Mobility, Safety, and Urban-Environmental Management Challenges in Rapidly Urbanizing Africa

Aliyu M. Kawu
Department of Urban and Regional Planning
and Centre for Human Settlements and Urban Development (CHSUD)

Abstract
Cities in developing countries are fast growing in human population and spatial expansion. This unprecedented phenomenon will continue in large parts of Sub-Saharan Africa. Although present attention is largely on challenges of human survival, environment and ecological sustainability, more effort needs to be focused on inter and intra -city resilience, human safety, conditions of the goods and services needed to secure sustainable development. Unlike post-industrial Europe and America, African cities seem to have, at the same time, all of rapid population growth, urban sprawl and rapid technological advancement ahead of deliberate planning at city and regional levels. The ensuing less coordinated developments has left many cities with inefficient urban transport that derails development within and between cities. The success of Bus Rapid Transit (BRT) implementation in Lagos and Cairo have spurred many cities to set up plans to also adopt the schemes. This has called for the assessment of present and potential BRTs and other Connected and Autonomous Vehicles (CAVs) for environmental and social resilience. Using primary and secondary data - physical observations, interviews, published literatures, satellite imageries, and government documents, this work assessed the nature and pace of public transportation provision in Nigeria by highlighting environmental and policy matters as many cities continue to search for sustainable urban mass transit. Findings shows that many cities have undertaken urban renewal activities aimed at road expansion and increased access; this development is welcomed by the people; the transport facilities are provided for different mass transits including CAVs; but many cities are yet to provide the vehicles for city transport, and there is non-inclusion of stakeholders. It is also observed that the planned urban mass transit systems have the advantage of enhancing city resilience through enforcement of physical development regulations that are presently less adhered to. Hence, the need to: mainstream other aspects of urban livelihood to the transport schemes to be people-oriented towards sustainable urban development; integrate wider consultations with stakeholders already engaged in urban transport business, in planning and management of the scheme at all levels.

Keywords: African urbanization, BRT, Urban management, mass transit, City resilience, Sustainability

Introduction

The movement of people and goods from one place to another is increasingly becoming paramount as the world is quickly becoming urban; hence the connotation of 'urban century' that needs efficient and effective urban transport planning and management as a veritable input to sustainable city resilience and growth (Antonson & Levin, 2018). With less technology and mounting fiscal challenges, Sub-Saharan African countries like Nigeria are increasingly embracing a more efficient urban transport system. By its operations, the Bus Rapid Transit (BRT) system is separated from and independent of many hindrances curtailing the maximization of the capacity, efficiency and speed of other mass transportation, especially those operated by the public including those working in conjunction with other urban authorities. The characteristics include separate and independent lanes, schedules, management frame, and areas of jurisdiction. In some metropolis, other operators are eased out of the urban road transport system in order for the BRT to significantly establish and flourish. The high regard accorded to the BRT has earned it the autonomy to operate and has increased its chances of adaptation as the future urban transportation system in many developing countries. As a system with high levels of connectedness, it's advantages are many and still emerging as their acceptance and adoption continues (Ahmad, Afolabi, Nda, & Daura, 2018; Kawu, 2022). The present and future advantages have necessitated many urban authorities to either adopt it or make provision for its adoption in the near future, with cities like Kano, Kaduna, Minna and Maiduguri and others already witnessing mass urban road rehabilitation and expansion for this purpose. The merits of Connected and Autonomous Vehicles (CAVs) are many and still emerging as their acceptance and adoption continues. The present and potential advantages of these systems have necessitat-

ed many urban authorities to either adopt this urban transport scheme or make provision for its adoption in the near future, with cities like Cairo in Egypt, Nairobi in Kenya, and, Kano, Kaduna, Minna and Maiduguri and others, in Nigeria, already witnessing mass urban road rehabilitation and expansion for the purpose (Kawu, 2022; Shehu, Kawu, & Ismail, 2023).

The introduction and subsequent adoption of modern mobility infrastructure like the BRT is also an indication of different social and economic opportunities to the immediate beneficiaries and the larger regional economy beyond the city. This, however, does not completely eliminate the possibilities of challenges. It has been noted that the widespread and increasingly diversifying urban "informal economic sub-sector" has been "facing increasing pressures for formalization and proper integration" (Agbiboa, 2018; Banks, Lombard, & Mitlin, 2020). The likely incursion into urban street space has the capacity to seriously curb informal economic activities thereby increasing vulnerability of many urban residents as unemployment intensifies. With increasing usage and advantage, Connected and Autonomous Vehicles (CAVs) like the BRT, will further emphasize the need for a nationwide urban renewal programme of road infrastructure rehabilitation. Although this activities of removing the menace of informal activities from urban roads has been tried in the past, many attempts failed. This was due to the fact that the urban economic sub-sector has been the "dominant source of livelihood for the majority of city residents" (Agbiboa, 2018; Kuffer, Pfeffer, & Sliuzas, 2016; Shaw & Saharan, 2018), and such interventions are confronted with the resultant consequences of needless relocation, resettlement and costly funding amidst absence of efficient federal and local policy backing (LAMATA, 2009; Tinubu, 2019).

Factors contributing to the rebuilding of existing urban landscapes will expose the weak structural development control at city and city regions. These issues have for long allowed widespread unhindered intrusions on roads and similar facilities thereby incurring additional expenses. Urban landscape has for a long time, created needless hindrance to effective urban development control both at City and Regional levels. This is also a hindrance that the introduction of modern urban transport like the BRT system need to effectively address as it possesses the potentials to undermine all efforts invested in it. Furthermore, reduction in finance can limit access to machineries and man-power for the reconstruction, management and especially the needed modifications in existing road networks. The highlight of challenges and merits has necessitated the examination of existing and proposed urban transport schemes and the accompanying urban renewal services in many studies (Di Marino, Tomaz, Henriques, & Chavoshi, 2022; Enright, 2013; Jelovac, 2013; Liu, Yang, Timmermans, & de Vries, 2021; Scerri & Attard, 2023). This will aid governments and urban officials in identifying areas of benefits and to effectively tackle elements with avoidable negative consequences in order to by-pass serious physical and social backlash.

Literature and conceptual issues

Urban transit as a conceptual component of city resilience

Efficient urban transportation is a veritable input to sustainable city growth and resilience (Antonson & Levin, 2018). In this regard, urban transport is seen as the efficient movement of persons, goods or services from one particular area to another and thereby forming important socioeconomic input to urban development (Dixon et al., 2022; Ignaccolo, Fazio, Le, Inturri, & Maja, 2023; Leonhardt & Balme, 2024; Mora, Gerli, Ardito, & Messeni, 2023). Such displacement conducted to achieve spatial and socioeconomic satisfaction is inevitable as human needs are increasingly non-ubiquitous. There is always the increasing need to move goods and services including people, their possessions and potentials that will use the conveyed goods and services (Enright, 2013; Vuchic, 2005) to a place to achieve higher values in order to enhance socioeconomic goals elsewhere.

