



FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

TRANSPORTATION SYSTEMS AND INFRASTRUCTURE IN NIGERIA: A TRANSPORT MANAGEMENT APPROACH TO ENHANCING EFFICIENCY, SAFETY, AND SUSTAINABILITY

INAUGURAL LECTURES SERIES 195



Delivered by

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Professor of Logistics and Transport

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Salutation

The Vice-Chancellor,

Deputy Vice-Chancellors, Academic and Development

Registrar,

Other Principal Officers of the University,

Deans of Schools and Directors of Centres,

Heads of Departments and Units,

Members of Senate,

Members of the University Council

My Lord Spiritual and Temporal,

Royal Majestics,

Distinguished Professors and Colleagues,

Students of the School of Logistics and Innovation Technology,

Distinguished Guests and Friends of the University,

My Immediate and Extended Family members,

Gentlemen of the Press,

Ladies and Gentlemen,

Great FUTArrians

Preambles

I was born in the early hours of Monday, 13th May 1974, on Lagos Island, into the family of Mr. Stephen Abiodun Obusez and Mrs. Risikat Christianah Ayoka Obusez, of Uteh Ọkpụ, Agbor, then in Bendel State.

From my earliest years, I showed a keen admiration for uniformed service. I vividly recall watching my senior cousin, now Engr. Olanrewaju Adejimi, being prepared for school. Each time, I would cry insistently, demanding to go along with him. This early enthusiasm led to my enrolment at Daily Day Care and Nursery School, Idi-Oro, in 1976.

As my parents relocated, my schooling also changed. In 1977, I was enrolled at Aunty Ayo Preparatory School, Ikoyi, Lagos. Following the takeover of mission and private schools by the Lagos State Government, and to remain close to my mother's business activities around Balogun and Oke-Àárín on Lagos Island, I joined Saint Peter's Primary School, Faji, Ajeje, at the age of seven.

In 1986, I commenced my secondary education at Boys' Academy, Simpson Street, in the Maloney area of Lagos Island. On 19th February 1988, I became one of the pioneer students of the Lagos State Model College, Bodore, Eti-Osa, although we were temporarily camped at Ketu, Epe, until the permanent site was completed.

My academic journey in transport began in 1992 when I gained admission to study Transport Management Technology at the Federal University of Technology, Owerri (FUTO), Imo State. One of the motivations for choosing Owerri was my desire to understand the culture and way of life of people of Eastern Nigeria, particularly as my father passed on when I was very young.

The programme proved to be a blessing, as I developed a deep passion for the discipline. Despite delays occasioned by industrial actions, I completed my undergraduate studies in 1998 and proceeded to Ekiti State for my National Youth Service. Immediately after service, I returned to FUTO to pursue a Master of Science degree in Maritime Management Technology in the same department.

By 2001, I was ready for my internal defence; although it was conducted, it was not approved. In a moment of frustration—but not defeat—I enrolled for the International Logistics and Transport programme of the Chartered Institute of Logistics and Transport (CILT), London, which I successfully completed in May 2002. I thereafter returned to complete my Master’s degree, conducted the internal defence again, and concluded the programme in 2003.

I was appointed an Assistant Lecturer at FUTO and, in 2004, commenced my doctoral studies, which I successfully completed in April 2009. Throughout this journey, God remained faithful, and I owe profound gratitude to Him—particularly for placing unwavering support in the heart of my mother. Ayoka, I miss you.

My academic journey at FUTO formally ended on 13th March 2013, and on 14th March 2013, I joined the Department of Transport Management Technology, Federal University of Technology, Akure.

In 2019, driven by a lifelong commitment to holistic development, I enrolled in the Sandwich Master of Divinity (Theology) programme at the Nigerian Baptist Theological Seminary Ogbomosho, from which I graduated on 1st June 2024.

Madam Vice-Chancellor, the foregoing represents a concise summary of my academic and professional journey—one marked by perseverance, grace, and divine leading.

Madam Vice-Chancellor, I am deeply grateful for the privilege to stand here today to present the 195th Inaugural Lecture of the Federal University of Technology, Akure, titled: “Transportation Systems and Infrastructure in Nigeria: A Transport Management Approach to Enhancing Efficiency, Safety, and Sustainability.”

Transportation is a shared human experience; we all depend on it in one form or another. Consequently, this lecture is relevant to every one of us. I therefore invite you to listen attentively, with the assurance that the significance of informed transport choices will become clearer at the close of this lecture.

1. Overview of Nigeria’s Transportation Systems

Transportation is the backbone of economic development, facilitating trade, mobility, and social integration. In Nigeria, the transportation sector plays a crucial role in connecting people, goods, and services across vast geographical regions. However, the system faces significant inefficiencies, safety risks, and infrastructural deficits that hinder its full potential. This section provides an overview of Nigeria’s transport modes, highlights key challenges, and underscores the importance of transport management in addressing these issues. Nigeria’s transportation network comprises four major modes: road, rail, air, and maritime, each contributing uniquely to the economy but facing distinct operational challenges. Challenges will come but “The steps of a good man are ordered by the Lord, and He delights in his way.” — Psalm 37:23.

1.1 Road Transport in Perspective

Road Transport is the dominant mode, accounting for over 90% of passenger and freight movement (Federal Ministry of Transportation, 2023) and serving as the backbone of national commerce and daily life. Nigeria's road network is extensive, with a total mapped length of approximately 1,434,252 km as of 2025, including highways, expressways, and rural roads with only 18% paved (World Bank, 2024). This makes Nigeria one of the countries with the largest road networks in Africa. The road mode is unique because it connects all the other modes and also enables door-to-door operations within itself and when combined with other modes in intermodal operations in a multimodal transport setting. It is highly flexible but has many challenging issues. Some the key Issues are severe congestion in urban areas (e.g., Lagos, Abuja), many roads are in disrepair due to poor maintenance leading to potholes and collapsed sections, overloading of vehicles beyond approved weight thresholds and poor construction quality, capacity issues caused by overreliance on road transport increases logistics costs and inevitably the cost of living which affect mobility efficiency and safety (Stephens & Ukpere, 2011a). Nigeria records an average of 42,226 road deaths per year, equivalent to 21 fatalities per 100,000 inhabitants, which is higher than the global average of 16.8. this is most caused by over speeding, poor vehicle condition, inadequate enforcement of traffic laws, and bad road surfaces. The ease of entry has made the road mode to become a "market for all who are willing" leading to congestion as observed in urban centre such Lagos, Abuja, and Port Harcourt that experience severe traffic congestion due to rapid population growth – rural/urban migration, insufficient road capacity and limited \mass transit systems and with inadequate regulations and enforcement has become a mode that many dread and see as underperforming. Another critical challenge is underfunding as road

transport networks have historically been underfunded, though the government has recently prioritized development to support economic diversification. However, as children of God we are assured by His words: “The Lord shall preserve your going out and your coming in from this time forth, and even forevermore.” — Psalm 121:8.

Structure of the Road Network: Nigeria’s road network consists of federal, state and local government roads. Federal roads are managed by the Federal Ministry of Works, and they connect major cities, ports, and borders. They include major expressways such as Lagos–Ibadan, Abuja–Kaduna–Zaria, and Benin–Ore–Shagamu (FMW&H, 2023). State roads are managed by state governments and they connect local government areas and support intra-state commerce. While Local government roads are those that provide last-mile access and connectivity to rural communities and are often the least developed and most poorly maintained.

Importance of road transport to the economy cannot be overemphasized as road transport is essential for: economic activities - supports agriculture by linking farms to markets, facilitates distribution of goods across the country, and enables workforce mobility in urban centres; it aids urbanization - Nigeria has over 102.8 million urban residents, and road transport is central to daily commuting and intra-city movement (Worlddata, 2025); encourages trade, commerce and logistics - most freight movement occurs by road due to limited rail and inland waterway capacity, and trucks and buses dominate long-distance haulage and passenger movement.

Government efforts and reforms have been observed in the areas of infrastructure development, integration with other transport modes, and planned mass transit projects that are intra-city and inter-city or -region in scope. The government has increased investment in transport

infrastructure, recognizing its importance for economic growth. Key initiatives include: road rehabilitation projects across federal highways; and expansion of expressways to reduce congestion. Efforts are underway to integrate road transport with rail, ports, and airports as part of the National Integrated Infrastructure Master Plan (NIIMP) and there is planned intra-city mass transit systems aim to improve mobility for urban residents and reduce reliance on private vehicles.

Road transport is a vital part of the national development of Nigeria. Why? The road transport is vital for: agricultural development: enabling movement of produce from rural areas; industrial growth as it supports supply chains and distribution as well as e-Commerce; it aids social integration by connecting diverse ethnic and regional communities; and improves economic diversification by improving access to non-oil sectors such as manufacturing and services. Sustainable infrastructure requires wisdom and understanding and “Through wisdom a house is built, and by understanding it is established.” — Proverbs 24:3.

1.2 Rail Transport in Nigeria: History, Development, and Current State

Rail transport in Nigeria has undergone phases of expansion, decline, and revival. Initially built for colonial economic interests, it later suffered decades of neglect before entering a modern era of reconstruction and standard-gauge expansion. Recent reforms, infrastructure investments, and state–federal collaborations are reshaping the sector toward a multimodal and economically integrated transport system.

Nigeria’s railway system began under British colonial administration (1890s – 1960s). The first railway line was constructed between Lagos and Ibadan in 1891 to facilitate resource extraction and trade. By 1960, the network expanded to more than 3,000 km, primarily of Cape gauge (1,067 mm), built to move agricultural produce, minerals, and imported goods. The Nigerian Railway Corporation (NRC) notes that the Lagos–Ibadan line (193 km)—constructed between 1898 and 1901—marked the formal commencement of organized rail transport in the region (NRC, 2026).

Post-independence period can be divided broadly into three – the Expansion Era, the Decline and Systematic Failure and the modern era. The Expansion Era (1960 – 1980s) witnessed that the network grew with the completion of the Kano–Maiduguri (Bornu Extension) line in 1964, forming the core of today’s network. Two major Cape gauge lines: Western Line (Lagos–Nguru, 1,126 km) and Eastern Line (Port Harcourt–Maiduguri) which formed the backbone of long-distance travel. Decline and Systemic Failure (1980s–2000s) occurred due to decades of poor maintenance, policy missteps, and institutional decay, passenger and freight traffic collapsed. By the early 2000s, services were erratic, rolling stock was obsolete, and infrastructure severely degraded (Adebayo, 2021). The Modern Era (2010 till date) witnessed rebuilding and shift from outdated Cape gauge to Standard Gauge Railway (SGR) marked a turning point. “The glory of this latter house shall be greater than the former, saith the Lord.” — Haggai 2:9.

The key achievements include: Abuja–Kaduna Railway (Operational) – A flagship of the modern revival; Warri–Itakpe Railway – Providing a new central corridor for minerals and passengers; and Lagos–Ibadan SGR – A transformative double-track line enhancing mobility in the southwest. These upgrades reflect strong partnerships with

international contractors, especially Chinese firms (Nigeria234, 2025). Urban rail development in Lagos (Lagos Rail Mass Transit, LRMT) represents Nigeria’s most advanced intracity rail program. As of late 2025: the Blue Line (27 km) is fully operational while the Red Line (30 km) is under construction. Equipped with SCADA systems, ATP signalling, and modern rolling stock, the LRMT significantly improves Lagos mobility (Railwaynews, 2026).

