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# Future of Autonomous Transportation Opportunities and Challenges in Nigeria

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**Abstract**
*Autonomous vehicles (AVs) are widely promoted as solutions to road safety challenges, congestion, and mobility inefficiencies, yet evidence on their applicability in African contexts remains limited. In Nigeria, persistent road traffic fatalities, chronic congestion, weak infrastructure, and regulatory gaps underscore the need for contextualised analysis linking AV adoption to local institutional, technological, and socio-cultural realities. This study examines the future of autonomous transportation in Nigeria, highlighting its opportunities, challenges, and policy implications. A descriptive research design was employed through a systematic review of literature from Scopus, ScienceDirect, SpringerLink, Google Scholar, and related repositories. Seventeen peer-reviewed studies published between 2010 and 2024 were selected using explicit inclusion and exclusion criteria and analysed through thematic synthesis. The analysis is anchored in the Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI) theory to explain user acceptance and system-level diffusion. Findings reveal that AV adoption in Nigeria is constrained by interconnected barriers, including inadequate road and digital infrastructure, high acquisition and deployment costs, regulatory and institutional gaps, cybersecurity risks, and low public trust. Nevertheless, significant long-term prospects exist for improving road safety, enhancing accessibility for vulnerable groups, reducing congestion, and stimulating smart mobility innovation if adoption follows a phased, context-sensitive pathway. The study concludes that AV deployment in Nigeria is less a technological challenge than an institutional and governance issue. It recommends targeted policy reforms, infrastructure investment, regulatory clarity, capacity building, and public engagement as prerequisites for successful integration, while providing policy-relevant insights for transport planning in developing economies.*

***Keywords:*** *Autonomous vehicles; Autonomous transportation; Smart mobility; Technology adoption; Transport policy*

## 1. Introduction

In recent years, autonomous vehicles (Avs) have increasingly gained global attention as a transformative innovation in transportation systems. Autonomous vehicles—also referred to as self-driving vehicles—are capable of sensing their environment and operating with little or no human intervention through the integration of sensors, cameras, radar, Light Detection and Ranging (LiDAR), Global Positioning System (GPS), and Artificial Intelligence (AI) technologies (Shahedi et al., 2023). Globally, approximately 31 million vehicles with some level of automation were produced in 2019, with projections rising to about 54 million units by the end of 2024, and the autonomous vehicle market, valued at roughly USD 24 billion, is forecast to reach about USD 63 billion by 2026 (Statista Research Development, 2023). These trends indicate a rapid shift toward automation as a core component of future mobility systems.

Autonomous vehicles are widely promoted for their potential to improve road safety, reduce traffic accidents attributable to human error, enhance travel comfort, and improve transport accessibility for vulnerable groups such as the elderly, children, and persons with disabilities (Meyer et al., 2017). Several developed countries—including the Netherlands, Japan, Singapore, the United States, France, Sweden, and the United Kingdom—have demonstrated the operational feasibility and efficiency of autonomous transport systems through pilot projects and real-world deployments (Jones, 2019; World Economic Forum, 2018). Inspired by these successes, emerging economies such as China, India, South Korea, and Canada have also begun integrating autonomous technologies into their transport planning frameworks.

Despite these global advancements, the adoption of autonomous transportation in Africa remains extremely limited. In Nigeria in particular, the deployment of autonomous vehicles is still at a conceptual or exploratory stage, even as the country continues to face intense transportation challenges. Road traffic crashes in Nigeria remain alarmingly high: in 2020–2022 alone, over 11,000 fatalities and more than 110,000 injuries were recorded as a result of road traffic crashes, with each year accounting for more than 5,000 deaths and tens of thousands of injuries (Atubi, 2022, Ajiboye, et al. 2021). Recent reports by the National Bureau of Statistics (NBS, 2025), show that road accidents increased by 9.4 % in the second quarter of 2025 compared with the same period in 2024, highlighting a persistent upward trend in crash occurrences.