Urban resilience is seen as an aspect of urban sustainability in which efficient transportation can help in making it easily achievable in both short and long term. In this scenario, urban settlements are known to strive in deliberately created atmosphere of efficient and effective transport system (Borghetti & Marchionni, 2023; Newton, 2012; Olesen, 2019) that does not fail and continues to live to its expectations in time, place and distance. Many studies (Elizabeth, Crick, Atela, and Conway, 2021; José, Neto, and

Heller, 2016; Pauline, Morse, and Saroj, 2022) have shown that the destructive effects of natural or man-made disasters are often aggravated with limited or absence of reliable transport system to convey victims or would-be victims from the scene of the undesirable event. Effective urban transport has enhanced city resilience through adequate conveyance of human and material resources to places of need in times of challenges and periods of relative peace (Almulhim, 2025; Santos, Safitri, Safira, Varghese, & Chikaraishi, 2021).

Global urbanization, urban transport and climate change

In many tropical countries, natural disasters are basically hydro-meteorological in nature. These are events closely related or aggravated by the "global phenomenon of climate change and global warming" (Abdulkadir, 2021*)* – largely a product of human activities through the production and burning of greenhouse gases (Ben, Opfer, & Hernandez, 2022; Schaal, Mitchell, Scheele, Ryan, & Hanspach, 2023; Tall, Patt, & Fritz, 2013; X. Wang et al., 2020)**.** The phenomenon often entails untold hardships to many urban residents through the disruptions of livelihood activities when flooding, rainstorms, windstorm, drought or excessive heatwaves happen. In response to this, global assessment has called for increase in city resilience through deliberate reduction in greenhouse gas emissions – a process known as decarbonization (Dioha, Duan, Ruggles, Bellocchi, & Caldeira, 2022; Haas, Herberg, & Löw-Beer, 2022; Patrizio, Sunny, & Mac Dowell, 2022; Sachs et al., 2019). Urban mass transit buses like the BRTs are offering this opportunity as they have the capacity to reduce the number of vehicles on urban roads. It is about the only practicable option for impactful decarbonization of the urban transport system in developing countries today (Adebayo & Kawu, 2022; Diallo, 2022; Fan & Beukes, 2021; Hassan, 2016). (See Figure I). While the literature on urban transport development in developing countries are growing (Aderibigbe, 2022; Cheeseman and de Gramont, 2017; Kåresdotter, Page, Mörtberg, Nässtrom, and Kalantari, 2022; Leonhardt and Balme, 2024; Mottee, Arts, Vanclay, Howitt, and Miller, 2020; Wang, de Jong, Van Bueren, Ersoy, and Chen, 2021; Zhou, Murphy, and Corcoran, 2020), there is little highlighting the deliberate attempts for decarbonization of the African urban atmosphere through urban mass transit provisions. Less is also on the global scholarly fora about how Nigerian cities and governments are investing on environment-friendly city transport infrastructure for urban resilience to mitigate negative effects of climate change.

State of urban roads and transportation

Urban roads are integral parts of every striving metropolitan economy and has always attracted attention in its provision and effective management. This is sometimes carried out through large scale urban road expansion along with rehabilitation as witnessed in Lagos ($6^0 28^/N, 3^0 24^/E$) – the Nigeria's administrative centre from the colonial era to 1991 and presently Africa's largest commercial hub (Ajibade, 2017; Lawanson & Fadare, 2013; Mabogunje, 2008; Nwannekanma & Daniel, 2021; Ukpata & Etika, 20012).

Figure I: BRTs and the goal of zero carbon transportation
Source: Kumar (2020)

Presently, most urban settlements in the country lack functional road networks with all the required facilities and amenities (Gangwal, Siders, Horney, Michael, and Dong, 2023; Leonhardt and Balme, 2024; Ukpata and Etika, 2012; Uwadiegwu, 2013). This has negatively affected urban and regional economies in many instances and has necessitated large procurement of additional road facilities and accompanying infrastructure as exemplified by Abuja ($9^0 05^/N, 7^0 31^/E$), Kaduna ($10^0 32^/N$, $7^0 26^/E$) and Mai-

duguri ($11^{0}50^{/}$N, $13^{0}08^{/}$E) amongst others. The increasing importance of road transport to urban and regional economies is a factor that informed the use of different modes of transportation in both township and regional roads. However, increase in the acceptance, usage and dominance of BRTs and similar Connected Vehicles (CVs) will further emphasize the need for urban-wide infrastructure rehabilitations, massive urban renewal schemes and road facility expansion.

One of the likely drawbacks of these activities is that it risk being wrongly viewed as unnecessary attacks on the 'striving' informal economic activities of many cities. The increasing commercial activities taking place at roadsides has a long history of presence of many cities' road space (Agbiboa, 2018). This, in many studies, have warranted the reconsideration of a number of urban development projects including road rehabilitation (Cupers, 2024; Dessie et al., 2025; Farvacque-Vitkovic, Godin, Leroux, Verdet, & Chavez, 2005; Ibem, 2009; Mukwaya, Mbabazi, & Ernstson, 2025; Olajide, Agunbiade, & Bishi, 2018; Tanko, 2016). The widespread road expansion exercises currently going on in Nigeria are likely to increase the vitality and potency of road transport system with additional physical and economic implications for the city and its immediate region. Documenting these events as it unfolds can aid in archiving these resultant effects and emergent opportunities that are not likely to gain the attentions of government and other authorities in charge of developmental activities.

Discussion of findings

Cities stand to gain a lot by embracing modern systems of urban mass transit (Adebayo & Kawu, 2022; Kawu, 2022). However, detailed assessments are needed to evaluate the potentials and challenges of advantages and particularly the policy measures to be taken in order to extend the benefits beyond the city boundaries. One of such areas is the expanding components of inter-city mass transit's outflows of services within and between city regions. Highlighting the vast advantages here will require going beyond the use of origin-and-destination assessments, but exploring field and documented sources as tools to identify likely avenues and systems that will maximise positive impacts. This approach was able to highlight the different impact areas the scheme has been able to address pressing environmental concerns like climate change and disaster mitigation measures and further demonstrated areas it can aid to achieve regional and global development agenda like the African Agenda 2063 and the Sustainable Development Goals (SDGs) respectively.

Urban roads and city transit

Urban environment is criss-crossed by different types of road network . While this gives access and easy movements, most of these facilities are often abused by the very users who use them on daily basis. Figure 2 shows a busy road with different uses including incompatible ones like hawking on road reservations, inter-city garage services, municipal solid waste dumpsite, evacuation of solid wastes, and, food and vegetable vending.. The uses that often shrink roads width and consequently affect its usage, capacity and safety. Many road rehabilitation exercises often widen the Right-of-Way (ROW) in many cities like Minna, Kaduna, Kano, Yola, and Maiduguri; however, adequate infrastructure are not inculcated into it design and execution in order to safe guide its uses from misuse and abuse.

Figure 2: Urban road in Minna serving multiple incompatible uses
Source: Fieldwork, May 2015

Urban transport as source of public revenue

The generation and development of urban transport revenues has been left largely to independent transportation providers' Associations by city administrations who are less enthusiastic due to regular finance from state and federal allocations. Associations

and trade unions like Amalgamated Commercial Motorcycle Riders Association of Nigeria (ACOMORAN), National Association of Road Transport Owners (NARTO), National Union of Road Transport Workers (NURTW), are known to have daily charges and collect monies from transport service operators in cities in Nigeria. This observation is corroborated by many works (Al-Hasan, Momoh, & Eboreime, 2015; Kamara et al., 2012; Olubomehin, 2012; Umaru, 2013) that also expressed disagreement with the practice. While the funds so collected are not remitted to government coffers; the associations hardly carry-out any activity or services to justify the huge amount collected on daily basis.