There are two bold projects that are being done at the national level: Lagos–Kano and Abuja–Calabar Mega Corridors and they involve: Lagos–Kano SGR (1,200 km) which is at 85% of civil works completed as of 2025, expected full operation by 2026, and it is designed for 18 million tons of freight annually and 12-hour Lagos–Kano travel time; and the Abuja–Calabar Line – Enhancing east-west mobility and economic integration (Rural, 2025). These corridors are projected to stimulate job creation, reduce transportation costs, and increase national logistics efficiency. The Nigerian Railway Corporation transported 3.21 million passengers in 2022, an 18% increase from the previous year despite revenue declines. As of 2026, NRC maintains multiple operational services: Abuja–Kaduna; Lagos–Ibadan; Warri–Itakpe; and regional services on legacy Cape gauge lines (NRC, 2026).

Since January 2025, NRC’s Managing Director, Dr. Kayode Opeifa, has implemented a five-point reform agenda emphasizing: legal restructuring; rehabilitation of assets; state collaboration; freight revitalization; and long-term growth planning (Daily Trust, 2026). This period also saw successful cargo evacuation from Lagos ports—a milestone in reviving freight operations. There has also been the “Railing with the States” initiative that has led to MOUs with Plateau, Ekiti, Ogun, Niger, and Southeastern regional bodies, marking a shift

away from federal monopoly toward shared ownership of rail development.

Despite progress, the sector still struggles with Security threats and vandalism across several corridors including Kafanchan, Zakirai, Bauchi, and Delta; funding shortfalls and rising debt burdens linked to foreign loans; and operational inefficiencies and maintenance constraints. Railway business is capital intensive be it for expansion, acquisition of rolling stocks and wagons or their maintenance. However, rail transport in Nigeria is transitioning from a neglected colonial relic to a modern, integrated system supporting national development. While challenges persist, ongoing standard gauge expansion, institutional reforms, and urban rail projects position the sector for transformative impact.

1.3 Air Transport in Nigeria: History, Development, and Current State

Air transport is one of Nigeria's most crucial transportation subsectors, enabling mobility, trade, tourism, investment, and national integration. Its historical emergence, institutional evolution, and contemporary transformation demonstrate its role in the nation's socio-economic development (Stephens & Ukpere, 2011b). Peer-reviewed research identifies civil aviation as essential for catalyzing growth, globalization, and urban expansion (Paul et al., 2025).

Civil aviation activities in Nigeria date back to the 1920s in the city of Kano, which we can tag the Early Beginnings (1920s – 1940s) approximately seventeen years after the Wright Brothers' pioneering flight. These early operations marked the start of Nigeria's integration

into global air travel routes, establishing the foundation for later infrastructural and regulatory development (Stephens & Ukpere, 2011b). Following establishment of the first domestic and international routes, Nigeria Airways (founded in 1958) became the national carrier, expanding services across Africa and beyond, marking a period of a new era in Nigerian civil aviation called Institutionalization and Growth (1950s – 1980s). Peer-reviewed literature by Paul et al., (2025) highlights how aviation contributed significantly to job creation, foreign direct investment, and national development during this period. Airports in Lagos, Kano, and Port Harcourt expanded to support increasing passenger and cargo traffic. The growth was rapid but was poorly managed and led to an era of Challenges and Decline (1990s – 2000s). The Nigeria Airways collapsed in 2003 due to financial mismanagement, fleet deterioration, regulatory lapses, and fiscal inefficiencies. This decline contributed to fragmented domestic airline operations, safety concerns, and inadequate maintenance infrastructure. During this period and before it, many airlines were given Airline Operating Certificates (AOC) and many failed and stopped operations as found out by Sidiq et al., (2024).

The need for transformation and strengthening of regulatory framework because expedient and the oversight role of the Nigerian Civil Aviation Authority (NCAA) has expanded dramatically. By 2026, Nigeria moved from regulating 21 airports to overseeing over 32 airports, including state-owned and concessioned facilities. Four international airports have achieved NCAA certification, reflecting improvements in safety and compliance. Regulatory reforms also include new Practice Directions for implementing the Cape Town Convention, enabling airlines to acquire modern aircraft through dry lease arrangements (Aviation Monitor 2026). “Though the righteous fall seven times, they

rise again.” — Proverbs 24:16, this tells us that there is hope for the Nigerian aviation sector.

Like other modes of transport, air transport is a strong contributor to the national economy. According to Oxford Economics (2023), aviation contributes USD 2.5 billion to Nigeria’s GDP and supports over 216,000 jobs across direct, indirect, and induced activities. The sector supports: 39,500 direct aviation jobs; 195,700 tonnes of air cargo processed annually; and significant contributions to tourism and trade (International Air Transport Association, 2023). These figures underscore aviation's catalytic role in commerce, investment, and employment (Adeniran et al., 2023) and we can rejoice because His words said: “But you shall remember the LORD your God, for it is He who gives you power to get wealth.” — Deuteronomy 8:18.

Nigeria’s aviation sector is projected to experience substantial growth, with passenger numbers expected to rise from 15.8 million in 2023 to 25.7 million by 2029. Driving factors include: clearance of \$700 million in trapped airline funds, restoring international confidence; removal from the Cape Town Convention risk list, easing access to affordable aircraft leasing; and airport concessions scheduled for 2025 to modernize airport infrastructure and improve efficiency (Nairametrics, 2025). For a sustainable growth to be maintained key projects reshaping the sector include: the completion of the Maintenance, Repair, and Overhaul (MRO) facility for Ibom Air, projected to save \$100 million annually in foreign maintenance costs (Nigerian Tribune/Zawya, 2025); and the ongoing upgrades to the Murtala Muhammed International Airport, Lagos, under a ₦712 billion modernization plan (Aviation Monitor, 2026). These initiatives address long-standing challenges in capacity, safety, and service delivery.

Since 2024 till date there has been further developments in the aviation sector. Nigeria's resolution of debts owed to foreign airlines has boosted international traffic and improved bilateral aviation relations. Air Peace's inaugural flight to the United Kingdom in 2024 exemplifies renewed global confidence Nigeria as shown in Radio Nigeria's Aviation Award (2025). There has been rapid fleet modernization and route expansion as airlines are increasingly acquiring new fleets through acquisition of dry-leased, fuel-efficient aircraft, expansion of domestic and regional route, and increased competition from state-owned airlines such as Ibom Air and new state-funded entrants (Sidiq *et al.*, 2024). The Nigerian College of Aviation Technology (NCAT) has received ₦3.6 billion for training infrastructure, supporting skills development in engineering, piloting, and air traffic management. International collaborations are enhancing capacity building for regulatory and operational personnel.

Despite progress, the sector faces that includes but not limited to: high operational costs; currency instability; inadequate regional connectivity; need for expanded MRO capability and stronger consumer protection enforcement (Sidiq *et al.*, 2024). Nigeria's aviation sector has evolved from modest colonial-era beginnings into a dynamic and globally integrated system. Driven by modernization efforts, regulatory reforms, and economic diversification, the sector is poised for continued growth. Challenges remain, but policy consistency and infrastructure investment will be pivotal in unlocking aviation's full economic potential.

1.4 Maritime Transport in Nigeria: History, Development, and Contemporary Dynamics

Maritime transport is the backbone of Nigeria's international trade, accounting for about 95% of the country's vehicular means of international trade and serving as a core driver of economic growth (Rural, 2025). Peer-reviewed researches indicate that maritime activities significantly influence national development by enabling trade flows, generating employment, fostering regional integration, and stimulating the blue economy [(Faith, 2025; Ikeogu et al., 2025).

The historical foundations of Nigeria's seaport system trace back to the early 1900s, during British colonial administration, when maritime transport became essential for export of agricultural commodities and import of manufactured goods. Extensive studies highlight four major phases of Nigerian seaport development between 1900 and 2015, covering eras of expansion, modernization, and institutional reforms (Badejo & Solaja, 2017).

The mid-1950s marked a turning point with the establishment of Nigeria's first indigenous shipping line, the Nigerian Line, founded by Patrick Osoba in partnership with Finnish shipping firm Nordstrom & Company. This era strengthened Nigeria's participation in global maritime trade and increased national control of maritime logistics (Faith, 2025).

Between the 1970s and 2004, maritime infrastructure expanded significantly to support Nigeria's growing oil economy. However, structural challenges such as congestion, inefficiency, and inadequate technology persisted (Stephens et al., 2012; and Stephens, 2014). The historical analysis of Nigerian seaports emphasizes recurring

constraints in port management, governance, and cargo handling capacities (Badejo & Solaja, 2017).

The 2004 port concession reforms fundamentally restructured the Nigerian Ports Authority (NPA) framework, shifting cargo-handling functions to private terminal operators under public–private partnership (PPP) arrangements. This reform enhanced efficiency, reduced dwell times, and improved port competitiveness. The seaport development literature identifies improved ICT-driven operations, enhanced concession management, and modernization of cargo-processing technologies as contemporary progress markers (Badejo & Solaja, 2017).

Maritime transport underpins over 90% of Nigeria’s international trade volume, a statistic aligning with global trade transport norms. Peer-reviewed quantitative analysis of a number of studies confirmed that Nigeria’s Maritime Transport GDP (MGDP) significantly influences the nation’s Total GDP, demonstrating maritime transport’s role as an economic growth catalyst (Ogunlade et al., 2021a; Oyeduntan, & Oshinubi, 2022). With six major seaports, Nigeria still lags behind smaller African economies in port throughput. For example, Nigeria handled 1,528,520 TEU in 2020, significantly below Morocco (6.98 million TEU) and South Africa (4.02 million TEU). This operational gap reflects the need for enhanced port competitiveness and infrastructural modernization (Oyeduntan, & Oshinubi, 2022).

A 2025 peer-reviewed study shows that Sustainable Maritime Transport (SMT), the Environmental Shipping Index (ESI), and the Liner Shipping Connectivity Index (LSCI) each exert a significant positive effect on maritime GDP, collectively explaining 83.5% of variation in maritime-sector output. These insights demonstrate: the economic value of environmentally

compliant port practices; the strategic necessity of improving Nigeria's international shipping connectivity; and the importance of modernizing port infrastructure through environmentally responsible investments (Ikeogu et al., 2025).

The Cabotage Act (2003), implemented in 2004, reserves domestic shipping activities for Nigerian-owned, -built, and -crewed vessels. This policy aims to stimulate indigenous fleet development, strengthen local maritime capacity, and reduce capital flight. Findings indicate that proper implementation of Cabotage laws will accelerate: job creation; skills development; blue economy growth; and protection of marine biodiversity (James et al., 2025). However, challenges remain in enforcement, investment mobilization, and shipbuilding capacity that has been noted (Stephens et al., 2012) since 2012. Researches identified several systemic challenges: funding deficits for fleet expansion, port infrastructure, and maritime research (Faith, 2025); manpower shortages, especially in specialized maritime professions; technological gaps in port automation, surveillance, and cargo handling; and environmental risks, including pollution and inadequate maritime security frameworks (Badejo, 2014). These issues impact the sector's competitiveness, efficiency, and alignment with global maritime standards.

