

***THEME: SUSTAINABLE TRANSPORTATION IN A DISRUPTIVE ERA: THE CHALLENGES OF DEVELOPING ECONOMIES:***

***KEYNOTE ADDRESS DELIVERED AT THE 6TH NATIONAL CONFERENCE OF THE CHARTERED INSTITUTE OF TRANSPORT ADMINISTRATION ON NOVEMBER 12, 2024, AT THE NICON LUXURY HOTEL, ABUJA***

***BY: DR. MUIZ BANIRE, SAN, OON, LIFE BENCHER***

---

**PREAMBLE:**

Permit me to begin by expressing my gratitude to the organisers of this event for considering me fit to make a presentation on this topical issue, and I appreciate the audience in advance for your interest in this paper. I did not take the invitation not for granted.

**INTRODUCTION:**

Transportation represents a significant interface for any economy. Without sustainable transportation, the progress within the context of a national economy could become unsustainable. Various contradictions and challenges at different levels within Nigeria alert us to this risk. The symptoms of a disrupted economy are probably displayed in the infrastructural starvation plaguing Nigeria. These, among others, justify the importance of this discourse on sustainable transportation, particularly in Nigeria, a nation shifting from an agrarian to an inclusive but ill-functioning, service-based economy due to insecurity and a reduction in oil revenue

Given the constant disruptions in the economies of Nigeria and, indeed, most other world economies, this paper first delves into a cursory view of the historicity and the essentialities of a sustainable transportation system within the context of Nigeria. This paper, therefore, intends to outline challenges and advance solutions that would enable Nigeria to transition from an inclusive service-based to a knowledge-driven economy, characterized by resilience and a stable middle class. Finally,

I view transportation as one of the strategic approaches to the cumulative adaptive challenge to the prevailing interruptions in national economies, devastating public morale and creating national anxiety.

#### ***NATURE AND HISTORICAL DEVELOPMENT OF TRANSPORTATION:***

In the simplest terms, transportation connotes the movement of persons or goods from one place to another. It could also be termed as anything that eases or facilitates the movement of people, animals and goods from one location to another location. Transportation is as old as the universe. We have seen stories in the scriptures of how people of the ancient time transported themselves from one location to the other.

<sup>1</sup>The Bible references various animals, including donkeys, mules, camels, and oxen. Among these, donkeys were likely the most favored mode of transportation in the Near East. In the biblical narrative, the donkey was the chief means of private and commercial transport throughout the history of Israel.<sup>2</sup> Horses, mules, donkeys and ships were also mentioned in Quran 16 v 4 and 36:41-42 as modes of transportation.

Humans have consistently endeavoured to explore the planet and relocate to various destinations, whether by land or by sea. The advancement of transportation has progressed from basic canoes to the capability of space travel. Log boats, also referred to as dugouts, which were made by hollowing out a tree trunk is one of the earliest means of transportation.

The precise moment when humans commenced the domestication of horses for the transportation of goods remains uncertain; however, experts suggest that this process began approximately in 4000 BCE. This era also coincides with the invention of the wheel. Archaeological evidence indicates that the earliest wheeled vehicles were utilized

---

<sup>1</sup> <https://www.studydrive.net/dictionaries/eng/hbd/t/transportation-and-travel.html#:~:text=The%20Bible%20mentions%20several%20different,ingots%20from%20Cappadocia%20in%20Turkey>. Assessed on 07/11/24

<sup>2</sup> Genesis 42:26

around 3500 BCE, with findings of these devices discovered in regions such as Mesopotamia, the Northern Caucasus, and Central Europe.

In 1769, the Watt steam engine changed everything. Boats were among the first to take advantage of steam-generated power; in 1783, a French inventor by the name of Claude de Jouffroy built the "Pyroscaphe," the world's first steamship. Other inventors also contributed at that time to the growth of Locomotives. In the modern day, we witnessed the emergence of Trains, vehicles and airplanes in different kinds and shapes.<sup>3</sup>

### *HISTORICAL CONTEXT OF TRANSPORTATION IN NIGERIA*

Historically, our domestic and international trade links provided the impetus for developing the much-needed transport infrastructure in the country. The advent of the railroads and the construction of the networks of roads and waterways in Nigeria were vital in shaping the economies of the different regions of the country, linking their hinterlands to their ports while at the same time creating the interconnections among the nation's hinterlands. The departed colonial powers saw the importance of transportation in an economy and thus used the railway system as an example of the importance of rail in 19th-20th century affairs when propagating arguments for support of the railway project in Nigeria.

Transportation as a corollary for economic development has had an exciting history in Nigeria. The various transportation modes, including roads, railways, seaports, and airports, were progressively introduced to our society, more compellingly and pervasively with colonialism. In the beginning, the development of significant infrastructures, roads, railroads, haulage vehicles, and waterways was meant to serve expatriate companies in exploiting primary resources and help in their shipment by sea to the metropolis while ensuring a quick replenishment of raw materials and manpower. Over time, the socio-political and

---

<sup>3</sup> <https://www.thoughtco.com/history-of-transportation-4067885> Assessed on 07/11/24

trading thrusts of these transportation systems began to change as using them became commoditised by the diffusion of new usable technologies in the form of more advanced infrastructures that could also serve the needs of other regional interest groups. Post-independence transportation policies, however, were even more progressive, not only to show nationalism but to make our industries viable through inter-regional and local connectivity to better harness abundant and shared production factors in a more specialised form of competitive advantage.

