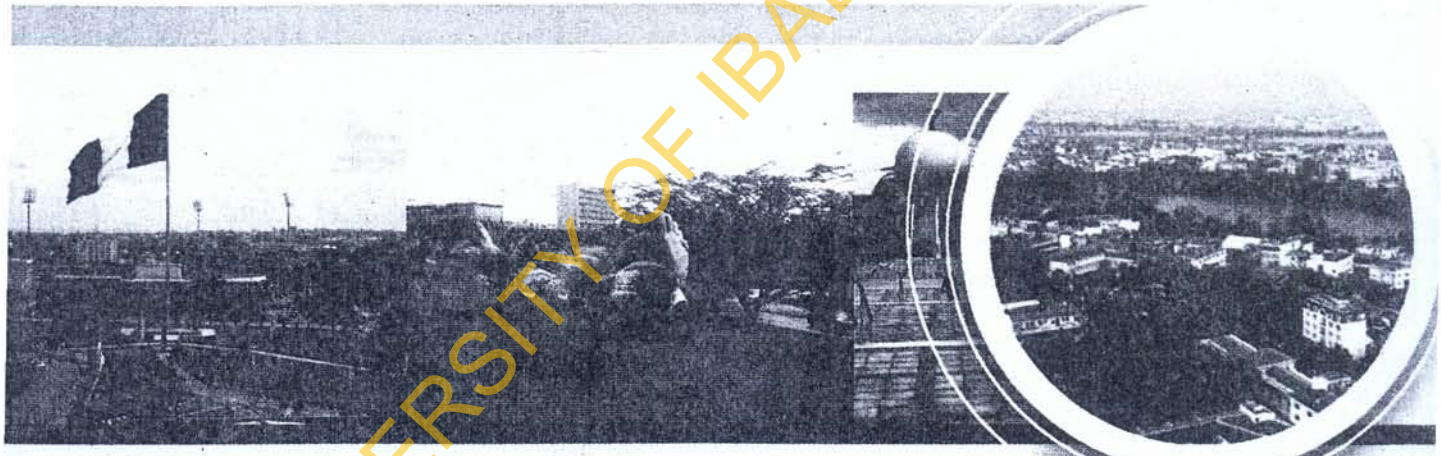
Building Clean Cities in Nigeria



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Green Transport for Nigerian Cities

Olusiyi Ipingbemi

14.1 Introduction

Half of the world's population now lives in cities and, by 2030, this figure is expected to rise to two-thirds. A total of 95 per cent of future urban growth is expected to occur in developing countries, where motorization is rising rapidly and creating major challenges (UN-Habitat, 2010). This disproportionate urban population has led to increasing need for mobility in cities resulting in increase in the length and number of trips made, as well as the volume of traffic. The environmental consequences of this increased motorization (particularly cars and motorcycles) are severe traffic congestion and worsening air pollution. The transport sector is one of the major contributors to greenhouse gas emissions (the major cause of climate change), and has the fastest growth in CO_2 emission of any sector (Yan and Crookes,

2009). It is estimated that transport produced the largest increase in global CO_2 emissions from 1970 to 2004 and was responsible for 23% of all energy-related CO_2 emissions in 2005 (IPCC, 2007). With increasing travel demand and car usage, it is projected that transport CO_2 emissions globally will grow by nearly 50% to 2030, and by more than 80% by 2050 (IEA, 2009).

Vehicle emissions have direct and deleterious impacts on human health and the physical environment. The air pollutants most immediately damaging to human health are lead, fine suspended particulate matter (for example, dust), and, in some cities, ozone. Respiratory and other diseases related to local air pollution in developing countries contribute to the premature death of more than half a million people each year, imposing an economic cost of up to 2 per cent of GDP in many countries (Gwilliam *et al.,* 2004). Globally, motorized transport emissions also contribute to the greenhouse gases responsible for climate change (Stern, 2006; IPCC, 2007).

