Sustainable Planning and Inclusive Cities in the Global South: A Systemic Review of Literature: A Case for Nigeria

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Abstract

The focus of this paper is sustainability assessment and planning of megacities of Global South (GS) and proposes a framework using the Federal Republic of Nigeria as a case study. The paper undertakes a systematic review of the mega and sustainable cities literature. Achieving inclusive, recreating and sustainable cities for all in the context of supreme rates of urbanisation, economy-oriented priorities, and chaotic urban development that characterise the developing world is a major challenge. As the world rapidly urbanises, there is much focus on achieving sustainability outcomes within cities. The analysis highlights a prospect in the reviewed academic literature for cities to become sustainable first to be considered truthfully smart. Accomplishing this goal requires not only envisioning sustainable cities and implementing strategies but also assessing progress toward sustainable urban development. Global population growth has resulted in increasing pressure on infrastructures (transportation, housing, water, electricity, etc.) with a noted negative impact on the environment of megacities and much so in the GS with limited systems and plans to support the growth. The primary goal of this paper is to develop an integrated model to analyse and track SDGs progress with megacities planning as key indicators. With the emergence of megacities in the 21st century and their continuous growth in population and economic power, the environmental impact has reached the global scale. This viewpoint brings a pressing reality to the need to build tomorrow's world on sustainability principles. The inherent limitations imposed in the GS further imply that achieving sustainable development goals 13 (SDG 11) demands measuring progress and development. This paper finds that urban sustainability valuation overall lacks a unifying framing and that it could be better aligned with common sustainability principles. It presents findings from the first-ever literature review on the carbon-neutral city concept, covering definitions, assessment approaches, and barriers and drivers for the transition to carbon neutrality. The paper offers recommendations for future urban sustainability valuation research, including the employment of mixed-methods research among other strategies.

Keywords: Sustainable Planning, Inclusive-Cities, Global South, Nigeria

1. Introduction

Urban growth is taking place on an unprecedented scale globally and its externalities on the environment and society are evident, attaining sustainability in cities is becoming a global concern. Truly, 54% of the world population was urban in 2014, and the global urban population is predicted to reach 66% by 2050. According to the United Nations [1] the world's urban population grew at an average rate of 2.5% per year, increasing from 0.8 billion to 4.2 billion from 1950 to 2018.

Also, the proportion of the urban population is forecasted to increase from 55% in 2018 to 68% by 2050 [2]. Emerging countries are the main drivers of this increase. While megacities provide better living opportunities, they also exhaust natural resources and create environmental degradation, lack of insufficient health, and social conflicts [3]. The literature has a broader perspective on the factors influencing CO2 emission reduction.

Unexceptionally, all parts of the world, today, are confronted with various environmental and/or socioeconomic crises. Over the past few years, human activities, predominantly post the industrial revolution, human activities in the production of greenhouse gases caused by the burning of fossil fuels the sustainable development goals aim not only to reduce carbon emissions and mitigate climate change but also to improve energy access and affordability, health, gender equality, and sustainable economic growth [4] United Nations Sustainable Development Goals, 2021.

However, certain important elements must be present for a city to be considered sustainable. These elements (sustainable education, renewable energy, energy efficiency, sustainable transportation, sustainable buildings, waste management, etc.), when combined with informed and willing inhabitants, dividends of sustainability may be realised.

The primary challenges to attaining effective megacity planning are severe. Megacity planning is a negotiated change process involving key players

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driving urban planning, together with government, society, and the private sector. It has the potential to address the major threats of the 21st century, poverty, inequity, and environmental risk. Most literature relating to carbon reduction focuses on the effectiveness of low-carbon implementation using different methods for testing that may lead to biased findings. Furthermore, studies evaluating the effects of low-carbon cities policy have mainly focused on the effects of policy implementation on factors such as air quality, economic growth, industrial, and foreign trade. Little has been done to address the effects of policy implementation on carbon reduction, and the findings have varied widely for those that did. Particularly, there is a lack of examination of the mechanism pilot policies.

To address these limitations, this paper proposes Systems Thinking (ST) to address these limitations. Megacity planning is intrinsically dynamic and complex; therefore, its behavior is not solely controlled by constituent components. Rather, it is a consequence of dynamic interaction among them. To effectively manage such a system sustainably, it is important to understand the underlying dynamic of component interactions. The limitation outlined in this paper calls for a thorough and diligent systemic methodology, a new planning approach to support a sustainable megacity planning process as proposed by [5] in their sustainable energy planning. Sustainable energy planning tools should be capable of incorporating dynamics, feedback loops, non-linearity, inherently long delays, and the nature of the socio-economic complexity of energy systems. The paper seeks to better understand how one might operationalise urban sustainability assessment to guide sustainable urban development.