The recent integration of the blue economy into the maritime transport foray has added new dimensions for the nation to increase productivity and boost general economic output from areas previously given little or not much attention. Recent peer-reviewed publications stress Nigeria's emerging potential in the blue economy, highlighting the need for integrated policies that connect: sustainable port operations; ocean resource management; renewable energy; and coastal infrastructure. Nigeria's 853-kilometre coastline positions it strategically for maritime

expansion (Ikeogu et al., 2025; James et al., 2025). God has so much blessed this nation, we only need to make use of these abundant blessings - “The earth is the Lord’s, and the fullness thereof; the world, and they that dwell therein. For He hath founded it upon the seas...” — Psalm 24:1–2.

Between 2017 and 2025, Nigeria has heavily invested in port modernization initiatives including: ICT-driven cargo-tracking systems; deep-sea port development (e.g., Lekki Deep Seaport); and Improved ship traffic management. Although not covered directly in the peer-reviewed data retrieved here, these efforts align with findings recommending stronger public–private partnerships (PPPs) for sustainable port financing (Badejo & Solaja, 2017; Ogunlade et al., 2021b).

Statistical modelling reveals that improvements in maritime GDP have a statistically significant predictive relationship with national GDP growth. This underscores the importance of sustained investment, policy consistency, and technological modernization (Ogunlade et al., 2021b; Oyeduntan, & Oshinubi, 2022).

Maritime transport remains a critical engine of Nigeria’s economic development. Historical growth patterns, contemporary reforms, and sustainability-driven innovations demonstrate the sector’s potential to transform national and regional economies. While significant challenges persist—funding, technology gaps, environmental governance, and enforcement inefficiencies—recent peer-reviewed research indicates that a coordinated blue-economy strategy, strengthened Cabotage implementation, and sustainable maritime frameworks will position Nigeria for long-term competitiveness in global maritime trade.

Despite its critical role, Nigeria’s transport system is plagued by four major challenges: inefficiency - port congestion, long cargo dwell times and other bottlenecks that results to an average 21 days vs. 3 days in South Africa. Poor Intermodal Connectivity due to weak integration between road, rail, and ports (Stephens, 2014; Adebayo & Musa, 2021); safety concerns with road accidents that is over 13,000 fatalities annually (Stephens & Musa, 2019; WHO, 2023), maritime insecurity, primarily led by piracy in the Gulf of Guinea (highest globally in 2022) though this is being tackled has been on decline since 2023 (“When you pass through the waters, I will be with you.” — Isaiah 43:2, we will not be afraid to pass through the nation’s coastlines); poor infrastructure that covers dilapidated roads - only 18% of federal roads in good condition (FMW&H, 2023), obsolete rail systems as we have narrow gauge lines still in use, limiting speed and capacity in most parts of the nation; sustainability gaps – we still have high carbon footprint as transport contributes 25% of Nigeria’s CO₂ emissions (IPCC, 2022), and still have lack of Green Policies with minimal adoption of electric vehicles (EVs) and renewable energy in transport.

2. Importance of Transport Management in Addressing Nigeria’s Transport Challenges

Transport management provides a coordinated, data-driven (as it draws from the word of God - “For by wise guidance you can wage your war, and in abundance of counselors there is victory.” — Proverbs 24:6), and policy-anchored approach to remedy Nigeria’s persistent issues of inefficiency, safety deficits, poor intermodal connectivity, and sustainability gaps.

It integrates planning, regulation, technology, financing, and stakeholder governance across all modes—road, rail, air, and maritime—to deliver measurable improvements in cost, time, reliability,

safety, and environmental performance (Federal Ministry of Transportation, Nigeria [FMoTN], 2025).

2.1 Management for Efficiency: Cutting Time, Cost, and Variability

2.1.1 Network & Operations Planning (Multi-modal, Demand/Supply Management)

Nigeria’s chronic congestion, high logistics costs, and long dwell times reflect fragmented planning and limited multimodal options (Chikere et al., 2014). A Transport Management Approach (TMA) prioritizes corridor-level operating plans, freight demand forecasting, and intermodal transfer points (port-rail-road), guided by national policies and KPIs. Embedding these practices in a National Integrated Transport Master Plan helps reduce bottlenecks and align investments with demand (“Let all things be done decently and in order.” — 1 Corinthians 14:40).

- a. Single Window/Port Community Systems (PCS): Digitalization streamlines clearance: the National Single Window Trade Portal and ongoing PCS initiatives reduce documentation delays and enhance cargo visibility - key to reducing dwell time and truck turnaround (FMoTN, 2025).
- b. Evidence of impact: At Nigeria’s newest deep-sea facility, Lekki Port, full commercial operations since April 2023 introduced automated equipment and 24/7 operations; reported vessel turnaround ~48 hours and cargo dwell time ~16 days with progressive ramp-up, highlighting how process discipline and automation improve reliability compared to legacy ports (Gazette Nigeria/NAN, 2025).

2.1.2 Intelligent Transport Systems (ITS) & Data Analytics

ITS tools—adaptive signals, ANPR, e-tolling, GPS fleet management, traffic control centers, and decision support analytics—create real-time situational awareness and enable predictive and prescriptive operations (e.g., dynamic rerouting, incident response). Evidence from Lagos and federal initiatives shows that comprehensive ITS deployments can lift urban average speeds and shorten incident clearance when backed by enforcement and maintenance.

2.1.3 Performance-Based Asset Management (PBAM) for Roads & Rail

Only a fraction of federal roads is in “good” condition; PBAM contracts tie payments to pavement service levels (roughness, faults) and mitigate the “build-neglect-rebuild” cycle. The World Bank’s Nigeria programmatic work emphasizes linking funding to measurable performance and policy reforms, which is consistent with PBAM adoption (World Bank, 2024, October).

2.1.4 PPPs & Financing Models.

Public-Private Partnerships have accelerated capacity and modernization (e.g., port concessions since 2004 and Lekki Deep Sea Port under a 45-year BOOT concession). PPPs distribute risk, embed performance clauses (berth productivity, gate throughput), and bring modern technology. World Bank DPF/PforR financing in 2024 further supports macro-reforms and infrastructure quality of spend (Nigerian Ports Authority, 2022, October; World Bank, 2024, June).

Combining corridor planning, PCS/Single Window, ITS, PBAM, and PPPs lowers end-to-end transit times, stabilizes schedules, and reduces

unit logistics costs—directly addressing inefficiency and weak intermodal integration.

2.2 Management for Safety: Engineering, Education, Enforcement, and Emergency Response

2.2.1 Road Safety Management Systems (RSMS)

Nigeria’s road injury burden is among Africa’s highest. The WHO Global Status Report on Road Safety 2023 estimates 36,722 deaths (17.2 per 100,000) in 2021 for Nigeria—underscoring the need for a systemic approach: “*safe roads, safe speeds, safe vehicles, safe users, and post-crash care.*” (World Health Organization, 2024, December). There is need for divine preservation: “For He shall give His angels charge over you, to keep you in all your ways.” — Psalm 91:11.

2.2.2 Engineering & Black-Spot Remediation

Guardrails, rumble strips, speed-calming, and median barriers at high-risk locations are proven countermeasures. Incorporating iRAP-aligned design standards and audits into federal and state works, and mandating safety case reviews for new projects, aligns with WHO best practice and the Ministry’s Transport Planning & Coordination functions (FMoTN, 2025).

2.2.3 Enforcement & Technology

The FRSC has advanced speed-limiter policies for commercial vehicles and increased breathalyzer and camera-based speed enforcement. While compliance and tampering challenges have been observed, FRSC reports demonstrate continuing enforcement and the legal basis

to mandate speed management, given court rulings that affirmed authority but limited cost-imposition powers.

Effective transport management closes these gaps via standardized procurement, audits, and tamper-proof telematics (Federal Road Safety Corps, 2021; Daily Post Nigeria, 2016, April 8; Punch, 2025, September 13).

2.2.4. Post-Crash Care & Integrated Emergency Systems.

Average response times remain long; deploying a national transport emergency number (122), GIS-enabled dispatch, and trauma center spacing markedly reduces fatality risk. Lagos’s GPS-enabled Lagos State Emergency Management Agency (LASEMA) dispatch improvements illustrate the gains possible with integrated command-and-control and performance monitoring (FMoTN, 2025).

2.2.5 Maritime Security Risk Management

Gulf of Guinea incidents have fluctuated, with IMB annual reports calling for sustained regional naval presence and implementation of the Yaoundé Architecture. Transport management ensures port community alerts, secure anchorage policies, and ISPS Code compliance are embedded in standard operating procedures and monitored via KPIs (ICC International Maritime Bureau, 2023, October; ICC International Maritime Bureau, 2024, January).

The result showed that RSMS, technology-enabled enforcement, and integrated emergency systems reduce fatal crashes and improve survivability; maritime security management lowers piracy risk and protects trade lanes.

2.3 Management for Sustainability: Decarbonization, Resilience, and Inclusive Mobility

2.3.1 Decarbonization Pathways & Technology

Transport is a leading source of energy-related emissions globally (~23% in 2019), and Nigeria’s transport emissions have risen, with analyses showing transport accounts for ~26% of national energy emissions and steep growth since 2010. A transport management framework operationalizes EV adoption, biofuel blending (e.g., E10 mandate), rail freight expansion, and bus rapid transit within a phased, costed roadmap and NDC 3.0 alignment (IPCC, 2022; Climate Analytics, 2025).

Policy instruments. Leverage NADDC EV Plan for pilots and charging standards; use targeted incentives, green bonds, and duty waivers to lower cost barriers while coordinating with power planners on grid readiness (FMoTN, 2025).

2.3.2 Climate Resilience (Adaptation)

Coastal and flood risks require elevated road profiles, permeable pavements, mangrove restoration, and road weather information systems. The IPCC highlights transformative shifts in urban form and demand management as critical for mitigating emissions and enhancing resilience—these can be codified in Sustainable Urban Mobility Plans (SUMP) for Lagos, Abuja, Port Harcourt, Kano, etc. (IPCC, 2022).

2.3.3 Inclusive, Low-Carbon Urban Mobility

Scaling BRT and NMT (walking/cycling) infrastructure, paired with cashless fare systems and MaaS platforms, sustains mode shift. Management ensures service quality, asset maintenance, and data-driven scheduling—critical lessons from Lagos BRT and rail

projects—while integrating ferry and metro services under metropolitan transport authorities (Yaya-Bankole et al., 2021).

Result showed that a managed decarbonization plan, resilience standards, and SUMP lower emission, will reduce exposure to climate hazards, and expand equitable access to mobility. “The Lord God took the man and put him in the garden to tend it and keep it.” — Genesis 2:15, with this you will agree with me that Sustainability is stewardship of God’s creation.

2.4 Governance & Institutions: Making Management Stick

2.4.1 Institutional Integration & KPI Regimes

Fragmentation across agencies (FRSC, VIO, NPA, NRC, Customs, NIMASA, State traffic agencies) complicates delivery. A TMA promotes Metropolitan Transport Authorities and a Federal Transport Regulatory Commission to harmonize standards (vehicle roadworthiness/emissions, axle loads, safety protocols) and monitor mode-specific KPIs (e.g., port dwell time, rail punctuality, road incident rates). The Ministry’s TPC department already houses functions to coordinate policy, intermodal planning, M&E, and statistics—these capacities should be scaled.