Until the 19th century, the diameter of most cities in Nigeria did not exceed a distance that could be traversed by foot. The growth of cities owing to industrialization process as well as revolution in technology has led to urban sprawl with its negative implications. Currently, most cities in Nigeria transcend the traditional municipal boundaries and are now extended areas spanning hundreds of square kilometres and integrating previously independent villages and towns. For example, the commuting distance of Lagos increased from 20km in 1970 to 35km in 1995, while that of Kaduna increased from 6km to 10km during the same period (Ikya, 1993, as cited in Ogunbodede, 2006). In Akure, the commuting distance increased from 5.2km in 1966 to 6.4km in 1976, 10.5km in 1986; 13km in 1996 and 19km in 2006 (Ogunbodede, 2006). This has led to increasing travel (cost, time), complex congestion, air and noise pollution and parking problems. This is compounded by increasing volume of traffic, particularly cars and two stroke motorcycles at the expense of high-occupancy vehicles, resulting in inefficient use of space, congestion and traffic air pollution.

Furthermore, the continued importation of second hand or used vehicles, popularly called 'Tokunbo', and poor investment in Non-Motorized Transport (NMT), have contributed immensely to unclean and inefficient urban transportation in Nigerian cities. Green (clean) transport, therefore, provides opportunities for people to get around their communities using durable and inexpensive mobility. It also contributes to environmental sustainability, thereby improving health and quality of life. It is in the light of the above that this chapter appraises the current urban transportation in Nigeria (focusing on road transport) with a view to proposing strategies that will ensure clean (green) transport in Nigeria cities. The chapter is divided into four sections. The first caters for the introduction. Section two reviews the existing transportation in Nigerian cities, while section three focuses on strategies for enhancing and sustaining green transport in Nigeria. The conclusion is in the last section.

14.2 Urban Transport Situation in Nigerian Cities

The enormity of the existing urban transportation challenges in developing countries, particularly in Nigeria, is daunting. The increasing rate of rural-urban drift in Nigeria has created more demand for urban travel in Nigerian cities.

14.2.1 Rapid Motorization due to Urbanization

As population increases, the demand for transportation also escalates. Rapid motorization unavoidably shifts future travel from the most sustainable modes to private vehicles. State-by- state data on car ownership in Nigeria is difficult to come by but aggregate data of car ownership in the country showed that it increased from one vehicle per 1000 persons in the 1980s to 31 vehicles per 1000 persons in 2007 (Adeniji, 1987; World Bank, 2013). In Lagos, for example, there seems to be a positive relationship between population increase (urbanization) and vehicle registration, as shown in Table 14.1. For instance, an increase in population from more than 7 million to 10

million plus between 2006 and 2011 led to an increase in vehicle registration from over 360,000 to more than 1 million between the periods. In other words, as population increased, more vehicles were purchased and put on the road for use. Furthermore, the plethora and diverse nature of urban transportation in Nigeria is aesthetically intrusive.

Table 14.1: Trend of Population and Vehicle Registration in Lagos State

Year	Population	Vehicle Registration
2002	7,884,203	341027
2003	8,119,153	261893
2004	8,361,103	240138
2005	8,610,264	275095
2006	9,113,605	365499
2007	9,405,240	657353
2008	9,706,208	795143
2009	10,016,807	885612
2010	10,337,345	1041751
2011	10,668,139	1114429

Sources: Lagos State Motor Vehicle Statistics, (2012);
NBS (2005; 2009; 2010; 2012)

14.2.2 Poor Coordination between Land Use and Transportation

In most Nigerian cities, transportation and land use policies are frequently considered separately, which results in the inefficient use of resources and higher environmental damage. For instance, owing to a prevailing lack of coordination, construction of new transport infrastructure often disrupts neighbourhoods and results in the relocation of urban residents to the periphery, increasing their travel distances and expenditure on transport. Residents of low-income neighbourhoods are especially prone to displacement and more vulnerable to changes in their mobility patterns. Similarly, zoning arrangement that separates uses, especially residential areas from employment locations, increases trip length and travel times. It

imposes economic burdens on the poor, many of whom reside on the urban periphery. The poor would have to devote disproportionate shares of their income to public transport fares and endure long journeys. Poor land use and transport integration contributes to traffic congestion, air pollution, decreasing economic productivity and competitiveness, loss of quality of life, and ultimately resulting in dysfunctional city.

