

Smart Cities Implementation: Challenges in Nigeria

Kadiri Kabir,
Big-DEAL Lab
University of the West of England,
Kabir.kadiri@uwe.ac.uk
Lukumon Oyedele,
Big-DEAL Lab
University of the West of England,
l.oyedele@uwe.ac.uk
Hakeem Owolabi,
Big-DEAL Lab
University of the West of England,
hakeem.owolabi@uwe.ac.uk
Olugbenga Akinade,
Big-DEAL Lab
University of the West of England,
olugbenga.akinade@uwe.ac.uk
Lukman Akanbi,
Big-DEAL Lab
University of the West of England,
ukman.akanbi@uwe.ac.uk
Abdul-Quayyum Gbadamosi
Big-DEAL Lab
University of the West of England,
abdul.gbadamosi@uwe.ac.uk

Abstract

A city is a large human settlement that have extensive systems for housing, transportation, sanitation, utilities, land use, and communication. Their density facilitates interaction between people, government organizations and businesses, sometimes benefiting different parties in the process. Cities have been seen as the cause of environmental degradation and resource depletion, casting an ecological footprint across the globe, far beyond their immediate regions. More often than not, cities are seen as problematic—congested, polluting, with poor housing, collapsing infrastructure, crime and poverty. Yet it is cities that drive economies and it is within them that innovations occur, and an increasing part of global output is produced. A new paradigm of city, though not fully defined concept, called the Smart cities, is gaining momentum. However, the adoption of the Smart city status for Africa and especially in the context of Nigeria portends a lot of challenges. A key issue in this part of the world is the challenge, particularly in Nigeria, where there are Planning Authorities and individuals have to abide by these regulatory codes before developing their private residences. Based on some of their challenges and many others, this study sets out to examine the feasibilities of smart city adoption in Nigeria, considering the existing structure of the planning regulation. Using a systematic review of literature, the study examines the opportunities for smart city application within the Nigerian settings.

Keywords: smart city, planning, infrastructure, ICT, global

1. Introduction

A city is a large human settlement that have extensive systems for housing, transportation, sanitation, utilities, land use, and communication. Their density facilitates interaction between people, government organizations and businesses, sometimes benefiting different parties in the process. (Cohen, and Garrett, 2010). Cities have been seen as the cause of environmental degradation and resource depletion, casting an ecological footprint across the globe, far beyond their immediate regions. More often than not, cities are seen as problematic—congested, polluting, with poor housing, collapsing infrastructure, crime and poverty. Yet it is cities that drive economies and it is within them that innovations occur and an increasing part of global output is produced (Godschalk, 2003).

In 1990 there were twenty-one states in Nigeria, with an estimated population of at least 100,000 inhabitants each of which were projected to double every fifteen years (US Library of Congress, 2013). According to statistics 43.5% of the Nigerian people lived in urban areas as at the year 2000. Now we have approximately 50% of our population living in urban cities with predictions that the urban population will hit 65% mark by the year 2020. Like what obtains in other developing countries, rapid urban growth in Nigeria has outpaced capacity of government to plan for it (Opoko, and Oluwatayo, 2014). Often, growth occurs so quickly that government officials do not have relevant statistics needed for sustainable development (Oyedepo, 2012). Another constraint has been dwindling national resources which have further been depleted by massive and uncontrolled corruption. (Babanyara, et al., 2010). Consequently, development is meagre, insufficient and not associated with the commensurate economic growth and effective redistributive measures required to alleviate poverty and create economic opportunities needed to improve living standards and quality of life of the people. (Opoko, and Oluwatayo, 2014). A crucial aspect of this is that city growth and expansion in Nigeria has been largely uncontrolled thus compounding problems in Nigeria (Mabogunje, 1990). These problems include inadequate and poor housing; slum areas; inadequate water supply; waste disposal; traffic and human congestion; high rates of unemployment and underemployment; poverty; crime and other social problems. Although studies have shown that the problem of housing is universal, it is more critical in developing countries like Nigeria because of its magnitude and lack of resources to tackle it. About 60-70% of Nigeria urban dwellers live in slums (Adelekan, 2010). Nigeria is highly vulnerable to the impact of climate change. Virtually every Nigerian city is vulnerable to natural or man-made disasters. (Joshua, et al., 2014). The poor however have greater difficulties recovering from disasters.