The paper starts by reviewing the literature on the fundamental dynamics of sustainable megacity planning in the Global South (GS). It further examines a common framework to identify, implement, and measure low-carbon interventions that will contribute to lower emissions and address urban development needs. The data collection method includes a comprehensive review of the state of the art of articles on low-carbon carbon cities (LCC) to identify and categorise low-carbon future (LCF) components. Cities are currently home to about 55% of the Global population and the number is expected to continue to increase. Urban growth is taking place on an unprecedented scale globally (see Figure 1).

The positive causal relationship between megacity, energy use, economic development, and population is a multifaceted dynamic in the global economy. It is emphasised here that an increase in migration is appropriate for economic development and economic development is a prerequisite for sustaining population growth that is well managed and driven by economic development would lead to an increase in migration as demonstrated in (Figure 2). Unfortunately, the causation described here is often ignored in GS by decision-makers and their advisers. This topic demonstrates the significance of megacity planning but argues that it can only be achieved if integrated with fundamental change that prioritises people and the environment above economic growth. The report focuses on cities in the global south, where urban development has outpaced national and local regulatory and planning frameworks.

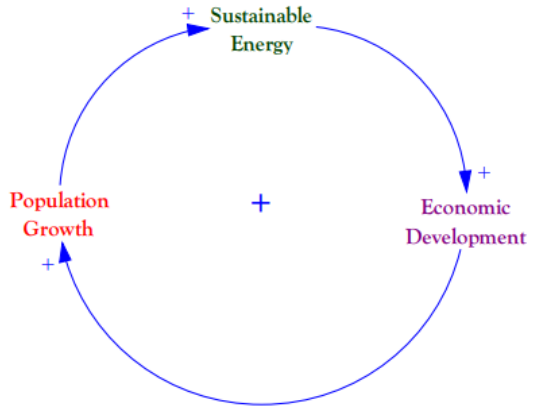

Figure 1. Positive Causation of Sustainable Energy-Economic Development and Population Growth [5]

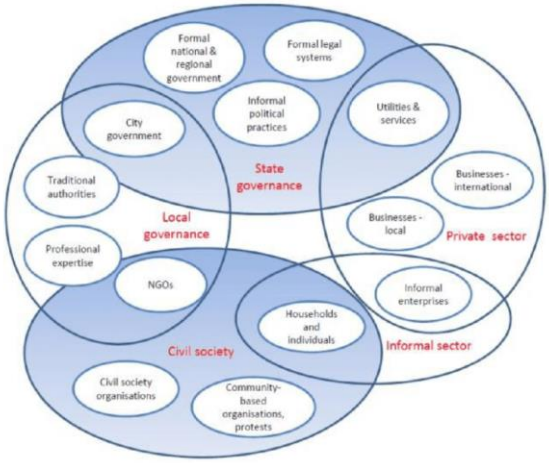

Figure 2. Actors and institutions of Urban Governance

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Global GHG emissions sources are generally ascribed to five major sectors, characterised by the Intergovernmental Panel on Climate Change (IPCC) Working Group 111 (WG3) as energy systems< industry, buildings, transport, and AFOLU (agriculture, forestry, and other land uses). These sectors cover aspects of energy supply, energy demand, non-energy related process emissions, and land-based emissions and removals. The term global south refers to low and middle-income countries with high levels of poverty as defined by the World Bank [6] [7] Shmeley and Shmeleva, 2018, defined urban sustainability as a multi-dimensional capacity of a city to operate successfully in economic, social, and environmental domains simultaneously.

The paper is informed by the question "Would the Systems Thinking Planning Paradigm improve understanding of the issues relating to low-carbon futures of megacities of the Global South"?

2. City Contexts

Managing urban development has become one of the most central challenges of the 21st century and is critical to the development of sustainable cities. Between 2014 and 2050, the global population is expected to increase from 7.2 billion to 9.6 billion, and the urban population from 3.9 billion to 6.3 billion (Table 2.1) Over 90% of growth will take place in cities and towns of the GS. This part discusses three framing contexts within which urban planning operates: urbanisation processes, urban governance, and urban land.

3. Urbanisation and Patterns of Urban Growth

Generally, the percentage of the global population living in cities is expected to rise from about 54% in 2014 to about 66% by 2050 and most of this growth will take place in GS regions. In 1990 there were 10 megacities with a combined population of 153 million; by 2014 these had increased to 28 and their combined population nearly trebled to 453 million. Urban growth is caused by many factors, including natural population increase, international migration, rural-urban migration, and boundary. In countries with low levels of urbanisation, the rate of urban growth tends to be higher than in countries with medium and high levels of urbanisation, although, drivers of urbanisation are very different in different regions.