14.2.3 Increased Congestion

Inadequate road space is another contributory factor to urban traffic congestion and air pollution. The less than ten per cent of land space devoted to all forms of road rights of way in the major cities in Nigeria (with the exception of Abuja) falls short of design requirements of between 25-30% of total land space (UNHABITAT, 2013). This contrasts with 15 to 20 percent in many rapidly emerging economies (e.g., Seoul and São Paulo), 20 to 25 percent in much of continental Europe (e.g., London and Paris), and 30 percent or more in America's largest automobile-oriented cities (e.g., Houston and Atlanta) (Cervero, 2013). Even if the proportion of the space devoted to movement in an already highly congested city or megacity is low, that does not mean that it can escape its problems simply by building more roads. Once the city fabric is established, it becomes increasingly expensive, and socially as well as environmentally disturbing to superimpose substantial additional road infrastructure. Moreover, where congestion is already suppressing demand, increasing capacity may simply generate such a large amount of extra traffic that the congestion reduction effects are much less than anticipated. Thus, it is not simply the amount of space devoted to roads but more complex considerations of the overall structure of the urban transport system that matters.

Also, narrow and poor road synchronization contributes to road congestion in Nigeria. In many cities, roads tend to be narrow and poorly built. As cities grow in an ad-hoc manner, no provision is made

towards scaling road capacities, eventually resulting into several bottleneck roads, which remain congested for extended periods of time. Also, poor road hierarchy (from local streets to distributor-collectors to main arterials) hampers the efficient traffic flows. Many cities in Nigeria suffer the effects of a monocentric metropolis without any circumferential highways to divert through traffic. The city's main commercial district, largest retail market, main hospital, industrial zone, and port are all close to the centre, resulting in extreme traffic convergence (and thus congestion) especially during peak hours.

Besides undeveloped street networks and poor road synchronization, poor traffic management contributes to hellish traffic conditions in many cities in Nigeria. In most cities in Nigeria, traffic management has not been successful implemented, owing in part to wider mix of traffic, absence of adequate planning and implementation skills and the low status accorded traffic management within city bureaucracies. Even where facilities exist, institutional weaknesses have limited their effectiveness.

Furthermore, drivers' behaviour contributes to recurring traffic congestion in Nigerian cities. Drivers often are not trained sufficiently to follow lane discipline. The impact of poor lane discipline, especially at traffic junctions, deteriorates the already overcrowded junction situation. Furthermore, drivers frequently disobey traffic regulations and block intersections, causing further traffic congestion. It is a common knowledge that drivers, particularly commercial motorcycle riders, violate almost all traffic rules and regulations because they are always in haste to get to their destinations. These problems are compounded by the fact that traffic law enforcement is poor, thereby providing no incentive for drivers to follow the rules. Similarly, the spillover of street hawkers and other vendors of the informal economy onto overcrowded streets along with the concentration of informal markets near major intersections and bus depots create bottlenecks. Pirie (2011) observes that, in most cities in sub-Saharan Africa, street vendors occupy around one-third of road space.

14.2.4 Vehicular Pollution

Furthermore, motorization is also marked by environmental justice concerns, given the growing international trade of old second-hand vehicles from high-income to low-income countries. In many African countries, import liberalization policies from the 1990s made it easier and cheaper for households to buy second-hand vehicles shipped across the Mediterranean Sea from Europe, flooding the market (and streets) in cities like Dakar and Lagos. With the importation of used vehicles into Nigeria, there are lots of hazardous effects, including global implications for such an action. Ajayi and Dosunmu (2002) provide the trend of imported used vehicles and their environmental implications (Table 14.2). As at 2012, Nigerians imported about 300,000 used cars valued at N550 billion naira (FRN, 2014). These used vehicles pollute the air with the emission of incomplete combustion of the old engines. These pollutants include COx, NOx, SOx, aldehydes, ketones, chlorinated organic compounds, ozonides and peroxides, carbon compounds containing nitrogen such as peracetyl nitrides. CO_2 has greenhouse effects, NO_2 will oxidize to HNO_3, and SO_2 will oxidize to H_2SO_4, which falls as acid rain or mist or fog. In Lagos State for example, 43% of the air pollution comes from vehicles (Mobereola, 2013). Heavy trucks and old buses contribute substantially to vehicle emission in Nigeria.