2. What is a smart city?

The smart city paradigm, (Trencher, 2018), is enjoying growing authority as the benchmark approach for urban development, widely promoted by governments and corporations in industrialized and emerging economies (Karvonen et al., 2019; Kitchen, 2014).

Kumar et al. (2018) noted that Wey and Hsu (2014) have argued about the new urbanism and smart growth concept to deal with city problems especially environmental, housing and citizens' well-being. European Parliament (2014) has defined smart cities as “a place where the traditional networks and services are made more efficient with the use of digital and telecommunication technologies, for the benefits of its inhabitants and businesses”. The focuses of smart cities development are improvements in citizens' life (Neirotti et al., 2014), environment efficiency, security and sustainability (Bulu, 2014; Niaros et al., 2017) with centrally controlled and monitored technological infrastructures. Giffinger et al. (2007) have defined smart governance, smart people, smart environment, smart economy, smart mobility and smart living as six major dimensions of a smart city. The smart cities would incorporate the ICTs (Kramers et al., 2014) and Internet of Things (IoT) (Elmaghraby and Losavio, 2014) embedded into most of the sector of urban development such as government functionality, city operations, services deliveries, and intelligent analytics to optimize the services, production and usability.

Ojo et al. (2014) have discussed the objectives of smart cities such as carbon reduction, improving energy efficiency, high quality living environment, green urban areas, state-of-art infrastructure and city evolution as living and innovative laboratory to compete at global standards.

The smart city transformation is a complex and multidimensional process (De Santis et al., 2014). The process of city transformation depends upon the collective integration of technological, governance, Institutional and transitional components. Smart cities can provide infrastructural and information-based services along with businesses opportunities for the economic development (King and Cotterill, 2007).

The foregoing are some of the perspectives as seen by various authors who have defined smart city, and the definition is still evolving just as the concept. However, the most comprehensive so far is the definition reported by Marsal-Llacuna, (2015) which defined a smart city based on the definitions of the ISO/TMB SAG (International Standards Organization Technical Management Board, Strategy Advisory Group), launched on January 2015 and which has been adopted by other international standardization bodies (International Electrotechnical Commission IEC, International Telecommunications Union ITU, Comité Européen de Normalisation CEN):

A smart city is one that

...dramatically increases the pace at which it improves its social economic and environmental (sustainability) outcomes, responding to challenges such as climate change, rapid population growth, and political and economic instability...

...by fundamentally improving how it engages society, how it applies collaborative leadership methods, how it works across disciplines and city systems, and how it uses data information and modern technologies

... in order to provide better services and quality of life to those in and involved with the city (residents, businesses, visitors), now and for the foreseeable future, without unfair disadvantage of others or degradation of the natural environment.

3. Existing Planning Authority Regulations

Town Planning Authority's Building Regulation is a legal document guiding development control operations in Nigeria. Development control on the other hand was initiated and later created by Nigeria Urban and Regional Planning Law No. 88 of 1992 to ensure orderly planning of cities and towns by stipulating permissible standards for all aspect of planning activities. It ensures that land is properly allotted and used in a manner that eliminates conflicts. Development control exists in order to regulate, in the public interest, the development and use of land (Ude, A. D., Umeh, T. O., Ukwunna, 2017). However, because this process is not digitalized it has become the nightmare of property development,

3.1 Challenges of making Nigerian Cities Smart

Awuah (2018) observed that the discussion of urbanization in Nigeria is usually centred around many issues, particularly the negative side of urbanization and the ineffectiveness of urban planning to tackle these issues. In Nigeria the challenge of urbanization includes urban poverty, inadequate formal land development, squatter and slum settlements, and absence of essential services (Ogbazi, 2013). These problems are associated with poor planning and ineffective government at all levels (Egbu etc 2008; Ogbazi, 2013). There is also the problem of delay and high cost of town planning approval and the registration of lands as noted by the World Bank 2014 and 2017. These delay in building plan approval for construction had resulted in people by-passing statutory approval and hence haphazard urban environment (Egbu etc 2008).

These crisis in the Nigerian urban setting is due majorly to corruption, the lack of human and material capitals and absence of harmony between the federal and state governments, local and state governments. The two major laws relating to land administration and urban planning are the Land Use Act of 1978 and the Urban and Regional Planning Act of 1992 both of which lack innovation and dynamism for sustainable urban development. Observers like Ogu (1999; 2002), and Ogbazi, (2013) argued that the laws tend to exclude the majority of urban-sector stakeholders from planning processes. Hence the formal planning processes, Chorkor, (1993); Ogbazi, (2013), is bereft of input from culture and the traditions of Nigeria.

