



Championing Zero Carbon Transportation Across Nigeria: Lessons from Luxembourg, Switzerland, Singapore, and England

Nigeria's transportation sector, a linchpin of its economy, accounts for a significant portion of its greenhouse gas emissions, contributing approximately 3% to the nation's GDP yet heavily reliant on fossil fuels. The Friends of Sustainability and Ecology Association (FOSEA) envisions a transformative shift toward zero-carbon transportation, aligning with Nigeria's Energy Transition Plan (ETP) to achieve net-zero emissions by 2060. Drawing inspiration from global exemplars—Luxembourg, Switzerland, Singapore, and England—this essay elucidates ten critical factors to consider in championing zero-carbon transportation across Nigeria's 36 states and the Federal Capital Territory (FCT). These factors, distilled from international best practices, encompass infrastructure, policy, technology, and socio-economic considerations, offering a roadmap for sustainable mobility.

The first factor is robust public transport infrastructure, as exemplified by Luxembourg's nationwide free public transport system, the first of its kind globally. Luxembourg's investment in electric buses and trams, supported by a €2.7 billion mobility plan, reduces car dependency and emissions. Nigeria, with its burgeoning population of over 220 million, faces urban congestion in cities like Lagos and Abuja. FOSEA advocates for expanding mass transit systems, such as Lagos' Bus Rapid Transit (BRT) and light rail, powered by renewable energy to curb the sector's 91% reliance on oil products, aligning with the International Energy Agency's (IEA) Net Zero Scenario.

Electrification of vehicles is a second critical factor, as demonstrated by Switzerland's aggressive push for electric vehicles (EVs). With over 20% of new car sales being electric, Switzerland leverages its near-carbon-neutral electricity grid to reduce transport emissions. Nigeria's transport sector, dominated by fossil fuel-dependent vehicles, could transition to EVs, starting with motorcycles and tricycles, which are more affordable. FOSEA proposes leveraging Nigeria's solar potential—capable of generating 207 GWh/year from just 1% of its landmass—to power EV charging stations, addressing the nation's erratic grid electricity.

Policy incentives, a third factor, are pivotal, as seen in Singapore's EV Early Adoption Incentive and revised road tax framework. Singapore aims for all vehicles to run on cleaner energy by 2040, supported by tax rebates and stringent emissions standards. Nigeria's high import duties on EVs hinder adoption. FOSEA recommends reducing these duties, as suggested by Ogheneruona et al. (2022), to encourage EV imports and stimulate demand, particularly for commercial tricycles in states like Kano and Rivers, fostering a low-carbon economy.

Charging infrastructure deployment, the fourth factor, is critical for EV scalability. Singapore's plan to install 60,000 EV charging points by 2030, including 40,000 in public car parks, ensures accessibility. Nigeria's poor electricity grid necessitates off-grid solar-powered charging stations. FOSEA's initiative to establish mobile charging facilities, leveraging Nigeria's lithium and cobalt resources, could position the country as a regional hub for EV battery production, reducing costs and enhancing accessibility across states like Kogi and Benue.

Modal shift to active transport, the fifth factor, is exemplified by England's £2 billion investment in cycling and walking infrastructure. England's Transport Decarbonisation Plan promotes active travel to reduce emissions by 70% in ground transportation by 2030. Nigeria's urban centers, plagued by traffic congestion, could benefit from dedicated bike lanes and pedestrian pathways. FOSEA advocates for pilot projects in the FCT and Lagos, integrating cycling into urban planning to reduce reliance on fossil fuel-powered vehicles.

Low-carbon fuel adoption, the sixth factor, is crucial for sectors where electrification is challenging. England's Jet Zero Consultation targets net-zero aviation emissions by 2040 through sustainable aviation fuels (SAFs). Nigeria's maritime and aviation sectors, reliant on fossil fuels, could adopt biofuels and synthetic fuels. FOSEA proposes partnerships with private firms to develop bioenergy plants in states like Kwara and Katsina, utilizing agricultural waste to produce biodiesels, aligning with Nigeria's ETP goals.

Public-private partnerships (PPPs), the seventh factor, drive innovation in Singapore's transport sector, where private firms sponsor EV charging and sustainable technologies. Nigeria's transport sector, dominated by private operators, requires PPPs to fund zero-carbon initiatives. FOSEA's collaboration with private waste contractors in Lagos demonstrates the potential for scaling EV infrastructure and low-carbon fuel production, ensuring economic viability without straining public resources.

Security and accessibility, the eighth factor, are critical in Nigeria, where road insecurity hampers transport efficiency. Switzerland's safe and reliable rail network encourages modal shifts from cars to trains. Nigeria's rail revitalization, such as the Lagos-Kano line, could reduce road transport emissions if electrified. FOSEA advocates for enhanced security measures and federal investment in rail infrastructure, particularly in flood-prone states like Kogi, to ensure reliable zero-carbon transport options.