Furthermore, the increasing number of two-wheelers as well as their operations in recent years has begun to raise environmental concerns in the country (Plate 14.1). Although study on their contribution to air pollution is rare in the country, findings from a study in a proximate economy (India) indicated that 45% of particulate emissions and two-thirds of unburned hydrocarbon emissions in the transport sector are estimated to come from two- and three-wheelers powered by two-stroke engines (Gwillian, 2010). These are estimated to emit more than 10 times the amount of fine particulate matter per vehicle-km than a modern car, and only a little less than a light diesel truck (Weaver and Chan 1996).

Plate 14.1: Emission from Two Wheeler

Table 14.2: Used Vehicles Imported into Nigeria between 1988 and 2005 and their Estimated Pollutants Emission Contents

Year	Used Vehicles Imported	Emissions in grams per average mile of air pollutants			Total Emissions by used Vehicles
		NOx	CO	HC	
1988	432	1728	38880	6912	47520
1989	766	3064	68940	12256	84260
1990	1878	7512	169020	30048	206580
1991	5304	21216	477360	84864	583440
1992	10554	42216	949860	168864	1160940
1993	15140	60560	1362600	242240	1665400
1994	9551	38204	859590	152816	1050610
1995	15130	60520	1361700	242080	1664300
1996	21551	86204	1939590	344816	2370610
1997	26568	106272	2391120	425088	2922480
1998	22732	90928	2045880	363712	2500520
1999	27730	110920	2495700	443680	3050300
2000	30388	121552	2734920	486208	3342680
2001	33046	132184	2974140	528736	3635060
2002	350704	142816	3213360	571264	3927440
2003	38362	153448	3452580	613792	4219820
2004	41020	164080	3691800	656320	4512200
2005	43678	174712	3931020	698848	4804580

Source: Adapted from Ajayi and Dosunmu (2002) NOx (Nitrogen Oxides), CO (Carbon Monoxide) and HC (Hydrocarbon)

Note: 2001-2005 are projections.

14.3 Way Forward

Nigerian cities are in urgent need of a new paradigm for envisioning and implementing sustainable transport. While current road transport systems have served as an engine of tremendous economic growth, they have also incurred huge costs in air pollution, emissions of greenhouse gases, injuries and fatalities from road crashes, lost productivity from congestion and, in some cases, the severance of communities. Such problems will be further exacerbated with the future anticipated in vehicle fleet in Nigeria unless strategies for cleaner, safer and more efficient transport systems are established.

a. Investing in Non-Motorized Transport (NMT)

In Nigeria, the majority of trips are still made by walking. About 40% of Lagosians amounting to about 5 million people walk on daily basis (UITP, 2010). It is believed that the same is true in many other Nigerian cities. However, providing precise figures of pedestrians on a comprehensive basis is difficult since non-motorized trips are often not counted in official census surveys. Walking and cycling has frequently had a negative connotation since both are often associated with poverty rather than being seen as an indicator of progress and efficiency. As a result, these environmentally-benign modes of transport are often neglected in the planning, design and modernization of either new or existing urban transport infrastructure investments. In order to achieve green transport in cities in Nigeria, government and other stakeholders must invest heavily in Non-Motorized Transport (NMT). For instance, in 2001, the then Transport Minister, Chief Ojo Maduekwe, attempted to introduce cycling in Nigerian major cities but the campaign was botched owing to concerns over the safety of the Nigerian roads for bicycle riding and the recklessness of drivers. As Madueke tried to promote cycling without the necessary infrastructure, in June 2001, he was hit by a bus and fell into a ditch while cycling to a cabinet meeting. Even after the accident,

he maintained that Nigerians should embrace cycling as a partial solution to the growing gridlock in many cities in Nigeria. Since then, the successive governments have not looked into its viability.

