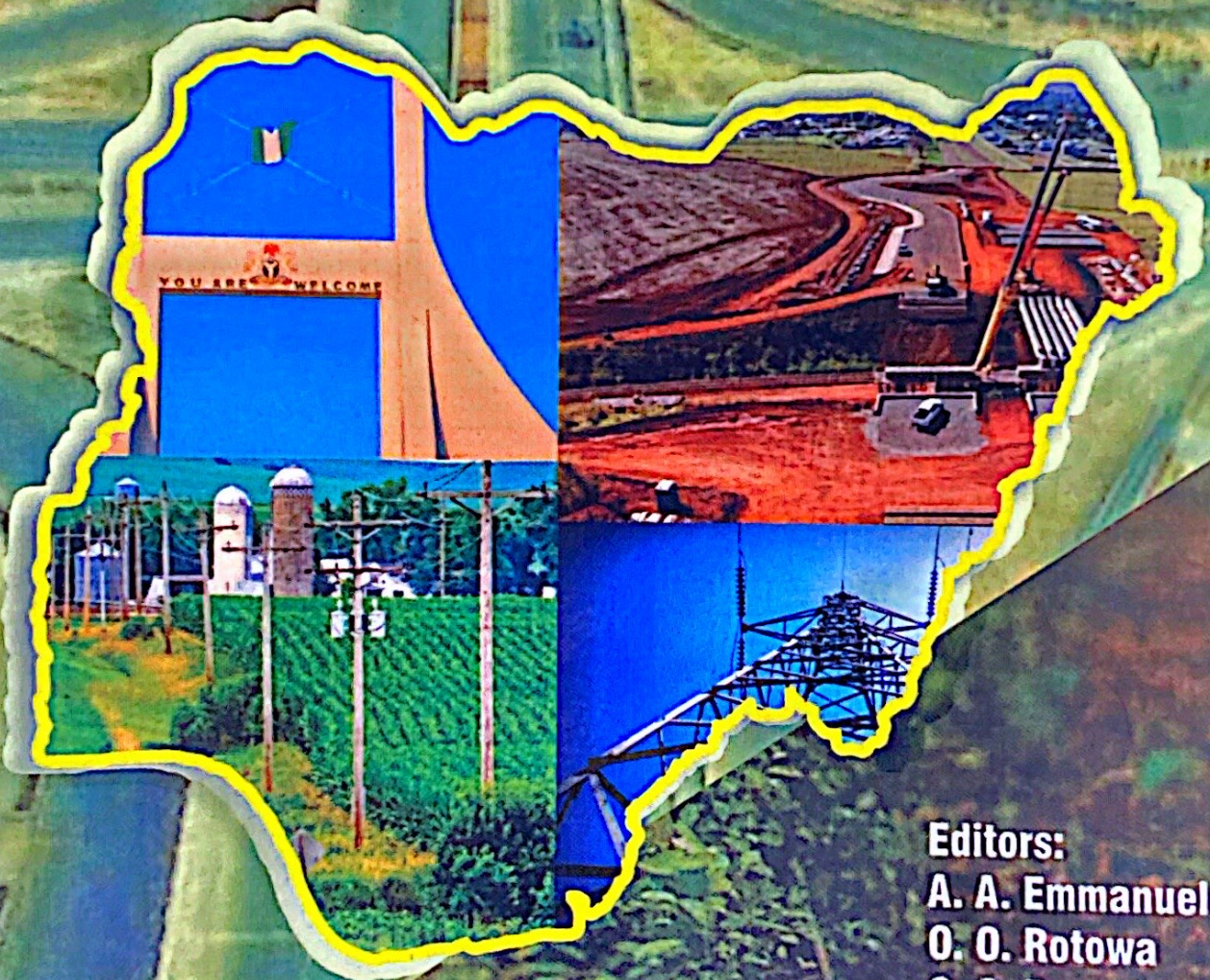
INFRASTRUCTURAL DEVELOPMENT AND PLANNING ADMINISTRATION IN NIGERIA



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PROFESSOR JULIUS AJILOWO BAYODE OLUJIMI

INFRASTRUCTURAL DEVELOPMENT AND PLANNING ADMINISTRATION IN NIGERIA

In Honour of

Professor Julius Ajilowo Bayode Olujimi

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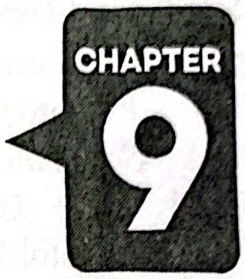
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Sustainable Urban Development and Compact City Concept: Towards an Adaptive Approach in Nigeria



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Introduction

Urbanisation is a global phenomenon. Fifty-six percent (56%) of the world's population lives in urban areas (World Bank, 2023). The trend is expected to continue, with the urban population more than doubling its current size by 2050, at which point nearly 7 of 10 people will live in cities (World Bank, 2023). Nigeria is not an exception, with 51.9% of the estimated population of 217 million in Nigeria living in urban centres as of 2020 (NBS, 2022). Although the Nigerian population is expected to double by 2050, and going by the current rate of urban population growth at over 4%, the percentage of urban dwellers would also increase accordingly, while Nigeria, China and India alone are projected to account for about 35% of the world's population growth between 2018 and 2050 (World Bank, 2023a).

Despite the rapid increase in urban population, Nigerian cities are growing without corresponding socio-economic and physical transformation (Aliyu & Amadu, 2017; Adesoye et al., 2019). The cities are, on a large scale, mainly unplanned, highly fragmented and disconnected with pantry investment in physical, social, and economic infrastructure and services (Nebo et al., 2020) and characterised by informal modes of social protection, infrastructure and service provision (Olajide et al., 2018) and dysfunctional municipal administration (Azu, 2018), to mention a few. The problems have been attributed partly to the acute shortage of financial resources with which local authorities can pursue their programmes free of interference from the higher levels of government (Azu, 2018).

The cause of malfunctioning cities, on the other hand, is the failure to plan the city growth or failure to ensure effective development control or pay close attention to land use management, as prescribed in the city

master plan (Nuhu & Bartholomew, 2020), if there is any. The failure to plan the city growth has influenced the unabated sprawling of many cities and towns with the spontaneous development of informal settlements or expansion of existing slums. The poorly managed urban growth and haphazard development of informal housing have resulted in a gradual deterioration of the urban environment and a decline in the quality of life (Muhammed & Abubakar, 2019).