2.4.2 Funding & PPP Discipline

World Bank’s recent financing supports fiscal reforms and quality public spending. Applying Road Funds/fuel levies, green bonds, and performance-based PPPs (with published scorecards) ensures sustained maintenance and investment discipline (World Bank, 2024, June).

2.4.3 Digital Transparency & Data

Open dashboards (port statistics, road conditions, crash data) empower accountability. NPA’s published statistics and operational updates show how transparency underpins performance culture; similar dashboards for road and rail accelerate learning and course-correction (NPA, 2022, October).

Governance reforms and stable financing institutionalize improvements, reduce policy drift, and produce consistent, verifiable performance gains because “When the righteous are in authority, the people rejoice.” — Proverbs 29:2.

2.5 Mode-Specific Applications of Transport Management

Road - Axle-load control (weigh-in-motion), fleet telematics for commercial vehicles, and corridor traffic operations centers to manage incidents and queues at urban bottlenecks. Legal and compliance strengthening around speed management and overloading, with tamper-proof devices and periodic audits (FRSC, 2021).

Rail - Punctuality, capacity, and safety dashboards; prioritized last-mile connections to industrial parks and ports; freight service guarantees to shift trucks off highways - aligned with NDC freight modal-shift targets (UNFCCC, 2025, September).

Aviation - Airport performance contracts (OSO/ACI benchmarks), MRO localization, and safety certification expansion improve throughput and reduce foreign maintenance leakage; economic value validated by IATA’s 2023 analysis (IATA, 2023).

Maritime & Ports - PCS deployment, truck appointment systems, gate automation, and berth productivity KPIs reduce dwell times and ship turnaround; ISPS compliance, patrol coordination, and intelligence sharing mitigate security risks (Stephens, 2014; NPA, 2022, October; ICC International Maritime Bureau, 2023, October 11).

3. Theoretical Framework: Transport Management Approach

Transport Management is a multidisciplinary framework that combines planning, operations, regulation, technology, stakeholder governance, and evaluation to optimize national mobility systems. Therefore, we can this framework is divine vision for Nigeria: “Write the vision; make it plain upon tablets, that he may run that readeth it.” — Habakkuk 2:2. The framework below integrates theory, applications, and global best practices (Singapore & Germany), culminating in models relevant for Nigeria’s transport transformation.

3.1 Definition of Transport Management

Transport Management refers to the systematic planning, coordination, control, and optimization of transport infrastructure, services, and user behavior to achieve efficiency, safety, sustainability, and economic productivity. It integrates logistics management, regulatory systems, intelligent transport systems (ITS), and multimodal coordination to ensure effective mobility. This approach aligns with global emphasis on demand management, supply optimization, policy harmonization, and technology integration in public transport systems (ETHOS Singapore, 2022).

3.2 Core Principles of the Transport Management Approach

3.2.1 Integration

If the Bible already established that “Two are better than one... for they have a good reward for their labour.” — Ecclesiastes 4:9 - Transport management, a framework which promotes intermodal connectivity, ensuring that road, rail, maritime, aviation, and non-motorized transport (NMT) systems are seamlessly linked, is what we need. We need integration. Developed and developing economies have adopted this - Germany emphasizes integrated mobility plans that bridge regional and national networks through ITS and multi-modal policies, and Singapore uses integrated land-use and mobility planning to manage limited space efficiently (ETHOS Singapore, 2022).

3.2.2 Efficiency

Efficiency is achieved by minimizing travel time, operating costs, and system delays. Singapore’s ERP and ITS reduce congestion through real-time pricing and adaptive signal control. Nigerian seaports can have efficient transfer of throughput from the maritime leg to the land-based transport leg when cargo handling improves and land-based transport have better interface with maritime leg at the seaport and there is promotion of intermodal through transport (Stephens & Ukpere, 2019b). Germany’s public transport network and modal shift strategies reduce emissions while increasing throughput (Deutschland.de, 2022). “He that is faithful in little is faithful also in much.” — Luke 16:10, as pointed out in God’s word.

3.2.3 Sustainability

Transport management emphasizes long-term environmental responsibility through clean energy use, mode shift, and active mobility.

Singapore's Green Plan 2030 promotes cleaner fleets, walking, cycling, and MRT expansion. Germany's Climate Action Plan requires traffic avoidance, modal shift, and energy efficiency.

3.2.4 Safety & Security

This includes road safety, system reliability, and emergency response using predictive analytics and ITS tools. This deployment comes handy under Transport Management Technology. It is possible to predict and prevent the occurrence of accidents on our road as shown by Stephens & Musa (2019) and even predict the brand of vehicles that will likely be involved certain type of accidents on certain roads (Stephens et al., 2019). The German's ITS Action Plan highlights safety-driven deployment of intelligent systems, also Singapore's ITS includes camera-based monitoring for incidents and command-and-control centers.

3.2.5 Technology Adoption

Technology enables automation, data-driven management, intelligent enforcement, and user-centric systems. Nigeria is gradually adopting technology to improve transport efficiency, improves regulatory enforcement, and promotes safety on our roads, in seaports, and around our inland waterways and coastal and territorial waters. NIMASA's state of the heart Coastal Area Monitoring Centre is not just helping to reduce crime and illegal activities in our territorial waters, it also serves as eagle eyes to as far as Senegal and Angola. Smart cards fare systems are now used in Lagos to block financial leakages to boost the confidence of investors in recouping their funds the same way it is done in Singapore which employs adaptive ITS, smart card fare systems, and ERP for the sake of efficiency. We need to invest heavily in ITS research and deployment just as it is done in Germany which invests

heavily in ITS research, autonomous mobility, and smart public transport control systems. “Wisdom is better than weapons of war.” — Ecclesiastes 9:18, as technology is the application of wisdom.

3.2.6 Stakeholder Collaboration

Effective transport systems require cooperation between government, agencies, private sector, academia, and society. Germany’s ITS networks involve universities, industry, and government in co-creation (Deutschland.de, 2022). Singapore’s transport planning integrates cross-sector mobility strategies and public feedback loops (Diao, 2022). We need to improve the level of stakeholder collaboration in Nigeria, particularly among the academia, private sector and government agencies. Data and information sharing is still difficult in Nigeria but there has been improvement since the enactment of the Freedom of Information Bill but not many researchers put to use the benefits of the Act.

3.3 Role of Technology in Transport Management

Technology forms the backbone of modern transport management systems through its applications in congestion management, safety, automation, and sustainability.

3.3.1 Intelligent Transport Systems (ITS)

ITS includes technologies such as real-time traffic monitoring, adaptive signal control, GPS-based fleet management, smart tolling, and automated incident response. In Singapore, adaptive traffic lights (GLIDE), ERP are used for calculating real-time congestion pricing, as smart sensors, CCTV, and command centers monitor in real-time traffic

situation and this also aid in recovery. ITS Road Action Plan emphasizing harmonized national deployment, cross-border intelligent systems, and integrated traffic management in Germany. In Nigeria, the deployment of ITS is catching up particularly in Lagos and a few other cities in Nigeria. For now, it is mostly used in Lagos for traffic monitoring and enforcement. For our territorial waters, it is used in combination of unmanned aerial vehicles (UAVs) that is drones to patrol and collect data in real-time. However, there is a strong need to improve this because of the response time and need to be proactive. That is why, we are working on the use of satellite-based, AI-powered monitoring systems so that extensive data collection can be done with instant wider coverage.

3.3.2 Clean Energy Technologies

Promoting EVs, hybrid buses, hydrogen mobility, and renewable energy-powered transport fleets. Singapore targets 60,000 EV charging points by 2030 and has converted more than 60% of public car parks to EV-ready spaces Singapore National Climate Change Secretariat (2025). Germany seeks 15 million EVs by 2030, expanding charging networks and promoting battery innovation. Nigeria.

3.3.3 Nigerian Experiences with Digitalization and Data Analytics

Nigeria's most advanced application of digital transport management is found in Lagos State, where the government has deployed an expanding Intelligent Transport System incorporating high-definition cameras, Automatic Number Plate Recognition (ANPR), and real-time traffic monitoring (Independent Newspaper Nigeria, 2025; Nairametrics, 2025).

These systems enable automated enforcement of traffic regulations, speed monitoring, and data-driven decision-making, reducing human interference and improving road safety. According to Lagos State officials, ITS deployment supports more efficient traffic flow and provides reliable data for planning and policy formulation (CLMI, 2025; African Review, 2025).

The Lagos Metropolitan Area Transport Authority (LAMATA) plays a central role in integrating data analytics into transport planning and operations. LAMATA employs digital tools such as non-intrusive traffic counts, real-time rail performance dashboards, and air-quality monitoring platforms to inform decision-making across modes (LAMATA, 2026; EPIC Air Quality Fund, 2025).

By leveraging data on daily trip volumes, travel patterns, and emissions, LAMATA supports evidence-based planning under the Lagos Strategic Transport Master Plan, demonstrating how analytics can guide sustainable urban mobility in a rapidly growing African megacity (Independent Newspaper Nigeria, 2025).

Beyond Lagos, digitalization is gradually expanding across Nigeria's transport sector. Market analyses indicate growing adoption of traffic analytics, fleet management systems, and route optimization tools in cities such as Abuja and Port Harcourt, driven by urban growth and logistics demand (Ken Research, 2025). However, challenges remain, including data interoperability, infrastructure costs, and digital skills gaps—issues commonly identified in developing countries by global institutions such as the World Bank and OECD (World Bank, 2023; OECD, 2024).

3.3.4. Challenges and Policy Implications

While digitalization and data analytics offer significant benefits, they also raise concerns about data privacy, cybersecurity, and governance. Effective transport digitalization requires clear regulatory frameworks, institutional coordination, and public trust (Kashem *et al.*, 2025; OECD, 2024). For countries like Nigeria, aligning transport digitalization with broader digital infrastructure investment and capacity building is essential to ensure inclusive and sustainable outcomes.

Digitalization and data analytics are redefining transport management by enabling real-time control, predictive planning, and evidence-based policy. Global experience demonstrates that intelligent transport systems, big data analytics, and AI-driven tools can significantly improve efficiency, safety, and sustainability. Nigerian examples—particularly in Lagos—illustrate the growing relevance of these technologies in African urban contexts.

As transport demand continues to rise, integrating digital technologies into transport management will be critical for building resilient, efficient, and people-centered mobility systems.

3.5. Role of Policy in Transport Management

3.5.1 Regulatory Frameworks

Transport systems operate within complex socio-economic, environmental, and institutional contexts. While infrastructure and technology shape how transport functions, policy determines who can operate, how services are priced and regulated, which modes are prioritised, and how demand is managed. Globally, governments rely

on transport policy to improve safety, efficiency, accessibility, and sustainability across all modes—road, rail, air, maritime, inland waterways, and non-motorised transport (OECD, 2024; International Transport Forum [ITF], 2019).

Effective transport management policy typically rests on three interrelated pillars:

1. Regulatory frameworks that set rules, standards, and institutional responsibilities
2. Demand-management policies that influence travel behaviour and system use
3. Incentive structures that encourage desired transport choices and investments

Regulatory frameworks establish the legal and institutional basis for transport systems. They define safety standards, market access, service quality, environmental limits, and enforcement mechanisms across all modes. The OECD and ITF emphasise that well-designed transport regulation improves efficiency while preventing market failures such as monopolies, unsafe operations, and environmental externalities (OECD, 2025; ITF, 2019).

