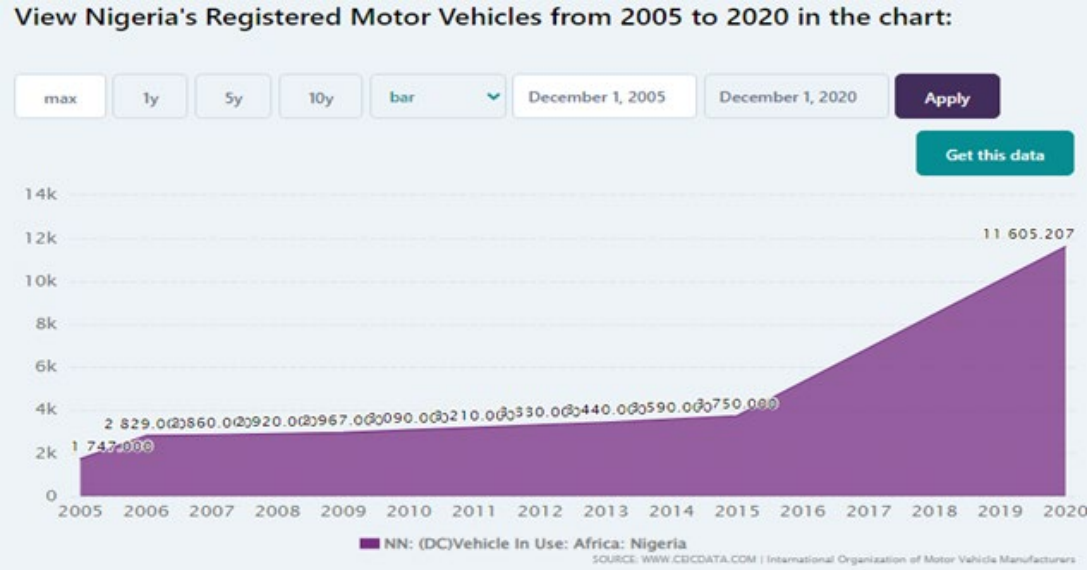
Reviving Nigeria's Automotive Industry: opportunities and challenges under the AfCFTA | ODI: Think change Retrieved from: https://odi.org/en/insights/reviving-nigerias-automotive-industry-opportunities-and-challenges-under-the-afcfta/

usedvehicles_updatereport2021.pdf (sustmob.org). Retrieved from https://sustmob.org/UsedVehicles/usedvehicles_updatereport2021.pdf

in the industry—such as rubber, aluminium, and lithium—are easily found in Nigeria should be taken very seriously. Theoretically, this might also encourage international investment. The global electric vehicle market currently, according to BloombergNEF's (BNEF) latest annual Electric Vehicle Outlook (EVO), represents a $7 trillion global market opportunity between today and 2030 and $46 trillion between now and 2050.

Nigeria could establish bilateral ties with other nations under the AfCFTA in order to trade raw material exports and integrate itself into upstream supplier networks. After that, the supply chain's parts and components might be made using these basic materials. In all likelihood, Nigeria may supply significant parts to nations like Egypt, Kenya, Morocco, and South Africa.
Economies of scale are currently limited in Nigeria by the low rates of electric car usage. Cost savings can be achieved through mass production, but the country's low demand for EVs prevents manufacturers from taking full advantage of economies of scale. In regard to this, the country should consider aiding, through policies and other financial instruments, the increased local production of electric vehicles.



Limited Consumer Awareness and Education on Electric

Another major obstacle to the widespread adoption of electric mobility in Nigeria is the low level of consumer education and awareness regarding EVs. Poor consumer education and awareness regarding electric automobiles is one of the main obstacles to Nigeria's adoption of electric mobility1. According to the research, reliable EV education is required to prevent potential anxiety and false information about the potential disruptions and benefits that EVs could bring to the market for conventional vehicles and the overall health of the national economy.
It is essential to comprehend the electric motors, battery systems, and charging procedures used in electric vehicles.
Lack of knowledge breeds mistrust and makes people reluctant to adopt novel and unfamiliar technologies. Furthermore, prospective buyers are not aware of the long-term financial benefits of owning an electric car, such as lower maintenance costs, fewer gasoline expenditures, and possible government subsidies, and this can all be traced to the lack of awareness problem prevalent in the country.

Another offshoot of the awareness challenge is range anxiety. The limited range of electric vehicles on a single charge worries prospective EV consumers. Such worries can be allayed by informing customers about the advancements in battery technology, increased range, and the suitability of EVs for regular travel.
Promoting EVs can be promoted by running focused information campaigns across various media platforms. Community workshops are efficient forums for specialists to exchange perspectives, tackle issues, and interact directly with the general public. Working with dealerships could be adopted as a means to guarantee that salespeople are educated about EVs, which would help them have intelligent conversations with prospective customers.

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Reviving Nigeria's Automotive Industry: opportunities and challenges under the AfCFTA | ODI: Think change Retrieved from: https://odi.org/en/insights/reviving-nigerias-automotive-industry-opportunities-and-challenges-under-the-afcfta

Government programmes, such as those supporting electric vehicles and offering financial incentives to manufacturers and users, are essential. Stakeholders may develop a comprehensive plan to inform the public, debunk myths, and promote the use of sustainable electric vehicles in Nigeria by pooling their efforts.