The introduction of Bus Rapid Transits (BRTs) and related urban transit systems would streamline the urban transport sub-sector and also initiate the need to replicate same in similar areas that are important but inadequately funded due to the wrong perception that they hardly generate adequate capital revenue to warrant attention. Areas include public water supply, primary healthcare services, primary and secondary education systems, even public investment in tourism, urban security systems and the likes. Avenues that can directly and indirectly generate additional resources for the development of the cities and the nation at large.

Lagos as a Leading Metropolis

Following Lagos state's example and success with the BRT, many states and cities in Nigeria are approaching the implementation of CAVs mainly through urban road expansion exercises and the provision of associated facilities. However, unlike Lagos city, many of these cities in Nigeria have vast land for road and related infrastructure expansion to accommodate modern urban mass transit.

Urban road construction and expansion are often important prelude to the introduction of modern transport systems like the CAVs especially the BRT in many developing countries. Activities like these are known to create increasing safety and growing affordable access for urban transportation especially for the low-income earners and similar urban residents to livelihood opportunities and the building of an enduring inclusive city (Dias, 2016; Roever and Skinner, 2016). In Kano state, for example, there is construction and the further reconstruction of many roadways in the largely commercial metropolis of Kano and its surroundings (Figure 3). In Minna, a similar road expansion and reconstruction exercises are also embarked upon to create adequate roadways, bridges and overhead bridges for easy passage of private and commercial vehicles, and to also create easy avenue for introduction of the BRTs in the fast-growing metropolis (Figures 3 and 4).

Figure 3: Dangi Interchange at Central Area, Kano, Nigeria
Source: https://images.app.goo.gl/xPAMMndAfVGh2RxJ7

Figure 4: Expanded Minna-Bida Road, Minna
Source: Field Surveys, March, 2022

Urban Transportation and the BRT - winners in affordable urban transport

The cities of Abuja and Lagos serving as administrative and commercial capitals respectively, for the most populous country in Africa, are amongst cities that have been experiencing guided physical planning activities in recent time. Many other urban areas in Nigeria have been left with less of formal physical planning interventions particularly in road infrastructure to ensure adequate setting for developments like the introduction and management of CAVs. At present, many residents of Nigerian cities are burdened by the unintegrated multi-modal city transit system characterised (Young et al., 2021), by heightened urban transport costs (Makarewicz & Németh,

2018; Nengroo, Bhat, & Kuchay, 2017; Xydis & Nanaki, 2015), social and environmental stress (Agbiboa, 2018; Roy & Pramanick, 2019).

However, functional integrated mass transit operations of Connected and Autonomous Vehicles (CAVs) will usher in the era of affordable and more dependable system that eliminates stress of unguided and largely unregulated multi-modal city transport for trips. This is in addition to creating increasing avenues for all stakeholders in urban management to work together within and between the different agencies mandated to guide developments activities as never before.

The Gains of CAVs - Boost to retail activities

The prospects that the BRT and similar vehicles and services are likely to bring in the needed sanity of urban transit to the Nigerian inner cities is actually high. In many cities, CAVs will announce the end of under-performing commercial and public transportation dominated by the informal commercial motorcycle and tricycles. The present system that often engage bitter encounters with operators and users of these services (Agbigboa, 2018; Ganiyu, 2019; Tinubu, 2019; Ukpata & Etika, 2012) will, in addition, face further policy and administrative interventions that might altogether exclude them from the city centres, high commercial centres and public administrative areas. Long-awaited safety on urban roads that has long alluded road users, residents and non-users of the road space alike. However, since large parts of cities in sub-Saharan Africa are informally settled, these present ubiquitous informal urban economic sub -sector will be forced to relocate to areas largely lacking requisite infrastructure for autonomous vehicles like the neighbourhoods and wards largely situated at the unguided urban peripheries.

Boost to formal retail activities

Efficient transportation can influence and further boost retail activities and lead to increase in city revenue potentials. The safety, effectiveness and reliability of autonomous vehicles facilitates decongestion of streets and other traffic bottle-necks. These developments are known to often hinder functional retails and viable economic activities linked to them.

CAVs and Emerging Urban Management Practices

At present, it can be said that there are policies on ground to ease the construction and administration of CAVs like the BRT in Nigeria. However, this is not widespread or adapted by many states and urban authorities. Abuja, the federal capital territory is known to have effective urban development policies and regulations that other cities are yet to have. Hence, Abuja and Lagos have become cities where innovative urban transportation and management strategies are continuously propagated and easily adopted. The novel introduction and management of the BRT in Lagos metropolis for instance, has shown other similar cities' inputs that have paved ways for overall improvement in the country's urban management programmes. This has helped in the inclusion of functional innovations, and, the institutionalization of the programmes of efficient urban management in many towns and cities. Overall, the phenomenon can lead to a reformation of urban matters of inclusive and intensive urban management processes even in emerging and burgeoning urban enclaves of developing countries, will no longer be treated as ad hoc exercises of the past (Dessie et al., 2025; Mwau & Sverdlik, 2020; Tibaijuka, 2009).

Improving city and inter-city linkages

Beside the need to improve road networks in the cities that are planning or implementing BRTs, there is also the need for holistic improvements on all linkages to the main routes where the CAVs can be accessed. This increased connectivity with the BRT stations can encourage patronage by extending access to residents living in neighbourhoods that are of considerable distance away from the BRT stations or bus stops. This can also serve as a shield for the users of the main roads by limiting access of certain vehicles to these rehabilitated access roads and streets.

Identification and improvement in city's administrative entities

The long-awaited identification of the different administrative area units (and their constituents) that form the city and establish boundaries of cities in a metropolis will be brought to light and be well articulated to function efficiently. For example, the metropolitan city of Kano with eight (8) LGAs of: Kano Municipal Council (KMC), Fagge, Dala, Tarauni, Nasarawa, Gwale, Ungogo, and, Kumbotso, that exhibit high fluidity in terms of physical and administrative governance issues. However, if the proposed BRT project

comes to life, the prospective LGAs and their wards will do all they can to maximise its gains, assets, and try to limit and curtail liabilities. It implies coming to terms with these environmental and structural hindrances that have for long kept the different entities from working together or forming one unified metropolis as witnessed in places like London, New York, Paris, and so on. With this, urban management will continue to effectively access regular funding that is presently lacking due to practices that often neglect stringent accountability.

BRTs as catalysts for sustainable management of cities and city regions

The physical and economic developments in the prospective urban mass transport sub-sector will spur others particularly those related to the transport industry to improve on their performance and outputs. New industries are also likely to come up to support and augment the striving urban mass transport operations of the BRTs. Delivery services, urban tourism, and surveillance and civil security are the likely subsector to directly receive immediate boost from functional activities of intra and -intercity BRT services.