#### *CURRENT TRANSPORTATION INFRASTRUCTURE IN NIGERIA*

Nigeria has a sizable amount of motorable road networks as well as various waterways and air operations. The roads vary from intra-city to interstate. Despite the efforts to make these facilities easily serviceable, the incessant upsurge of users of Nigerian roads, waterways, and air services is still grossly inadequate. This growth has continued to raise questions about the adequacy of physical infrastructure in supporting economic and social activities. Roads are characterized by congestion and lengthy trip times. Additionally, most roads are either unpaved, not surfaced for years, or have been deserted. As a result, the roads are not user-friendly, and they deteriorate after only a short period following repair.

Nearly 90% of all motorised travel and more than 80% of all freight are done by road. Although operations over the Nigerian railway system are highly limited, a few of these, like Ibadan-Lagos, Abuja-Kaduna, Lagos Blue and Red lines, are for commuters. Urban air connectivity in Nigeria has been improved by constructing new airports and rehabilitating and expanding most of the existing ones. The recent construction of container terminals like the Lekki-Deep Sea Port and additional equipment at Nigerian seaports has improved operations and turned the sea route into an efficient transportation route for imported and exported goods. Recently, there have been different policy strategies, including privatising some modes of transportation, and the government

has taken steps to transform the entire sector. Efforts have been made to improve and expand Nigerian ports and waterways.

#### *CHALLENGES IN TRADITIONAL TRANSPORT*

##### ***Environmental Impact:***

Road transportation is argued to be a principal contributor to environmental damage - via air pollution and traffic noise which evidences the great negative impact. It is also a source of accidents, congestion, physical inconvenience, offensive smells, including soil and water pollution ranging from spilled fuels and oil. Road construction can lead to a decrease in size and fragmentation of natural habitats, threatening the very existence of many species of flora and fauna.<sup>4</sup>

According to the International Transport Agency (IEA), the transport sector was globally responsible for 62% of world oil consumption and 25% of total final energy demand in 2011. In Nigeria, the oil consumption by the transportation sector is even greater, consuming 80% of the total petroleum products.<sup>5</sup> Lagos alone has an estimated population between 18 and 20 million and an annual growth rate at 6 percent. With increased urbanization comes urban transportation challenges such as traffic congestion, parking problems, accidents, and environmental pollution. Nigerian population highly depends on public transport for their mobility needs.<sup>6</sup> The consumption of fossil fuels (mainly petrol and diesel) in the transport sector contributes 25.4 million tonnes of CO<sub>2</sub> or 50% of the national emissions; almost all of this (99%) is from road transport. Gas flaring adds further CO<sub>2</sub> emissions - this is a significant issue for Nigeria, since up to 75% of the gas extracted together with oil is flared.

---

<sup>4</sup> THE ENVIRONMENTAL IMPACT OF TRANSPORTATION: AIR, RAIL, ROAD, AND WATER by Huang Mei, Institute of Geography, Chinese Academy of Sciences, Beijing, China accessed at <https://www.eolss.net/sample-Chapters/C09/E4-08-04-01.pdf> on 07/11/24

<sup>5</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0301421512010622> Assessed on 07/11/24

<sup>6</sup> <https://www.unep.org/nigeria-0> Assessed on 07/11/24

In Nigeria, this is due to a decline in other transport sectors, especially rail. For example, the number of rail passengers declined from 14 million to less than 1 million between 1980 and 2005 while rail freight decreased from 3 million tonnes to less than 500,000 tonnes within the same period<sup>7</sup>. This technological shift, besides industry and agriculture, is significant in addressing climate change in the long term. There are several eco-friendly technologies and practices in the operation of transportation activities, such as biofuels, CNG, Electric vehicles, hybrid systems, public transport, and trains, existing in the forms of buses, trains, and subways, but each technology carries its advantages and disadvantages. It is technology-friendly, and urban planning can make a significant difference. Changing land use design, e.g., building walkable neighbourhoods, adopting smart growth, designing denser development, and implementing congestion pricing, can be impressive and dissuade environmental disaster while promoting a perfect mode toward sustainable transportation in a disruptive era.

#### **SOCIAL FACTORS**

Social Factors. The idea of "why and who gets what, where, when, and why" underpins social values justifications. Transportation investments should be socially just, and the value created should be distributed evenly. In Nigeria, transportation access and use are highly skewed and show disparities across geographical vicinities juxtaposed with economic divide (rural-urban). Ownership and use of transport affect public services and economic employment contributions. In this regard, gender analysis denotes that males control or own transport, which increases their capacity to explore employment from any available sector different from women. A substantial reduction exists in transportation ownership between the rich and the poor in Nigeria, where the public transportation system is mainly for the rich and the

---

<sup>7</sup> AfDB, 2007

lower modes are mainly for the poor. As a result, it constitutes a challenge that contributes to usage levels.