The Local Government is full of many instances of inadequacies of land administration and planning because they do not have the mandate to apportion lands (Agunbiade and Rajabifard, 2013; Adeniyi, 2013), as the Land Use Act of 1978 converted old forms of estate into right of occupancy and vested Urban land on state governors. By this, Ikejiofor etc., (2004), existing right of occupancy has to be covered by the certificate of occupancy issued by the governor. In addition the certificate of occupancy (C of O) and the Urban and Regional Planning Act, has made the state and the local governments responsible for survey, planning and provision of infrastructure, as they have to ensure that urban land is properly surveyed, planned and serviced amidst , Adeniyi, (2013); Deininger etc, (2014), a myriad of contradictory legal frameworks. Also, UN-Habitat, (2010) and Ogun, (2010), noted that urbanization is also occurring in small towns, some of which are boundary areas which, Adams, (2016), have ambiguous jurisdiction.

The crisis of urbanization in Nigeria was exacerbated by lack of data and outdated city plans (Aribigbola, 2007) ,lack of coordination amongst planning institutions (Ogu 1999), failure to execute detailed land-use plans (Gandy, 2005; Bloch, 2014; Sawyer, 2014), absence of cutting edge technology to facilitate planning and land administration processes (Akingbade et al., 2012), lackadaisical attitude to new knowledge in the field of planning and poor urban coordination and corruption , Ogun, (2010) and Idemudia, (2012), as a result of failure of the government to utilize the huge oil income which have attracted the citizen to the urban centres that were not adequately prepared to cope with the influx leading to increased pressure on existing infrastructure. With the above scenario on ground how could the introduction of a smart city be conceived, planned and implemented?

3.2 State of infrastructure in Nigeria

The conditions of infrastructure in Nigeria has not encourage innovation and the adoption of new technology as observed by Liman (2017) who noted that adequate attention had not been giving to the development of infrastructure. With the free flow of oil money, prudent management of our resources had not prevailed, careful planning ignored, and many white-elephant projects or projects that have no relevance to social growth and development had been engaged in. In fact, this has set the tone for recklessness that we see in our public places where shoddy infrastructure that has no bearing on the people or the economic development of our federating units are put in place. The country has not taken advantages of economic boom and bust and consequently, all the infrastructure in the country have deteriorated to a very deplorable situation. This ugly trend was accentuated by our lack of maintenance culture and the cankerworm of corruption that is destroying anything in its way.

3.3 Challenges of Smart Cities

Harrison & Donnelly (2011, p. 6), stated that “the current ad hoc approaches of smart cities to the improvement of cities are reminiscent of pre-scientific medicine. They may do good, but we have little detailed understanding of why. Smart cities are a field in want of a good theoretical base”. Surely as the smart city practice become more common, the concept will eventually mature. This was the case for other concepts, for instance sustainable cities (Jabareen, 2008). However, the delay in the conceptualisation will most likely to result in inefficient policies, poor investment decisions, and not being able to properly address the urbanisation challenges in a timely and adequate manner.

Besides, the current hype around smart cities tends to be mostly technocratic, beyond speculation, there is no strong evidence to suggest that a smart city can provide genuine answers to a number of complexes problems cities face today. As underlined by Mora et al. (2017, p. 20), “the knowledge necessary to understand the process of building effective smart cities in the real-world has not yet been produced, nor the tools for supporting the actors involved in this activity”. Desired outcomes from the smart city initiatives have to be identified and articulated at the initial stage of the planning process. However, the planning process is not clearly stated in the smart city initiatives (Yigitcanlar, 2016)—for a good reason, there is no widely accepted sound smart cities framework. The messiness of outcomes is due, in part, to a lack of clarity of what are we trying to measure and plan for in the first instance.

4. Necessary conditions for smart city implementation

The conceptual variants of smart city have been identified and clarified by Nam and Pardo (2011) into three categories of core factors: technology (infrastructures of hardware and software), people (creativity, diversity, and education), and institution (governance and policy). Given the connection between the factors, a city is smart when investments in human/social capital and IT infrastructure fuel sustainable growth and enhance a quality of life, through participatory governance (Caragliu etc 2009).