Opportunities for Growth in the Electric Mobility Sector in Nigeria

Driven by a global trend towards sustainable and electric mobility, Nigeria has the potential to enter a revolutionary era in the transportation sector. The expansion of EV charging infrastructure is a promising growth opportunity. Embarking on this move would be significant because it has the potential to drastically alter the nation's economic, environmental, and technological landscape, in addition to promoting the adoption of electric mobility. An important area for growth is the infrastructure for EV charging. Building a comprehensive and accessible network of EV charging stations would help scale the growth of EV adoption, encourage local talent development for the EV market and generate jobs across multiple sectors of the economy. Given that the ease of charging is a major component in consumers' decisions to adopt electric vehicles, the significance of this infrastructure cannot be emphasised, and the electric mobility market will only continue to grow more slowly without a strong charging infrastructure.

To address this issue, public-private partnerships, government incentives, and innovative business models can be used as drivers for significant investment, ensuring a robust charging network across major urban centres and highways. Nigerian roadside mechanics are usually informally trained in fixing internal combustion engine vehicles (ICEVs), with little-to-no-knowledge of EV maintenance. However, the knowledge of automobiles that these (roadside)mechanics possess can be used as an advantage if technical training can be developed to enhance their skills for EV maintenance in the country.

The growth of the charging infrastructure has significant economic ramifications. It promotes the creation of jobs, especially in the fields of charging station operations, maintenance, and building. Additionally, it has the potential to draw in foreign direct investment and inspire local business owners to enter the rapidly expanding electric mobility sector. As more charging stations are installed, the need for qualified technicians, customer care representatives, and support workers will inevitably increase. Moreover, the development of other industries is linked to building a thorough charging network. It encourages indigenous production of electric vehicles, lowering reliance on imports and promoting innovation. This boost to local manufacturing can help progress technology, which will help associated sectors grow as a result.
Apart from the financial advantages, a sophisticated infrastructure for charging tackles a crucial issue - range anxiety. Potential EV buyers are frequently discouraged by this psychological barrier, which is based on worries about the availability of charging stations. This apprehension is lessened when charging stations proliferate, encouraging a larger portion of the Nigerian public to consider electric vehicles a practical choice.

Local Manufacturing and Innovation

One key opportunity that Nigeria has to explore in developing its EV market is enhancing local EV production. Nigeria possesses copious amounts of vital minerals and metals, such as nickel, cobalt, and lithium, that are necessary for the manufacturing of electric vehicle batteries. Nigeria may create a vertically integrated electric vehicle supply chain by using these natural resources, from the extraction of raw materials to the production of batteries, thereby lowering its reliance on imports and fostering the growth of domestic value-added companies.

However, to achieve this, there is a need for development of a local skilled workforce able to ensure the sustainable management of plants and resources for the sector. The government can encourage domestic investment in EV production facilities and technological development by enacting policies that are favourable to the industry, such as import levies on fossil fuel vehicles, subsidies for EV manufacturing, and grants for research and development. Since the country boasts a sizable pool of highly qualified workers in a number of engineering specialties, such as mechanical, electrical, and automotive engineering. Through partnerships with educational institutions and investments in vocational training programmes, it can produce a highly qualified workforce that is capable of developing, producing, and

maintaining electric vehicles domestically with little or no external interference. The country has a lot of students in the Master's and PhD grade of its education system. Pouring funds to support students to focus on research in this domain would help to rapidly improve the innovation ecosystem in the country. Also, organisations in the Nigeriagerian EV space would have more funds to help them bring existing innovative products to the market through such schemes.

Additionally, by offering tax benefits, regulatory frameworks, and policy incentives, the Nigerian government is instrumental in fostering an environment that is conducive to the production of electric vehicles locally. One policy initiative that has also helped other countries is the provision of financial subsidies towards the purchase of electric vehicles. This would be a massive encouragement to those interested in such vehicles, especially for public transport systems and even for the private owners as it would help reduce the upfront cost of electric vehicles and make them more affordable for consumers.
The local EV industry in Nigeria can grow more quickly through partnering with foreign EV producers, technology suppliers, and investors. By facilitating knowledge transfer, technology transfer, and capital access, strategic collaborations can help local manufacturers take advantage of worldwide best practices and innovation in EV design, production, and supply chain management.

For safety, high-quality, and environmentally sustainable, standards and regulations must be established. While quality standards guarantee dependability and performance, safety rules enforce crashworthiness and fire safety. Emissions and battery recycling are covered by environmental legislation. Establishing uniformity in charging infrastructure fosters dependability and compatibility. These actions would increase market demand, boost customer trust, and propel EV technology advancement.
Nigeria can achieve its sustainability objectives, spur economic expansion, and establish itself as a pioneer in environmentally friendly transportation by fostering the development of EVs.

Conclusion

Nigeria is at a turning point in the development of sustainable modes of transportation, with room to grow in the electric vehicle market. Even with obstacles including low consumer awareness, expensive electric car prices, and restricted infrastructure, the country has a great deal of potential to set the standard for electric transportation.

By addressing the infrastructure issue through public-private partnerships and government incentives, additional EV charging networks will be able to be established, increasing the accessibility of electric vehicles in both urban and rural locations. Initiatives to support regional innovation and industry also offer opportunities for economic expansion, job creation, and technological improvement. Nigeria has the potential to decrease its need for imports by establishing a strong supply chain for electric vehicles, utilising its ample natural resources and proficient labour population.

All parties involved, including the public, educational institutions, businesses, and government agencies, must work together to achieve these objectives. To expedite the adoption of electric mobility and establish Nigeria as a pioneer in sustainable transportation, cooperative actions focused at increasing awareness, offering incentives, and putting supportive regulations into place will be essential.

Nigeria can take action to address urgent environmental issues, promote economic development, and encourage innovation for a more promising and sustainable future by leveraging the growth potential in the electric transportation sector.

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