3.5.1.2 Global Perspectives across Transport Modes

Road transport: Regulations govern vehicle standards, driver licensing, emissions, speed limits, and commercial transport operations.

Rail transport: Policies typically regulate infrastructure access, safety certification, fare structures, and public-private participation, particularly where rail is a public monopoly (ITF, 2019).

Air transport: International conventions and national aviation authorities regulate safety, airspace management, airport operations, and increasingly, environmental performance such as sustainable aviation fuels (World Bank, 2022).

Maritime and inland waterways: Regulatory frameworks address port governance, vessel standards, environmental protection, and logistics efficiency (ITF, 2019).

3.5.1.3 Nigerian Regulatory Frameworks

In Nigeria, the National Transport Policy (NTP) provides the overarching framework guiding all modes of transport. Adopted in 2021, the NTP emphasises integration, safety, sustainability, and private-sector participation across road, rail, air, maritime, and inland water transport (Federal Ministry of Transportation, 2021).

At the sub-national level, Lagos Metropolitan Area Transport Authority (LAMATA) represents a strong example of regulatory institutionalisation. LAMATA plans, regulates, and franchises public transport services, ensuring coordination across buses, rail, ferries, and non-motorised transport through legally backed frameworks such as the Lagos Strategic Transport Master Plan (Independent Newspaper Nigeria, 2025).

3.5.2 Demand-Management Policies

3.5.2.1 Concept and Rationale

Demand-management policies aim to influence when, where, how, and whether people travel. Instead of continuously expanding infrastructure,

these policies manage demand to reduce congestion, emissions, and inefficiencies. The ITF identifies demand management as essential for achieving climate and congestion goals across all transport modes (ITF, 2019).

3.5.2.2 Global Examples across Modes

Road transport: Congestion pricing schemes in cities such as London, Stockholm, Milan, and New York City charge vehicles for entering congested zones, leading to reduced traffic volumes, faster travel speeds, and improved air quality (Fang, 2021; Fraser et al., 2025).

Public transport: Timetable coordination, peak-hour pricing, and service prioritisation manage passenger demand and smooth system loads (OECD, 2024).

Aviation: Slot allocation, noise restrictions, and carbon-related charges manage demand at congested airports (World Bank, 2022).

Freight and maritime transport: Time-window regulations and port access rules reduce congestion and improve logistics efficiency (ITF, 2019).

3.5.2.3 Demand-Management in Nigeria

Nigeria has limited direct pricing-based demand management, but indirect measures exist. In Lagos, bus rapid transit (BRT) lanes and rail investments prioritise high-capacity modes, effectively shifting demand away from private cars (Independent Newspaper Nigeria, 2025). Policy discussions increasingly reference congestion management and parking controls as future tools under state transport strategies (LAMATA, 2025).

3.5.3. Incentive Structures in Transport Policy

3.5.3.1 Types of Transport Incentives

Incentives complement regulation and demand management by making preferred behaviours more attractive. They can be: financial: subsidies, tax reliefs, fare discounts; non-financial: priority lanes, parking privileges and institutional or employer-based: commuter benefits, flexible work arrangements. (OECD, 2024; World Economic Forum, 2024).

3.5.3.2 Global Incentive Examples

- Public transport subsidies: Most cities subsidise buses and rail to ensure affordability and modal competitiveness, often covering 40–60% of operating costs (EU Urban Mobility Observatory, 2024).
- Electric vehicle incentives: Countries such as Norway and the Netherlands use tax exemptions and purchase incentives to accelerate EV adoption (World Economic Forum, 2024).
- Shared mobility incentives: France’s carpooling subsidies and integrated ticketing in Scandinavian cities encourage ride-sharing and micromobility (World Economic Forum, 2024).

3.5.3.3 Nigerian Incentive Structures

In Nigeria, incentives are increasingly used to support sustainable transport. Public transport fares in Lagos are subsidised to maintain affordability, while regulatory protection of BRT corridors provides

operational incentives for mass transit operators (Independent Newspaper Nigeria, 2025). Nationally, emerging incentives for cleaner transport—including electric vehicles and alternative fuels—are embedded within broader energy and transport policy reforms, signalling a gradual shift toward incentive-based sustainability (Federal Ministry of Transportation, 2021b).

3.5.4 Policy Integration across Transport Modes

International best practice shows that transport policies are most effective when regulation, demand management, and incentives are aligned across all modes. The ITF stresses that integrated policy frameworks can reduce emissions by up to 70% globally if implemented at scale (ITF, 2019). For Nigeria, aligning national policy (NTP), state-level regulation (e.g., LAMATA), and targeted incentives offers a pathway toward safer, more efficient, and more sustainable transport systems across road, rail, air, and water transport.

Policy plays a decisive role in transport management by shaping markets, influencing demand, and guiding investment and behaviour. Regulatory frameworks provide structure and safety, demand-management policies optimise system use, and incentive structures encourage sustainable choices. Global experience demonstrates that coherent policy design across all transport modes delivers better mobility, environmental outcomes, and economic efficiency. Nigeria’s evolving transport policy landscape—anchored by the National Transport Policy and reinforced by institutions such as LAMATA—illustrates how developing countries can adapt global best practices to local contexts. Strengthening these policy pillars remains essential for effective and future-ready transport management.

3.6 Role of Stakeholder Collaboration in Transport Management

“Behold, how good and pleasant it is for brethren to dwell together in unity!” — Psalm 133:1. Transport systems improve when stakeholders coordinate effectively across institutions and Transport Management as an approach and discipline ensures this and we would look at from the government-private partnerships, academia-industry-government collaboration, and community & behavioural frameworks

3.6.1 Government–Private Partnerships (PPPs)

Why PPPs matter across all modes? PPPs mobilize private capital and know-how to finance, deliver, and manage transport infrastructure and services—when designed carefully, they can improve lifecycle performance, accelerate delivery, and share risks across stakeholders (OECD/ITF, 2014; OECD, 2024/2025). Case study reviews across Europe, Asia, and Latin America illustrate diverse PPP models (e.g., DBFMO concessions, toll road HOT lanes, rail rolling-stock PPPs, port terminals) and highlight lessons on structuring, renegotiation, and outcomes (World Bank PPPLRC, 2007; G20 PPP, 2019). Empirical work finds countries learn from early PPP experience, reducing cancellation risks—particularly in transport compared to other sectors.

3.6.1.1 Modal coverage

Roads - PPP express lanes (e.g., I-495 HOT lanes, USA) demonstrate dynamic pricing and corridor capacity gains via privately financed operations (G20 PPP, 2019).

Rail - Rolling-stock and network PPPs (e.g., UK Intercity Express Programme; Gautrain in South Africa) show how private financing and performance incentives can enhance service quality and availability (G20 PPP, 2019).

Air - PPPs in airport development and service contracts (e.g., air-side facilities and passenger experience upgrades) are mainstream in many regions; policy analysis stresses robust risk allocation and regulatory oversight (OECD/ITF, 2014).

Maritime & Inland Waterways - PPPs dominate container terminals and deep-sea port projects, where concession contracts and performance-based regulation underpin efficiency and throughput (UNESCWA/IsDB, 2019).

Active mobility - PPPs can support bike-share systems and intermodal hubs through availability-based payment structures and performance targets (OECD/ITF, 2014).

3.6.2 Nigerian PPP examples

Ports (maritime): Nigeria's PPP programme includes the Lekki Deep Sea Port concession (45-year term) and recent FEC approvals for the Bakassi Deep Seaport and Port of Ondo Deep Seaport, injecting over ₦6.43 trillion (~\$4.29bn) in private capital to expand port capacity and decongest existing gateways (ICRC project register; Punch, 2025, September 13; Logistics Update Africa, 2025). Container terminals: Earlier Lagos container terminal concessions are documented as PPP anchors for diversifying Nigeria's economy and improving maritime logistics performance (World Bank PPPLRC, 2017).

Urban rail (Lagos): The Lagos Rail Mass Transit system is managed by LAMATA, with rolling stock, power, signalling, and fare collection delivered via private concession contracts—LAMATA retains policy/regulatory roles and infrastructure stewardship, illustrating a city-level PPP blend.

Bus rapid transit (road): Under the Lagos Strategic Transport Master Plan, LAMATA franchises BRT operations to private operators, expands capacity (e.g., articulated buses), and integrates ITS—demonstrating PPP-based service delivery and operational efficiency (Nairametrics, 2025; LAMATA, 2026).

Key takeaway: PPP success depends on transparent procurement, risk allocation, performance-based contracts, and credible regulatory capacity—areas where Nigeria’s ICRC framework and LAMATA’s franchising model are steadily maturing (LAMATA, 2026; Infrastructure Concession Regulatory Commission, 2023).

3.6.3 Academic & Research Institutions Collaboration with Industry and Government

3.6.3.1 The Triple Helix and mobility innovation

Collaboration among government–industry–academia (the “Triple Helix”) accelerates transport innovation by combining real-world operational data and market insights with rigorous research and independent validation (Federation of American Scientists, 2024). Examples include Mobility Innovation Hubs that align e-mobility, autonomy, and shared mobility projects, fostering new business models and workforce development (Wu, Zheng, & Wang, 2025); William Davidson Institute, 2024).

3.6.3.2 Global success stories across modes

Rail & metro operations: Academic partnerships have optimized timetables and fare equity, with industry platforms (e.g., Cubic Transportation Systems) working with universities to co-design and validate ticketing, passenger-flow models, and accessibility upgrades (Cubic Transportation Systems, 2025).

Road traffic management: University-led AI models for adaptive signals and congestion prediction are widely piloted with agencies, cutting delays and emissions (FAS, 2024).

Aviation: Open-innovation partnerships (e.g., accelerator programs) demonstrate cross-sector collaboration for passenger experience and operational efficiency (2080 Ventures case studies).

Maritime logistics: University–industry studies of port operations and PPP governance inform contract design, performance benchmarking, and digitalization (UNESCWA/IsDB, 2019).

3.6.3.3 Nigerian collaboration examples

LAMATA research tie-ins: LAMATA’s published master plans, resilience strategy, and climate action work rely on demand modelling, air-quality monitoring, and operational analytics—areas where academic partners and international development agencies contribute methods and capacity (LAMATA, 2025).

Operational design & intermodality: LAMATA’s AFD-supported consultancy for Quality Bus Corridors (QBCs) and interchanges explicitly requires refined demand modelling, financial modelling, and training—typical academia–industry–government tasks supporting bus, rail, and inland waterways integration (LSTMPP1 REOI, 2023).

Key takeaway: Targeted collaboration mechanisms (grants, research contracts, placements) and open data access improve evidence-based policy, speed up pilots, and build technical skills within agencies and operators (FAS, 2024; W.D.I., 2024).

3.6.4 Community & Behavioural Frameworks

3.6.4.1 Why behaviour and community engagement matter

Transport outcomes hinge on human behaviour—mode choice, peak travel, and safety practices. Behavioural frameworks (COM-B; “nudge” approaches) and community engagement improve acceptance, equity, and sustained change across modes (Energy Saving Trust, 2025; Alta & Behavioural Insights Team, 2026).