It is important to note that efforts to minimise urban sprawl and contain urban growth while providing the required infrastructural facilities at minimal cost have taken centre stage in urban management discourse in Nigeria (Ujoh et al., 2010; Nnaemeka-Okeke, 2016). Some strategies, such as the sustainable city project, which incorporates the environmental planning and management approach, urban basic service and the traditional master planning approach, have been implemented. However, many Nigerian cities' continuous haphazard physical expansion has pointed to the imperatives of adopting an alternative approach to achieve sustainable urban growth. Compact city has been variously recommended as an approach that offers much promise for sprawl minimisation, urban containment and improved access to the required physical and social infrastructure within an urban environment (Nicolodi, 2005; Rajashree et al., 2012; Donald, 2017).

A compact city is an urban development approach that seeks to increase built-up area and residential population densities, intensify urban economic, social and cultural activities and manipulate urban size, form, structure and settlement systems in pursuit of the environmental, social and global sustainability benefits derived from the concentration of urban functions (Burgess, 2000). The compact city concept seeks to design buildings with relatively high intensity, mix the functions of urban areas, and base their functioning on efficient public transport (Center for Livable Communities, 2005). The idea of a compact city is a high-density, mixed-use city with clear (non-sprawling) boundaries (Kotharkar et al., 2014).

As observed by Gasidło (2017), urban sustainability objectives like reduced land use, reduced energy use, better access to facilities, social cohesion, better job opportunities, etc., are achievable by containment of urban limits, intensifying the city and increasing the urban density. Though compact development is not new in most Nigerian cities, as

traditional urban planning essentially favoured compactness, attention was never paid to city sprawling in traditional urban planning due essentially to limited population and fewer facility requirements at the time. Nevertheless, with the high urbanisation rate and complex nature of urban development, the contemporary Compact City Concept is desirable to address Nigeria's contemporary urban development problems.

A careful observation of urban planning practice in Nigeria and findings from the literature (Wapwera et al., 2015; Muhammed et al., 2015; Olajide et al., 2018) revealed that the approach is yet to be fully adopted. The non-adoption of the approach may be due to the lack of comprehension by urban planners, limited information on the benefits of the compact city approach for sustainable urban development in Nigeria or other technical or administrative challenges. Therefore, this paper seeks to examine the concept of compact city, its applicability in Nigerian cities, its strengths and weaknesses and identify the impediments to its adoption to making a solid case for its adoption and application in managing urban development in Nigeria.

The Concept and Features of Compact City

The compact city concept has its roots in the higher-density living idea of the radiant city, the utopia for a city of high-rise buildings off the ground and the fast mass transit systems of Le-Corbusier. The term 'compact city' was first coined by Dantzing and Saaty (1973), two American mathematicians whose utopian vision was primarily driven by a desire to see more efficient use of resources. Both scholars sought a rational model of city development in the context of growing urbanisation problems in the United States. The scholars' proposed model assumed the city's development as concentric zones: core, core edge, inner residential area, mid-plaza, and outer residential area. Besides the master plan to achieve compact development, attention was also drawn to the plan for the transport system or other infrastructure (Dantzing & Saaty, 1973).

Jacobs's earlier work (1961) alluded to the concept of a compact city when she critically evaluated modernist planning policies and concluded that those policies were destroying many existing inner-city communities. Jacobs also criticised the tendency, inherited from the garden city concept, towards reducing the density of dwellings in urban

areas. Jacobs, after that, mooted the idea of compact development by proposing four conditions necessary to enable the diversity essential for a functional urban centre: mixed uses, small walkable blocks, mingling of building ages and types, and "a sufficiently dense concentration of people". 'Sufficient' density would vary according to local circumstances, but generally, a hundred dwellings per acre (Jacobs,1961). The latter work of Haughton and Hunter (1994) in their exposition of the concentrated centre city model further amplified the compact city concept. From the early 1990s, scholars have consistently advocated the compactness and mixed-use concept as it is justified on an ecological and environmental basis.

Though the contemporary model of a compact city is not precisely defined and has been subject to many interpretations (Organisation for Economic Co-operation and Development (OECD, 2012), conclusions from the literature indicate a compact city as a city of short distances. Bibri et al. (2020) argued that a compact city is an urban planning and design concept promoting relatively high residential density with mixed land uses. The compact city concept is based on an efficient public transport system with an urban layout that encourages walking and cycling, low energy consumption, and reduced pollution (Westerink et al., 2013). The compact city concept refers to the urban model associated with a more densified occupation, with consequent overlapping of its uses (homes, shops and services) promoting the movement of pedestrians, cyclists and public transport users (Ogrodnik, 2020).

Compactness evokes closeness, focus, continuity and concentration (World Bank, 2023b). Houses and components of technical and social infrastructure should be close to each other and concentrate on public space, reducing distance and facilitating access to all city functions (Gasidło, 2017). A compact city concept is a city with well-connected buildings, technical and social infrastructure, and adequate accessibility to city functions (Tapper & Drilling, 2018). Yao et al. (2022) justified the compact city idea by arguing that a large resident population in a limited urban space provides opportunities for social interaction and a feeling of safety in numbers and "eyes on the street". A compact city is also arguably a more sustainable urban settlement type because it is less

dependent on the car, requiring less (and cheaper per capita) infrastructure provision (Dempsey, 2010).

Compact development typically has three forms - densification, intensification and containment. Densification denotes a resolve to increase urban density over time through different means to achieve predefined goals (Dempsey & Jenks, 2010). The densification process can typically be observed either through the increase in population and jobs (functional density) (Berghauser & Haupt, 2010) or inbuilt floor area (structural density) within a defined area (Wang et al., 2019).

Urban intensification is a development that allows for more people to connect, work and play within the existing urban boundary. Urban intensification is a conscious attempt to re-develop, expand, or re-purpose existing areas, buildings or vacant lands (Xindong & Kai, 2018). Urban containment consists of drawing a line around an urban area within which development is encouraged, often with density bonuses or minimum density requirements, to accommodate projected growth over a specified future period, typically ten to twenty years (Lambert & Meyer, 2008). Urban intensification is the process of confronting the reasonable development needs of the local region or state and facilitating them in such a manner that preserves public properties, minimises fiscal burdens and minimises adverse interactions between land uses while improving the social and equitable distribution of the benefits of the growth and enhances the quality of life (Hass-Klau, 2014).