The use of Information and Communication Technology (ICT) to enhance people's living within the city shows that technology is fundamental to a smart city (Hollands, 2008). A well-functioning infrastructure is absolutely necessary but not enough to become a smart city. IT infrastructure and applications are prerequisites, but without real engagement and willingness to collaborate and cooperate between public institutions, private sector, voluntary organizations, schools and citizens there is no smart city (Lindskog, 2004). In the case of the planning approval process, the whole process submission and approval of building plans can be digitalized. This presupposes that that Planning Authority will have the latest facilities to carry out these digital operations. The submission of plan must be online coupled with the payment of relevant fees online after the assessment had been done and the appropriate fees charged and communicated through email to the Architect and approval or denial can be issued online. The same procedure will apply for the Structural, Mechanical and Electrical and other service drawings. This would cut down on the bureaucracy of going back and forth to the Planning Authority office. Progress of work can be monitored by also streaming the construction process and instructions can be issued to stop or continue with the work where the appropriate procedures are not properly followed.

The availability and quality of the IT infrastructure is not the only definition of smart city (Caragliu etc 2009). Importantly, other definitions stress the role of human infrastructure, human capital and education in urban development (Boulton and Stanley , 2012). For urban development, Florida (2002) suggested 3T (tolerance, technology, and talent), of which two are germane to people and their relationship. Smart people is an important component of smart city (Giffinger and Fertner, 2007), (Giffinger, etc 2010). The smart people concept comprises various factors like affinity to lifelong learning, social and ethnic plurality, flexibility, creativity, cosmopolitanism or open-mindedness, and participation in public life. Problems associated with urban agglomerations can be solved by means of creativity, human capital, cooperation among relevant stakeholders, and their bright scientific ideas: in a nutshell, "smart solutions" (Caragliu etc 2009). The label smart city therefore points to clever solutions by creative people.

The support of government and policy for is governance fundamental to the design and implementation of smart city initiatives. This category comprises a variety of institutional factors drawing from the discussion of smart community or smart growth initiatives: not just supportive policies but also the role of government, the relationship between government agencies and non-government parties, and their governance. It is necessary to establish administrative environment (initiatives, structure, and engagement) supportive for smart city (Yigitcanlar and Velibeyoglu, 2008). To enable smart city initiatives, the category should also include integrated and transparent governance, strategic and promotional activities, networking, and partnerships (Odendaal, 2003).

4.1 The conceptual framework of smart city in Nigeria

Based on the definition by Marsal-Llacuna, (2015), the conceptual framework of Nigerian smart city should function based the eight factors proposed by Chourabi *et al.*, (2012) for a smart city. These are government, management and organization, technology, policy context, people and community, economy, built infrastructure and natural environment. Each of these factors is significant to be considered in benchmarking the extent of smart city and when assessing the smart city initiatives. In Nigeria, the people and community factor are the most paramount as they could heavily influence each of the other seven factors.

The Government is the core of smart city. It must be ICT based, Giffinger et al (2007). Its success and failure hinges on it. The government must be honest ,participatory, (Giffinger et al 2007; Odendaal 2003), accountable, (Johnston and Hansen, 2015; Mooij, 2003), transparent (Johnston and Hansen, 2015; Mooij, 2003; Nfuka, 2010), leadership (Johnston and Hansen, 2015) for all the stakeholders.

Management and organization, considering the processes in the country today would be by far the most challenging. However, this can be overcome by ensuring that it is driven by private initiatives with minimum participation by the government.

Technology: it is hoped that the IT system, with advanced analytic to help people make more intelligent decisions about alternatives and actions, supported by the latest generation of interconnected hardware, software, and network technologies that provide real-time awareness of real world in order to optimize the socio-economic life of the citizens Chourabi *et al.*, (2012). The policy context involve the institution , legal , environmental , regulatory,(Gil-García and Pardo, 2005), political and social bottlenecks that must be overcome by public administrators and other stakeholders across all the level of government in Nigeria.

The people and communities that the smart city is expected to serve must be adequately involved in every step of the process so that it can positively impact on their quality of life so that their input into the process can be more informed, educated and supportive.

The Economy of the smart city must be well integrated in the national and global market, it must be innovative, competitive, productive, flexible, trademark and entrepreneurship. This is because ,economy, Giffinger, et al, (2010), is one of the major drivers of the smart city initiatives. Built infrastructure , particularly power, and others like wireless hotspots, Wi-Fi networks, kiosks and fibre optic channels must be reliable, steady, and efficient. The human capital to operate and coordinate these facilities must also be provided for. Because of the environment, adequate security must be available

The natural environment is one of the cardinal points of smart city, that is, sustainability and optimal management of natural resources and related infrastructure such as green open spaces, sewer and waterways. The smart cities, Giffinger, et al., (2007), are expected to protect and conserve the environment.