Preferences and satisfaction or otherwise from the transportation system are determined through social factors such as gender, income level, occupation, educational attainment, car ownership, age, household size, type of trip purpose, accessibility, perception of safety, environmental hazards; inclusive opposition to airport noise, youth security in public transport, children's safety, disabled access, etc. Policymakers need to consider social impacts and benefits, with the potential to engage more people in the planning process. Understanding people's attitudes towards different aspects of transportation, which policy can address or set goals to achieve (for example, confidential services, reliability, passenger safety, low travel cost, reduced travel time, increased mobility, personal security, access to jobs, public acceptability, healthy life, good travel experiences, livelihood improvement, economic activities, environmentally friendly, travel time minimisation, reduction of and ease of traffic congestion, equity, providing information and mobility, investment in technology, metropolitan governance and effectiveness, public-private partnerships, governance, aligning the political with the personal, equitable access to opportunities, urban transformation, and poverty reduction, low energy use and CO<sub>2</sub> are crucial in the formulation of strategic goals and objectives. Besides, inclusive planning and implementation ensure participation and contribution from all the affected for a good policy, and a plan for all to be carried along, as a result of common agreement. In diverse and complex societies, no single perspective can capture the entire importance or complexity of its system; hence, indulge in wider discourse. Inclusive planning for diverse interests (governments, employers, staff, touts, women, youth, elders, different categories of transport mode users, and experts in the field) will ensure integrated policy towards sustainable transport, operationalizing the vision.

## *DISRUPTIVE FORCES IN TRANSPORT*

### *ELECTRIFICATION*

In 2021, during the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26) held in Glasgow, Scotland, Nigeria declared its ambition to attain carbon neutrality by the year 2060. Following this declaration, the country has made considerable progress towards this objective. In 2022, Nigeria released its Energy Transition Plan, which outlines the strategies for emission reduction, and established the Energy Transition Office to oversee the implementation of this plan. At COP26, Nigeria reaffirmed its dedication to achieving carbon neutrality by 2060. Shortly thereafter, the Energy Transition Plan (ETP) was introduced, emphasizing the extensive efforts necessary to meet the 2060 net zero target. Since this commitment, the Climate Change Act 2021 has been enacted, and the Federal Government has granted full approval to the Energy Transition Plan.

Transportation electrification is an essential component of Nigeria's strategy for decarbonization. By promoting the use of electric vehicles, including two- and three-wheelers, implementing biofuels, enhancing electric vehicle and charging infrastructure, and fostering the electric vehicle market, Nigeria aims to reduce its emissions significantly. This initiative will also generate employment opportunities, strengthen the economy, improve public health, and offer citizens clean, affordable, efficient, and reliable transportation solutions that will enrich their everyday lives.

However, the country encounters considerable obstacles in its pursuit of ambitious climate objectives. The termination of its fuel subsidy in 2023 has nearly tripled transportation costs, adversely impacting an economy primarily reliant on oil, gas, and agriculture. The demand for transportation services continues to exceed supply in both urban and



rural regions, highlighting the urgent need for infrastructure improvements. As Nigeria's rapidly growing population is projected to reach 791 million by the century's end, the pressure on the transportation system is expected to escalate further.

Efforts to achieve these objectives hold the promise of generating economic opportunities and enhancing environmental outcomes across the nation. In response to these national commitments aimed at transforming the transportation sector, both the public and private sectors in Nigeria have taken significant steps. Numerous projects focused on electric vehicle (EV) adoption and the development of charging infrastructure have been initiated throughout the country. Initiatives range from the deployment of electric buses in Lagos to the establishment of fully solar-powered charging stations, facilitated by the National Automotive Design and Development Council in collaboration with universities. Stakeholders are poised to take action.

Nevertheless, despite the positive engagement, several challenges remain. Beyond the economic benefits of fostering a local EV manufacturing industry, the potential cost savings and emissions reductions associated with implementing these strategies, Nigeria could achieve a scenario with over 60% electric two-wheeler sales and potentially avoid up to two megatons of CO<sub>2</sub> equivalent emissions annually by 2040. This progress will pave the way for rapid advancements and influence other vehicle categories. Furthermore, efforts to meet Nigeria's renewable energy generation targets will significantly enhance these emissions reductions.

The quest for a transformative and sustainable revolution aimed at enhancing transportation in Nigeria is taking place against the backdrop of global advancements in the transport industry. These technological innovations are reshaping the delivery of transportation services, making them more efficient and safer, while also benefiting the environment through advancements in vehicle technology, human-machine interactions, and automation. The emerging technologies for

commercial and societal applications encompass electric vehicles, drones, urban air mobility solutions, hyperloop systems, capsule transit, carbon nanotubes, versatile and visually appealing 3D printing, alternatives to petroleum, fuels such as compressed natural gas (CNG), and enhanced battery or electrical energy storage systems capable of maintaining standby for up to six months.

**RMI**, an organisation which supports clean and reliable energy, has highlighted the following as the Key barriers to rapid e-mobility market growth in Nigeria which I agree with:

1. unavailability of affordable and accessible financing options for electric vehicles (EVs);
2. absence of awareness among consumers and the private sector regarding e-mobility alternatives and their financial benefits;
3. development of charging infrastructure and the reliability of the power grid, alongside restricted access to after-sales services for EVs; and
4. absence of comprehensive and supportive policy framework.

As a follow up to the above, the following solutions were proffered:

1. Reduction of the high upfront costs of EVs by strengthening EV production capacity and encouraging EV imports. Striving to strengthen the Naira could also be very helpful in this regard.
2. Building factories;
3. Designing resilient supply chains;
4. Deploying charging infrastructure;
5. Encouraging investment;<sup>8</sup> and
6. Provide a global standard framework and learn from advanced countries.