The compact city has some captivating characteristics, in addition to its high density and mixed-use developments, such as continuous and contained urban development delimited by legible boundaries; high local and regional accessibility; different centralities; smaller infrastructure networks (water, electricity, sanitation); more significant control over government oversight (Burton, 2002; Chhetri, 2013; Liaqat, 2017; Ghisleni, 2022). Since compact cities favour using different modes through shorter trips, lowering infrastructure spending and encouraging community interaction, compact cities have been understood as more sustainable urban models (Artmann et al., 2019). For instance, the water or electricity network supplying 20 homes can cover much more. This thinking also applies to other public services such as hospitals, schools, etc., where their continuous and compact

development avoids the emergence of urban interstices such as vacant lots. Clear urban boundaries, revitalised city centres, enhanced cycling or walking, and improved quality of public spaces are also essential features of the compact city (Bibri et al., 2020).

Strengths and Weaknesses of Compact City

The compact city indeed secures a development that is environmentally sound, economically viable, and socially beneficial, especially when strategically planned and well–designed prior to its development. As such, it can be viewed as an–encompassing understanding of urban complexities and an all-embracing conception of planning practices and development strategies (Burton, 2002; Arbury, 2005; Dempsey, 2010; Brown, 2017). Compact development and public transit integration encourage people to be less reliant upon vehicles, thus reducing fossil fuel consumption and emissions, greenhouse gases, air pollution and traffic congestion (Omar et al., 2016).

Compact cities reduce sprawl by maximising land use in cities (Haiyan, 2008) and limiting the loss of green areas (Adegun et al., 2021). Limiting the loss of green and natural areas and protecting rural and agricultural land from further development are immensely beneficial to urban and peri-urban agriculture development. Limiting the loss of green areas enhances urban food security and ensures that the nutritional needs of the urbanites are met (Urban Land Institute and National Multi Housing Council, 2006; Adegun et al., 2021).

As noted by Ogrodnik (2020), brownfield sites, vacant lots, and abandoned properties often create barriers between existing districts and neighbourhoods, which often inhibits walking, cycling and other more sustainable forms of transportation that promote the use of the automobile. With careful compact development design, pedestrian-friendly districts can connect (Ogrodnik, 2020). A compact city also facilitates increased economic efficiency in delivering essential urban services (Bibri et al., 2020). It helps revitalise city centres by promoting densely built dwellings, shops, businesses, and accessible infrastructure and facilities, reducing crime and providing safety through natural surveillance (Yao et al., 2022).

A compact city creates a better quality of life through more social interaction, community spirit, and cultural vitality due to the proximity

to facilities, services, amenities, workplaces, public spaces, public transportation, and walking and cycling opportunities (Kaji, 2003). Compact cities equally support human, psychological, and physical health through ready access to open green space, neighbourhood walkability, and social contact (Lehmann, 2010).

However, the environmental benefits derivable from the compact city approach have been questioned on the ground that the anticipated energy reduction is modest compared to the discomfort inflicted by compact development. Easthope and Randolph (2009), for instance, contended that the compact city model produces high levels of noise pollution due to the proximity between dwellings, transport lines, business activities, and service facilities. The concentrated impact of dense populations on the environment and the lack of planning for noise pollution control prevent the desired outcomes of this model from being achieved. Tappert et al. (2018) opined that it is impossible to halt the urban decentralisation phenomenon suited to the majority of the population, favouring the tranquillity of rural and semi-rural areas. Thus, energy consumption, greenhouse gas emissions and the loss of open green areas in light of the escalating urbanisation trend are the central issues in the arguments of some scholars.

In a comparative assessment of compact cities to dispersed cities to determine the variation in their sustainability factors, Westernick et al. (2013) observed that the sustainability disadvantages of compact cities included higher vulnerability to disaster impacts, less personal space, less green space where people live, and higher environmental impact because of density. Rérat (2012) similarly argued that resource and design limitations limit how many people can fit into a space. Thus, while a high density may be achievable, it will likely counter the demands and expectations of residents who want more privacy and personal space.

Submissions from many studies (e.g., Breheny, 1997; Neuman, 2005; Haiyan, 2008; Shanahan et al., 2017) indicate that compact urban developments can increase land and dwelling prices, cause severe congestion in transport, and create social exclusion. It is argued that neighbourhood density might negatively impact neighbourhood satisfaction (Bramley & Power, 2009), sense of attachment, and the quality of public utilities (Dempsey et al., 2012). Breheny (1997)

empirically investigated the effects of compact policies on the population and concluded that people are unsatisfied with the–high-density development of dwellings. Dense urban areas are often responsible for increasing crime levels (de Roo & Miller, 2000).

Application of the Concept Elsewhere

Around the globe, countries experiment with compact city models. The following discussion explores three case studies. The first case study is from Australia, the second is from Belgium, and the third is from England. In 2000, Australia adopted the compact city model for all its urban planning. Urban planners adopted this development philosophy because projections showed that the growth in Australia's largest cities was expected to be high over the next decade (Bunker, 2014).

In adopting the compact city model, Australian planners set their development objectives to limit urban sprawl; promote infill, renewal, and redevelopment; increase dwelling type diversity; diversify economic activity in communities; motivate development to remain close to the economic diversity; encourage residents to use public transportation; and inspire residents to walk or cycle instead of driving cars (Artmann et al., 2019). Australia's growth patterns since 2000 have followed these objectives with positive outcomes. Fossil fuel reduction objectives are being met, and compact community members are adopting more active lifestyles, enhancing public health (Bunker, 2014). The Australian experience suggests that compact city planners can meet their objectives by planning to make urban communities self-sustaining.

Belgium adopted two different development models in its urban planning, including the New Urbanism and Compact City models. Both models promote dense populations with many open green spaces and proximity to shopping and work options (Boussauw et al., 2012). The closer the proximity is within a community, the more likely people are to walk or cycle instead of driving (Marcotullio, 2017). This shows that compact city models can produce environmental and public health benefits if proximity is optimised and planners integrate pedestrian designs into the compact city layout.