In addition to human and social costs, road transport dysfunction imposes a significant economic burden on Nigeria's largest urban centres. For example, traffic congestion in Lagos—Nigeria's commercial capital—results in residents spending up to four hours daily in gridlock, leading to an estimated annual loss of productivity valued in the trillions of naira (Giwa, 2025). These statistics underscore that poor road safety, chronic congestion, and inefficient transport systems not only endanger lives but also severely constrain economic productivity and quality of life.

These challenges are compounded by Nigeria's weak transport infrastructure, inadequate regulatory frameworks, limited investment in modern mobility technologies, and pervasive public distrust in system safety. While global literature identifies barriers such as high infrastructure costs, cybersecurity risks, regulatory gaps, public trust deficits, adverse weather conditions, and communication system limitations (Bagloee et al., 2016), there is insufficient Nigeria-specific evidence examining how these barriers interact with local realities.

The absence of a contextualised assessment of autonomous transportation in Nigeria constitutes a significant knowledge and policy gap. Without such an understanding, policymakers risk either ignoring a potentially transformative mobility solution or adopting policies that are misaligned with Nigeria's development needs. This gap is particularly concerning given Nigeria's rapid urbanisation, growing population, and urgent need for safer, more efficient, and more inclusive transportation systems.

This study is important for Nigeria for several reasons. First, it provides a timely examination of autonomous transportation as a potential response to persistent mobility challenges, including high road traffic fatalities and dominant congestion costs. Second, it contributes to national discourse on smart mobility and digital transformation in the transport sector, aligning with broader development goals such as sustainability, innovation, and

economic competitiveness. Third, by highlighting both opportunities and constraints, the study supports evidence-based decision-making for transport planners, regulators, and investors considering future mobility pathways in Nigeria.

The overriding aim of this study is to examine the future of autonomous transportation in Nigeria by analysing its opportunities and challenges. Specifically, the study aims to:

i. Review global trends and experiences in autonomous vehicle adoption and deployment.

ii. Identify the potential benefits of autonomous transportation for Nigeria's urban and national transport systems.

iii. Examine the key technological, infrastructural, regulatory, economic, and social challenges affecting the adoption of autonomous vehicles in Nigeria.

iv. Propose policy-relevant insights to guide the gradual integration of autonomous transportation into Nigeria's mobility framework.

This study is expected to make several contributions. Academically, it enriches the limited body of literature on autonomous transportation in developing countries, particularly within the African context. From a policy perspective, it provides insights that can inform the development of regulatory frameworks, infrastructure planning, and investment strategies for autonomous mobility in Nigeria. Practically, the study raises awareness among stakeholders—including government agencies, transport operators, and the general public—about the implications of autonomous vehicles for future mobility, thereby supporting informed dialogue and long-term transport planning.

## 1.1 Literature Review

### 1.1.1 Concept of Autonomous Vehicles: A Critical Perspective

The term "autonomous vehicle" refers to a type of vehicle that does not require a human operator but relies on driver assistance technologies (Cole, 2025). They are capable of sensing their environment and performing driving tasks with limited or no human intervention through the integration of artificial intelligence (AI), sensors, control algorithms, and communication systems (SAE International, 2018). While earlier studies, particularly in developed countries, conceptualise Avs primarily as technological innovations aimed at safety enhancement and efficiency (Litman, 2020; Thrun et al., 2006), recent scholarship emphasises their broader socio-technical implications, including infrastructure readiness, regulatory frameworks, and public acceptance (Milakis et al., 2017).

Empirical studies from developed economies such as the United States, Germany, and Japan show that AV deployment is closely linked to advanced road infrastructure, strong regulatory oversight, and high levels of digital literacy (Fagnant & Kockelman, 2015; Kyriakidis et al., 2015). For instance, Waymo's pilot studies in Arizona revealed reductions in human-error-related crashes, but also highlighted challenges related to pedestrian unpredictability and mixed traffic conditions (Waymo, 2021).