Promoting Non-Motorized Transport (NMT) implies establishing connected walking networks and bicycles facilities as well as providing safe crosswalks (at grade and grade separated). Apart from Lagos, in the whole south-western Nigeria, no city can boast of a functional grade separated crosswalk. Where walkways are provided, they serve as part of road furniture and not necessarily to serve the needs of pedestrians. It is, therefore, not surprising that there is provision for street lights for vehicles (placed at the centre of the reserve) at the expense of pedestrians who use sidewalks. Also, urban design must make provision for cycle parks so as to avoid the chaotic and unorganized parking currently experienced with motorcycle operation in the country.

Also, NMT facilities must accommodate people with disabilities and other special needs and address security concerns for pedestrians and cyclists. Environments designed with more street lighting and a mixture of land uses that generates foot traffic throughout the day is likely to decrease the risk of crime to pedestrians. Well-designed streetscapes with destinations close by tend to draw city residents of all backgrounds to sidewalks and public spaces, creating the kind of natural surveillance and 'eyes on the street' championed by Jacobs (1961). Design features, like smaller city blocks, can also encourage foot travel in Nigerian cities. In Ahmedabad (India), only 13 per cent of trips made by those living in a neighbourhood with an average block size of 4 hectares were by foot, compared to 36 percent for an otherwise similar neighbourhood with much smaller average block sizes of 1.2 hectares (Swamy *et al.*, 2012).

In some developed and transition economies, more attention is now giving to NMT at the expense of motorized traffic. Highways are gradually giving way to green transport. In a publication titled *The Life*

and Death of Urban Highways by the Institute for Transportation and Development Policy (ITDP) (2012), it is indicated that in Cheonggyecheon (Seoul), the removal of the highway and the development greenways along the corridor decreased air and noise pollution and traffic. Also, in Bogotá (Colombia), a 45-kilometre greenway connects low-income neighbourhoods to the downtown, and includes a mass-transit system that revolutionized bus rapid transit and carries 1.8 million people, and over 300 kilometres of bike lanes.

In a nutshell, every urban transportation design must make provision for both pedestrians and cycling facilities. Making provisions for NMT in road infrastructure reduces emissions of air pollutants and greenhouse gases (GHGs), protects all road users by allocating space to different modes according to speed, and increases affordable access to vital services and other transport modes, in particular public transport. In all, investments in NMT infrastructure are cost-efficient, pro- poor and environment-friendly.

b. Investing in High Occupancy Vehicles

High occupancy vehicles are vehicles that can carry large numbers of people at the same time. Therefore, investing in trains and high-capacity passenger buses is imperative. In the 1970s and 1980s, rail transport made significant contribution to both passenger and freight traffic in Nigeria. For instance, in 1980, rail moved more than 10 million passengers and over 1 million metric tonnes of goods (Adesanya, 2012). However, rail operations nosedived thereafter but several initiatives at resuscitating railway system in Nigeria are under way. For instance, the Lagos State's light rail project estimated at N160 billion is expected to be completed soon. The River State's monorail project is scheduled for completion in 2015 at a cost of about 150 billion. The Federal Government is also embarking on 186 km standard gauge rail line that connects Nigeria's Federal Capital, Abuja, with its commercial capital, Kaduna, under Private-Public Partnership arrangement with Chinese Bank. Similar efforts are also under way

with respect to light rail project in Abuja. The rail line, which is about 46 km, runs from Idu to Airport. The 25-year rolling plan to revolutionize rail transport in the country is a welcome development but it must go beyond the usual rhetoric. Government must ensure improved rail connectivity and modernization in Nigerian cities, thereby increasing rail patronage and decreasing demand for para-transit which are noted for congestion and excessive air pollution owing to poor maintenance. Current efforts in inter-city rail rehabilitation/modernization must be replicated at city level to take care of many Nigerians who want to use rail transport.