The British Government in 1988 set up an urban task force, producing a report titled "Towards an Urban Renaissance". The report Influenced by

this report, the UK Government issued Planning Policy Guidance on Housing, which introduced a 60% brownfield target, a minimum net residential density guideline of 30 dwellings per hectare, a sequential hierarchy beginning with urban brownfield land, maximum parking guidelines replacing the previous minima, and a policy of intensification around public transport nodes. These targets were substantially exceeded over the succeeding years, with the brownfield proportion reaching 80% by 2009, with an average density of 43 dwellings per hectare (Department of Communities and Local Government, 2010).

Contemporary Nigerian Urban Spatial Structure

Rapid urbanisation has had profound consequences for the physical configuration of Nigerian cities. The present-day urban structures are transforming as new areas emerge, typically on urban peripheries or fringes, and established areas adjust to accommodate increases in urban populations (Ujoh et al., 2010; Izueke et al., 2013). The contemporary Nigerian cities are multifaceted and dynamic entities marked by the assemblage of traditional core and its residential, commercial and industrial zones with numerous new, typically suburban or peripheral areas, which arise in an array of configurations and social realities and which contain a wide range of economic functions and social activities (Muhammed et al., 2015).

Residential areas and types strongly reflect the complexity and emerging social differentiation of contemporary Nigerian urban structures. Residential urban form emerges as a symbol of social distinction (Wapwera et al., 2015). In other words, residential types correspond to each segment of society. However, these residential types are not homogenous; they encompass a wide range of diversity and complexity, as reflected in informal settlements and residential areas occupied by the middle class.

Fourchard (2003) establishes three categories of informal settlements in Nigerian cities:

1. Informal settlements are in the core areas of cities. These tend to be the oldest and largest settlements, with the lowest quality residences and the highest population density. With the presence of markets and a wide range of commercial functions, they also tend to be congested and

overcrowded. This type of settlement can be found within the pre-colonial areas of the cities.

2. Squatter settlements located at the periphery of areas originally planned to house newcomers (i.e., Sabo Gari). These areas are marked by a degree of control by urban planning authorities, and illegal squatting has only emerged to a limited extent at their edges.

3. Informal Settlements on the Periphery. These settlements have frequently appeared through unplanned urbanisation along transport infrastructure, notably roads. The development of this type of informal settlement is associated with the emergence of a new labour market, which created employment opportunities without housing provision. Densities in peripheral informal settlements vary and tend to be characterised by lower population densities than informal settlements in the inner city. In contrast to informal settlements in the inner city, the urban form is heterogeneous in pattern; thus, houses built with cement, mud or wood can all coexist within the same district. Informal settlements in the periphery tend to house newcomers in urban areas; as such, they are ethnically, professionally, socially, and religiously diverse. This type of informal settlement can be found throughout cities of all sizes, such as Sharada in Kano, Kakuri in Kaduna and Wadata in Makurdi (Onu & Onu, 2012). These settlements accommodate a wide range of low-income earners such as factory workers, semi-skilled and unskilled construction workers and petty traders engaged in small-scale businesses. They are often adjacent to industrial areas or markets.

Morakinyo et al. (2012) observed that informal settlements remain the preponderant physical form of urban areas throughout the country, and the emerging typology of informal settlements in the Nigerian urban landscape is thus marked by complexity. Not only are there various forms of informal settlements, but these forms and their characteristic features also vary from city to city. They are closely linked to development within a particular urban area (Nnaemeka-Okeke, 2016).

Complexity in urban structure is also manifested in the middle and upper classes residential areas. As cities have undergone a process of urban expansion, Government Reserved Areas (GRAs), formerly meant for the European colonial rulers and later inhabited by the Nigerian elites, have been assimilated through redevelopment, often involving

densification as housing on large plots is either converted to new residential stock or converted into commercial uses (Bloch et al., 2015). Former GRAs are now effectively coupled with newly developed lower-density residential areas on the periphery that emerge as the new suburbs of Nigerian cities.

This development is associated with the emergence of a larger middle class wanting specific residential areas to live in and to project its social values and aspirations (Bloch et al., 2015). According to Standard Bank (2014), Nigeria is leading the growth of new middle-class households on the continent. Nigeria's middle class grew by 600 per cent between 2000 and 2014, giving the country 4.1 million middle-class households; current estimate indicates that Nigeria has 8.4 million middle-class households (The Cable, 2023).

The growth of the middle class has given rise to tremendous real estate development and the appearance of what Bloch (2014) calls Africa's new suburbs in Nigeria. Whether in the form of new, purpose-built towns or satellite cities, large-scale developer-built residential estates or owner-financed and built single-family houses, the periphery of many, if not most, large and medium-sized Nigerian cities have witnessed an astonishing relative and absolute increment to their housing stock in the past decade (Nnodim, 2022).

Suburban residential development is now emblematic of the periphery of Nigerian cities and is a significant contributor to urban expansion. The urban fabric thus now consists of a collage of various types representing different histories and social realities. It is expected to find middle-class areas and informal settlements side by side. This urban form manifests social and economic differentiation in contemporary Nigeria, characterised by a strong interpenetration of diverse urban uses. With the exposition of urban form and growth factors and the challenges of urban development in Nigeria, it is imperative to examine the urban planning practice in the country and its response to the challenges, which is the thrust of the next section of the chapter.

Urban Planning Practice in Nigeria

The legal and administrative frameworks for urban planning practice in Nigeria are provided by the Urban and Regional Planning Act of 1992. The Act's main objective is to promote land use planning and

development control functions to the three-tier government structure in the country. In achieving this aim, among others, it provides for the setting up of the Commission at the federal level for dealing with federal matters, a Board to be set up at the State government level to deal with all state matters, with a Local Planning Authority to be set up in each Local Government and area council in the country (Federal Republic of Nigeria, 1992). By implication, there should be at least a Commission, 36 Boards and 774 Local Planning Authorities in the country.

The Act seeks to achieve a more liveable urban environment by giving more seriousness to the issue of development control than ever before. First, a multidisciplinary development control department with a broader power to approve or disapprove development proposals from even government agencies is needed (Oyesiku, 1997). Second, enforce various development control mechanisms and orders against erring developers (Adeleye, 2010). Third, by giving in-depth consideration to significant development proposals' environmental implications to prevent environmental degradation and decay (Oyesiku, 1997).