Legal and Institutional Elements of the BRTs

The development of government policies and technical regulations on digital CAVs generally and BRTs in particular will herald stronger basis for improvement on institutions and agencies targeting urban liveability, economic development and the enhancement of general security. For example, in many urban centres in Nigeria, proposals for the installation of security gadgets including digital surveillance equipment have always been left at the drawing table due to lack of or insufficiency of finance and possible 'infringement' on privacy. However, the efficient digitization and other necessities that are part of CAVs will greatly accelerates processes and other related matters of zero carbon urban transport like fare collection and diligent accounting. The overwhelming ability to influence the general wellbeing of urban residents as a whole as occasioned by thriving associated infrastructures like city-wide electricity power – the fulcrum of modern civilization and the driver of the Urban Century. Many aspects of modern urban road transportation have been left unattended largely due to inadequate of the adoption of innovations and the changing phenomena associated with modernity like the BRT. The suggestions made here are hinged on amicable resolution of present and potential issues to be addressed through non-stringent approaches like the involvement of community and residents' organizations that are devoid of the many ills of formal bureaucracies (Tarvainen, 2022).

Legalizing the operations of the BRTs

BRT vehicles are characterised by certain operational modalities that differentiates them from the usually city transit buses that are familiar to many people. These include its enormous size compare to the commonly available urban transit buses, the speed and designated lane are also aspects that, in many aspects, need legal backing; as there seems to be little in this regard. These activities and structural provisions for the BRTs, in many instances, predisposes them to interact differently with other vehicles and the general road users. The existing traffic rules and regulations effective in many cities might be oblivious of these and could lead to avoidable litigations if the vehicles commence operations without them.

Urban Development Policy

The formulation of Urban Development Policies (UDPs) for cities in order to accommodate BRTs and their peculiarities will bring forth the need and the formalization of needed institutionalization of the entire projects contained in the urban development programmes. The UDP document is also important as many urban areas in the country presently lack legally functional master plan, and even those that have lack adequate input for the BRTs. The end of the phenomena where hastily formed committees are fund of churning out regulations and sometimes code of conduct for present and future social and economic developments.

The establishment of functional border and border entities

Many land-related administrative entities in Nigeria are without clearly defined borders, even though there have been pressing issues demanding for such (Falade & Aribigbola, 2010; Gahman et al., 2019; Giannakis & Bruggeman, 2020; Grandi & Sellar, 2020; Grišakov, 2014). Intercity borders will help demarcate administrative and physical entities that constitute the city, establish the constituents and limits of rules and regulations operating in the different

constituting settlements that make up large cities. For the BRTs to function optimally, there is the need for the establishment of legally defined borders concerning: urban enclaves, wards, and local government areas particularly in large cities that has the potentials to attract public and private interests in the business of BRT operations and maintenance.

Border activities

Inter-border and cross-border activities are among the issues that are likely to be encountered by the operations and management of BRTs as many urban areas encompass different LGAs with increasing number of states fused together by growing urban agglomerations. For BRTs to operate efficiently in these areas, there is the need for a public physical development monitoring agency with the mandate to operate within and across the different border settlements, wards, and or LGAs. The inadequacy of a statutory body with such authority is already apparent in Lagos State and its neighbouring Ogun state, and between the nation's administrative Federal Capital Territory, Abuja and her neighbouring states of Nassarawa and Niger where social and economic interests are known to often plummet into physical aggressions with life threatening consequences (Daniel, Wapwera, Akande, Musa, & Aliyu, 2015; Ibrahim, Ibrahim, & Polytechnic, 2017; Momoh, Opaluwah, & Albeera, 2018).

States' Urban Development Board

The formation and empowerment of State Urban Development Boards (UDBs) as a government agency to effectively participate in every State's BRT project and similar schemes is a required input for success and the sustainability of the entire urban transport modernization programme. Since BRT projects goes beyond the transport ministry as it encompasses acquisition of land and properties already with government approvals and rights, it then indicates that for success to be attained UDBs as a body should head the different activities since it is amongst her mandate to spear head physical developments in urban areas of the state. However, as important as the activities of UDBs are, in many states the agency, and those associated with the BRT projects (Usman, 2021), are lacking in physical and man-power resources to effectively operate in all urban areas in the state.

Air pollution abatement plans

BRT vehicles are high-capacity machines that often pollute the immediate atmosphere and the environment due to their use of fossil fuels; and, as they get older the rate of pollution also become higher (Diallo, 2022; Fan & Beukes, 2021; Jacobsen, 2021; UITP, 2019). In order to curtail massive pollution of the urban air, there is the need to set out legal time frame for the use of the buses and the sustainable process and procedure for effective disposal. This can also be extended to other components of the vehicles, like the most effective durations for servicing the brake system even before the entire vehicle is regarded as worn-out.

The recognition of local groups as users and stakeholders of the scheme

The recognition and involvement of local community organizations and groups like residents' associations, trade unions and cultural organizations are very important to the success of public and private projects in the host community. However, many cities are yet to recognize these partners and stakeholders in policy documents as important in project formulation, execution, development and management (Dapilah, Nielsen, Lebek, & D'haen, 2021; Kawu, 2016; Malu, 2022; Mohammed, Jiman, Kawu, & Mohammed, 2019; Paul, Bee, & Budimir, 2021; Tefera, Tadesse, & Asmare, 2022). Many agencies like States' Urban Development Boards, Transport Authority, Environment Management Board, Emergency Management Board, or the ministries of Land and Environment; Transport, are yet to be empowered by the state's laws to engage with these teaming and world acclaimed partners in sustainable development (Falade & Aribigbola, 2010; Mabogunje & Briggs, 2022; Steynor et al., 2020; Tan et al., 2020). In certain areas, these resident groups and other community-based organizations are yet to be formed and or recognized by the authorities; and are in a situation that have constricted their coming to limelight. Where fully operational and engaged, the local organizations have been found to help resolve many seemingly intractable issues to institute sustainable development.

The Way Forward for Sustainable BRT Operations in Nigeria

Proactive local and regional policies on CAV infrastructure plans

Local community organizations (CBOs) are also

people-oriented avenues of development due to demonstrated ability to positively look inwards for lasting solutions, thereby exhibiting multi-stage stakeholders' attributes and presence in all aspects of global south urban development. The seemingly intractable challenges of adequate land management: acquisition, entitlements, compensations and rights, have been shown to be well handled by these local organizations. This has helped in addressing many social, cultural and environmental hurdles that have in many instances stalled developmental efforts by governments and aid agencies (Kawu, 2005, 2016; Kawu, Ahmed, & Usman, 2012; Muktari & Kawu, 2013). However, by continuously de-emphasizing these all important roles, many governments authorities in Nigeria have become deficient in devising approaches that can effectively resolve socioeconomic fall out of policy implementations. The absence of this has gave birth to lingering issues of claims of rights, local taxations, differential price regimes, and policy duplications across. These negative consequences are avoidable once existing and potential trade unions, residents and civil organizations have inclusive and participatory roles in development programmes at all levels. This can be in in addressing persistent policy issues of territorial delineations, infrastructure finance and management, and, regional empowerments. The tested approaches that have left landmark successes in many parts of the world especially in the global south—as exemplified by Grameen Bank in Pakistan (Yunus, 2008, 2009), and participatory budgeting in Brazil (Cabannes, 2004; Cabannes, Lipietz, & Cabannes, 2017).