China, the United States, and Europe collectively represent approximately 95% of the global electric vehicle (EV) sales market.

---

<sup>8</sup> Clay Stranger et al., A Vision for E-Mobility in Nigeria: The Opportunity, Challenges, and Path Forward, RMI, 2024, <https://rmi.org/insight/nigeria-mobility-support/> Assessed on 07/11/24

Projections indicate that this market could surpass US\$950 billion by the year 2030, with a compound annual growth rate (CAGR) exceeding 23%. This anticipated growth is primarily driven by decreasing battery costs, advancements in battery technology heightened environmental consciousness, and favourable government policies. Nevertheless, several challenges persist. The escalating demand for lithium, an essential element in battery manufacturing, raises significant environmental issues. It is estimated that lithium demand may increase by over 40 times by 2040, while the extraction process emits around 15 tons of CO<sub>2</sub> for every ton of lithium produced. Furthermore, a mere 5% of lithium batteries are currently recycled, although new recycling initiatives are beginning to tackle this problem. China leads the production of EV batteries, holding more than 70% of the global supply chain for critical battery components. The emergence of Chinese startups that provide competitively priced EVs, along with international collaborations, is intensifying competition with established automotive brands. Concurrently, the Chinese EV market is confronted with its own set of challenges, including international tariffs, aggressive pricing strategies, and heightened competition among suppliers.

In 2023, an electric vehicle manufacturer based in the United States, SAGLEV, established a partnership with petrol stations throughout Nigeria to implement charging stations. It is important to note that electric vehicles are currently favoured over internal combustion engines. The CEO and Chairman of SAGLEV verified the collaboration with notable petrol stations such as Ardova and Enyo, as reported.<sup>9</sup>

Innovation should lead to technological advancements that promote the development of safer, cleaner, and more efficient vehicles and transportation networks, as well as provide various affordable options for evacuees. It is essential for innovations to decrease travel demand, encourage a transition from private vehicles to public transportation, utilize information and communication technology (ICT) for real-time

---

<sup>9</sup> <https://www.esi-africa.com/news/nigeria-petrol-stations-to-become-charging-hubs-for-electric-vehicles/>

traffic management, and implement electric and intelligent traffic solutions to effectively address congestion and minimize the necessity for travel. As the ecosystem of demand for acceleration shapes user acceptance and fosters multi-stakeholder support for innovative transportation and response systems, the involvement of the private sector and effective governance are crucial.

#### **AUTONOMOUS VEHICLES OPERATION IN NIGERIA:**

Recent lifestyle and societal transformations have spurred various inventions and technological advancements aimed at enhancing the quality of life and facilitating transportation. Among these innovations are autonomous vehicles, which play a crucial role in improving lifestyles through extensive research focused on increasing accessibility, enhancing safety, and promoting environmental sustainability. The classification of autonomous vehicles is divided into 5 levels, each characterized by distinct features, efficiencies, and capabilities. At Level 0, most vehicle functions are managed by human operators. Level 1 allows for the automation of certain systems, such as automatic braking and cruise control. Level 2 enables the vehicle to perform at least two automated functions simultaneously. Level 3 introduces advanced capabilities, allowing the vehicle to handle safety functions under specific conditions. Level 4 offers full driving automation, where the vehicle can operate independently in certain scenarios without human intervention. Finally, Level 5 represents complete self-driving capabilities, requiring no human oversight.

In Nigeria, several pertinent questions arise regarding the implementation of autonomous vehicles. Similar to the evolution witnessed in the telecommunications sector, self-driving cars are expected to become a reality in Nigeria in due course. The pressing inquiry is when this transition will occur. I join other stakeholders in calling on the Federal Road Safety Corps (FRSC) to take proactive measures to incorporate future transportation considerations into traffic law enforcement to address legal matters, most importantly,

safety concerns. As we anticipate this development, it is essential to consider who will be held accountable in the event of an autonomous vehicle breaching traffic regulations, particularly when no human operator is present. Will the responsibility fall on the vehicle's owner?<sup>10</sup>

#### **THE IMPACT OF SHARED MOBILITY:**

Shared mobility, encompassing car-sharing and bike-sharing, plays a crucial role in reshaping the transportation framework in Nigeria. The advantages of shared mobility in Nigeria include the following:

1. **Decreased congestion:** The implementation of shared mobility leads to a reduction in the number of vehicles on the roads, significantly alleviating the adverse effects of traffic congestion on the economy.
2. **Enhanced mobility:** Shared mobility offers cost-effective transportation alternatives for Nigerians, thereby improving overall mobility.
3. **Economic advantages:** It generates job opportunities and fosters economic growth, as individuals transition from private vehicle usage to engaging in commercial vehicle-sharing services.
4. **Environmental advantages:** This approach contributes to a decrease in carbon emissions, promoting a cleaner and safer environment.
5. **Increased safety:** Shared mobility encourages safer transportation practices and minimizes accidents due to the reduction in vehicle traffic.

However, car-sharing in Nigeria faces several challenges, including inadequate infrastructure, regulatory issues, security concerns, financing difficulties, and a lack of effective public awareness, all of which hinder the progress of shared mobility in the country.