The rate of urbanisation presents key challenges. In general, high urban growth rates are an indicator of economic success. For example, cities in Asia that experienced unprecedented growth in the 1970s and 1980s − Hong Kong, Shanghai, and Seoul are now among the top global trading centers. In China, where urbanisation increased from 20% to 50% from 1980 to 2011, urban workers earn on average three times more than rural workers, and their productivity is boosted by government commitments to infrastructure spending. But, in Africa, unlike Asia and Latin America, urbanisation has decoupled from economic growth, resulting from push factors such as drought, harvest failure, or conflict, rather than pull factors of economic opportunity. GS urban population is likely to increase from 295 million in 2000 to 748 million by 2025, more than doubling the size of GS cities in just 25 years, with the result that the development benefits of urbanisation may be outweighed by challenges such as overloaded infrastructure and water shortages.

3.1. Pattern of Urban Growth in the Global South

The GS now has some of the world's largest cities. By 2018, 28 megacities had emerged, providing a home for a total of 453 million people. Of these, 16 are in Asia, four are in Latin America, and three are in Africa, Dhaka, in Bangladesh, for instance, is one of the wildest-growing megacities worldwide, with a predictable population of over 17.6 million within its 1,528 square kilometers area, and is anticipated to have close to 26 million by 2,035. In the rapidly urbanising regions of Asia, economic growth has not always been coupled with efforts to include sustainability more explicitly in urban development agendas.

These dynamics raise several significant questions: Can urbanisation in the GS be better planned and managed to speed up the eradication of poverty, reduce inequality, address climate change emergencies, enhance gender equality, and provide productive employment to drive economic growth?

4. Urban land

Urban land and space have an important role in urban development and poverty reduction, strongly influenced by traditions of land ownership and government objectives. Access to land for urban development hinges on functioning institutions that define property and development rights, and resolve land disputes. However, in contexts of rapid urbanisation, access to urban land is a crucial problem for the poor. The efficiency of public land policy

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hinge largely on the dimensions and integrity of administrative systems, which are often not well modified to contexts of rapid urbanisation where state land may be informally occupied or traded. Few governments can afford to intervene directly in land markets to help the poor, so policies often focus on streamlining land registration or regularising informal tenure. Where land registration and transfers are legalised, and reliably recorded, the impacts of policy intervention are relatively predictable, but where many transactions are informal, it is difficult both to assess policy impacts and to collect property tax.

5. Evolution of Urban Planning

Urban planning is largely government-led and its effectiveness depends on the capacity of local administrations and acceptance by the majority of urban builders. It emerged as a spatially oriented discipline in the late 19th century in answer to rapid urbanisation in Europe and North America, unhygienic housing for the burgeoning urban workforce, and air and water pollution. Its main element, spatial planning, has two core functions, to outline the planned growth of human settlements through the allocation of land for urban development, and to offer the framework for day-to-day development management.

Urban planning contributes to the wider perspective of urban management which includes all the activities that provide, maintain, and upgrade urban infrastructure and services. Urban planning has also developed as a core device for delivering wider social and environmental goals. However, in GS Urban planning was imported by colonial powers and largely ineffective in addressing realities on the ground. Today, urban planning is largely government-led and its effectiveness depends on the capacity of local administrations and acceptance by the majority of urban builders.

6. Problem Statement

Urbanisation is one of the world's most important social and economic phenomena today. This paper reviews the formation of megacities and summarises the main problems, challenges, and opportunities faced by the sustainable development of such large megacities. The goal is to advance cutting-edge research in the field of Global South urbanisation, urbanisms, and urban sustainability. The economies and societies of megacities in GS have developed rapidly, but they are faced with major socioeconomic and environmental problems, such as an increase in slum-dwellers, air and water pollution, resource depletion, and rising urban poverty.

They are also under pressure from increasing population, resources, environmental threats, lack of shelters and basic services, and elevated air pollution more than international standards. In GS megacity, projects are evaluated using traditional concepts with fewer considerations for sustainability. The unsuitability of traditional tools is rooted in socioeconomic, political, and technological differences, compared to developed nations. There is a general lack of research on dynamic methodology on sustainable megacities futures for the case of Nigeria.