The introduction of novel urban transport services of the BRT is new in many Nigerian and African cities. The project is likely to face many environmental and operational hindrances and obstacles in its management and overall sustainability; due to the fact that there is a lot of physical, administrative and legal issues that are yet to be reckoned with. However, with a large and increasing market populated with keen urban residents, the project has virtually all it takes to succeed. But, in order to ensure sustainable development particularly through effective and efficient resolution of all present and future hindrances, the providers and managers of the services together with government at all levels need to work with the local organization as stakeholders and partners in progress. These groups have been known as dependable players in the areas of urban development and management (Kawu, 2016; Meredith & MacDonald, 2017; Van Dijk & Blokland, 2016). In fact, the sustainability of urban projects has been shown to increase when NGOs participate, and, city resilience is also strengthened with the involvement of these partners (Akudeka et al., 2021; Brinkley & Wagner, 2022; Ibiloye et al., 2022; T. Lawanson & Okokon, 2014).

Beside the need to improve road networks in the cities that are planning for the implementation of BRTs, there is also the need for holistic improvements on all roads and linkages to the main routes where other CAVs could be. This can encourage patronage by extending access to residents living far away from the BRT facilities, and, to further serve as a shield for users of these roads by limiting access of certain vehicles to these rehabilitated access roads and streets.

Conclusion

Towns and cities in Nigeria are increasing in population and spatial extent. In response, government and urban authorities have embarked on urban renewal and the rehabilitation of road infrastructure. The provision and management of BRTs in Nigerian cities has the potential advantage of instilling urban development activities that will have multiple social and economic benefits. The formalization and strict definitions of the various aspects of urban development activities according to the different stakeholders in the city could see the light of the day. A marked reduction in air pollution and avoidable road crashes are potential advantages together with citywide boost in retail activities due to ease in traffic congestions and travel time reduction. However, present and potential advantages of the projects can only be maximised if there is the inclusive and participation of all stakeholders in the planning, execution and management of the infrastructure and facilities to be provided at all levels.

References

Abdulkadir, A. (2021*). Climate Change, Environmental Degradation and Our Common Future.* Inaugural Lecture Series 88, Federal University of Technology, Minna, Nigeria, held on the 19th August, 2021.

Adebayo, G. M., & Kawu, A. M. (2022). Bus Rapid Transit and the opportunities and challenges of sustainable urban transportation in metropolitan Kano, Nigeria. *Journal of Inclusive Cities and Built Environment*, *2*(3), 1–12. https://doi.org/10.54030/2788-564X/2022/v2s3a1

Aderibigbe, O. (2022). Adoption of Integrated Transport System for Sustainable Transport Planning and Development. *Journal of Inclusive Cities and Built Environment*, *2*(1), 41–44. https://doi.org/10.54030/2788-564X/2022/cp1v2a9

Agbiboa, D. E. (2018). Informal Urban Governance and Predatory Politics in Africa: The Role of Motor-Park Touts in Lagos. *African Affairs*, *117* (466), 62–82. https://doi.org/10.1093/afraf/adx052

Ahmad, K. A., Afolabi, S., Nda, M., & Daura, H. A. (2018). Economic Benefit of Introducing a Bus Rapid Transit (BRT) in Kano State Nigeria. In *IOP Conference Series: Earth and Environmental Science* (Vol. 140). https://doi.org/10.1088/1755-1315/140/1/012093

Ajibade, I. (2017). Can a future city enhance urban resilience and sustainability? A political ecology analysis of Eko Atlantic city, Nigeria. *International Journal of Disaster Risk Reduction*, *26* (September), 85–92. https://doi.org/10.1016/j.ijdrr.2017.09.029

Akudeka, E. K., Olayinka, N., & Adzandeh, A. (2021). Site Suitability Analysis for Landfill in Ashiyie, Ghana. *Journal of Geospatial Science and Technology*, *2*(1), 16–33. https://doi.org/10.54222/afrigist/jgst/v2i1.2

Al-Hasan, A. Z., Momoh, S., & Eboreime, L. (2015). Urban poverty and informal motorcycle transport services in a Nigerian intermediate settlement: a synthesis of operative motives and satisfaction. *Urban, Planning and Transport Research*, *3*(1), 1–18. https://doi.org/10.1080/21650020.2014.978950

Almulhim, A. I. (2025). Building Urban Resilience Through Smart City Planning : A Systematic Literature Review, 1–33.

Antonson, H., & Levin, L. (2018). A crack in the Swedish welfare façade? A review of assessing social impacts in transport infrastructure planning. *Progress in Planning*. https://doi.org/10.1016/j.progress.2018.11.001

Banks, N., Lombard, M., & Mitlin, D. (2020). Urban Informality as a Site of Critical Analysis. *The Journal of Development Studies*, *56*(2), 223–238. https://doi.org/10.1080/00220388.2019.1577384

Ben, Y., Opfer, K., & Hernandez, E. (2022). Decentralized renewable energies and the water-energy-food nexus in rural. *Environmental Challenges*, *6* (October 2021), 100432. https://doi.org/10.1016/j.envc.2021.100432

Borghetti, F., & Marchionni, G. (2023). Cross-border critical transportation infrastructure: a multi-level index for resilience assessment. *Transportation Research Procedia*, *69*(2022), 77–84. https://doi.org/10.1016/j.trpro.2023.02.147

Brinkley, C., & Wagner, J. (2022). Who Is Planning for Environmental Justice—and How? *Journal of the American Planning Association*. https://doi.org/10.1080/01944363.2022.2118155

Cabannes, Y. (2004). Participatory budgeting: a significant contribution to participatory democracy. *Environment and Urbanization*, *16*(1), 27–46. https://doi.org/10.1177/095624780401600104

Cabannes, Y., Lipietz, B., & Cabannes, P. Y. (2017). Revisiting the democratic promise of participatory budgeting in light of competing political, good governance and technocratic logics. *Environment & Urbanization*, *30*(1), 67–84. https://doi.org/10.1177/0956247817746279

Cheeseman, N., & de Gramont, D. (2017). Managing a mega-city: Learning the lessons from Lagos. *Oxford Review of Economic Policy*, *33*(3), 457–477. https://doi.org/10.1093/oxrep/grx033

Cupers, K. (2024). Anticipation by redress: Transforming African mega-infrastructure futures. *Environment and Planning D: Society and Space*. https://doi.org/10.1177/02637758241231153

Daniel, M. M., Wapwera, S. D., Akande, E. M., Musa, C. C., & Aliyu, A. A. (2015). Slum housing conditions and eradication practices in some selected Nigerian cities. *Journal of Sustainable Development*, *8*(2), 230–249. https://doi.org/10.5539/jsd.v8n2p230

Dapilah, F., Nielsen, J. Ø., Lebek, K., & D'haen, S. A. L. (2021). He who pays the piper calls the tune: Understanding collaborative governance and climate change adaptation in Northern Ghana. *Climate Risk Management*, *32*. https://doi.org/10.1016/j.crm.2021.100306

Dessie, E., Oranga, A., Lines, K., Initiative, K. D., Cook, J., Trust, C., … Somewhere, S. (2025). *Kibera Public Space Project: ACRC Urban Reform Database case study*. Manchester. Retrieved from https://african-cities-database.org/urc-record-index/KPSP/