The provision of large buses for urban travel is also vital. Government at all levels, as a matter of urgency, must invest heavily in providing large buses (mass transit) for the public. At Present, some state governments are investing in this area, but they need to intensify their efforts. A step further in this direction is the emerging public transport system known as Bus Rapid Transit (BRT). This has received global approval after the successes recorded in South America. Lagos (Nigeria) is the first city in Africa to adopt this model of public transport and it has helped to reduce travel time, congestion and air pollution (Plate 2). The BRT operations in Lagos began in 2008 with a short, 22 km, corridor along a congested bottleneck and were designed to carry more than 200,000 passengers daily. After the introduction of the system, 35 per cent fewer vehicles carry the same number of passengers and fuel consumption fell by 32 per cent along the corridor, reducing the total annual output of CO_2 by 25,000 tonnes (Mobereola, 2009). Recently, a 45% reduction in GHG resulting from the use of High Occupancy Vehicles was projected by 2030 (Mobereola, 2013). The public enthusiastically adopted the system, as fares were 30 per cent cheaper than on the informal transport vehicles and passengers enjoyed a 35 per cent reduction in travel time with waiting time at bus stops cut by an average of 55 per cent and by 73 per cent at peak times. BRT has some advantages over other forms of mass transit. It is cheaper and faster to construct, and requires smaller land space. However, in terms of capacity and productivity, it can equal the best mass transit.

For instance, the TransMilenio in Bogota (full BRT) carries over 1.4 million passengers per day (GTZ, 2012). The main line carries over 45,000 people per hour with peak period of 70,000. By 2015, the system will move more than 80% of the city's approximately 7 million people. This has raised energy efficiency in Bogota while at the same time reducing congestion.