This paper argues that in most GS countries, particularly, Africa, there is a general lack of research on dynamic methodology on sustainable megacities futures for the case of Nigeria, the challenge of developing a more functionally integrated, environmentally sustainable, and socially inclusive urban environment. Therefore, geographic knowledge engineering is needed for city or territory infrastructure

7. Concept of Sustainability

The concept of sustainable megacity has emerged as a result of three important global trends at play, namely, the diffusion of sustainability, the spread of urbanisation, and innovative cities that use information and communication technologies, and other means to improve quality of life, the efficiency of urban operation and services, and competitiveness while ensuring that it meets the needs of present- and future generation concerning economic, social and environmental aspect.

Mega-cities are designed in an attempt to overcome problems that traditional cities face such as the rapid growth of the population and associated needs. Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs [6]. Megacities design is a relatively new study field that appeared with the smart city concept. However, it is a difficult and error-prone task which suggests the designer’s skill.

Cities are gradually gaining the attention of researchers, policymakers, government representatives, and global organisations. Making and remaking a sustainable megacity has become a great challenge mostly in the global south cities where population growth is volatile and uncontrollable. The pursuit of a sustainable mega-city has not only emerged as a major challenge to the government but also a widely applicable sustainable development policy in the global south as well as in global not arguable [7].

At the current pace, it is estimated that 65% of the global population will live in the city by 2025[8] and most of this growth will be in Asia, Africa, and Latin America [9] (UN, 2000). This extraordinary urbanisation growth has stimulated scholars and policymakers to examine sustainable urban

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development possibilities that can pre-empt major environmental and social upheavals.

As echoed by [10] [11]. The link between sustainability and urbanisation has recently joined under what is labeled smart sustainable cities. Therefore, smart sustainable cities are seen as a new techno-urban phenomenon that materialised around mid-2010 [12]. These initiatives are meant to improve the city's services to bring an improved value of life to the citizens [12]. It is estimated as of 2018, there are about 473 mega-city developments globally [13]. Human capital growth, attractions of sustainable living ethics, and renewed apprehensions for the earth have redirected city planners to a new frontier for the creation of sustainable cities [14].

In literature, it is evident that city planners are taking initiatives to create cities with low to zero carbon emissions, build sustainable structures, and produce higher foundations of learning where sustainability practices are rooted in their programs. [15] affirmed that countries around the globe are adopting sustainability practices. This obvious in new sustainable cities that are springing up reason has been a new frontier in city planning may be linked to renewed gratitude for human capital development, healthy living standards, and concern for the environment.

The practices of megacity planning refer to the mega-city environment at a macroscale, looking beyond individual buildings to the wider layout of the city and its streets, plazas, landmarks, infrastructure, and other domains of public life. The standard mega-city form occurred largely in 19th-century efforts to modernize and regulate regions' fast-rising and industrialising cities.

The main role of megacity planning in recent times is to link cities to the global economy and attract foreign investment, which is ever more important in the era of intercity competition. The challenge for mega-city planners is the need to create more livable and sustainable cities, an effort that can be traced to early megacity models. This and other challenges (for example, climate change, resource scarcity, and affordable housing provision) will need the field of urban planning to become ever more state-of-the-art in terms of its approaches, while also more self-governing in terms of the players and forms of knowledge that are given a voice in decision-making [16].

8. Literature Review

This section of the report applies a systemic review of the existing state-of-the-art literature to identify the research gaps and demonstrate a strong understanding of megacities, their assessment, measures, and policy vis-a-vis Systems Thinking.

Concern over climate change and universal uncontrol of population growth, energy security, pollution, and city mobility has led to a focus on the development of holistic methods in tackling sustainability challenges to ensure a more sustainable future [17]. In the existing literature, it is evident that the key question for the 21st century is achieving sustainable megacities and mitigating the adverse effects of climate change and since cities are growing sources of carbon emissions, current studies on sustainable transition futures are gradually reflecting the opportunity for real change offered by a possible future sustainable in megacities.

8.2. Planning for a Sustainable City

There is evidence that, to date, action to encourage sustainable development agendas in cities has had limited effect. As climate change threatens resources and natural ecosystems, an integrated global compact to address these threats is urgently required. Meanwhile, poverty and hunger remain persistent in many countries, and rapid urbanisation calls for major changes in the way that urban development is planned and managed. Urban planning remains a key mechanism for attaining sustainable development and resource maintenance objectives in cities. Urban planning systems must also address the major urban challenges of climate change, rapid urbanisation, poverty, and informality.

At the planned level, urban planning as part of a broader urban management agenda is essential to encourage sustainable development agendas, necessitating integration across the broad domains of land use, food security, job creation, transport, infrastructure development, nature conservation, water conservation, renewable energy, waste recycling, and housing. Include e-mail addresses if possible. Two 12-point blank lines should follow the author's information.