In contrast, studies from developing countries reveal a more complex landscape. Research in China and India indicates that poor road markings, informal driving behavior, and weak enforcement of traffic laws significantly limit AV operational efficiency (Zhang et al., 2019; Kumar & Agarwal, 2022). African-focused studies remain sparse; however, existing transport

research in Nigeria suggests that high accident rates, poor road conditions, and weak intelligent transport systems (ITS) readiness may constrain AV adoption (Aderamo, 2012; FRSC, 2023). Thus, while Avs promise transformative benefits, their conceptualization must be context-sensitive rather than technologically deterministic.

1.2 Components of Autonomous Vehicles: Empirical and Contextual Insights

The core components of Avs—sensors, semiconductors, high-definition maps, software, control systems, communication networks, and cybersecurity—have been widely examined in technical literature (Paden et al., 2016; Coffin et al., 2020).

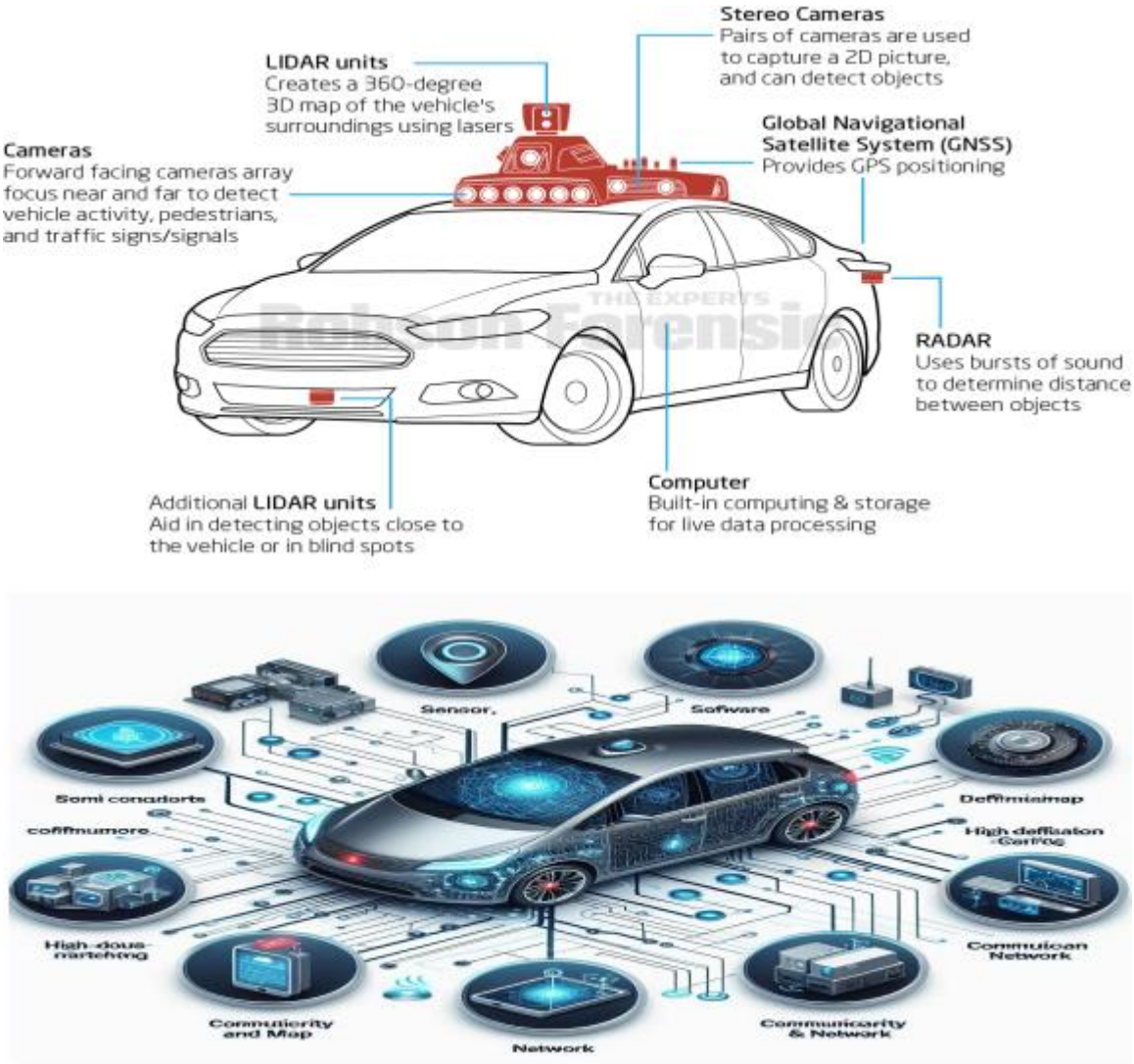


**Figure 1**. Autonomous vehicles showing the various functional component
**Source:** Adopted and modified from Leiss (2018)

In developed countries, empirical evidence shows that the effectiveness of these components is enhanced by well-maintained infrastructure and reliable digital ecosystems. Conversely, studies in developing contexts reveal performance degradation due to infrastructural deficiencies. Zhang et al. (2019) observed that sensor reliability declines in environments with poor road demarcation and inconsistent signage. In Nigeria, where road

markings are often faded or absent and digital mapping coverage is uneven, reliance on HD maps and sensors alone may be insufficient. Furthermore, cybersecurity risks are heightened in environments with weak data protection regulations, raising concerns about system vulnerability and public trust (Kshetri, 2021).

This contrast highlights that AV components are not universally transferable technologies; rather, their effectiveness depends on local infrastructural, institutional, and governance conditions—an issue largely overlooked in Nigerian transport literature.

### 1.3 Automated, Autonomous, and Self-Driving Vehicles: A Comparative Synthesis

While the terms automated, autonomous, and self-driving vehicles are often used interchangeably, empirical literature distinguishes them based on technological maturity and human involvement (SAE International, 2018). Automated vehicles (Levels 1–2) dominate current global markets, particularly in developing countries, due to affordability and infrastructural compatibility (Litman, 2020).