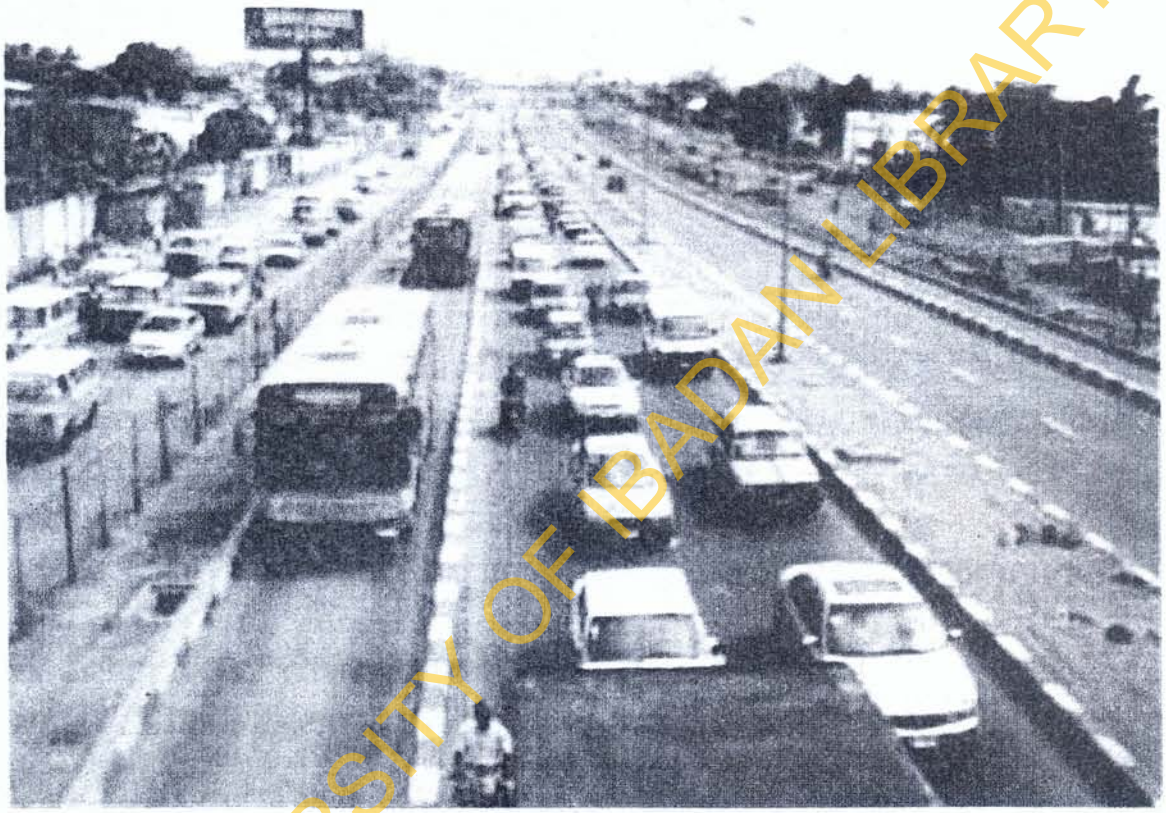

Plate 2: BRT Bus on its dedicated lane in Lagos

c. Urban Design and Land Use Integration

Researchers and practitioners have spent well over two decades debating the need for a change in the way urban transportation is planned in order to develop cleaner and more sustainable cities. Since the 1960s, transport planners have developed a strong tradition of scientific method for solving urban transport problems, using the classic deductive approach (data collection, defining goals and objectives, forecasting future demands) (Banister, 2002). This approach treats land use as a given, with no suggestion that transport planners should

advocate land use change in order to create a more effective transport system. However, viewed from a sustainability perspective, urban transport planning cannot be treated in isolation from land use and the environment without compromising the goal of sustainability (Geerlings and Stead, 2003). It is, therefore, imperative that transport and land use planning be integrated in order to reduce the need to travel by, for example creating mixed use development in close proximity to public transport and the enhancement of the urban environment to encourage walking and cycling (Banister, 1997).

Integrating urban land use design and mobility focuses on how to bring people and places together, by creating cities that focus on accessibility, rather than simply increasing the length of urban transport infrastructure or increasing the movement of people or goods. This implies a shift away from strict zoning regulations that have led to a physical separation of activities and functions, and thus, an increased need for travel. Instead, Nigerian cities should be built around the concept of 'streets,' which can serve as the focus for building liveable communities. Cities in Nigeria should embrace mixed land use, both in terms of functions (i.e. residential, commercial, manufacturing, service functions and recreational) and in terms of social composition (i.e. with neighbourhoods containing a mixture of different incomes and social groups).

Implementing land use policies that discourage sprawl and reduce unnecessary driving should be the focus of land use planning in Nigeria. Such policies should also take into consideration infilling development. This strategy found its expression in smart growth or compact city. For example, a compact city in which all the functions of the town take place in a limited area would generate shorter trips in the city. This reduction in trip distance could also trigger a switch in modes: for example, people previously using motorized modes could switch to non-motorized ones (cycling and walking).

d. Regulatory Policies

As part of the measures to achieve green transport in Nigerian cities, government must regulate the vehicle importation in the country, particularly second-hand vehicles popularly called 'Tokunbo.' The 2013 Nigerian Automotive Policy that spelt out guidelines for vehicles importation is a step in the right direction. For instance, import duties on second-hand vehicles have been reviewed upward to 67% as against 35% in order to limit the importation of used vehicles and encourage people to buy new vehicles. The policy, through incentives, is promoting the establishment of locally assembled vehicle plants. However, the federal government policy on the age of vehicle must be reviewed. The Federal Government of Nigeria has recently increased the age of vehicles to be imported to the country from 10 years to 15 years. This may be counterproductive, especially for second-hand vehicles, which are known to pollute more than new vehicles.

Similarly, it is very important that, in the light of the current events in the world environment, there is need to set emission standards for all modes of transport in the country, ranging from motorcycles to railways. Such emission standards should have a target to be achieved within a specified period. The National Environmental Standards and Regulations Enforcement Agency (NESREA), which regulates the Nigerian environment, should be saddled with the responsibility of setting and enforcing emission standards for vehicles. Other stakeholders such as the Vehicle Inspection Office (VIO) should ensure that only vehicles that are environment-friendly and comply with emission standards should be allowed to ply Nigerian roads.