Di Marino, M., Tomaz, E., Henriques, C., & Chavoshi, S. H. (2022). The 15-minute city concept and new working spaces: a planning perspective from Oslo and Lisbon. *European Planning Studies*. https://doi.org/10.1080/09654313.2022.2082837

Diallo, F. D. (2022). Conflicted translations : an analysis of the bus rapid transit policy adoption process in Cape Town Con fl icted translations : an analysis of the bus rapid transit policy adoption process in Cape Town. *Territory, Politics, Governance*, 1–19. https://doi.org/10.1080/21622671.2022.2099967

Dioha, M. O., Duan, L., Ruggles, T. H., Bellocchi, S., & Caldeira, K. (2022). Exploring the role of electric vehicles in Africa's energy transition: A Nigerian case study. *IScience*, *25*(3). https://doi.org/10.1016/j.isci.2022.103926

Dixon, T. J., Karuri-sebina, G., Ravetz, J., Tewdwr-jones, M., Dixon, T. J., Karuri-sebina, G., … Tewdwr-jones, M. (2022). Re-imagining the future : city-region foresight and visioning in an era of fragmented governance. *Regional Studies*. https://doi.org/10.1080/00343404.2022.2076825

Elizabeth, K., Crick, F., Atela, J., & Conway, D. (2021). Climate Risk Management What role for multi-stakeholder partnerships in adaptation to climate change ? Experiences from private sector adaptation in Kenya. *Climate Risk Management*, *32*. https://doi.org/10.1016/j.crm.2021.100319

Enright, T. E. (2013). Mass transportation in the neoliberal city: The mobilizing myths of the Grand Paris Express. *Environment and Planning A*, *45*(4), 797–813. https://doi.org/10.1068/a459

Falade, J. B., & Aribigbola, A. (2010). Rapid urban sector profiling for sustainability studies (RUSPS) in developing countries: Implications for urban planning in Ondo State, Nigeria. *Theoretical and Empirical Researches in Urban Management*, *5*(5), 82–94.

Fan, H., & Beukes, E. A. (2021). *Enhancing Financial Sustainability and Commercial Viability of Bus Rapid Transits (BRTs) in Sub-Saharan Africa (SSA): The Factor Analysis Report*. Washington: The World Bank. Retrieved from www.worldbank.org

Farvacque-Vitkovic, C., Godin, L., Leroux, H., Verdet, F., & Chavez, R. (2005). *Street addressing and the management of cities*. Washington, D. C.: World Bank. Retrieved from www.worldbank.org

Gahman, L., Hjalmarson, E., Cohen, A., Chattopadhyay, S., Rigo, E., Launius, S., … Sanatan, A. (2019). Introduction to the Special Issue: Border Imperialism. *Acme*, *18*(1), 104–106.

Gangwal, U., Siders, A. R., Horney, J., Michael, H. A., & Dong, S. (2023). Critical facility accessibility and road criticality assessment considering flood-induced partial failure. *Sustainable and Resilient Infrastructure*, *8*, 337–355. https://doi.org/10.1080/23789689.2022.2149184

Ganiyu, M. A. (2019). *Assessment of the Challenges and Opportunities of Bus Rapid Transit (BRT) Operations in Kano Metropolitan Area*. Master in Sustainable Urban Development (MSUD) Thesis, Federal University of Technology, Minna, Nigeria.

Giannakis, E., & Bruggeman, A. (2020). Regional disparities in economic resilience in the European Union across the urban–rural divide. *Regional Studies*, *54*(9), 1200–1213. https://doi.org/10.1080/00343404.2019.1698720

Grandi, B. S., & Sellar, C. (2020). Geofinance between national and firm internationalization strategies : an analysis of the Italian banking system across borders.

Grišakov, K. (2014). infrastructure Narrating the link : connecting cities and infrastructure, *9843*. https://doi.org/10.1080/20429843.2013.10796000

Haas, T., Herberg, J., & Löw-Beer, D. (2022). From carbon democracy to post-fossil capitalism? The German coal phase-out as a crossroads of sustainability politics. *Sustainability : Science, Practice, and Policy*, *18*(1), 384–399. https://doi.org/10.1080/15487733.2022.2069542

Hassan, N. I. (2016). Proposed Kano bus mass transit Bus Rapid Transit in Kano: matters arising. Retrieved 3 February 2022, from https://www.solacebase.com/2020/08/22/proposed-kano-bus-mass-transit-bus-rapid-transit-in-kano-matters-arising

Ibem, E. O. (2009). Community-led infrastructure provision in low-income urban communities in developing countries: A study on Ohafia, Nigeria. *Cities*, *26*(3), 125–132. https://doi.org/10.1016/j.cities.2009.02.001

Ibiloye, O., Decroo, T., Masquillier, C., Jwanle, P., Okonkwo, P., Van Olmen, J., … Van Belle, S. (2022). Outcomes of a community-based antiretroviral therapy programme for key populations living with HIV in Benue State, Nigeria: Protocol for a realist evaluation. *BMJ Open*, *12* (11), 1–11. https://doi.org/10.1136/bmjopen-2022-062941

Ibrahim, O. R. (2016). Condition of Walking Facilities in Public Urban Space in Nigerian Cites: The Lagos Megacity Example. *Regions Magazine*, *304*(1), 6–10. https://doi.org/10.1080/13673882.2016.11868975

Ignaccolo, M., Fazio, M., Le, S. S., Inturri, G., & Maja, R. (2023). Accessibility of railway transport in Southern Italy. The “15 - minutes station”: a case study to evaluate the pedestrian accessibility of railway transport. *Transportation Research Procedia*, *69* (2022), 536–543. https://doi.org/10.1016/j.trpro.2023.02.205

Jacobsen, M. (2021). *Assembling Bus Rapid Transit in the Global South. Translating global models, materialising infrastructure politics*. Retrieved from www.routledge.com/

Jelovac, S. R. (2013). Towards sustainable waterfront transformation: through the Mediterranean to Montenegro. *WIT Transactions on Ecology and The Environment*, *173*, 37–52. https://doi.org/10.2495/SDP130041

José, D., Neto, D. A., & Heller, L. (2016). Which is riskier : life on the floodplain or in housing imposed from above ? The case of flood-prone areas in Rio, *28*(2), 169–182. https://doi.org/10.1177/0956247815613679

Kamara, A. S., Mrozek, M., Nuah, S., Robert, N., John, M., & George, F. (2012). *Challenges of informal motorcycle transport in Liberia* (GIZ “capacity development in the transport sector/ roads in Liberia”). Eschborn, Germany.

Kåresdotter, E., Page, J., Mörtberg, U., Näsström, H., & Kalantari, Z. (2022). First Mile/Last Mile Problems in Smart and Sustainable Cities: A Case Study in Stockholm County. *Journal of Urban Technology*, *29*(2), 115–137. https://doi.org/10.1080/10630732.2022.2033949

Kawu, A. M. (2005). *Development Control in Traditional Settlements: A Case Study of Zaria City*. MSc (URP) Thesis, Ahmadu Bello University Zaria - Nigeria.