Conclusion

The paper begins by narrating the challenges of cities which has necessitated the inevitable development of smart cities and then goes on to define a smart city as the benchmark approach for urban development as it is widely promoted by government and corporate bodies in the world. It goes on to explain the functions of the Town Planning Authority Building Regulation and later delves on the difficulties of making Nigeria cities smart such as removing the bottleneck created by the existing Land Use Act of 1978 and the Urban and Regional Planning Act of 1992 that vested the right of land ownership on the Federal and State governments and have ended up in creating barrier to development leading to the terrible state of inadequate infrastructure to catalyse the development of new initiative like smart cities. Even though the smart cities initiative is still fraught lack of consensus on its definition and conception, the smart cities are field in want of a good theoretical base in order to fully take advantage of its benefits. The paper then identifies the condition for smart city implementation such as a very strong IT base after which the conceptual framework of smart city in Nigeria was proposed. With these situations, the implementation of smart cities in Nigeria can be facilitated.

References

- Adams, P. (2016) *State(s) of crisis: sub-national governments in Nigeria*, Africa Research Institute, Briefing note 1602.
- Adeniyi, P. (2013) *Improving land sector governance in Nigeria: implementation of the Land Governance Assessment Framework. A synthesis report*. Lagos.
- Agunbiade, M. E. and Rajabifard, A. (2013) ‘Analysing of inter-agency integration for land delivery in Nigeria: data, process and policy integration’’, in *Proceedings of Global Geospatial Conference, 4–8 November*. Addis Ababa, Ethiopia,.
- Akingbade, A., Navarra, D., Zevenbergen, J. and Georgiadou, Y. (2012) ‘The impact of electronic land administration on urban housing development: the case study of the Federal Capital Territory of Nigeria’’, *Habitat International*, 36(2), pp. 324–32.
- Andrew Boulton, Stanley D., B. and L. D. (2012) *Cyberinfrastructures and “smart” world cities: Physical, human, and soft infrastructures*. 1st Edition. Edited by M. H. & F. W. P. Taylor, B. Derudder. Edward Elgar. Available at: [https://books.google.co.uk/books?hl=en&lr=&id=Xx6f66uShzQC&oi=fnd&pg=PA198&dq=Boulton,+A.,+Brunn,+S.+D.,+%26+Devriendt,+L.+\(Forthcoming\).+Cyberinfrastructures+and+“smart”+world+cities:+Physical,+human,+and+soft+infrastructures&ots=JKP7Fnow](https://books.google.co.uk/books?hl=en&lr=&id=Xx6f66uShzQC&oi=fnd&pg=PA198&dq=Boulton,+A.,+Brunn,+S.+D.,+%26+Devriendt,+L.+(Forthcoming).+Cyberinfrastructures+and+“smart”+world+cities:+Physical,+human,+and+soft+infrastructures&ots=JKP7Fnow) (Accessed: 19 December 2018).
- Aribigbola, A. (2007) ‘Urban land use planning, policies and management in Sub Saharan African countries: Empirical evidence from Akure, Nigeria’ (report presented at the 4th World Bank Urban Research Symposium), Washington, DC, June 2007.’ Washington, DC.
- Awuah, K. G. B. (2018) ‘Urban development and governance in Nigeria: challenges, opportunities and policy direction’, *International Development Planning Review*, 40(1), pp. 27–49. doi: 10.3828/idpr.2018.1.
- Bank, W. (2014) *Doing business in Nigeria 2014: understanding regulations for small and medium-size enterprises*. Washington, DC,: World Bank.
- Bank, W. (2017) *Doing business: equal opportunity for all. Economy profile: Nigeria, 2017.*, Washington, DC,: World Bank.
- Caragliu, A., Del Bo, C., & Nijkamp, P. (2009) ‘Smart cities in Europe. In Proceedings of the 3rd Central European Conference in Regional Science’, in. Košice, Slovak Republic, Oct 7-9. Available at: http://www.cers.tuke.sk/cers2009/PDF/01_03_Nijkamp.pdf.
- Chorkor, B. A. (1993) ‘External European influence and indigenous social values in urban development and planning in the Third World: the case of Ibadan, Nigeria’, *Planning Perspectives*, 8(3), p. 283–306.
- Chourabi, H. et al. (2012) ‘Understanding Smart Cities : An Integrative Framework’, *2012 45th Hawaii International Conference on System Sciences*. IEEE, pp. 2289–2297. doi: 10.1109/HICSS.2012.615.
- Deininger, K., Hilhorst, T. and Songwe, V. (2014) ‘Identifying and addressing land governance constraints to support intensification and land market operation: evidence from 10 African countries’’, *Food Policy*, 48, p. 76–87.
- Egbu, A. U., Olomolaiye, P. and Gameson, R. (2008) ‘“A neo-institutional economic critique of the system for allocating urban land and development rights in Nigeria”’, *Habitat International*, 32(1), pp. 121–135.
- Florida, R. (2002) ‘The Rise of the Creative Class: And How It’s Transforming Work, Leisure, Community and Everyday life’, *A/A Journal*. Winter 2003, 69(1), pp. 90–91. Available at:

<http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=1&sid=758c6386-7562-4a9e-b23b-ff84f6c3400f%40pdc-v-sessmgr01> (Accessed: 19 December 2018).

Gandy, M. (2005) 'Learning from Lagos', *New Left Review*, 33, p. 36–52.

Giffinger, R. and Fertner, C. (2007) 'City-ranking of European medium-sized cities', *Centre of Regional ...*, pp. 1–12. doi: 10.1021/acsami.6b00232.

Giffinger, R., Gudrun, H. and Haindlmaier, G. (2010) 'MART CITIES RANKING: AN EFFECTIVE INSTRUMENT FOR THE POSITIONING OF CITIES? ACE: Architecture, City and Environment = Arquitectura, Ciudad y Entorno [en línea SMART CITIES RANKING: AN EFFECTIVE INSTRUMENT FOR THE POSITIONING OF CITIES?]', *Año IV*, pp. 7–25. Available at: http://www-cpsv.upc.es/ace/Articles_n10/Articles_pdf/ACE_12_SA_10.pdf AccessUPCommons:<http://hdl.handle.net/2099/8550>.

Giffinger, R., Haindlmaier, G. and Kramar, H. (2010) 'The role of rankings in growing city competition', *Urban Research and Practice*, 3(3), pp. 299–312. doi: 10.1080/17535069.2010.524420.

Gil-García, J. R. and Pardo, T. A. (2005) 'E-government success factors: Mapping practical tools to theoretical foundations', *Government Information Quarterly*, 22(2), pp. 187–216. doi: 10.1016/j.giq.2005.02.001.

Hollands, R. G. (2008) 'Will the real smart city please stand up?', *City*, 12(3), pp. 303–320.

Hollands, R. G. (2008) 'Will the real smart city please stand up? Intelligent, progressive or entrepreneurial?', *City*, 12(3), pp. 303–320. doi: 10.1080/13604810802479126.

Idemudia, U. (no date) 'The resource curse and the decentralisation of oil revenue: the case of Nigeria', *Journal of Cleaner Production*, 35, pp. 183–93.

Ikejiofor, U. (1997) 'The private sector and urban housing production process in Nigeria: A study of small-scale landlords in Abuja', *Habitat International*, 21(4), pp. 409–425. doi: 10.1016/S0197-3975(97)00014-3.

Johnston, E. W. and Hansen, D. L. (2015) 'Design Lessons for Smart Governance Infrastructures * # Erik W. Johnston Derek L. Hansen', in Alan P. Balutis, Terry F. Buss, B. I. (ed.) *Transforming American Governance: Rebooting the Public Square: Rebooting the public square*. 2nd edn. London and New York: Routledge, pp. 1–30. Available at: https://s3.amazonaws.com/academia.edu.documents/30941690/Johnston_Hansen_Gov_3_0_chapter_final.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1545709909&Signature=fJRXeKGCKuHJgvQu4amow3mpvRg%3D&response-content-disposition=inline%3Bfilename%3DDesign_Les.

Karvonen, A., Cugurullo, F., Caprotti, F. (2019) *Inside Smart Cities: Place, Politics and Urban Innovation*. Eds. Routledge, London,.

Kitchen, R. (2014) 'The real-time city? Big data and smart urbanism', *GeoJournal*, 79(1), pp. 1–14. doi: <https://doi.org/10.1007/s10708-013-9516-8>.