8.1. Sustainable Megacity

Megacities defined by Baklove, Molina, and Gaus, 2016, [18] as urban agglomerations with a population exceeding 10 million are fast becoming a global phenomenon. Cities with more than 10 million are termed megacities. Megacity refers to a policy agenda designed to reduce the environmental impacts of urban development. Cities are seen as engines of economic development and social change.

Today, the megacities notion has become a global phenomenon and a movement; it promises to enable us to use resources in cities in more efficient ways, to make public transport more attractive, and to provide planners and decision-makers with data to allocate resources more accurately [19].

The Figure 3 shows how the megacities are distributed on a normal map. Megacities are major global risk areas. Due to the highest concentration of people and extreme dynamics, they are particularly

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prone to supply crises, social disorganization, political conflicts, and natural disasters. Their vulnerability can be high. There are currently, hundreds of megacities initiatives underway across the globe, and substantial resources are allocated to these projects. Although some of these projects incorporate dimensions beyond technology, there is little evidence in practices that sustainability targets are achieved in cities claiming to be megacities to move the megacity notion closer to the goal of a sustainable city.

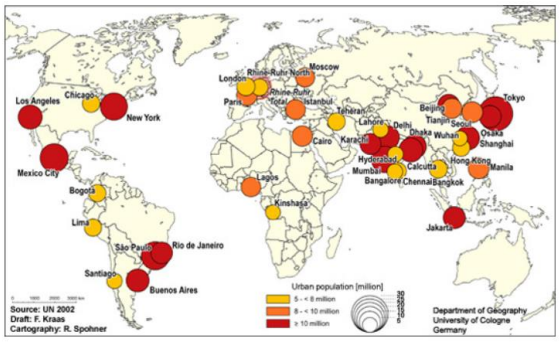

Figure 3. World megacities [13], [19]

Megacities are seen as a promise for a new and sustainable urban future providing technological solutions to our urban challenges and changing how we manage and live in cities. In contrast, critics view megacities as another form of neo-liberal urban entrepreneurialism, in pursuit of old-fashioned growth agendas. A mere focus on efficiency gains is not going to bring true sustainability to our cities. Keeping these two conflicting views in mind, some scholars also reconceptualise megacities as 'smart sustainable cities' and offer transformation roadmaps to guide urban administrators, managers, and planners in understanding the essential stages and components to be considered during the transformation journey.

Against this backdrop, this paper aims to address the research question of whether cities can become smart using System Thinking (ST) tools. The methodological approach of this investigation includes the systematic selection of relevant academic articles from the smart city literature. This is followed by analysis and critical review (see Figure 4).

Various factors must be considered when considering sustainability in megacities. One of the most important dimensions of sustainability in megacities is the environment. The environment in megacities development has been neglected due to achieving higher economic profit. Environmental resources have been destroyed and exhausted as a result of not considering sustainable development principles while developing megacities. Therefore, to achieve sustainable management of environmental development in megacities, new ways should be found to best integrate the environment into urban development.

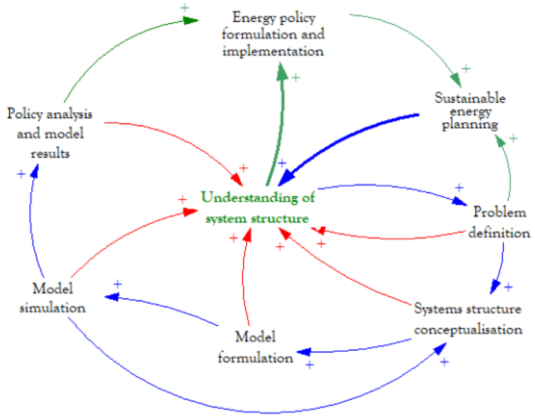

Figure 4. The phases of System Thinking and system Dynamic Methodology [5]

As shown in the Figure above, Olaniyi, 208, in his work Decision Support Systems for Sustainable Energy Planning in Developing Economy affirms that, there are various stages involved in the analytical approach. The diagram shows these phases and possible succession. The arrows symbolize the cycling and iterative nature of the process. It is important to emphasise that the modeling process is not a linear progression; it begins and ends with an understanding of the problem relating to (Sustainable Energy development (SED). The stages require a good understanding of what and why various stakeholders are interested in a particular problem(s), Systems Structure Conceptualisation, Model Formulation, model simulation, Policy Analysis, and Result, Policy Formulation, and Implementation.