Kawu, A. M. (2016). *Assessment of Urban Development Activities of Community Based Organizations in Minna, Nigeria*. PhD (URP) Thesis, Ahmadu Bello University, Zaria.

Kawu, A. M. (2022). Case study: Autonomous vehicles in Nigerian cities: environmental and policy issues. In S. Parkes & E. Ferrari (Eds.), *Regional Studies Policy Impact Books* (4:1, 32–34). Taylor & Francis. https://doi.org/10.1080/2578711X.2022.2085920

Kawu, A. M., Ahmed, A., & Usman, A. S. (2012). Learning from Tradition: Elements and Practice of Urban Development Control in Zaria City, Nigeria. *American International Journal of Contemporary Research*, *2*(7), 205–213. Retrieved from www.aijcrnet.com

Kuffer, M., Pfeffer, K., & Sliuzas, R. (2016). Slums from space-15 years of slum mapping using remote sensing. *Remote Sensing*. MDPI AG. https://doi.org/10.3390/rs8060455

Kumar, N. (2020). *BMTC Buses in Bangalore.* https://media.licdn.com/dms/image/v2/

LAMATA. (2009). *Lagos BRT-Lite: Africa's First Bus Rapid Transit Scheme Evaluation: Summary Report*. (G. Dairo & C. Brader, Eds.). Lagos.

Lawanson, T. O., & Fadare, S. (2013). Neighbourhood differentials and environmental health interface in Lagos metropolis, Nigeria. *Habitat International*, *39*, 240–245. https://doi.org/10.1016/j.habitatint.2012.12.001

Lawanson, T., & Okokon, V. (2014). Impact Assessment Of Social Investments: A Focus On Mobil Producing Nigeria And Host Communities In Akwa Ibom, Nigeria. In S. Ogunlana, G. Idoro, M. Dada, A. Iweka, V. Ilechukwu, & W. Alade (Eds.), *Construction in Developing Countries and its Contribution to Sustainable Development.* Proceedings of International Conference, Lagos, 28th-30th Jan (786–795). University of Lagos.

Leonhardt, N., & Balme, C. B. (2024). *Developing Theatre in the Global South: Institutions, networks, experts*. London: UCL Press. https://doi.org/https://doi.org/10.14324/111.9781800085749

Liu, Y., Yang, D., Timmermans, H. J. P., & de Vries, B. (2021). Simulating the effects of redesigned street-scale built environments on access/egresspedestrian flows to metro stations. *Computational Urban Science*, *1*(1), 1–14. https://doi.org/10.1007/s43762-021-00004-z

Mabogunje, A., & Briggs, J. (2022). Professor Akin Mabogunje (1931–2022). *Scottish Geographical Journal*, 389–390. https://doi.org/10.1080/14702541.2022.2146738

Mabogunje, A. L. (2008). The Challenges of Mobility within Nigeria's Emerging Megacities. In *Integrated Transport System in Nigeria's Emerging Megacities: Issues, Challenges and Options* (1–18). Lagos Megacity Development Authority.

Makarewicz, C., & Németh, J. (2018). Are multimodal travelers more satisfied with their lives? A study of accessibility and wellbeing in the Denver, Colorado metropolitan area. *Cities*, *74*, 179–187. https://doi.org/10.1016/j.cities.2017.12.001

Malu, L. N. (2022). *Transitional Justice in West Africa. Transitional Justice in West Africa*. https://doi.org/10.4324/9781003242994

Meredith, T., & MacDonald, M. (2017). Community-supported slum-upgrading: Innovations from Kibera, Nairobi, Kenya. *Habitat International*, *60*, 1–9. https://doi.org/10.1016/j.habitatint.2016.12.003

Mohammed, M., Jiman, C., Kawu, A. M., & Mohammed, J. K. (2019). Comparative Environmental Justice Among Dutsen Kura Hausa and Dutsen Kura Gwari Neighbourhoods of Minna, Nigeria. *ATBU Journal of Environmental Technology*, *12* (1), 1–12.

Momoh, J., Opaluwah, A., & Albeera, H. (2018). Challenges Facing Nigeria's Urban Environment: The Abuja Case. *Journal of Sustainable Development in Africa*, *20*(2), 34–49.

Mora, L., Gerli, P., Ardito, L., & Messeni, A. (2023). Technovation Smart city governance from an innovation management perspective : Theoretical framing , review of current practices , and future research agenda. *Technovation*, *123*(December 2021), 102717. https://doi.org/10.1016/j.technovation.2023.102717

Mottee, L. K., Arts, J., Vanclay, F., Howitt, R., & Miller, F. (2020). Limitations of Technical Approaches to Transport Planning Practice in Two Cases: Social Issues as a Critical Component of Urban Projects. *Planning Theory and Practice*, *21*(1), 39–57. https://doi.org/10.1080/14649357.2019.1696980

Muktari, O., & Kawu, A. M. (2013). Assessment of Inter-Campus Transportation: A Case of Federal University of Technology, Minna-Nigeria. *Journal of Logistics and Transport, Nigerian Institute of Transport Technology, Zaria.*, *5*(1), 30–41.

Mukwaya, P. I., Mbabazi, J., & Ernstson, H. (2025). *Kampala: City report* (ACRC Working Paper 2025-25 No. 25). Manchester. Retrieved from www.african-cities.org

Mwau, B., & Sverdlik, A. (2020). High rises and low-quality shelter : rental housing dynamics in Mathare. *Environment & Urbanization*, *32*, 481–502. https://doi.org/10.1177/0956247820942166

Nengroo, Z. A., Bhat, M. S., & Kuchay, N. A. (2017). Measuring urban sprawl of Srinagar city, Jammu and Kashmir, India. *Journal of Urban Management*, *6*(2), 45–55. https://doi.org/10.1016/j.jum.2017.08.001

Newton, P. W. (2012). Liveable and Sustainable? Socio-Technical Challenges for Twenty-First-Century Cities. *Journal of Urban Technology*, *19*(1), 81–102. https://doi.org/10.1080/10630732.2012.626703

Nwannekanma, B., & Daniel, E. (2021, August 16). Touts: Untamed monsters that rule Lagos roads. *The Guardian Nigeria News*, p. 12. Retrieved from https://guardian.ng/news/nigeria/touts-untamed-monsters-that-rule-lagos-roads/

Olajide, O. A., Agunbiade, M. E., & Bishi, H. B. (2018). The realities of Lagos urban development vision on livelihoods of the urban poor. *Journal of Urban Management*, *7*(1), 21–31. https://doi.org/10.1016/j.jum.2018.03.001

Olesen, K. (2019). Infrastructure imaginaries: The politics of light rail projects in the age of neoliberalism. *Urban Studies*, *57*(9), 1811–1826. https://doi.org/10.1177/0042098019853502

Olubomehin, O. O. (2012). The Development and Impact of Motorcycles as Means of Commercial Transportation in Nigeria, *2*(6), 63–69.