Furthermore, policies that restrict the use of cars, such as congestion and parking pricing should be put in place. These regulations are very successful in developed economies, such as the UK and Singapore. Vehicle quota system and plate number scheme can also be implemented to restrict the use of cars. The plate number scheme was implemented some time ago in Lagos but was not successful. However,

it could be refined and re-introduced after sharing knowledge from other climes about the basis for the success of their own schemes.

e. Phasing out Leaded Petrol and Embracing Vehicles with More Efficient Engines

The road to cleaner transport is to phase out the addition of lead to gasoline. Although more than three-quarters of the gasoline sold worldwide today is unleaded, some very large countries, such as Indonesia and almost the whole of sub-Saharan Africa, remain to be converted. Eliminating lead additive from gasoline can also trigger wider environmental improvement, as availability of unleaded gasoline throughout a country is a prerequisite for the introduction of catalytic converters to reduce other emissions. The Nigerian government initiative titled 'Phasing-out leaded Gasoline, 2002' as a response to the World Bank Clean Air Initiative in sub-Saharan African cities in 2001 should be vigorously pursued. This is imperative in view of the destructive nature of lead consumption.

Care must be taken, however, that lead is not simply replaced by other octane enhancers which have their own adverse health impacts. Sulphur in diesel and gasoline generates emissions of SO_2, which causes acid rain and contributes directly to particulate emissions, but is particularly damaging because it renders inoperative most of the current technologies for suppressing particulate emissions. It differs from lead in being an inherent component of the basic fuel rather than an additive. While it can be reduced by hydro-treating the base fuels, it carries a far higher cost penalty. Many countries pin their hopes of improving urban air quality on the introduction of alternative fuels. For example, all taxis in Buenos Aires already operate on compressed natural gas (CNG) and the Indian High Court recently instigated a process of replacement of diesel by CNG for buses and all pre-1990 auto-rickshaws and taxis in highly polluted New Delhi (Gwillian, 2010).

f. Promoting Intelligent Transport Systems (ITS)

In relation to urban passenger travel, a major investment opportunity exists for Information Technology (IT) applications and telematics that support the provision of comprehensive alternatives to car use by providing real-time and tailored information on alternatives such as public transport or rental bikes. At the same time, the application of new technologies, such as better traffic management or more comprehensive "Intelligent Transportation Systems" can be a driver for enhancing the operational efficiency of the entire transport sector and reducing energy consumption of all forms of motorized transport. Another impetus towards greener mobility can be catalysed through promoting vehicle technologies that provide mobility that is free of local pollution impacts. If options such as electric bikes, cars, buses, trams or urban rail systems are being powered by renewable energy sources, they can account for significant positive environmental advantages both at the local and global levels. They would also be major drivers for advances in production and storage of solar energy besides providing zero or low-carbon mobility options. At present, most African countries, particularly Nigeria, are at a disadvantage in respect of introducing these modes, as the electricity supply is usually neither sustainable nor stable enough to cope with this extra demand but they are still promising options for the future.

14.4 Conclusion

Urban travel in Nigerian cities is characterized by long trips and increasing travel time and these have enormous implications for traffic congestion and air pollution. However, investing in Non-Motorized Transport (NMT) and High Occupancy Vehicles (HOV) will improve transportation in Nigerian cities by providing access to all and reducing dependence on motorized vehicles. It also has health, economic and environmental benefits. Integration of land use and transport through smart growth policy or compact city development, policies that regulate importation of second-hand vehicles and set emission

standards as well as integration of ITS into Nigerian urban transportation system will bring about clean and sustainable transport in the country. However, the transition from car-dependent to transport inclusive cities would be challenging. At the policy level, there is an urgent need to design and adapt (review) urban policies that integrate all travel modes, including using bicycles as a means of public and private transport. Further, most legal and institutional frameworks regulating urban transport and mobility are not progressive enough to enable equal attention to various modes of urban mobility. Political will and long-term planning will be critical if this is to change. Besides, efforts can also be made on advocacy and enforcement of progressive legislation to promote safe integration of two-wheelers and walking on exiting urban roads. If all these measures are taken seriously, urban transportation in Nigeria will become safe, environment-friendly and aesthetically pleasing.

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