Self-driving vehicles (Levels 3–5) have shown promising results in controlled environments in developed economies but face adoption barriers elsewhere. Kyriakidis et al. (2015) found that public trust declines significantly when Avs operate in complex traffic environments typical of developing countries. In Nigeria, where mixed traffic involving pedestrians, motorcycles, and informal transport is prevalent, full autonomy may face heightened safety and acceptance challenges.

Thus, comparative analysis suggests that Nigeria is more likely to experience a gradual transition through automation rather than immediate full autonomy, a nuance absent in much of the existing literature.

### 1.4 Theoretical Framework: Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI)

To anchor this study theoretically, the Technology Acceptance Model (TAM) (Davis, 1989) and the Diffusion of Innovation (DOI) Theory (Rogers, 2003) are adopted. TAM posits that perceived usefulness and perceived ease of use determine users' acceptance of new technology. Empirical studies in Europe and Asia confirm that safety perception, cost, and trust significantly influence AV acceptance (Kyriakidis et al., 2015; Nordhoff et al., 2018). However, TAM-based studies in Nigeria are scarce, particularly in the transport sector, despite evidence that user perception strongly shapes technology adoption in developing economies.

DOI theory complements TAM by explaining how innovations spread within a social system based on attributes such as relative advantage, compatibility, and complexity. In Nigeria, socio-cultural norms, income inequality, and institutional readiness may slow AV diffusion despite potential advantages such as accident reduction and congestion management.

### 1.5 Conceptual Framework

The proposed framework posits that: technological factors (system reliability, safety, cost); infrastructure readiness (road quality, digital mapping, V2X); institutional factors (regulation, cybersecurity, policy support), and user perception (trust, perceived usefulness). These jointly influence AV adoption and deployment outcomes in Nigeria. TAM explains user-level acceptance, while DOI explains system-level diffusion.