#### **DIGITALIZATION AND INTERNET OF THINGS (IoT):**

---

<sup>10</sup> [https://frsc.gov.ng/wp-content/uploads/2021/07/INSIGHT-Magazine-Sept-2020-Edition\\_FINAL.pdf](https://frsc.gov.ng/wp-content/uploads/2021/07/INSIGHT-Magazine-Sept-2020-Edition_FINAL.pdf) Assessed on 07/11/24

The necessity for digitization within the transportation industry became increasingly apparent during the peak of the pandemic, as innovators sought alternative methods to operate their businesses while avoiding physical interactions. This trend was particularly evident in the logistics sector, where numerous companies embraced technological advancements to limit direct contact. In developed nations, various solutions, including robotics, drones, the Internet of Things (IoT), and Artificial Intelligence (AI), rapidly emerged as substitutes for human involvement, thereby minimizing human interaction and, consequently, the transmission of the virus.<sup>11</sup>

### ***Areas Improved by the Internet of Things.***

#### **Smart Metering**

In response to the issues of electricity theft and suboptimal billing practices, Nigeria has adopted IoT-based smart metering systems. These advanced meters facilitate real-time tracking of electricity usage, allow for remote meter readings, and ensure precise billing. This initiative contributes to minimizing energy losses and promotes equitable billing practices.

#### **Traffic Management**

In prominent urban areas of Nigeria, particularly Lagos, IoT-driven solutions are being utilized for traffic management. Intelligent transportation systems leverage sensors and data analytics to oversee traffic patterns, identify congestion, and enhance signal timing. This approach aims to ameliorate traffic conditions, decrease travel durations, and improve road safety.

#### **Security and Surveillance**

Nigeria is increasingly implementing IoT-based security and surveillance systems to bolster public safety. These systems integrate smart cameras, motion detectors, and facial recognition technology to

---

<sup>11</sup> <https://businesspost.ng/travel/sustaining-nigerias-transport-sector-using-technology/> Assessed on 07/11/24

identify and address security threats. They offer real-time monitoring, prompt alerts, and facilitate effective law enforcement actions.

These instances illustrate the diverse applications of IoT technology in Nigeria. The integration of IoT holds significant promise for enhancing various sectors and tackling critical challenges within the nation. Consequently, it is essential to explore additional sectors where the adoption of IoT could lead to transformative improvements for the country.<sup>12</sup>

### Sustainable Transport Solutions

**Electric and Hybrid Vehicles:** These vehicles will encourage zero-emission or reduced gas emissions. Hybrid vehicles combines both electric and fossil fuel propulsion.

#### **CONSIDERATION OF ALTERNATIVE TO FUELS:**

**Biodiesel:** This is a renewable and biodegradable fuel produced domestically from sources such as vegetable oils, animal fats, or recycled cooking oil. It complies with both the biomass-based diesel and overall advanced biofuel criteria established by the Renewable Fuel Standard.

**Compressed Natural Gas (CNG):** this has been actively promoted by the Nigerian government as an alternative fuel to mitigate the nation's carbon emissions and diversify its energy portfolio. The Nigerian National Petroleum Company (NNPC) Limited is spearheading the establishment of CNG stations nationwide in collaboration with NIPCO Gas Limited.

**Hydrogen fuel cells:** this present a significant opportunity for Nigeria, which is well-equipped to produce and utilize green hydrogen. The

---

<sup>12</sup> <https://www.hostafrica.ng/blog/technology/internet-of-things-it-application/> Assessed on 07/11/24s

country possesses a wealth of renewable energy resources, including wind, solar, biomass, and hydropower.

In a notable advancement towards a more sustainable energy future, the House of Representatives in Nigeria has proposed a Bill aimed at establishing a policy framework for the development of the biofuels energy sector. This initiative seeks to improve the quality of petroleum products while addressing the existing challenges associated with fossil fuel reliance.<sup>13</sup>

#### **NON-MOTORISED TRANSPORTATION:**

Cycling infrastructure such as bike-lanes and bike sharing programs, pedestrian friendly design - walkable cities and reduced vehicle dependency.

#### **PUBLIC TRANSPORT REVITALIZATION:**

Efficient buses, trains: Efficient bus and Train systems are crucial for sustainable transportation, reducing congestion, emissions, and energy consumption. This can be achieved through Bus Rapid Transit (BRT) with dedicated lanes, efficient routing, real time traffic monitoring, dynamic routing, smart bus stops (real time information, minimised waiting times) among others. We already saw this in Lagos State. The gesture can be extended to other states.

#### **CASE STUDIES:**

As indicated earlier, Nigeria can learn from other advanced countries in order to enhance sustainability in the transport sector in a disruptive era. I will now quickly highlight the practice in some of the Developed countries.

##### **A. NORWAY'S ELECTRIC VEHICLE ADOPTION**

---

<sup>13</sup> [https://www.vanguardngr.com/2023/10/rep-s-move-to-establish-bio-fuels-energy-industry-framework/#google\\_vignette](https://www.vanguardngr.com/2023/10/rep-s-move-to-establish-bio-fuels-energy-industry-framework/#google_vignette) Assessed on 07/11/24



As of 2023, Norway has established itself as the preeminent global leader in the adoption of electric vehicles over the past decade. With substantial government incentives in place, 87 percent of new car sales in the country are now fully electric. This remarkable achievement can be attributed to a variety of factors, including government support, a robust public charging network, private sector investments, heightened environmental consciousness, and economic advantages.