Thus, to achieve these objectives and ensure sustainable urban development management, the 1992 Act emphasises the preparation of various types of physical development plans, the principal among which is the urban master plan, which is to be prepared by the federal and state governments. Other plans include a national physical development plan (to be prepared by the federal government only), a regional plan (to be prepared by the federal and state governments), a sub-regional plan (to be prepared by the federal and state governments), a subject plan (to be prepared by the federal, state and local governments), a local plan (to be prepared by the state and local governments), a town plan (to be prepared by the local government only), a rural area plan (to be prepared by the local government only). The Act also highlights social inclusion in managing the urban physical environment by encouraging public participation in urban planning to promote acceptability and support for planning decisions (Federal Republic of Nigeria, 1992).

Due to the centrality of an urban master plan to the compact city development, a brief discussion of the nature and contents of the master plan shall be undertaken. The urban master plan envisages the desired form of the urban area at a future time. It is a dynamic long-term

planning document providing a conceptual layout for future growth and development. It is an instrument to work out land and infrastructure requirements for various urban uses and allocate land for various uses, leading to harmonious and sustainable distribution of activities so that urban centres are provided with a form and structure within which they can perform all their economic and social functions efficiently and effectively (World Bank, 2015).

The urban master plan also seeks to promote growth and guide towns and cities' present and future development with a perspective of 20-25 years (American Planning Association, Michigan Chapter [APAMC] 2023). An urban master plan integrates and ensures harmonious interrelationships among various urban land uses, such as housing, transportation, infrastructure, and so on, that affect people's quality of life (APAMC, 2023). It restricts ecologically sensitive areas, heritage sites, and traditionally built-up areas and gives special norms for these places (Central Michigan University, 2023). The master plan facilitates the balanced growth of a city by preventing the concentration of activity at the section of a city. It considers the even distribution of facilities for optimal performance.

According to Oyesiku (1997), a standard master plan must contain five essential elements: land use, circulation, community facilities, civic design and utilities. The land use element establishes the basic policies guiding the city's physical form and provides direction on various development, conservation, and land use compatibility issues. It describes the balancing of priorities that must take place to accommodate a multiplicity of land uses within the boundaries of an urban area. More than any other part of a master plan, this element lays out the policies through which the city will accommodate growth and change while conserving and enhancing its residential neighbourhoods, commercial districts, and other areas (Kent County Council, 2022). Because the land use element integrates the policies and objectives of all other elements, it is usually given greater weight than these elements in urban development.

The circulation element considers the transportation system's present and future uses to ensure maximum service with minimal financial and environmental costs (Central Michigan University, 2023). Provision for circulation in a master plan seeks to ensure a road pattern which will

give the least density of roads per unit area while maintaining minimum hauling distance. Keeping the density of roads to an economical minimum has initial cost advantages and future advantages in road maintenance costs and the acreage of land taken out of production (Kent County Council, 2022).

Depending on the nature of the land terrain, other modes are also considered in a master plan. The community facilities element identifies existing public facilities and evaluates future needs and proposed or planned facilities in a city (University System of Georgia, 2018). The facilities include schools, libraries, art galleries, parks, playgrounds, healthcare centres, churches, mosques, cemeteries, fire stations, police stations, neighbourhood centres and stadia.

Civic design provides the correct setting and perspective to every component necessary for urban living, making it pleasant and artistic (County of Sacramento, 2012). A conscious appreciation of the importance of placing architecture and art in a town should be attached. It is the art that 'governs the siting and appearance of every material object from the lamp standard and the sidewalk to the community centre and town hall, the parks and playgrounds necessary for the efficient functioning and progress of the modern urban community (County of Sacramento, 2012).

Civic design should take care of topography; give variety in the type and size of streets, whether arterial highway, business thoroughfare, straight or curved, or dead ends; ensure uniformity of architecture and planting within the confines of each street, permitting variation from street to street; control the placing of open places and public structures with an eye for their effect on their surroundings and each other (University System of Georgia, 2018). Utility element in a master plan ensures that a city's present and future utility needs are met. The utility elements included in a master plan are pipelines, wire conduits, stormwater management plan, water distribution networks, sewerage disposal system, telephone, gas and electricity (Kent County Council, 2022).

Urban master plan has been the principal instrument for controlling growth and ensuring sustainable urban development in Nigeria. The absence of a master plan in many cities in Nigeria has made effective

development control a challenging task for urban and regional planners. Consequently, many of these cities are growing haphazardly in every direction, depending on the strength of the pull factors in each direction of the city. Poor implementation also characterised the existing master plans where they exist, hence the plethora of physical, environmental, social, and economic challenges pervading Nigerian cities.

Compact City Concept– Application for Nigeria

As discussed earlier, there are three forms of compact development: densification, intensification and containment. Looking at the structure of Nigerian cities, higher densities are found only in the core areas, while the sprawl continues to spread outside the existing urban boundaries- encroaching on agricultural lands, resulting in more fuel consumption for transport and more per capita cost of infrastructure provision, all the three forms of compaction are much desirable.

Densification and intensification are required, especially in the cities with more potent pull effects, such as the state capitals, which serve as commercial, industrial and educational centres in addition to their administrative functions. Lagos, Ibadan, Port Harcourt, Abuja and Kano are notable for such functions. Cities with high concentrations of commercial, manufacturing and educational activities without large administrative functions, such as Onitsha, Aba, Warri, Zaria, Ife and Oyo, equally require densified and intensified developments.

To address sprawling development effectively, the cities must be adequately contained through adequate buffers. Urban planners and researchers have variously used the green belt to limit cities' growth and ensure densified and intensified development (Shanahan et al., 2017; Artmann et al., 2019). This has not been effectively used in Nigeria, where many cities do not have clear boundaries. Except for Abuja, where the provisions of the city's master plan are enforced, and the city's buffer is preserved, other cities have no well-preserved buffers. This has consequently led to uncontrolled urban incursion into agricultural land and leap-frog development of one city into another. Lagos is a classic case in this regard. It has sprawled into Ogun State in every axis of its development.