### 1.6 Knowledge Gap and Contribution of the Study

Despite growing global literature on autonomous vehicles, three critical gaps remain evident: The Contextual Gap: Most empirical studies are concentrated in developed countries, with limited adaptation to Nigeria's unique transport, infrastructural, and institutional realities; The Theoretical Gap: Nigerian AV-related discussions are largely descriptive, lacking grounding in established technology adoption theories such as TAM or DOI and The Policy-Relevance Gap: There is insufficient evidence linking AV technology readiness to transport policy, safety regulation, and infrastructure planning in Nigeria. This study addresses these gaps by contextualising AV adoption within Nigeria, applying robust theoretical frameworks, and generating insights relevant to transport policy, planning, and academic discourse.

## 2 Methodology

### 2.1 Research Design

This study adopted a descriptive research design based on a systematic review of secondary data. The descriptive approach is suitable because it enables an objective examination and synthesis of existing scholarly works on autonomous vehicles, particularly focusing on their prospects, challenges, and implications for mobility. The reliance on secondary data allows the study to consolidate prior empirical and conceptual evidence without direct field experimentation.

### 2.2 Data Sources and Literature Search Strategy

A structured literature search was conducted using reputable academic databases to ensure coverage of high-quality and peer-reviewed studies. The databases searched include: Scopus, ScienceDirect (Elsevier), SpringerLink, Google Scholar, Academia Edu and ResearchGate in order to capture working papers and supplementary studies. These databases were selected due to their extensive indexing of transportation, engineering, technology adoption, and policy-related research.

The search was conducted using predefined keywords and Boolean operators to improve precision and reproducibility. The key search terms included:

i. *"autonomous vehicle"*
ii. *"autonomous transportation"*
iii. *"challenges of autonomous vehicles"*
iv. *"prospects of autonomous vehicle adoption"*
v. *"effects of autonomous vehicles on mobility"*

Examples of Boolean combinations applied include:

i. ("autonomous vehicle" OR "self-driving car") AND ("challenges" OR "barriers")
ii. ("autonomous vehicle adoption") AND ("prospects" OR "opportunities")
iii. ("autonomous transportation") AND ("mobility" OR "transport systems")

Search results were screened by reviewing titles, abstracts, and keywords to determine relevance.

2.3 Inclusion and Exclusion Criteria

To ensure methodological rigor and relevance, the following criteria guided the selection of studies: Under the inclusion Criteria, the following were taken into consideration. Namely, peer-reviewed journal articles and conference proceedings, studies published between 2010 and 2024, empirical or conceptual studies focusing on autonomous vehicles, their adoption, impacts, challenges, or prospects, studies conducted in both developed and developing countries and articles written in English while the exclusion Criteria are the **o**pinion articles, editorials, news reports, and blog posts, studies unrelated to transportation or autonomous vehicle technology, articles lacking clear objectives or findings and duplicate publications across databases. After applying these criteria, seventeen (17) relevant studies were retained for final analysis. Many excluded papers were descriptive commentaries without empirical grounding, which explains why only a limited number met the inclusion threshold.

2.4 Data Analysis Technique

The selected studies were analysed using thematic synthesis, a qualitative analytical technique suitable for reviewing heterogeneous studies. The analysis followed three stages: Initial coding of key issues such as technological readiness, safety concerns, infrastructure needs, policy and regulation, and public acceptance; Theme development, where similar codes were grouped into broader analytical categories and Comparative synthesis, contrasting findings across developed and developing country contexts and drawing implications for emerging economies such as Nigeria This approach allowed the study to move beyond mere description toward critical synthesis and interpretation.

## 3. Results

This section synthesises the body of literature examined in the study to provide a clear overview of existing knowledge and research trends. Table 1 as shown below presents a structured summary of the reviewed studies, outlining their primary focus areas, the country or regional contexts in which they were conducted, and their key findings. By organising the literature in this way, the table enables quick comparison across studies, highlights geographical and thematic patterns, and identifies gaps that justify the present research. Table 1 below therefore summarises the reviewed studies by highlighting their focus areas, country context, and key findings.