Better coordination of transport, land use and open space planning, development of a green compact city, preservation of blue and green infrastructure, and promotion of local production are among the approaches which have been recognised as significant phases of more sustainable development of megacities.

8.3. Sustainable Development Goals (SDGs).

The sustainable development goals (SDGs) also known as global goals, were endorsed by United Nations (UN) at the 2015 Conference on Sustainable Development in Rio de Janeiro. It represents the transition from today's society to a more environmentally friendly one. The development must balance sustainability's social, economic, and environmental dimensions with impact across all societies and sectors, such as global health, climate change, human settlement, and inequality.

The 2030 Agenda was adopted by all United Nations Member States in 2015, and provides a shared blueprint for peace and prosperity for people and the planet, now and into the future At its heart are the 17 Sustainable Development Goals (SDGs), which are an

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urgent call for action by all countries, developed and developing in a global partnership.

Figure 5. The 2030 Agenda for Sustainable Development

They recognise that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and support economic growth, all while tackling climate change and working to preserve our oceans and forests (see Figure 5).

8.4. Megacity Planning

This paper is focused on the sustainability assessment and planning of megacities with a focus on the Global South (GS). Megacities are hot spots of global environmental change, both as drivers of resource consumption and as locations of the hostile effects of urbanisation. Better knowledge of mega-urban growth patterns is therefore particularly helpful for a better understanding of the global urbanization processes to manage their growth, which is one of the significant steps towards attaining global urban sustainability.

Existing literature revealed that growing megacities often experience profound changes to their spatial pattern and configuration. With this viewpoint, the planning of megacities must focus on moving from a concept to implementation, which requires-setting objectives and targets, assigning roles and responsibilities, and building a feasible strategy and portfolio of interventions to meet the objectives and target. Megacity's success depends greatly on robust planning outset as with many programs.

Megacity planning requires policy intervention. Policy Interventions and project interventions are two types of intervention that can be developed for megacity planning. Stakeholders' input, Municipal priorities, and economic contexts play a significant role in determining the intervention options that could be pursued under megacity planning. Various studies have been written for specific nations and regions on the most effective project and policy options to achieve low-carbon city development, particularly considering the local political and economic context.

A policy intervention could lead to various project interventions. For instance, a city energy efficiency policy that includes regulations (for example, building codes, household, household energy efficiency, etc.) provides the impetus for city-wide projects to replace outdated household appliances with more energy-efficient ones.

8.5. Setting Objectives and Target

The megacity objectives and targets should be measurable and reliable, reflect the mission and scope, and be associated with the municipality's commitment to the Program. The objectives and targets should be developed using a cross-sectoral approach and, if an emissions inventory exists, reflect carbon performance goals for the major emitting sectors or the city as a whole. In the absence of an emissions inventory, the municipality could consider the status of each sector through an assessment that evaluates the adoption of new technology and best practices.

This assessment can serve to orient the objectives and targets by identifying priority sectors that will require more attention and additional resources to achieve enterprise resources cost-effectively. Sectors that have already adopted advances in technology and other best practices may not require capacity building or support.

8.6. The Challenges of Megacity Planning

The world has transformed and cities are now home to 55 percent of the world's population. The world's urban population is predicted to rise to about 60% of the world's population and 730 million people will live in megacities by 2030. Megacities play a vital role in the sustainability and livability of the globe in the next few decades. As the economies and societies of megacities develop, so also, they are also under pressure from increasing population, resources, and ecological threats.

Indeed, this paper argues that geographic knowledge engineering is needed for city or territory infrastructure. Multidisciplinary data and citizen involvement allow not only spatial reasoning but also evaluation of various scenarios and alternatives for territorial intelligence governance, to help face the main problems of megacities

8.6.1. Policies and Measures. This section assesses mitigation policies, practices, and actions that may unlock the mitigation potential in urban environments and facilitate the transition of discussions. Given a series of problems exposed by big cities, scientific planning, and governance is needed for the future

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development of cities. With this in mind, the paper presents policy options and good practices that can enhance the mitigation ambition to support the achievement of the Sustainable Development Goals (SDGs). Policies and measures for emissions scenario need to cover all sectors and regions over the 21st century to be associated with a climate change projection.

A sustainable city must be a knowledge-based city, every aspect of the city must show efficiency; energy efficiency is an important sustainability principle that must be enshrined in a sustainable city to prevent needless energy waste. Energy efficiency is defined as using less energy by enhancing the efficiency of the system to offer the same product output. For example, from lightbulbs to HVAC units, energy expended should be in manifolds less than inefficient alternatives, but with the same or much better outputs. This concept enables us to improve the existing systems for better performance on both technical and economic fronts while addressing environmental concerns. Improving energy efficiency also reduces external dependence and vulnerabilities in the energy sector.