3.6.4.2 Global frameworks and tools

Behavioural insights for TDM: Practical guides show how small, low-cost interventions (default options, habit formation, trial periods) can shift car trips to public transport, cycling, walking, and micromobility, complementing supply-side investments (Alta/BIT, 2026).

Community engagement frameworks: Transit agencies codify two-way dialogue, data-driven communication, and feedback loops to build trust and tailor solutions (Lane Transit District, 2024).

Regional TDM strategies: Stakeholder-led TDM frameworks define governance, KPIs, funding, and partnerships to mainstream behaviour change across corridors and modes (CONNECT Beyond regional TDM framework, 2021).

3.6.4.3 Nigerian practice and opportunities

Lagos stakeholder engagement: LAMATA’s strategy to transition from informal minibuses to regulated, high-capacity buses and rail hinges on engaging operators and communities, integrating first/last-mile services,

and deploying e-ticketing and ITS to improve user experience (Nairametrics, 2025; LAMATA, 2025).

Maritime communities: Deep-sea port PPPs require inclusive stakeholder processes (local communities, logistics firms, regulators) to mitigate impacts and build local employment pathways (ICRC registry; Punch, 2025, September 13).

Key takeaway: Combining behavioural insights, inclusive community processes, and transparent KPIs is essential to sustain modal shifts (road→rail/water/active), improve safety culture, and ensure benefits reach vulnerable groups (Energy Saving Trust; Alta/BIT, 2025; CONNECT Beyond, 2021).

3.6.4.4 Putting It Together: An Integrated Collaboration Agenda (All Modes)

Formalize PPP governance and capacity (contract design, renegotiation protocols, performance dashboards) across roads, rail, ports/blue economy, airports, and intermodal hubs (OECD/ITF, 2014; UNESCWA/IsDB, 2019; ICRC, 2023). Institutionalize Triple Helix partnerships—co-fund applied research and pilot deployments for AI traffic management, fare equity, port digitalization, safety analytics, and low-carbon operations (MDPI; WDI; Cubic; FAS (FAS, 2024; W.D.I., 2024). Adopt behavioural & community frameworks—embed COM-B, local co-design, targeted incentives, and TDM toolkits in programme design for public transport, cycling/walking, and shared mobility, ensuring measurable equity and accessibility gains (Energy Saving Trust, 2025; Alta/BIT; CONNECT Beyond, 2021). Nigeria focus: Scale LAMATA-style franchising and intermodality, expand port PPP transparency, and strengthen agency–university partnerships for modelling, monitoring, and evaluation across Lagos, Abuja, Port

Harcourt, and emerging deep-sea ports (LAMATA, 2026; ICRC, 2023; Lagos Public Procurement Agency, 2023).

3.7. Comparative Analysis with Global Best Practices

A comparison with global leaders reveals gaps and opportunities in Nigeria’s transport management landscape. Singapore and Germany provide models of highly advanced transport governance, sustainability, and technology deployment. The table below contrasts key features across the three countries to highlight Nigeria’s strengths, weaknesses, and policy needs. The word of God says: “In the multitude of counselors there is safety.” — Proverbs 11:14.

Congestion management from the example used above showed that: Singapore demonstrates the most advanced congestion management system globally through ERP and ITS; Germany focuses on integrated ITS and cross-border coordination; and Nigeria lacks automated traffic management, causing severe congestion in growing metropolitan regions. Sustainable mobility was observed in Singapore and Germany to have explicit national targets, long-term investment plans, and EV adoption strategies, whereas in Nigeria there is no fully implemented sustainable mobility framework, though local initiatives (Lagos BRT, some EV pilots) exist.

For technology adoption, Singapore uses real-time data, sensors, and predictive analytics in transport operations; Germany focuses on ITS innovation, autonomous mobility, and integrated public transport information systems; and Nigeria needs coordinated ITS policies and infrastructure to adopt similar capabilities. And finally on policy strength, Singapore exercises strict demand-management (ERP +

vehicle quota); Germany enforces climate-aligned national mobility policy; and Nigeria requires stronger, harmonized national transport policy enforcement and integrated multimodal planning.

This comparative presentation confirms that countries with strong governance, integrated planning, high ITS penetration, and sustainability frameworks consistently outperform others in efficiency, safety, and environmental responsibility. Nigeria stands at an important juncture where adopting these best practices can radically transform national transport outcomes. From this example we can Nigeria can learn the following as lessons:

1. Adopt ERP-like congestion pricing and ITS-powered traffic management in major urban corridors.
2. Integrate land-use planning with transport; build SUMP as Germany and EU cities do.
3. Introduce aggressive renewable energy and EV adoption strategies.
4. Leverage universities and research centers to develop data-driven transport policies.

Table 1: Comparative Transport Management Practices – Singapore, Germany, and Nigeria

Dimension	Singapore	Germany	Nigeria
Congestion Management	<p>Uses Electronic Road Pricing (ERP) with real-time dynamic pricing to reduce peak-hour traffic. Also applies extensive ITS systems, CCTV, adaptive signals (GLIDE) and corridor-level monitoring.</p>	<p>Deploys nationwide ITS Action Plan, emphasizing coordinated EU-wide traffic management, multimodal travel information, and smart road capacity use.</p>	<p>Nigeria faces severe congestion, especially Lagos, Abuja, and Port Harcourt. ITS adoption is limited, and manually operated traffic control dominates. Lack of adaptive signals, minimal real-time monitoring, and poor enforcement worsen congestion. <i>(Note: Nigeria column is based on previously provided lecture data, not requiring external search)</i></p>
Sustainable Mobility	<p>Actively shifting to “Walk-Cycle-Ride” model; expanding MRT to 360 km by 2030; cleaner bus fleet; aims for all public buses to use cleaner energy by 2040; 60,000 EV chargers by 2030.</p>	<p>Climate Action Plan 2050 requires emissions reductions, modal shift from road to rail, increased cycling/walking, and adoption of clean fuels. Public transport and EV strategies are central pillars.</p>	<p>Sustainable mobility is still emerging. Very limited EV charging network, minimal cycling/walking infrastructure, and low public transport modal share. Urban mobility dominated by informal minibuses; limited mass transit systems except BRT (Lagos).</p>

Dimension	Singapore	Germany	Nigeria
			<i>(Based on user-provided Nigeria lecture data)</i>
Technology Adoption (ITS & Digitalization)	World leader in ITS: ERP smart tolling, adaptive traffic lights, AI-driven traffic analytics, smart fare systems, and island-wide sensor networks.	Strong ITS industry with over 90 companies and 24 research institutes. Focus areas: autonomous driving, smart rail, fleet telematics, and cross-border multimodal systems.	Nigeria is in early stages of ITS adoption. Traffic management remains mostly manual; digital tolling exists only on select roads. Lack of nationwide ITS architecture. ITS deployment at ports improving but inconsistent across cities. <i>(Based on lecture data)</i>
Policy Strength	Strong regulatory tools such as vehicle quota system, congestion pricing, emissions policies, EV incentives, integrated land-use and transport planning.	Robust legal and policy framework for sustainable transport, EV adoption, modal shift, ITS deployment, and environmental compliance (EU Green Deal alignment).	Policies are fragmented across agencies (FRSC, State Traffic Agencies, VIO, Federal Ministry of Transport). No nationwide mass transit policy; limited enforcement; weak emissions regulation; transport plans are not fully integrated. <i>(Based on lecture data)</i>

Source: Author's Comparison (2026)

3.8. Applicable Models for Transport Management

3.8.1 Four-Pillar Sustainable Mobility Model (Germany)

Traffic avoidance focuses on reducing unnecessary travel by improving urban form rather than expanding roads. Research shows that compact development, mixed-use zoning, and proximity-based design reduce travel distances, car dependency, and congestion by bringing housing, work, and services closer together. Cities such as Singapore and Copenhagen demonstrate how compact, mixed-use, transit-supportive environments reduce per-capita travel and energy consumption while enhancing livability (Welle et al., 2015; City of Copenhagen, 2015).

Strategies influencing avoidance include the compact city, mixed-use development, 15-minute city planning (Welle *et al.*, 2015; Litman & Pan, 2025), and Transit-Oriented Development (TOD)—all of which shorten trips and support walking, cycling, and mass transit. TOD examples from Hong Kong and Stockholm show how concentrating development near transit hubs lowers car ownership and improves accessibility (Foord, 2010; Sustainability Directory, 2025; Urban Design Lab, 2025; City of Copenhagen, 2015; IEA, 2025; IPCC, 2022).

Nigeria's major cities face severe congestion driven by urban sprawl, poor land-use integration, and long-distance commuting. Lagos commuters lose several hours daily due to dispersed development patterns (Internet Geography, 2025; Lagos Global, 2025). However, Lagos' Strategic Transport Master Plan and investments in BRT, the Blue Line rail, transit corridors, and digital mobility platforms indicate early adoption of avoidance principles. Other medium-sized cities such as Akure, Ibadan, and Abeokuta have opportunities to embed compact growth, mixed-use centers, and walkable networks before congestion

becomes entrenched (Amiara, 2019; Weidacher, 2024; Litman & Pan, 2025).

3.8.2 Modal Shift: Prioritizing Rail, Cycling, and Walking

Modal shift reduces traffic by encouraging movement toward space-efficient and low-emission modes. Walking, cycling, and rail require far less urban space than cars and generate significantly lower emissions (OECD, 2021; Newman & Kenworthy, 2015; Pucher & Buehler, 2011; IFT-OECD, 2024; World Bank, 2023; UNESCAP, 2025). Cities with strong modal shift—Tokyo, Copenhagen, Amsterdam, Bogotá—show lower congestion, improved public health, and better urban accessibility (Iqbal *et al.*, 2025; Biraghi *et al.*, 2025).

Rail systems in particular can reduce vehicle kilometers traveled by 20–40%, especially when integrated with TOD (Cervero & Murakami, 2009; OECD, 2021). Lagos’ Rail Mass Transit (Blue and Red Lines) represents Nigeria’s most significant modal shift effort (Federal Ministry of Transportation, 2021; LAMATA, 2022), complemented by emerging cycling initiatives and widespread walking (Banister, 2008; Litman, 2023), which—if supported with safer infrastructure—could formally contribute to traffic avoidance (Weidacher, 2024; Urbanao, 2024; Hodder Education, 2024; Internet Geography, 2025; Flitt, 2025).

3.8.3 Energy Efficiency in Urban Transport

Energy efficiency focuses on reducing fuel consumption through improved vehicle technology, better public transport fleets, and optimized network management (IEA, 2025; Global Fuel Economy Initiative [GFEI], 2025).

Globally, advances in engine performance, electrification, lightweight materials, and EV deployment significantly cut fuel use. Public

transport—especially BRT and rail—moves more people with less energy per passenger (Gehl, 2010; Ewing & Cervero, 2017; IEA, 2025; Litman, 2023). Intelligent Transport Systems (ITS) further improve efficiency through adaptive signal control and reduced idling (Ewing & Cervero, 2017).

In Nigeria, inefficient vehicle fleets, congestion, and weak traffic management increase fuel use. Lagos’ BRT system demonstrates the potential of high-capacity, fuel-efficient buses, and ongoing efforts to introduce electric and gas-powered fleets align with emerging energy-transition policies. Pilot EV projects and national legislative initiatives indicate early progress toward cleaner mobility (Akinwale & Olanrewaju, 2020; Iqbal et al., 2025; Biraghi et al., 2025).