The Norwegian government has enacted numerous policies to promote the adoption of electric vehicles. These measures encompass tax exemptions, toll-free access, and complimentary parking for electric vehicle owners. Furthermore, the government has set an ambitious goal for all new car sales to be zero-emission by 2025. To facilitate this objective, Norway has developed a comprehensive public charging infrastructure, boasting over 10,000 charging stations nationwide.

The private sector has also been instrumental in Norway's electric vehicle success. Major companies such as Tesla, Nissan, and Volkswagen have made significant investments in the Norwegian market, providing a diverse array of electric vehicle models and charging solutions. Additionally, Norwegian enterprises have pioneered innovative technologies related to electric vehicles, including advanced charging systems and battery management software.

Norway's strong commitment to environmental sustainability and cultural focus on eco-friendliness have further propelled the adoption of electric vehicles. A significant number of Norwegians perceive electric vehicles as a means to minimize their carbon footprint and contribute to a healthier environment. Moreover, electric vehicles present economic benefits, such as lower fuel expenses and reduced operational costs.

The effects of electric vehicle adoption in Norway have been profound. The nation has experienced a 50% reduction in transport-related emissions, leading to improved air quality and a decrease in greenhouse gas emissions. Additionally, the rise in electric vehicle adoption has

spurred economic growth, resulting in increased investments and job opportunities within the electric vehicle sector.

Nevertheless, Norway continues to confront challenges in sustaining its leadership in electric vehicle adoption. These challenges include the need to expand charging infrastructure to accommodate rising demand and managing the increased electricity consumption on the grid.

#### **B. SINGAPORE'S SMART TRAFFIC SYSTEM:**

Singapore, a compact island city-state, encounters distinct transportation challenges stemming from its constrained land area and elevated population density. In response to these issues, Singapore has implemented an advanced smart traffic system that leverages technology and innovation to enhance traffic flow, mitigate congestion, and improve the overall commuter experience.

Central to Singapore's smart traffic initiative is the Intelligent Transport System (ITS) framework, which facilitates real-time monitoring, data analysis, and predictive modelling. A pivotal element of the ITS is the Electronic Road Pricing (ERP) system, which dynamically adjusts toll rates according to current traffic conditions, thereby alleviating congestion and promoting efficient travel. The Traffic Management Centre acts as the operational hub, overseeing centralized monitoring and control.

In order to collect real-time traffic information, Singapore has established a comprehensive network of smart traffic sensors. Commuters benefit from mobile applications that provide immediate traffic updates and route planning assistance, enabling them to make well-informed travel decisions. The integration of IoT sensors, data analytics, artificial intelligence, cloud computing, and mobile networks allows Singapore's smart traffic system to optimize traffic signal management, decrease congestion, and enhance the commuter experience.

The advantages of Singapore's smart traffic system are significant. By improving traffic flow and lessening congestion, travel times have been reduced by 15%. Additionally, the system has bolstered safety through real-time monitoring that facilitates rapid incident response. Commuters experience enhanced convenience with timely information and efficient route planning. From an economic perspective, the system has boosted productivity and lowered fuel consumption, while environmentally, it has led to a 30% reduction in emissions.

Numerous initiatives and projects have played a significant role in the success of Singapore's smart traffic system. The Smart Nation Initiative seeks to incorporate technology into everyday life, while the Intelligent Transport Systems (ITS) World Congress 2019 highlighted Singapore's capabilities in this field. Traffic Management 2.0 signifies the evolution of traffic management, utilizing cutting-edge technologies. Trials for autonomous vehicles are currently in progress, with self-driving buses and taxis undergoing testing. The Smart Mobility 2030 strategy presents Singapore's vision for future transportation.

Statistics indicate that Singapore's smart traffic system has yielded remarkable outcomes. Traffic congestion has been reduced by 20%, travel times have decreased by 15%, and 90% of commuters rely on public transport. Additionally, cycling infrastructure has expanded by 50%, and emissions have been lowered by 30%.

### **C. BARCELONA'S SUPERBLOCKS**

Barcelona's Superblocks initiative represents a forward-thinking urban planning approach designed to reclaim public spaces, alleviate traffic congestion, and enhance air quality. Initiated in 2016, this program has significantly altered the urban landscape by emphasizing pedestrian-friendly environments and promoting sustainable transportation options. The city's densely populated areas and narrow streets have historically created difficulties for both residents and visitors. The traditional grid layout, established by Ildefons Cerdà in the 19th

century, favored vehicular movement at the expense of pedestrian accessibility.

The advantages of the Superblocks initiative have been considerable. There has been a 25% reduction in traffic congestion and a corresponding 25% decrease in nitrogen dioxide levels. Additionally, pedestrian zones have expanded by 30%, while bicycle usage has increased by 20%. Local businesses have also experienced a boost due to heightened foot traffic. This program has garnered international acclaim, serving as an inspiration for similar projects in cities such as Medellín, Colombia; New York City, USA; and Copenhagen, Denmark.

Although there was initial pushback from some residents and business owners, comprehensive community outreach and engagement efforts were instrumental in garnering support for the initiative. Upgrading the existing infrastructure to facilitate the Superblocks presented technical challenges, and it was essential to carefully balance the needs of residents, businesses, and visitors. The Superblocks initiative exemplifies how urban planning can contribute to creating a more sustainable, liveable, and equitable urban environment.

According to the City of Barcelona, the Superblocks program has emerged as a benchmark for urban health, with the World Health Organization acknowledging its innovative strategies. As cities around the globe confront similar urban issues, the lessons learned from Barcelona's Superblocks underscore the importance of prioritizing people over vehicles and fostering a more sustainable urban landscape.