Another important criterion used to measure the readiness of cities to adopt sustainability practices is an efficient, emission-free, affordable, and accessible city-wide transportation system. To be effective, sustainable transportation must stay away from the conventional urban transportation system in which transportation is restricted to means of mobility in urban settings, a condition that prevents innovation in transportation services. A sustainable transportation strategy must recognize the four emerging areas of innovation in city transportation: Mobility, City Logistics, Intelligent System Management, and Livability.

Sustainable transportation is one in which transportation does not endanger public health or ecosystems and meets the needs for access consistent with:

(a) Utilization of renewable resources below their regeneration rates.

(b) Utilization of non-renewable resources below the rates of development of renewable substitutes.

Taking crucial action to combat climate change and its overwhelming impacts is therefore imperative to save lives and livelihoods and is key to making the 2030 Agenda for Sustainable Development and its 17 goals the blueprint for a better future.

To limit warming to 1.5 degrees Celsius above the pre-industrial level, set out in the Paris Agreement, GHG emissions will need to peak before 2025. Then, they must decline by 43% by 2030 and to net Zero by 2050. The 17 Sustainable Development Goals are key to realising the agenda and are of equal importance with the policies and measures and should be accorded equal priority in their implementation efforts and in the global indicator framework for monitoring progress. These policies to lower, or at least slow down growth, in CO2 and other GHG emissions will have some impact on reducing future warming. Development of methodology in line with global GHG emission inventories is needed, to track the effectiveness of cities' GHG reduction policies. Furthermore, cities should set more ambitious and easily traceable mitigation goals. At a certain stage, carbon intensity can be a useful indicator for decarbonization of the economy and provides better flexibility for cities with fast economic growth and an increase in emissions. But in the long run, moving from intensity mitigation targets to absolute mitigation targets is essential to achieve global carbon neutrality by 2050.

As pointed out above, creating sustainable cities requires many interventions; from human capital development and knowledge economy to protection of the environment, new sustainable cities must set new standards in governing future cities. The required elements for making sustainable cities are many, however, the rallying point of these elements is the triple-bottom-line approach of sustainability (i.e. environment, economics, and social).

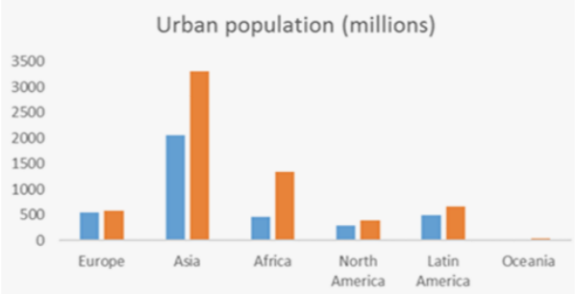

Figure 6. Population Division, 2015. World Urbanization Prospects [10], [11]

Figure 6 presents regional urbanisation trends to 2050 and shows that it is expected that urbanisation will continue in all regions of the world, although from different starting points in terms of the current shares of the urban population, and at different paces.

As Figure 2 shows, North America has the largest share of the urban population and it is expected to further increase, from about 82 percent in 2014 to 87 percent by 2050. The second most highly urbanized region is Latin America: the share of its urban population is expected to grow from about 80 percent in 2014 to 86 percent by 2050. These regions are followed by Europe and Oceania, in which the shares of urban populations are expected to grow from about 73 and 71 percent in 2014 to 82 and 74 percent by 2050, respectively.

The data is from 1980-2020 and the statistics for 2023 are a predicted figure; the data on some cities are

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collected at the jurisdiction level and the statistics cited by this paper have been modified according to the official data of the corresponding country or city (see Table 1).

Table 1. The population of megacities and their growth rate (from 1980 to 2023) [1]