3.8.4 Post-Fossil Fuel Mobility: Renewable-Powered Transport

Globally, transport’s dependence on fossil fuels necessitates a shift toward renewable energy—electric vehicles, green hydrogen, and sustainable biofuels (International Energy Agency [IEA], 2025; IPCC, 2022). Countries such as Norway, Germany, and China lead in EV adoption, while hydrogen pilots support heavy-duty and long-distance mobility.

Nigeria’s Energy Transition Plan and proposed EV & Green Mobility Bill outline a long-term shift toward electric mobility, supported by pilot electric buses in Lagos and renewable-powered mobility projects in both urban and rural contexts (Olawole & Aloba, 2014). Although challenges such as grid reliability and high upfront costs remain, renewable mobility offers major opportunities for emission reduction, energy security, and green economic development.

3.8.5 Multimodal Integration Model

Modern transport management emphasizes integrating all modes—road, rail, air, maritime, and non-motorized transport—into a seamless system. Multimodal integration improves accessibility, reduces travel time, enhances network resilience, and supports sustainability goals. International bodies (OECD/ITF, World Bank, UNESCAP) highlight the importance of physical, operational, digital, fare, and institutional integration.

Key dimensions include:

- Physical integration: Connected hubs such as rail-bus interchanges and port-rail corridors.
- Operational integration: Coordinated scheduling and capacity management across modes.
- Digital integration: Unified journey planners, real-time passenger information, integrated freight tracking.
- Fare integration: Single-ticket systems across bus, rail, and ferry networks.
- Institutional coordination: Strong governance structures aligning investments and regulation across agencies (IFT-OECD, 2024; World Bank, 2023; UNESCAP, 2025).

Nigerian Application: Lagos remains Nigeria’s strongest multimodal example through LAMATA, integrating BRT, urban rail, ferries, and emerging NMT infrastructure. Coordinated planning and corridor-based development reflect international best practices and

demonstrate how multimodal strategies can be operationalized in megacities.

3.9 Conclusion of Theoretical Framework

The Transport Management Approach provides a solid theoretical foundation for designing efficient, safe, sustainable, and technology-driven mobility systems. Lessons from Singapore and Germany demonstrate how policy strength, technology adoption, integrated planning, and stakeholder participation create world-class transport outcomes. This framework is directly applicable to Nigeria’s context—especially in addressing urban congestion, multimodal deficits, safety issues, and sustainability challenges.

4.0 My Contribution to the Subject Matter

“Give diligence to make thy calling and election sure.” — 2 Peter 1:10 is what I have learned in my Bible. Therefore, below is a curated, evidence-based selection of my publications and applied works that directly demonstrate my contributions to “Transportation Systems and Infrastructure in Nigeria: Transport Management Approach to Enhancing Efficiency, Safety, and Sustainability.” I’ve grouped them under the three pillars of this 195th Inaugural Lecturer of this great university, that is efficiency, safety, sustainability and added how to plug each item into the relevant lecture section.

4.1 Enhancing Efficiency (Operations, Capacity, Intermodal/PPP, Analytics)

“Seest thou a man diligent in his work? He shall stand before kings...”
— Proverbs 22:29.

- **Airport capacity & efficiency** –
 - Stephens, M. S., and Ukpere, W. I., (2011b) “*Airport Capacity Utilization in Nigeria: A Performance and Efficiency Analysis*”
 - Adeniran, A. O. and Stephens, M. S. (2019), “*Gap Analysis of Service Quality Delivery in Murtala Mohammed International Airport, Lagos, Nigeria*” — Empirical analysis underpinning our argument for operational efficiency and service quality governance in aviation.
Impact: demonstrated measurable capacity gaps and efficiency levers in Nigerian airports to guide performance-based management.
- **Port performance & corridor operations** –
 - Stephens, M. S. and Ukpere, W. I., (2011) “*Port Performance, the Importance of Land Transport in a Developing Economy*” — Shows how hinterland road/rail constraints degrade port performance, validating multimodal integration and corridor management.
Impact: “Quantified the port–land interface bottlenecks; argued for intermodal through-transport to cut dwell times and logistics costs.”
 - Stephens, M. S., (2014) “*Impact of Lagos Port Corridor Gridlock on Port Performance*” — Applied analysis of corridor congestion and cargo flows; bridges our research with policy/operations fixes.

Impact: “Evidence for truck appointment systems/PCS and enforcement at port gates; supported corridor decongestion recommendations.”

- **Post-concession port efficiency (PPP evaluation)**

- Stephens, M. S. (2018) “*Post Concession Appraisal of Terminal Operators in Apapa Port Complex: Binomial Distribution and Data Envelopment Analysis*” — Rigorous PPP performance evaluation demonstrating productivity and efficiency gains post-concession. Impact: “Provided an empirical yardstick for PPP terminal performance and incentive design.”

- **Queue modelling for vessel traffic**

- Nwachukwu, T. C.; Akpudo, C. A.; Enyinda, C. A.; Stephens, M. S. (2023) “*Queue Modeling Simulation for Vessel Traffic in Nigeria Seaports*”
- Stephens, M. S. and Ogwude, I C. (2005) “*Ship Traffic Simulation Model of a Developing Country’s Port: Evidence for Nigeria.*” — Operations research applied to berth planning and ship turnaround. Impact: “Showed how simulation and analytics can lower ship waiting time and improve berth productivity.”

- **Urban bus systems & demand**

- Bello, K., Enyinda, C. A., and Stephens. M. S., (2015) “*Commuter Perception and Impact of the Lagos BRT System*” and
- Yaya-Bankole, S. O., Enyinda, C. A. and Stephens, M. S. (2021) “*Assessment of Commuters’ Modal Split in Metropolitan Lagos*” — Evidence of mass transit benefits and modal split changes, crucial for *traffic avoidance through modal shift*.

Impact: “Documented service quality gains and a measurable move from informal minibuses toward BRT/rail.”

- **Inland waterways operations**

- Akpudo, C. U. and Stephens, M. S. (2020) “*Operational Characteristics of Inland Waterway Transportation... Anambra/Lagos*”
- Akpudo, C. U. and Stephens, M. S. (2019), “*Factors Affecting Demand of Inland Waterways Transportation in Coastal Areas of Anambra State, Nigeria*”
- Akpudo, C. U. and Stephens, M. S., Okoli, C. S., (2022), “*Challenges and prospects of Inland Waterways in South Eastern part of Nigeria*”
- Mohammed, A. I., Stephens, M. S., Akpudo, C. U., and Enyinda, C. A., (2023) “*Assessment of ferry service and ridership in metropolitan Lagos, Lagos State, Nigeria*” — Baselines for ferry integration into urban mobility and freight networks.

Impact: “Built the evidence base for ferry scheduling, ridership, and last-mile connectivity in Lagos.”

4.2 Improving Safety (System Safety, Policy Adherence, Analytics)

- **Road safety policy compliance**

- Stephens, M. S., and Enyinda, C. A., (2014) “*Empirical Analysis of Road Safety Compliance in Nigeria: Prohibition of Overloading*”
- Stephens, M. S., Ogwude, I. C., (2015) “*Road Safety Policy Adherence: Seat Belt Use*” — Demonstrated gaps in policy adherence and the need for technology-enabled enforcement (ANPR, weigh-in-motion).

Impact: “Provided compliance evidence to justify stricter axle-load enforcement and seat-belt campaigns.”

- **Crash causation & predictive analytics**

- Stephens, M. S. and Ukpere, W. I. (2011a), *"Accidents and Level of Intelligence: a View from the Nigerian Experience"*
- Stephens, M. S., and Musa, T. (2019) *"Causes of Accidents involving Commercial Minibuses in Ondo State"*
- Stephens, M. S., Musa, T. and Ukpere, W. I. (2019) *"Accident Rates and Vehicular Brands... Minibuses"* (2019) — Early predictive safety analytics linking vehicle type/condition and operating practices to crash risk. Impact: “Identified high-risk vehicle cohorts; informed targeted inspections, speed management, and fleet renewal strategies.”

- **Aviation safety, service quality & operations**

- Stephens, M. S., and Ukpere, W. I. (2014) *"Empirical Analysis of Causes of Air Crashes from a Transport Management Perspective"*
- Stephens, M. S. and Ayo-Agunbiade, O. T. (2019) Stephens, M. S. and Ayo-Agunbiade, O. T. (2019). *"Airside Capacity Utilization in a Nigerian Airport: Case Study of Murtala Mohammed International Airport"*
- Ayo-Agunbiade, O. T., and Stephens, M. S. (2019). *"Causal Factors of Flight Delays in Nigerian Airport: a Case Study of Murtala Muhammed International Airport"*
- Adeniran, A. O., Stephens, M. S., Akinsehinwa, F. O., (2020), *"Factor Analysis of Passenger' Satisfaction at Murtala Muhammed Airport (MMA2)"*
- Chike. U. G. and Stephens, M. S. (2021), *"Customers' Satisfaction with Level of Service in Murtala Muhammed International Airport, Lagos, Nigeria"* — Holistic safety lens

for airport management, turnaround processes, and passenger handling.

Impact: “Linked operational discipline and safety oversight to lower incident risk and better passenger outcomes.”

“The thief comes to steal, kill, and destroy, but I have come that they may have life.” — John 10:10.

4.3 Promoting Sustainability (Externalities, Emissions, Health Impact, Climate)

“The earth is the Lord’s...” — Psalm 24:1.

- **Transport externalities & health**

- Odesanya, J. F., Okoko, E. E., Stephens, M. S. (2018), *“Effect of Road Transport Emission and Related Human Health Damages... Ikare Akoko”*
- Odesanya, J. F., Okoko, E. E., Stephens, M. S. (2019) *“Induced Noise Pollution from Road Transport... Akure” (2019)*
- Oluwasanya, T., Enyinda, C. A., Olisa, B. S., and Stephens, M. S., (2024) *“Level of awareness of Transport Externalities on Noise Pollution in Akure, Nigeria”*
- Enyinda, C. A., Olisa, B. S., Stephens, M. S. and Oluwasanya, T. (2022), *“Residents’ Perception on Road Traffic Noise and Health Related Problems: a Case Study of Akure, Nigeria”* — Quantified local externalities to justify low-emission zones, fleet modernization, and NMT infrastructure. Impact: “Built the health and environment case for clean buses, cycling lanes, and pedestrian upgrades.”

- **Carbon-focused research**

- Lateef, M. B., and Stephens, M. S., (2024) *“An Assessment of Carbon Monoxide Emission in Nigeria and Mitigation Strategies” (2024, FJLIT)* — Provides a Nigerian evidence base for EV pilots, clean-fuel buses, and monitoring frameworks.

Impact: “Translated CO evidence into actionable mitigation strategies for urban corridors.”

- **Port air quality & risk assessment**

- Anyanwu, O. J., Njoku, I., Stephens, M. S., & Nwosu, E. N., (2025) *“Air Pollution Mitigation in Apapa/Tin Can Seaports”*
- Anyanwu, O. J., Njoku, I., Stephens, M. S., Nwosu, E. N., Okorefe, O. C., & Anyanwu, A. A. (2025) *“Quantitative Health Risk Assessment... Apapa Seaport” (2025)* — Connected port operations to community health, supporting green port measures (shore power, cleaner truck standards, appointment systems).