## **POLICY AND REGULATORY FRAMEWORKS**

### **Policy and Regulatory Frameworks for Sustainable Transport in Nigeria:**

Nigeria's transportation sector faces numerous challenges, including congestion, pollution, and safety concerns. To address these issues, the

government has established policy and regulatory frameworks to promote sustainable transport.

#### National Policies:

1. National Transport Policy: Envisions a safe, efficient, and environmentally friendly transportation system.
2. National Environmental Policy: Emphasizes sustainable development and environmental protection.
3. Nigeria's Vision 20:2020: Aimed to reduce greenhouse gas emissions and promote sustainable transportation, which is now belated.

#### Regulatory Frameworks:

1. Federal Highway Administration (FHA) Act (2004): Regulates highway development and maintenance.
2. National Inland Waterways Authority (NIWA) Act: Oversees inland water transportation.
3. Nigerian Railway Corporation (NRC) Act: Governs railway operations.

#### Sustainable Transport Initiatives

2. Lagos State Transportation Policy (2018): Focuses on public transportation. Lagos also encourages non-motorized transport.
3. Abuja Transportation Policy: Emphasizes integrated transportation systems.

#### **INTERNATIONAL AGREEMENTS**

Nigeria has shown a strong commitment to tackling climate change and minimizing emissions. Several significant initiatives and pledges highlight the nation's resolve to mitigate the effects of transportation-related emissions. As a participant in various international agreements, Nigeria aligns its transportation emissions objectives with global

endeavors aimed at combating climate change and fostering sustainable development.

1. Nigeria is a signatory to the Paris Agreement, which aims to limit global temperature rise to well below 2 degrees Celsius above pre-industrial levels. This agreement obligates Nigeria to lower emissions across all sectors, including transportation, thereby contributing to global climate stabilization.
2. Nigeria supports the SDGs, particularly Goal 11 (Sustainable Cities and Communities) and Goal 13 (Climate Action), which focus on sustainable urban development, clean energy, and the reduction of greenhouse gas emissions.
3. African Union Agenda 2063: Nigeria's involvement in the African Union's Agenda 2063 aligns with the continent's collective goal of establishing integrated, prosperous, and sustainable economies. This includes the promotion of sustainable transportation systems and the reduction of emissions.
4. Economic Community of West African States (ECOWAS): As a member of ECOWAS, Nigeria is part of regional efforts to address transportation emissions. ECOWAS has initiatives to promote energy efficiency and renewable energy adoption in the transportation sector.

#### **INCENTIVES:**

The federal government through the Minister of State Petroleum Resources (Gas), Ekperikpe Ekpo, has recently launched the ride-sharing Compressed Natural Gas (CNG) programme aimed at providing accessible and affordable transportation for Nigerians.<sup>14</sup>

#### **TAX CREDITS:**

---

<sup>14</sup> [https://www.thisdaylive.com/index.php/2024/08/13/fg-launches-ride-sharing-cng-conversion-incentive-scheme/#google\\_vignette](https://www.thisdaylive.com/index.php/2024/08/13/fg-launches-ride-sharing-cng-conversion-incentive-scheme/#google_vignette) Assessed on 07/11/24

The Value Added Tax (Modification) Order 2024 (referred to as the “Order” or “VMO 2024”) introduces several specific amendments. The changes outlined in VMO 2024 are primarily aimed at supporting Nigeria's ongoing energy transition initiatives. It acknowledges the significance of gas as a crucial fuel in the long-term shift towards clean energy, offers VAT exemptions for the renewable energy value chain, addresses the challenges posed by Nigeria's current energy situation (along with the associated fuel costs) following the harmonisation of exchange rates, and aims to provide relief for Nigerian citizens in the medium term.<sup>15</sup>

#### **VEHICLE-TO-GRID TECHNOLOGY:**

Vehicle-to-Grid (V2G) technology presents a viable solution to Nigeria's energy issues, particularly in light of escalating fuel prices and a suboptimal energy infrastructure. In this regard, V2G technology, often referred to as car-to-grid, enables electric vehicle (EV) batteries to both consume power from the grid and return energy to it. By charging vehicles during periods of low demand and supplying energy back to the grid during peak usage times, V2G systems facilitate energy load balancing, diminish dependence on fossil fuels, and help stabilize energy costs. Edo State in Nigeria serves as an exemplary case for the adoption of V2G technology. With its abundant natural resources and a conducive business climate, Edo State is well-positioned to emerge as a center for V2G innovation. The state's access to essential raw materials, such as lithium for battery production, along with a progressively supportive policy framework for green technologies, renders it an attractive destination for investment in EV and V2G infrastructure. The implementation of V2G technology in Edo State could provide substantial advantages, including mitigating the effects of volatile fuel prices, fostering local economic development through

---

<sup>15</sup> <https://www.pwc.com/ng/en/assets/pdf/vat-modification-order-2024-incentivising-energy-transition-in-nigeria.pdf>

job creation and investments, and reducing reliance on imported fuels. These developments would not only strengthen energy security but also advance Nigeria towards a more sustainable energy landscape..<sup>16</sup>