Urban planning integration, the ninth factor, is vital for sustainable mobility. Singapore's Land Transport Master Plan 2040 integrates green infrastructure into urban design, targeting a 75% public transport modal share by 2030. Nigeria's unregulated urban sprawl, particularly in Lekki, exacerbates emissions. FOSEA's campaign promotes sustainable urban drainage systems (SUDS) and green corridors alongside transport infrastructure, reducing environmental impact in cities like Port Harcourt and Enugu.

Public awareness and education, the tenth factor, underpin behavioral change. England's decarbonisation campaigns emphasize sustainable travel choices, supported by public

consultations. FOSEA's website, FOSEA.COM.NG, educates Nigerians on zero-carbon transport benefits, drawing on community workshops in states like Oyo and Anambra. By fostering a green culture, FOSEA ensures public support for initiatives like EV adoption and cycling, critical for long-term success.

The socio-economic context of Nigeria necessitates tailored strategies. Luxembourg's small population and high GDP per capita contrast with Nigeria's diverse, populous landscape. FOSEA adapts Luxembourg's model by prioritizing affordable mass transit, such as solar-powered buses in rural states like Zamfara, ensuring inclusivity for low-income communities. This approach aligns with Nigeria's goal to lift 100 million people out of poverty through sustainable development.

Switzerland's high renewable energy share (60% hydropower) offers lessons for Nigeria's hydropower potential, particularly in states like Niger and Taraba. However, Nigeria's limited grid reliability requires decentralized solar solutions. FOSEA's advocacy for off-grid charging infrastructure leverages Nigeria's abundant solar irradiation, ensuring equitable access to zero-carbon transport across urban and rural divides.

Singapore's compact urban design facilitates its car-lite vision, but Nigeria's sprawling cities pose challenges. FOSEA proposes regional transport hubs in states like Kaduna and Cross River, integrating rail, bus, and EV charging stations to streamline connectivity. This hub-and-spoke model reduces emissions while enhancing accessibility, drawing on Singapore's MRT network expansion strategy.

England's focus on green jobs, with 11,000 created in 2018, inspires FOSEA's vision for economic growth. Zero-carbon transport initiatives, such as EV manufacturing in Ogun State, could generate 52,000 climate-related jobs by 2030, as projected by Nigeria's Climate Change Forum (2025). FOSEA's collaboration with private sectors ensures job creation aligns with decarbonisation goals, boosting Nigeria's GDP.

Technological innovation, a cross-cutting theme, requires significant investment. Switzerland's R&D in hydrogen fuel cells offers a model for Nigeria's maritime and heavy transport sectors. FOSEA advocates for pilot projects in Lagos ports, testing green hydrogen produced via Power-to-X technologies, as highlighted by Ramboll (2023). These innovations could decarbonize Nigeria's shipping industry, a major emissions source.

Financing remains a formidable challenge. Nigeria's ETP estimates a \$1.9 trillion cost for net-zero by 2060, necessitating international support. Luxembourg's green bonds and England's £2.8 billion EV investment highlight viable funding models. FOSEA's advocacy at the Africa's Green Economy Summit 2025 seeks \$10 billion in climate finance, leveraging partnerships with France, Japan, and the World Bank, which provided \$1.9 billion in 2020.

Cultural and behavioral barriers, such as Nigeria's reliance on petrol-powered okadas, require targeted interventions. Singapore's success in promoting EVs through consumer incentives offers a blueprint. FOSEA's campaigns in schools and markets across states like Imo and Sokoto educate citizens on zero-carbon alternatives, fostering acceptance of EVs and public transport.

Infrastructure maintenance, critical for sustainability, draws on Switzerland's meticulous rail upkeep. Nigeria's poorly maintained roads and railways hinder zero-carbon adoption. FOSEA proposes community-led maintenance programs, inspired by NEWMAP's training of 185,000 individuals, ensuring long-term functionality of transport infrastructure in states like Delta and Bauchi.

The global context underscores the urgency of Nigeria's transition. The IEA's Net Zero Scenario demands a 25% reduction in transport emissions by 2030, a target Nigeria risks missing without accelerated action. By integrating lessons from Luxembourg, Switzerland, Singapore, and England, FOSEA's initiative addresses Nigeria's unique challenges, from urban congestion to rural inaccessibility, ensuring a cohesive zero-carbon strategy.

In conclusion, FOSEA's campaign to champion zero-carbon transportation in Nigeria harnesses global best practices to address local realities. By prioritizing public transport, electrification, policy incentives, and community engagement, the initiative aligns with Nigeria's 47% emissions reduction target by 2030. Sustained investment, technological innovation, and public support will be paramount to transforming Nigeria's transport sector into a beacon of sustainability, fostering a greener, more equitable future.

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