**Table 1.** Summary of Reviewed Studies on Autonomous Vehicles

| Author(s) Year | Study Focus | Country/Region | Key Findings |
|---|---|---|---|
| Souza & Castañon (2021) | Public acceptance of autonomous vehicles | USA | Trust, safety perception, and perceived usefulness strongly influence adoption |
| Meyer & Becker (2019) | Infrastructure requirements for AV deployment | Germany | Digital and road infrastructure readiness is critical |

| Author(s) Year | Study Focus | Country/Region | Key Findings |
|---|---|---|---|
| Zhang et al. (2019) | Policy and regulatory frameworks | China | Government-led regulation accelerates AV implementation |
| Ogunleye & Adams (2022) | Transport innovation adoption | Nigeria | Weak infrastructure and regulatory gaps constrain adoption |
| Okafor et al. (2023) | AV impact on urban mobility | Nigeria | Potential efficiency gains exist, but institutional readiness is low |
| Khan et al. (2025) | Challenges of AV adoption | India | High costs and low public awareness are major barriers |

**Source:** Authors' fieldwork, 2025

The methodological approach used provides a structured and transparent basis for reviewing autonomous vehicle literature. However, the synthesis reveals that most empirical studies are concentrated in developed economies, with limited Nigeria-focused or Africa-specific evidence. This study contributes by systematically organising global findings while identifying context-specific gaps relevant to developing countries.

## 4. Discussions

### 4.1 Challenges to the Adoption of Autonomous Vehicles

The results from the reviewed literature reveal that the adoption of autonomous vehicles (AVs) in Nigeria is constrained by interacting technological, economic, regulatory, and socio-cultural barriers, consistent with findings from both developed and developing economies. Rather than operating in isolation, these barriers reinforce one another, slowing diffusion, as predicted by the Diffusion of Innovation Theory and the Technology Acceptance Model (TAM), which emphasise perceived usefulness, ease of use, and institutional support as key adoption drivers.

#### 4.1.1 Technological and Infrastructure Readiness (Short-term Challenges)

Technological readiness emerges as a fundamental short-term barrier. Autonomous vehicle systems rely on advanced sensors, artificial intelligence, high-definition digital maps, and real-time vehicle-to-infrastructure (V2I) communication. Empirical studies from China and Singapore show that large-scale AV deployment has only been possible following sustained investments in smart infrastructure, including lane discipline, traffic digitisation, and continuous system testing (Chen et al., 2022).

In contrast, Nigeria's road infrastructure is characterised by poor road markings, inconsistent traffic management, and limited digital mapping, conditions that undermine AV system reliability. This finding aligns with evidence from other developing countries where AV trials remain limited to controlled environments due to similar infrastructural deficits. Thus, Nigeria's challenge is not merely technological availability but technological compatibility with existing road conditions.

4.1.2 Cost and Economic Constraints (Short- to Medium-term Challenges)

The high cost of AV acquisition and supporting infrastructure—such as LiDAR systems, charging stations, and data-processing facilities—represents another significant barrier while studies from advanced economies suggest that costs decline with economies of scale (Petchmark, 2023). This benefit remains distant for Nigeria due to limited local manufacturing capacity and high import dependence.

Compared to countries like China, where government subsidies and industrial policy have reduced AV production costs, Nigeria lacks targeted financial incentives, thereby restricting adoption largely to experimental or elite use. This reinforces inequality concerns and limits widespread diffusion.

4.1.3 Regulatory and Institutional Gaps (Short-term Challenges)

The absence of a clear and standardised regulatory framework is one of the most critical short-term constraints identified. Evidence from Singapore demonstrates that regulatory clarity, including testing guidelines, liability frameworks, and safety certification, accelerates AV deployment by reducing uncertainty for investors and users.

In Nigeria, however, the lack of explicit AV legislation creates ambiguity regarding liability, insurance, data governance, and safety standards. This institutional vacuum slows innovation and weakens public confidence. Harmonisation with international standards, as recommended in previous studies, would enable Nigeria to benefit from global best practices while attracting foreign investment.