Patrizio, P., Sunny, N., & Mac Dowell, N. (2022). Inefficient investments as a key to narrowing regional economic imbalances. *IScience*, *25*(3). https://doi.org/10.1016/j.isci.2022.103911

Paul, J. D., Bee, E., & Budimir, M. (2021). Mobile phone technologies for disaster risk reduction. *Climate Risk Management*, *32*. https://doi.org/10.1016/j.crm.2021.100296

Pauline, J., Morse, S., & Saroj, D. (2022). Whose resilience matters ? A socio-ecological systems approach to defining and assessing disaster resilience for small islands. *Environmental Challenges*, *7*. https://doi.org/10.1016/j.envc.2022.100511

Roy, A., & Pramanick, K. (2019). Analysing progress of sustainable development goal 6 in India: Past, present, and future. *Journal of Environmental Management*, *232*, 1049–1065. https://doi.org/10.1016/j.jenvman.2018.11.060

Sachs, J. D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N., & Rockström, J. (2019). Six Transformations to achieve the Sustainable Development Goals. *Nature Sustainability*, *2*(9), 805–814. https://doi.org/10.1038/s41893-019-0352-9

Santos, J. R., Safitri, N. D., Safira, M., Varghese, V., & Chikaraishi, M. (2021). Road network vulnerability and city-level characteristics: A nationwide comparative analysis of Japanese cities. *Environment and Planning B: Urban Analytics and City Science*, *48*(5), 1091–1107. https://doi.org/10.1177/2399808321999318

Scerri, K., & Attard, M. (2023). ScienceDirect ScienceDirect Assessing perceptions of pedestrian-focused intervention in a car- dependent European island. *Transportation Research Procedia*, *69*, 29–36. https://doi.org/10.1016/j.trpro.2023.02.141

Schaal, T., Mitchell, M., Scheele, B. C., Ryan, P., & Hanspach, J. (2023). Using the three horizons approach to explore pathways towards positive futures for agricultural landscapes with rich biodiversity. *Sustainability Science*. https://doi.org/10.1007/s11625-022-01275-z

Shaw, A., & Saharan, T. (2018). Urban development-induced displacement and quality of life in Kolkata, *31*(2), 597–614. https://doi.org/10.1177/0956247818816891

Shehu, A., Kawu, A., & Ismail, G. (2023). Assessment of Parking Space Management of Federal Capital City, Abuja. *International Journal of Research Publications*, *125*(1), 860–878. https://doi.org/10.47119/IJRP1001251520234943

Steynor, A., Leighton, M., Kavonic, J., Abrahams, W., Magole, L., Kaunda, S., & Mubaya, C. P. (2020). Learning from climate change perceptions in southern African cities. *Climate Risk Management*, *27*. https://doi.org/10.1016/j.crm.2019.100202

Tall, A., Patt, A. G., & Fritz, S. (2013). Reducing vulnerability to hydro-meteorological extremes in Africa . A qualitative assessment of national climate disaster management policies : Accounting for heterogeneity. *Weather and Climate Extremes*, *1*, 4–16. https://doi.org/10.1016/j.wace.2013.07.007

Tan, P. Y., Zhang, J., Masoudi, M., Alemu, J. B., Edwards, P. J., Grêt-Regamey, A., … Wong, L. W. (2020). A conceptual framework to untangle the concept of urban ecosystem services. *Landscape and Urban Planning*, *200*. https://doi.org/10.1016/j.landurbplan.2020.103837

Tanko, A. I. (2016). Urban energy challenges in sub-Saharan Africa. *Current Opinion in Environmental Sustainability*, *20*, 80–85. https://doi.org/10.1016/J.COSUST.2016.07.002

Tarvainen, A. (2022). The modern / colonial hell of innovation economy : future as a return to colonial mythologies. *Globalizations*, 1–23. https://doi.org/10.1080/14747731.2022.2048460

Tefera, S. A., Tadesse, T. B., & Asmare, G. W. (2022). Prevalence of household food insecurity in Ethiopia during the COVID-19 pandemic: Evidence from panel data. *Scientific African*, *16*, e01141. https://doi.org/10.1016/j.sciaf.2022.e01141

Tibaijuka, A. K. (2009). *Building prosperityn the centrality of housing in economic development*. Earthscan.

Tinubu, F. (2019). Commercial motorcyclists on BRT lane cause collision. Retrieved 3 February 2022, from https://phenomenal.com.ng/2019/09/commercial-motorcyclists-on-brt-lane-cause-collision

UITP. (2019). *Transforming Cities with Bus Rapid Transit (BRT) Systems: How to Integrate BRT?* Brussels. Retrieved from www.uitp.org

Ukpata, J. O., & Etika, A. a. (2012). Traffic Congestion in Major Cities of Nigeria. *Journal of Engineering and Technology*, *2*(8), 1433–1438.

Umaru, I. G. (2013). Commercial Motorcycle Activity, Value Creation and the Environment in the Developing World: The Case of Nasarawa State, Nigeria. *International Journal of Social Science Research*, *1*(1), 122–139. https://doi.org/10.5296/ijssr.v1i1.4034

Uwadiegwu, B. O. (2013). Factors Responsible for Traffic Congestion in Nigeria: A Case Study of Mayor Bus Stop and Coal Camp Along Agbani Road in Enugu City, Nigeria. *Journal of Environment and Earth Science*, *3*(3), 71–79.

Van Dijk, M. P., & Blokland, M. W. (2016). Introduction and reflection on benchmarking for the delivery of water and sanitation services to the urban poor. *International Journal of Water*, *10*(2–3), 109–121. https://doi.org/10.1504/IJW.2016.075563

Vuchic, V. R. (2005). *Urban transitn operations, planning and economics*. J. Wiley & Sons.

Wang, B., de Jong, M., Van Bueren, E., Ersoy, A., & Chen, Y. (2021). Unravelling Decision-Making Processes on Location Choices for High-Speed Railway Stations in China: A Comparison of Shenzhen, Lanzhou and Jingmen. *Planning Theory and Practice*, *22*(3), 433–454. https://doi.org/10.1080/14649357.2021.1933578

Wang, X., Zhao, C., Müller, C., Wang, C., Ciais, P., Janssens, I., … Piao, S. (2020). Emergent constraint on crop yield response to warmer temperature from field experiments. *Nature Sustainability*, *3*(11), 908–916. https://doi.org/10.1038/s41893-020-0569-7

Xydis, G., & Nanaki, E. (2015). Wind Energy Based Electric Vehicle Charging Stations Sitting. A GIS/Wind Resource Assessment Approach. *Challenges*, *6*(2), 258–270. https://doi.org/10.3390/challe6020258

Young, J. C., Alexander, J. S., Bijoor, A., Sharma, D., Dutta, A., Agvaantseren, B., … Mishra, C. (2021). Community -Based Conservation for the Sustainable Management of Conservation Conflicts : Learning from Practitioners.

Yunus, M. (2008). Creating A World Without Poverty: Social Business And The Future Of Capitalism. *Global Urban Development*, *4*(2), 1–19.

Yunus, M. (2009). BOOK REVIEW - Creating a world without poverty: social business and the future of capitalism. *The Electronic Journal of Sustainable Development*, *1*(3), 5–7.

Zhou, J., Murphy, E., & Corcoran, J. (2020). Integrating road carrying capacity and traffic congestion into the excess commuting framework: The case of Los Angeles. *Environment and Planning B: Urban Analytics and City Science*, *47*(1), 119–137. https://doi.org/10.1177/2399808318773762