Notably, achieving a compact city does not just mean densification, intensification or containment; it also means good planning to achieve

an overall more compact urban form. This suggests that the concept can be implemented at any scale, i.e., from intensifying old city areas to planning entirely new cities. The first significant step in implementing a compact city development plan in Nigerian cities and towns is to have an effective master plan where compact city tools and concepts such as mixed-use, transit-oriented development, affordable housing and parks/recreation use and other uses that facilitate bustling economic and social engagements within a limited urban space are planned for. While many cities do not have master plans, some, primarily the federal and state capital cities such as Abuja, Lagos, Ibadan, Kaduna and Awka, have.

Second, laws and policies that encourage cluster development, high-density population and mixed-use zoning should be implemented and adequately enforced. For instance, setting a maximum limit for a building's footprint and decreasing lot sizes in single-unit housing districts will promote compact neighbourhood and vertical growth while preventing oversized tower block development (Berghauser et al., 2010; Rérat, 2012). Building adequate and necessary infrastructure to support compact development is also desirable. This includes street and highway design, water and wastewater systems and utility installations. There is a need to create an urban growth boundary that requires new development to be maintained within a specified municipal area. This will encourage the density within the designated areas.

Impediments to the Compact City Concept Application in Nigeria

- Lack of Master Plan to Guide City Development and Poor Implementation of the Existing Plan: As noted in the previous section, the availability of a master plan is desirable for the application of a compact city approach. It is instructive to note that many urban centres in the country have no physical development plans, and no serious effort is being made in this direction (Orekan & Oluyele, 2018). Therefore, physical planners have no coherent working document to work with, making planning control haphazard and inconsistent and facilitating the sprouting of buildings and informal settlements without the urban planning authorities noticing them. Where there are physical development plans, they are seldom implemented. For instance, the master plan for Ilorin, Kwara

State, prepared in 1975, got only 15% implementation at the end of the plan period (year 2000) (Al Handasah, 2021).

- It is essential to note that an attempt at implementing compact city development requires effective public engagement to guarantee public acceptance of the approach. Urban planning practice in Nigeria is lacking. Although the 1992 Act requires the planning commission, boards and authorities to ensure public participation in urban planning, this is hardly undertaken because of inadequate technical capacity, limited access to funds or lack of goodwill to engage the public meaningfully (Wapwera et al., 2015).
- The emergence of a larger middle class wanting specific residential areas to live in and project its social values and aspirations in Nigerian cities (Block et al., 2015) may impede compact development. Only the low-income class may be encouraged to occupy the compact neighbourhood. In contrast, middle-class and high-income urban residents will continue to frustrate the compact approach through massive residential developments in the urban peripheries. Thus, the goal of urban containment inherent in the compact city concept may be defeated.
- The land tenure system in Nigeria constitutes another major impediment to compact city implementation. Despite the existence of the Land Use Act of 1978, which vests land ownership in the state governors, informal land distribution within the cities is widely practised, leading to private ownership and control of small parcels of land within the city limits. Although wide variations occur from one city to another, individuals own much less land area. However, when all these small landowners are put together, collective land ownership comes to more than half of the total urban land. Private ownership of small parcels of urban land sometimes interferes with the effective control of the spatial pattern of the city. It prevents positive decisions on urban growth containment, such as the compact development approach.
- The persistent infrastructural deficit in most Nigerian cities creates an unfavourable environment for compact city development.

Conclusion and Policy Recommendations

Building sustainable cities will be a key to holding Nigeria's social and economic growth in the future. Therefore, as there is a consensus among scholars that urban form contributes to urban sustainability and reduces the ecological footprint of cities, there is a need to explore the compact city concept for its possible intervention in the restructuring and planning of Nigerian cities. It should, however, be noted that the availability of a master plan is pivotal to the application of the compact city concept. There is, therefore, the need to ensure the preparation and implementation of comprehensive master plans for cities and towns in order to monitor and control their growth and ensure a healthy, sustainable and compact development of the cities for the benefit of not only the urban dwellers but the country at large whether rural or urban. For cities with existing master plans, because the compact approach is unpopular among Nigerian urban planners and, therefore, might not have been factored into the master planning process, it is desirable to review these plans to accommodate compact development to ensure optimal use of urban space and preserve agricultural and green belts.

To create more awareness and ensure that urban planners at the national and sub-national levels (i.e., states and local governments) are adequately exposed to the concept and benefits of compact city concept in urban planning, the professional bodies – the Town Planners Registration Council (TOPREC) and the Nigerian Institute of Town Planners (NITP) – should embark on the training of urban planners in this regard through their annual Mandatory Continuous Professional Development Programme (MCPDP) and annual national conference. State chapters of NITP should complement the national efforts through regular and occasional lectures in their respective state meetings and other professional functions.

References

Adegun, O. B., Ikudayisi, A. E., Morakinyo, T. E. & Olusoga, O. O. (2021). Urban green infrastructure in Nigeria: A review. *Scientific African, 14,* 1-11.

Adesoye, T., Sridhar, M., Coker, A. & Adejumo, M. (2019). Landscaping of residential estates as a mitigation measure to reduce carbon dioxide and temperature levels in inner Ibadan City, Nigeria. *Int. J. Environ. Monit. Anal.* 7(5), 93–102.

Aliyu, A. A. & Amadu, L. (2017). Urbanisation, cities, and health: The challenges to Nigeria - A review. *Ann Afr Med., 16*(4),149-158.

APAMC (American Planning Association, Michigan Chapter) (2023). What is a Master Plan? Available at: https://www.planningmi.org/ (Accessed 13 May 2023).

Arbury, J. (2005). From urban sprawl to compact city – An analysis of urban growth management in Auckland. Master's thesis, University of Auckland. Available at: https://www.greaterauckland.org.nz/wp-content/uploads/2009/06/thesis.pdf (Accessed 26 May 2023).

Artmann, M., Kohler, M., Meinel, G., Gan, J. & Ioja, I. (2019). How smart growth and green infrastructure can mutually support each other? — A conceptual framework for compact and green cities. *Ecological Indicators*, *96*, 10–22.

Azu, V. (2018). Issues and challenges of urban governance in Africa: The Nigerian experience. *Global Journal of Political Science and Administration, 6*(2), 1–12.