4.1.4 Public Trust, Cultural Acceptance, and Ethics (Long-term Barriers)

Beyond infrastructure and regulation, long-term barriers relate to public trust, cultural norms, and ethical considerations. High-profile AV accidents globally have heightened safety concerns, particularly in countries where trust in technology and institutions is already fragile. TAM-based studies consistently show that perceived risk negatively influences adoption intentions, a pattern evident in Nigeria.

Culturally, driving in Nigeria is often associated with autonomy, skill, and personal control, which contrasts with the passive role required in autonomous mobility. This cultural resistance mirrors findings from other low- and middle-income countries but contrasts sharply with Singapore, where public education campaigns and pilot projects have gradually normalised AV usage.

Ethical dilemmas—such as how AVs should prioritise safety in unavoidable crash scenarios—further complicate acceptance. These issues require long-term policy engagement, public dialogue, and ethical governance frameworks rather than purely technical solutions.

4.1.5 Employment and Environmental Concerns (Long-term Barriers)

The literature also highlights concerns regarding job displacement in driving-related occupations, particularly in trucking and taxi services. While evidence from developed economies suggests that AVs also create new roles in data analysis, maintenance, and software engineering, Nigeria's skills gap may limit access to these opportunities unless proactive reskilling policies are introduced. Environmental challenges, including battery disposal and

lifecycle emissions, further underscore the need for sustainable AV policies to avoid transferring environmental burdens rather than solving them.

4.2 Prospects of Autonomous Vehicles in Nigeria

Despite these challenges, the findings indicate that AVs offer significant long-term prospects for Nigeria's transport system, particularly in safety, mobility, and economic innovation.

4.2.1 Road Safety Improvement

Empirical evidence consistently identifies human error as the dominant cause of road accidents in Nigeria (Oyetubo et al., 2018; Ajiboye et al., 2021; 2023). In countries such as China, pilot AV programmes have demonstrated reductions in collision rates due to consistent driving behaviour and real-time hazard detection. Applying these insights to Nigeria suggests that AV adoption—if adapted to local conditions—could significantly reduce accident rates, aligning with national road safety objectives.

4.2.2 Enhanced Mobility and Accessibility

AVs also present opportunities to improve mobility and accessibility, especially for populations underserved by existing public transport systems. Autonomous shuttles and ride-sharing services, as observed in Singapore, have improved first- and last-mile connectivity. For Nigeria, such applications could enhance rural–urban connectivity and provide mobility for the elderly, persons with disabilities, and those without access to private vehicles.

4.2.3 Economic Innovation and Smart Infrastructure Development

From an economic perspective, AV adoption could stimulate innovation in data services, software development, and intelligent transport systems. However, realising these benefits requires strategic infrastructure investment, including smart traffic signals, V2I communication, and digital mapping (Ajiboye et al., 2024). Without such investment, the economic prospects of AVs remain largely theoretical.

4.3 Effects of Autonomous Vehicle Usage on Mobility in Nigeria

Autonomous vehicle usage has the tendency to transform mobility in Nigeria, reshaping how people and freights move within rural or urban areas. These developments enhance the efficacy, accessibility and sustainability of public transport systems. One notable effect of autonomous vehicle usage on mobility is traffic congestion reduction. By leveraging on advanced algorithm and real time data, autonomous vehicle can maintain consistence speed, optimize transport routes, and reduce traffic congestions. This is because most traffic congestion in Nigeria are artificial and are caused by drivers stop and picking passengers on transport route, road side parking and markets along the roadside (Ajiboye et al. 2021, Ndayako et al., 2023). Optimised transport service does not only save time for commuters, it decreases fuel consumption, reduce greenhouse gases, improved health and contribute to environmental sustainability (Imam & Ohida, 2024). The synthesis of findings indicates that AV usage has the potential to reshape mobility patterns in Nigeria, with both positive and unintended consequences.