#### **ENERGY STORAGE, GRID STABILIZATION**

Nigeria's power grid is facing incessant collapse amidst instability, making its stabilization a significant priority. Recently, the Federal Government introduced a sophisticated Supervisory Control and Data Acquisition (SCADA) system aimed at enhancing the efficiency, reliability, and sustainable operation of the national grid. This initiative represents a promising approach to maintaining transportation in an era marked by disruptions.<sup>17</sup>

#### **PUBLIC AWARENESS AND EDUCATION**

Government, NGOs, investors and are enjoined to use Social media, events, Influencer partnerships, educational programs, curriculum integration, and community engagement to champion to create awareness on the sustainability of transport. Public involvement and environmental education would help all the necessary means to design a sustainable transportation environment. Nigeria has a future. Public transportation remains the best option. It is necessary to realise that urgent changes are needed to develop more economically friendly, socially acceptable, and environmentally friendly transport in Nigeria. Sustainable transportation must be pursued through integrated improvements in transportation to ensure economic prosperity, reduce social stress, and maintain a balanced, healthy ecology around our

---

<sup>16</sup> <https://nigerianobservernews.com/2024/09/navigating-nigerias-fuel-crisis-how-vehicle-to-grid-v2g-technology-offers-sustainable-solutions/#:~:text=By%20charging%20vehicles%20during%20off,fuels%2C%20and%20stabilise%20energy%20costs>. Assessed on 07/11/24

<sup>17</sup> <https://businessday.ng/news/article/nigeria-launches-advanced-technology-to-stabilise-national-grid/>  
Assessed on 07/11/24



living area. Addressing Nigeria's challenges without adequately considering transportation problems would have a limited and slow impact. To address environmental degradation, efforts should be focused also on measures and provisions necessary to mitigate negative environmental impacts of transportation.

#### **POLICY RECOMMENDATIONS, FUTURE DIRECTIONS AND CONCLUDING REMARK**

This paper provides a critical examination of the existing transportation system in Nigeria, aiming to identify the essential priorities for establishing a sustainable transportation framework that promotes economic efficiency and social effectiveness. By synthesizing contemporary literature and practices in transportation, it proposes a comprehensive set of policy recommendations aimed at fostering sustainable transportation. This approach tackles the various challenges associated with developing a diverse range of transportation infrastructures and modalities, ensuring that environmental and social factors are integrated into their planning and execution. Additionally, it emphasizes that the development, enhancement, or expansion of the transportation network should be systematic, well-planned, and coordinated, serving as the cornerstone of a holistic and sustainable transportation policy that involves the active participation of relevant stakeholders. This policy framework is intended to steer Nigeria's transportation development in a manner that aligns individual projects with the broader objectives of the nation's transportation strategy.

The federal government ought to implement a comprehensive transportation infrastructure encompassing road, rail, maritime, and air transport, complemented by an effective mass transit system. Research indicates that, similar to the practices in many nations with high economic development indices, Nigeria's approach to sustainable development in transportation should transition towards a cohesive, policy-driven national transportation framework. It is essential to enhance and expand the interconnections among various transportation systems to ensure coherence, synchronization, and sustainability across

the developed modes. Simultaneously, there should be a reduction in reliance on motorized personal transport, achieved by establishing dedicated pathways for mass transit. The planning of land use and spatial organization is vital to this initiative, necessitating the simultaneous development of new, functionally designed urban areas where transportation across all modes is tailored to meet diverse travel requirements, including access to healthcare, employment centers, and residential areas.

It suffices to establish that the transportation system has to provide doors functioning by hypertrophy. Ports development is a natural result, and this should be portrayed in this light as the transportation of the hinterland is dependent on ports. Lagos and many coastal cities in Nigeria are important for industrial development, having natural endowments in terms of abundant natural resources. It would be advisable to have regional and zonal transportation development that includes urban and rural infrastructure systems that will decrease poverty, population increase in urban areas, and provide socio-economic benefits. Finally, developing a viable transportation policy framework in Nigeria must be holistic. Such a policy must address the economic, environmental, social, and institutional means possible to improve the effectiveness of human endeavour to move around. In the paper, the centrality of the private sector in transport investment is stressed; hence, there is a need to periodically assess the investment phase of former and subsequent transport guidelines. The purpose serves as a reality check and, at the same time, a mechanism for reviewing and modifying the guidelines at will.

For sustainable transportation that will be appropriate for a disrupted economies, I, therefore, make a CLARION CALL on the following critical to-do list:

1. A robust transportation policy for the federal and state governments, Lagos State, led the way.

2. Rapid deployment of alternate energy like CNG and Electric vehicles. The Presidential Committee on CNG Initiatives must more than double its efforts to meet the national demand. The committee should encourage greater buy-in from the private sector to match the initiative's investment requirements.
3. Adoption of cutting-edge technologies to increase accessibility and affordability.
4. Stakeholders massive investment in the transportation sector.
5. Greater attention to the road that carries over ninety per cent of our national mobility needs. This is not only through increased fund allocation but also by creating a Road Authority to coordinate and regulate this humongous transport mode for the national economy's rapid growth. This will also be a significant means of harnessing revenue that is going into illegal self-appointed actors cashing out on the lacuna occasioned by the lack of any single authority in charge.
6. Creation of awareness on the sustenance of the transportation sector.
7. Lastly, I challenge our tertiary and research institutions to rise to the occasion and devise innovative solutions to our transportation challenges regarding safety, comfortability, affordability, availability, and sustainability.

I thank you all for Listening.