Berghauser Pont, M. & Haupt, P. (2010). Space matrix: Space, density and urban form. NAi.

Bibri, S., Krogstie, J. & Kearrholm, M. (2020). Compact city planning and development: Emerging practices and strategies for achieving the goals of sustainability. *Developments in the Built Environment, 4*, 1-20.

Bloch, R. (2014). Africa's new suburbs. In: Hamel P., Keil R., (Eds.), *Suburban Governance. A Global View*. Toronto: University of Toronto Press.

Bloch, R., Fox, S., Monroy, J. & Ojo A. (2015). *Urbanisation and urban expansion in Nigeria. Urbanisation Research Nigeria* (URN) Research Report. London: ICF International.

Boussauw, K., Neutens, T. & Witlox, F. (2012). Relationship between spatial proximity and travel-to-work distance: The effect of the compact city. *Regional Studies*, *46*(6), 687–706.

Breheny, M. J. (1997). Urban compaction: feasible and acceptable? *Cities, 14*(4), 209–217.

Bunker, R. (2014). How is the compact city faring in Australia? *Planning Practice & Research*, *29*(5), 449–460.

Burgess, R. (2000). The compact city debate: A global perspective. In Jenks, M. and Burgess, R. (Eds.) *Compact Cities: Sustainable*

Urban Forms for Developing Countries. New York: Spon Press. P. 21.

Burton, E. (2002). Measuring urban compactness in UK towns and cities. *Environment and Planning B: Planning and Design, 29*, pp. 219–250.

Center for Livable Communities (2005). Compact Development for More Livable Communities. Available at: www.lgc.org/freepub/docs/community_design/focus/compact_development.pdf (Accessed 26 May 2023).

Central Michigan University (2023). Master Plan Components. Available at: https://www.cmich.edu/about/university-mission-vision-values/cmus-strategic-envisioning-process/campus-master-plan/master-plan-components (Accessed 06 June 2023).

Chhetri, P. (2013). Mapping urban residential density patterns: Compact city model in Melbourne, Australia. *City, Culture and Society, 4*, pp. 77–85.

County of Sacramento (2012). Master plan procedures and preparation guide. Available at: https://planning.saccounty.gov/PlansandProjectsIn-Progress/Documents/Growth%20Area%20Plans/MasterPlanGuidelines-01.24.12.pdf (Accessed 26 May 2023).

Dantzing, G. & Saaty, T. (1973). *Compact city: A plan for a livable urban environment.* San Francisco: W. H. Freeman & Co.

Dar Al Handasah (2021). *Ilorin city master plan: Inception report.* Ilorin: Dar Al Handasah Associates. P. 9.

de Roo, G. & Miller, D. (2000). *Compact cities and sustainable urban development: A critical assessment of policies and plans from an international perspective*. Urban Planning and Environment, Ashgate Publishing Limited, ISBN: 0754615375

Dempsey, N. (2010). Revisiting the compact city. *Built Environment, 36*(1), 4–8.

Dempsey, N. & Jenks, M. (2010). The future of the compact city. *Built Environment, 36*(1), 116–121.

Dempsey, N., Brown, C. & Bramley, G. (2012). The key to sustainable urban development in UK cities? The influence of density on social sustainability. *Progress in Planning, 77*(3), 89–141.

Department of Communities and Local Government (2010). Land Use Change Statistics (England) 2009 – provisional estimates. Wayback Machine.

Donald, B. (2017). Challenging the conceptual boundaries of the compact city paradigm in sub-Saharan Africa: Towards Southern alternatives. DPU working paper No. 187. Development Planning Unit, University College London.

Easthope, H. & Randolph, B. (2009). Governing the compact city: The challenges of apartment living in Sydney, Australia. *Housing Studies, 24*(2), 243–259.

Federal Republic of Nigeria (1992). *The Nigerian Urban and Regional Planning Decree No. 88 of 1992.* Lagos: The Federal Government Printer.

Fourchard, L. (2003). Understanding Informal Settlements: The case of Ibadan, Nigeria. Global Report on Human Settlements 2003. UN-Habitat.

Gasidło, K. (2017). Compact city in dispersion. *STUDIA REGIONALIA. Journal of the Polish Academy of Sciences, 51*, pp. 7–16.

Ghisleni, C. (2022). What are compact urban cities? Available at: https://www.archdaily.com/976666/what-are-compact-cities (Accessed 13 May 2023).

Haiyan, C. (2008). Sustainable urban form for Chinese compact cities: Challenges of a rapid urbanised economy. *Habitat International*, *32*, pp. 28–40.

Hass-Klau, C. (2014). Motorisation and footpath planning during the Third Reich. *The Pedestrian and the City,* Routledge.

Izueke, E., Madu, C., Eme, I. (2013). Urban planning problems in Nigeria: A case of Onitsha metropolis of Anambra state. *Singaporean Journal of Business Economics and Management Studies, 1*(12), pp 41-59

Jacobs, J. (1961). *The death and life of great American cities.* New York: Random House.

Kaji, H. (2003). Compact city as a sustainable urban form: Is the compact city approach appropriate as an urban development policy for cities in developing countries? *Keio: Policy Management,* Keio University.

Kent County Council (2022). The master planning process. Available at: https://www.kent.gov.uk/__data/assets/pdf_file/0003/23583/Masterplanning-for-SuDS-Part-5.pdf (Accessed 06 June 2023).

Kotharkar, R., Bahadure, P. & Sarda, N. (2014). Measuring compact urban form: A case of Nagpur City, India. *Sustainability, 6*: pp. 4246–4272.

Lambert, T. & Meyer, P. (2008). Practitioner's Corner: New and fringe residential development and emergency medical services response times in the United States. *State, 40*(2), 115–124.

Lehmann, S. (2010). *The principles of green urbanism: Transforming the city for sustainability.* London: Earthscan.

Liaqat, H. (2017). Measuring urban sustainability through compact city approach: A case study of Lahore. *Journal of Sustainable Development Studies, 10*(2), 61–81.

Marcotullio, P. (2017). *Towards sustainable cities: East Asian, North American and European perspectives on managing urban regions*. New York: Routledge.