#### 4.3.1 Traffic Efficiency and Environmental Sustainability

Studies from Europe and Asia demonstrate that AVs can reduce congestion by optimising routes, maintaining consistent speeds, and minimising erratic driving behaviour (Petrick, 2019; Wang & Zhang, 2019). In Nigeria, where congestion is often caused by informal transport practices and poor traffic discipline (Ajiboye et al., 2021), AVs could enhance traffic flow and reduce fuel consumption, emissions, and commuter travel time.

#### 4.3.2 Accessibility and Inclusive Mobility

AV-enabled transport services could bridge existing gaps in Nigeria's public transport system by providing reliable, on-demand mobility. This aligns with global evidence that AVs can support inclusive transport systems when integrated with public transit rather than replacing it.

#### 4.3.3 Urban Planning and Induced Demand Risks

In the long term, AV integration could influence land-use patterns by reducing parking demand and freeing urban space for pedestrian and green infrastructure. However, comparative evidence from developed countries warns of induced demand, where increased convenience leads to longer trips and higher vehicle miles travelled. Without careful policy coordination, these effects could offset environmental and congestion benefits in Nigerian cities.

#### 4.3.4 Synthesis and Implications

Overall, the results suggest that while Nigeria faces substantial short-term barriers—particularly infrastructure and regulation—the long-term prospects of autonomous vehicles remain significant if supported by coherent policy, public engagement, and phased implementation. Comparisons with Singapore and China highlight that successful AV adoption depends less on technological availability alone and more on institutional readiness, public trust, and strategic planning, offering critical lessons for Nigeria's transition toward autonomous mobility.

## 5. Future Directions

To facilitate AV adoption in Nigeria, the following policy actions are recommended:

Enhancing public awareness and trust through the agencies such as the National Automotive Design and Development Council (NADDC) and the Federal Road Safety Corps (FRSC) by leading targeted public campaigns to educate Nigerians on AV safety, efficiency, and reliability, thereby increasing societal acceptance and trust.

The Federal Ministry of Transportation (FMT), in collaboration with private stakeholders, should invest in AV-supportive infrastructure, including smart traffic systems, sensor networks, and simulation testing environments that reflect Nigerian traffic and weather conditions.

The National Transport Commission (NTC) and NADDC should develop policies that incentivise local AV investment, establish standards for safety and operation, and provide tax or funding support for AV deployment projects.

The National Institute for Transport Technology (NITT) and all the universities offering Transport Management Technology should incorporate AV technology training into its programmes to build a skilled workforce capable of supporting AV deployment, maintenance, and operations.

Furthermore, the following research directions should be considered in the nearest future by conducting empirical studies on public perception and acceptance of autonomous vehicles in different Nigerian cities in order to identify cultural or social barriers; performing cost-benefit analyses of AV deployment in urban and rural Nigerian contexts, accounting for infrastructure investment, safety improvements, and potential reductions in congestion and investigating the environmental impacts of AV adoption in Nigeria, including energy consumption, emissions, and the potential for integrating renewable energy solutions.

By combining these policy interventions with evidence-based research, Nigeria can establish a roadmap for the successful integration of autonomous transportation, ultimately enhancing mobility, safety, and inclusivity for its growing population.

## 6. Conclusion

This study examined the future of autonomous transportation in Nigeria, highlighting opportunities, challenges, and potential impacts on mobility and accessibility. The findings indicate that technological readiness, high infrastructure costs, adverse weather conditions, and low public trust are key barriers to autonomous vehicle (AV) adoption. Despite these challenges, AVs have the potential to improve urban mobility, increase accessibility for the elderly and persons with disabilities, and enhance transportation efficiency and safety across Nigeria. Crucially, the study demonstrates that the successful integration of AVs requires not only technological advancement but also supportive policy frameworks, strategic public-private partnerships, and targeted public education. Addressing the identified challenges in a coordinated and context-specific manner will be essential for realizing the benefits of AV technology in Nigeria.

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