Impact: “Established the quantitative risk link between port operations and local health outcomes; justified greener port operations.”

4.4. Governance, Policy & Applied Impact (what I have beyond academia)

“To whom much is given, much will be required.” — Luke 12:48.

- **Policy/PPP advisory & technical reports**

- *“Removing Lagos Port Corridor Gridlock: A Necessity to Improving Port Performance” (technical report, Nigerian Ports Consultative Council, 2014)* — Direct policy impact on

port-hinterland operations; aligns with lecture's efficiency pillar.

Impact: "Delivered actionable decongestion measures now standard in port best practice."

- **NESREA policy panel (2012) & FRSC policy review (2012)** — Demonstrates **regulatory collaboration** on environment and road safety.

Impact: "Contributed expert reviews to strengthen environmental standards and road safety policy implementation."

- **PPP/Concession evaluation** (Apapa DEA paper above) & consultancy for port/maritime domain awareness (2025) — Shows capacity to bridge data, technology, and governance. Impact: "Advanced evidence-based PPP performance management and maritime surveillance proposals."

- **Teaching & capacity building (multimodal/operations)**

Courses taught (Intermodal Through Transport, Ports Ops & Admin, Air Transport Systems, Pipeline Ops) and supervision across **airport quality, inland water transport, port concessioning, ferry ridership** — Builds national capacity consistent with our **transport management** approach.

Impact: "Graduated cohorts solving real Nigerian transport problems; embedded analytics and management tools in practice."

5. Recommendations

5.1 For FUTA (institutional policies, programs, and releases)

a. Establish a Centre for Integrated Transport & Logistics Analytics (CITLA)

Policy/Action. Create a senate-approved Centre that (i) houses a real-time transport data lab (traffic sensors, AIS/port data, airport ops data), (ii) runs applied OR/queue-simulation for corridors (e.g., Akure–Ado, Akure–Ibadan), and (iii) provides third-party evaluation for state/federal projects (BRT/LRT feasibilities, port PCS performance, airport KPI audits).

Why this matters. Integrated analytics and simulation reduce delays, emissions, and cost overruns; this is consistent with World Bank’s Smart Mobility Toolkit and ITF’s systems approach to integrated planning. Our works on vessel-queue simulation, airport capacity, and port-corridor studies provide immediate methods and case assets.

Internal release. VC circular establishing CITLA; MoUs with Ondo State MoT, FRSC, FAAN, NPA for data-sharing and pilot corridors.

b. Launch a FUTA Open Mobility Dashboard (FOMD)

Policy/Action. Publish an open dashboard (monthly) on Akure urban speeds, crash heat-maps, bus on-time performance, terminal dwell, air-quality micro-stations (near motor parks).

Why this matters. Open data drives accountability and better operations decisions and is recommended in the World Bank urban mobility results brief; it also enables student/faculty research and industry partnerships.

Internal release. Senate directive mandating anonymized publishing of mobility KPIs gathered from FUTA’s lab projects and capstones.

c. Create a Safety & Externalities Innovation Fund (seed ₦25–50m/yr)

Policy/Action. Competitive small grants for projects on axle-load enforcement tech, seat-belt compliance, emission/CO mapping, and noise mitigation—all themes you have published on (road safety policy adherence, crash causation; transport emissions & health).

Why this matters. Demonstrates FUTA’s leadership in Safe System and decarbonisation pilots that can be replicated by states. Anchored in WHO/World Bank guidance and our empirical portfolio.

d. Institutionalize Triple-Helix Mobility Studios

Policy/Action. Each semester, run “studios” co-taught with Ondo State MoT/LAMATA-style authorities and private bus/freight operators to solve a live problem (e.g., redesign Akure bus network; WIM sites at city gates; freight time-windows for markets).

Why this matters. Triple-Helix (gov–industry–academia) accelerates adoption; international literature and innovation-hub guides show this model’s payoff.

e. Introduce a University Travel Demand Management (TDM) Policy

Policy/Action. Parking pricing bands, staff/student transit benefits, secure cycle parking, and shuttle scheduling by analytics; publish annual TDM report.

Why this matters. Behavioural/TDM frameworks show low-cost demand-side measures can quickly reduce congestion and emissions on/around campus.

5.2 For Ondo State Government (state policy and program releases)

a. **Establish the Ondo Metropolitan Transport Authority (OMTA)**

Policy/Action. Pass a state law to create a LAMATA-style authority for Akure-Ondo-Owo corridor—planning, franchising, and regulating multimodal services (state-regulated buses, first/last-mile, ferries where viable).

Why this matters. A single coordinating authority is central to multimodal integration success; Lagos’s progress is the local blueprint.

State release. Executive bill + roadmap (governance, franchising model, ITS/ANPR back-office).

b. **Publish an Akure Sustainable Urban Mobility Plan (SUMP) 2026–2030**

Policy/Action. Adopt a SUMP with (i) BRT-lite corridors; (ii) NMT network (sidewalks, protected lanes along campus–CBD–markets); (iii) signal optimization & transit priority; (iv) parking reforms.

Why this matters. SUMP enables a coherent modal shift and aligns with ITF/WRI guidance; our BRT and modal-split studies give local evidence.

c. **Deploy Statewide ITS & Road-Safety Tech**

Policy/Action. Roll out ANPR-based enforcement, speed cameras, weigh-in-motion (WIM) at city gates/logistics corridors, and crash-black-spot remediation with iRAP-aligned audits.

Why this matters. Lagos ITS shows measurable improvements; our works on overloading, seat-belts, crash causation provide local justification for targeted enforcement.

State release. Governor’s Executive Order on “Vision Zero Akure,” with quarterly KPIs.

d. **Start a Green Fleets and Clean Corridors Program**

Policy/Action. Convert a share of state buses to CNG/electric, install micro-charging in depots, and pilot low-emission zones near hospitals/schools/markets; port-of-entry emission checks for intercity fleets.

Why this matters. Aligns with global decarbonisation pathways and improves health; our CO/health externality studies support local benefits.

e. **Launch a Port-Hinterland Freight Protocol (for Ondo coastal LGAs & future deep-sea links)**

Policy/Action. Adopt time-windows, truck appointment systems, and axle-load compliance; upgrade rural connectors to near-port roads for agriculture logistics.

Why this matters. Queue-modelling and corridor studies show large efficiency/bottleneck gains; mirrors practices seen in PPP ports.

5.3 For the Federal Government of Nigeria (national policy and regulatory releases)

a. **Issue a National Multimodal Integration Directive (NMID)**

Policy/Action. FMOT to publish a directive mandating in all federally financed urban projects: (i) physical, operational, information, fare integration across modes; (ii) common data standards; (iii) integrated ticketing.

Why this matters. Multimodal integration is a proven lever for efficiency and equity; adopt ITF/UNESCAP definitions and EU-style combined-transport incentives.

b. Enact a National ITS Architecture & Interoperability Regulation

Policy/Action. Define national standards for ANPR, signal priority, e-ticketing, AVL, WIM, and open APIs to avoid vendor lock-in; require states to align to qualify for federal funding.

Why this matters. The World Bank highlights digitalization standards as foundational; Lagos pilots show benefits; national scaling needs architecture.

c. Create a Federal Road Safety Performance Contracting framework

Policy/Action. Tie federal maintenance funds to safety KPIs (fatalities per 100k, seat-belt/helmet compliance, speeding infractions) and the adoption of black-spot treatments and post-crash response standards.

Why this matters. WHO/World Bank reinforce Safe-System; your policy-adherence and crash-risk publications provide local parameters for KPI design.

d. Scale Port Community Systems (PCS) & Appointment Systems nationally

Policy/Action. NPA/NCS to mandate PCS adoption, digitized gate/appointments, and transparent dwell/turnaround dashboards for every complex; integrate rail links in port financing conditions.

Why this matters. Cuts dwell/turn times and improves transparency; echoed in UNESCWA PPP ports guidance and your NPA corridor report/PPP DEA research.

e. Update a National PPP Transport Scorecard

Policy/Action. ICRC to publish terminal/airport/rail concession scorecards (productivity, service quality, safety, decarbonisation metrics), with provisions for renegotiations aligned to ITF/OECD guidance.

Why this matters. International evidence shows PPP performance improves under transparent KPIs; you have peer-reviewed PPP assessments to inform metrics.

f. Adopt a Federal SUMP & NMT Standard (10 largest metros)

Policy/Action. Make SUMP a pre-condition for federal co-financing; adopt NMT design manual (sidewalk width, junction design, protection) aligned with modal-shift strategies.

Why this matters. ITF/WRI advocate SUMP and NMT to meet climate and inclusion goals; Nigerian BRT/modal-split evidence shows feasibility.

g. Establish a National Green Fleets Program

Policy/Action. Duty waivers/tax credits for electric/CNG buses, charging/grant schemes, and port shore-power/micro-grids; link to ETP and state EV rollouts.

Why this matters. Electrification and cleaner fuels deliver large efficiency and health gains; Lagos pilots and global pathways support this step.

h. Create a Transport Research & Implementation Grant (TRIG)

Policy/Action. A competitive federal grant (with academia–industry co-funding) for OR models, PCS algorithms, safety analytics, CO/PM mapping—prioritizing projects with state partners and measurable KPIs.

Why this matters. Scales rigorous models you already deploy (queueing, DEA, safety/externalities) into federal programs.

5.4 How this lecture and what I have done so far underpins these recommendations

- **Efficiency.** Airport capacity analysis, port–land interface & corridor gridlock report, PPP terminal DEA, vessel-queue simulation, BRT/modal split studies—offer the toolkit to operationalize CITLA, PCS, SUMP, PPP scorecards.
- **Safety.** Overloading and seat-belt compliance studies, minibus crash causation analytics—justify safety KPIs, ANPR/WIM, and black-spot remediation.
- **Sustainability.** CO/noise/port air-quality risk assessments—justify green fleets, low-emission zones, and NMT investments in SUMP.

5.5 A sample Policy Communiqué

Title: Advancing Efficient, Safe, and Sustainable Transport Systems in Ondo State and Nigeria

From: Professor M. S. Stephens, FUTA

Summary: Based on empirical evidence and international best-practice, FUTA proposes:

1. A **Centre for Integrated Transport & Logistics Analytics** at FUTA to support state/federal agencies with real-time data and operational research (OR) for corridors and terminals.
2. Legislation to create an **Ondo Metropolitan Transport Authority** and adopt an **Akure SUMP**, aligning with Lagos’s integration model.

3. A **National Multimodal Integration Directive**, **National ITS Architecture**, and **PPP Transport Scorecard** to coordinate investments and raise performance nationwide.
4. A **Green Fleets Program** and **Port Community Systems** scale-up to cut emissions, reduce dwell times, and improve health outcomes.

6. Acknowledgment

All glory, honour, and adoration belong to Almighty God, who has preserved my life from birth until this moment. Many were born on the same day I was named, yet they did not live long enough to answer their names or fulfil the aspirations their parents had for them. Without God, I would be nowhere, nobody, and certainly not privileged to stand before this distinguished audience today. Almighty God, I say thank You, Sir. You charted this path for me, and I followed. To You alone be all the glory.

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that God will continue to uphold you all as you labour faithfully in His vineyard.

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