Lindskog, H. (2004) 'Smart communities initiatives.', in *Proceedings of the 3rd ISOneWorld Conference (Las Vegas, NV, Apr 14-16)*, pp. 1–16. Available at: [http://www.heldag.com/articles/Smart communities a pril 2004.pdf](http://www.heldag.com/articles/Smart%20communities%20a%20pril%202004.pdf).

Marsal-Llacuna, M.-L. (2015) 'Measuring the Standardized Definition of " smart city ": A Proposal on Global Metrics to Set the Terms of Reference for Urban " smartness " Introduction : What ' s Smartness in the Smart City ? ', in, pp. 593–611. doi: 10.1007/978-3-319-21407-8.

Mooij, J. (2003) 'Smart Governance ? Politics in the Policy Process in Andhra Pradesh , India', (October), pp. 1–36.

Nfuka, E. N. (2010) 'Towards an Effective IT Governance in the Public Sector Organizations in a

Developing Country - A Case Study of Tanzania’.

- Odendaal, N. (2003) ‘Information and communication technology and local governance: understanding the difference between cities in developed and emerging economies’, *Computers, Environment and Urban Systems*, Pergamon, 27(6), pp. 585–607. doi: 10.1016/S0198-9715(03)00016-4.
- Ogbazi, J. U. (2013) “‘Alternative planning approaches and the Sustainable Cities Programme in Nigeria’”, *Habitat International*, 40, pp. 109–118.
- Ogu, V. I. (1999) ‘Evolutionary dynamics of urban land use planning and environmental sustainability in Nigeria’, *Planning Perspectives*, 14(4), pp. 347–68.
- Ogun, T. P. (2010) ‘Infrastructure and poverty reduction: implications for urban development in Nigeria’, *Urban Forum*, 21(13), pp. 249–66.
- Sawyer, L. (2014) ‘Piecemeal urbanisation at the peripheries of Lagos’, *African Studies*, 73(2), pp. 271–89.
- Trencher, G. (2018) ‘Towards the smart city 2.0: Empirical evidence of using smartness as a tool for tackling social challenges’, *Technological Forecasting and Social Change*. Elsevier, (July), pp. 0–1. doi: 10.1016/j.techfore.2018.07.033.
- Ude, A. D. , Umeh, T. O., Ukwunna, C. (2017) ‘Town Planning Authority Building Regulations and Compliance Challenges in Nigeria a Case Study Imo State’, (April 2017).
- UN-Habitat (2010) *The state of African cities 2010: governance, inequality and urban land markets*. London: Earthscan.
- Yigitcanlar, T. and Velibeyoglu, K. (2008) ‘Knowledge-Based Urban Development: The Local Economic Development Path of Brisbane, Australia’, *Local Economy: The Journal of the Local Economy Policy Unit*. SAGE PublicationsSage UK: London, England, 23(3), pp. 195–207. doi: 10.1080/02690940802197358.
- Godschalk, D.R., 2003. Urban hazard mitigation: creating resilient cities. *Natural hazards review*, 4(3), pp.136-143.
- Cohen, M.J. and Garrett, J.L., 2010. The food price crisis and urban food (in) security. *Environment and Urbanization*, 22(2), pp.467-482.
- Opoko, P.A. and Oluwatayo, A.A., 2014. Trends in urbanisation: implication for planning and low-income housing delivery in Lagos, Nigeria. *Architecture Research*, 4(1A), pp.15-26.
- Oyedepo, S.O., 2012. Energy and sustainable development in Nigeria: the way forward. *Energy, Sustainability and Society*, 2(1), p.15.
- Babanyara, Y.Y., Usman, H.A. and Saleh, U.F., 2010. An overview of urban poverty and environmental problems in Nigeria. *Journal of Human Ecology*, 31(2), pp.135-143.
- Mabogunje, A.L., 1990. Urban planning and the post-colonial state in Africa: A Research Overview 1. *African Studies Review*, 33(2), pp.121-203.
- Adelekan, I.O., 2010. Vulnerability of poor urban coastal communities to flooding in Lagos, Nigeria. *Environment and Urbanization*, 22(2), pp.433-450.
- Joshua, I.A., Makama, J.G., Joshua, W.I., Audu, O. and Nmadu, A.G., 2014. Disasters in Nigeria: A public health perspective. *Journal of Community Medicine and Primary Health Care*, 26(1), pp.59-75.