Morakinyo, K., Ogunrayewa, M., Koleosho, B. & Adenubi, O. (2012). Urban informal settlements as spatial manifestations of urbanisation in Sub-Saharan Africa: A case study of Ajegunle informal settlement, Lagos, Nigeria. *Developing Country Studies, 2*(11).

Muhammed, S., Sabiu, N. & Khalil, M. (2015). An overview of urbanisation and its challenges on sustainable development in Nigeria. *Dutse Journal of Pure and Applied Sciences*, *1*(1), 19 – 29.

Muhammed, Z. & Abubakar, I. (2019). Improving the quality of life of urban communities in Developing Countries. In *Responsible Consumption and Production: Encyclopedia of the UN Sustainable Development Goals,* Springer, Switzerland.

Nebo, L. C., Oko, O. J. & Anyim, N. A. (2020). Urban governance: An overview. *GNOSI: An Interdisciplinary Journal of Human Theory and Practice, 3*(1), 1.

Neuman, M. (2005). The compact city fallacy. *Journal of Planning Education and Research*, *25*, pp. 11–26.

Nicolodi, C. (2005). Barcelona: The urban evolution of a compact city. Italy: Litografia Stella Roverero (Tn) Italia.

Nnaemeka-Okeke, R. (2016). Urban sprawl and sustainable city development in Nigeria. *Journal of Ecological Engineering, 17*(2), 1–11.

Nnodim, O. (2022). Housing deficit worsens amid Abuja, Lagos vacancy rates. Available at: https://punchng.com/author/onnodim/ (Accessed 6 October 2022).

Nuhu, H. T. & Bartholomew, J. L. (2020). Impacts of urban sprawl on livability in Kaduna metropolis, Nigeria. *7*(6), 334-343

OECD (2012). Compact city policies: A comparative assessment. OECD Green Growth Studies. OECD Publishing.

Ogrodnik, K. (2020). Indicators of the compact city concept – Necessary data and the possibility of application. *Architecture Civil Engineering Environment, 4*, pp. 23–36.

Olajide, A. O, Agunbiade, E. M., & Bishi, B. A. (2018). The realities of Lagos urban development vision on livelihoods of the urban poor. *Journal of Urban Management, 7*(1), 21–31.

Omar, D., Omar, K., Othman, S. & Mohd Yusoff, Z. (2016). Walkability design for urban public housing park. *Environment-Behaviour Proceedings Journal, 1*(3), 311.

Onu, V. & Onu, A. (2012). Urban residential housing and low-income earners: A study of Makurdi metropolis, Benue state, Nigeria. *European Scientific Journal, 8*(28), pp 231-246

Orekan, O. A. & Eluyele, K. P. (2018). Urban Growth Issues and Environmental Sustainability in Nigeria. *Covenant Journal of Research in the Built Environment, 6*(2), 74-87.

Oyesiku, K. (1997). *Modern Urban and Regional Planning law and administration in Nigeria.* Ibadan: Kraft Books. Pp. 97–104.

Rajashree, K., Pankaj, B. & Ashish, V. (2012). Compact City Concept: Its Relevance and Applicability for Planning of Indian Cities PLEA 2012 - 28th Conference, Opportunities, Limits & Needs Towards an environmentally responsible architecture Lima, Perú 7-9 November 2012.

Rérat, Patrick (2012). Housing, the compact city and sustainable development: Some insights from recent urban trends in Switzerland. *International Journal of Housing Policy, 12*(2), 115–136.

Shanahan, D., Cox, D., Fuller, R., Hancock, S., Lin, B., Anderson, K., Bush, R. & Gaston, K. (2017). Variation in experiences of nature across gradients of tree cover in compact and sprawling cities. *Landscape and Urban Planning, 157*, pp. 231–238.

Standard Bank. (2014). Understanding Africa's Middle Class. Insights and Strategy. July 2014.

Tappert, S., Klöti, T. & Drilling, M. (2018). Contested Urban Green Spaces in the Compact City: The (re-)negotiation of urban gardening in Swiss Cities. *Landscape and Urban Planning, 170*, 69–78.

The Cable (2023). Rescuing the Nigerian middle class.Thursday, November 9, 2023. https://www.thecable.ng/rescuing-the-nigerian-middle-class

Ujoh, F., kwabe, I. & Ifatimehin, O. (2010). Understanding urban sprawl in the Federal Capital City, Abuja: Towards sustainable urbanisation in Nigeria. *Journal of Geography and Regional Planning, 3*(5), 106-113.

University System of Georgia (2018). Master plan guidelines. Available at: https://www.usg.edu/facilities/assets/facilities/documents/2018-10-03_USG_Master_Plan_Guidelines.pdf (Accessed 11 June 2023).

Urban Land Institute (2006). Compact Development: Changing the Rules to Make It Happen, ULI Community Catalyst Report Number 6. Available at:

Wang, L., Omrani, H., Zhao, Z., Francomano, D., Li, K. and Pijanowski, B. (2019). Analysis of urban densification dynamics and future modes in southeastern Wisconsin, USA. *PLoS ONE 14*(3), 1-22.

Wapwera, S., Mallo, D. & Jiriko, G. (2015). Institutional framework and constraints in Jos Metropolis, Nigeria's urban and regional planning system. *Journal of Geography and Regional Planning, 8*(10), 244-260.

Westerink, J., Haase, D., Bauer, A., Ravetz, J., Jarrige, F. & Aalbers, C. (2013). Dealing with sustainability trade-offs of the compact city in peri-urban planning across European city regions. *European Planning Studies, 21*(4), 473–497.

World Bank (2015). Master Planning. Available at: https://urbanregeneration.worldbank.org/node/51 (Accessed 28 May 2023).

World Bank (2023a). Urban Development. Available at: https://www.worldbank.org/en/topic/urbandevelopment/overview (Accessed 06 June 2023).

World Bank (2023b). Inclusive Cities. Available at: https://www.worldbank.org/en/topic/inclusive-cities (Accessed 13 May 2023).

Xindong, A. & Kai, G. (2018). Urban intensification and the character of urban landscape: A morphological perspective. *International Journal of Architectural and Environmental Engineering,* 12: 9.

Yao, Y., Pan, H., Cui, X. & Wang, Z. (2022). Do compact cities have higher efficiencies of agglomeration economies? A dynamic panel model with compactness indicators. *Land Use Policy*, 115.