Country					Megacity		
Name	Urbanization rate in 1980 (%)	Urbanization rate in 2020 (%)	Total population growth rate (%)	Urban population growth rate (%)	Name	Population in 2020 (thousand)	Population growth rate (%)
The Democratic Republic of the Congo	27.07	45.64	239.58	472.47	Kinshasa	14342.44	598.65
Egypt	43.86	42.78	133.43	127.71	Cairo	20900.60	184.41
Nigeria	21.97	51.96	180.63	563.67	Lagos	14368.33	458.60
Bangladesh	14.85	38.18	108.39	435.70	Dhaka	21005.86	543.23
Indonesia	22.10	56.64	84.57	372.94	Jakarta	35426.72	197.45
The Philippines	37.46	47.41	131.46	192.96	Manila	13923.45	133.82
Thailand	26.79	51.43	46.48	181.20	Bangkok	10539.42	123.14
Russia	69.75	74.75	4.15	11.62	Moscow	12537.95	54.10
Turkey	43.78	76.11	90.64	231.40	Istanbul	15190.34	245.47
France	73.28	80.98	21.55	34.31	Paris	11017.23	27.08
Mexico	66.34	80.73	93.01	134.88	Mexico City	21782.38	67.20
Argentina	82.89	92.11	61.92	79.94	Buenos Aires	15153.73	52.76
Colombia	63.74	81.43	81.05	131.29	Bogota	10978.36	211.43
Peru	64.57	78.30	91.90	132.68	Lima	10719.19	141.55
South Korea	56.72	81.41	35.37	94.30	Seoul	25924.06	213.93
Pakistan	28.07	37.17	166.90	253.43	Lahore	12642.42	338.73
					Karachi	16093.79	218.83

8.7. Sustainability Principles in the Literature

The paper focuses on key issues concerning the concepts of development, sustainability, and sustainable development. The issues embrace the history of SD as well as the pillars and principles of this concept. The paper also presents the Sustainable Development Goals (SDGs) and the associated debate regarding the trade-offs, complementarities, costs, and benefits, as well as what can be done to achieve the much-debated SD.

Based on the literature reviewed, there is no consensus for principle-based urban sustainability assessment frameworks, which creates an important research gap for future studies in this field. With calls in the literature to guide sustainability assessment with clear, integrative sustainability principles, it is, therefore, necessary to ask how many of the included studies applied such a framing.

The concept of sustainability is much discussed in the literature and continues to influence future discourse concerning development science. This, given by many scholars, implies that the best choices are likely to remain those that meet the needs of society and are environmentally and economically viable, economically and socially equitable as well as socially and environmentally acceptable. This leads to three interconnected spheres of sustainability that describe the relationships among the environmental, economic, and social aspects of SD as captured below.

Relationships among social, environmental, and economic sustainability. Source: Justice Mensah and Sandra Ricart Casadevall.

It can be concluded from the figure above that, almost everything man does or plans to do on earth has implications for the environment, economy, or society's continued existence and well-being of the human race. The domain constitutes a set of interrelated concepts that should form the basis of human decisions and actions in the quest for SD. The paper supports the argument by opining that basically, the figure illustrates that proper decisions on sustainable resource management will bring about sustainable growth for a sustainable society.

The paper revealed that no coordinated, systemic approach profoundly summarises the capacity to make and implement decisions and the extent to which these decisions recognise and respond to the interests of developing countries. However, several studies have identified a significant gap between the planning and implementation of megacities' sustainability. This gap is attributed to a lack of strategic implementation framework, utopian visions, funding, capacity building, and horizontal-vertical cooperation.

Future research on megacities should focus on (1) devising appropriate regulatory and non-regulatory strategies to integrate socio-demographic and socio-economic factors to influence lifestyle and behavioral change; (2) the integration of stakeholder participation and engagement in the megacities planning process; (3) a triple-bottom-line collaboration between the government, enterprises, and universities/research institutes; (4) megacities inventory by sector and devising appropriate long-term targets to ensure deep decarbonization; (5) the assessment of megacities planning and barriers to implementation; (6) the interests of stakeholders in the planning and implementation of megacities; (7) research on co-benefits of megacities implementation; and (8) the scalability and replicability of megacities technological solutions; (9) smart cities solutions for low carbon city; and (10) linking green building and neighborhood certification with performance incentives and density bonus schemes.

8.8. Systems Thinking as a Methodological Choice

Cities across the world face unprecedented challenges. From transportation infrastructure and modernizing water to creating conditions for friendly, inclusive, and diverse communities, cities face many social and environmental sustainability challenges. The problems they face are intricate and immensely complex. They are products of interactions that vary with time and space, involving multiple actors and disciplines, composed of interconnected relationships often nonlinear effects.

Efforts to solve this have been driven by oversimplified understanding and linear thinking asserted from simplistic causal relationships offering deceptive certainty and predictability

Traditionally, our practices have been sector and compartment-oriented, leading to fragmented policy-

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making, and decisions that move problems in time and space, rather than solve them. Systems Thinking (ST), and its potential to help us address complexity, offers, and alternative approaches to traditional, top-down, sectorial, urban decision-making. Managing megacities' problems involves understanding them first, looking at system interactions and conditions rather than focusing simply on solutions. For instance, the awareness that technological developments and advances will provide at the end solutions to our problems is increasingly proving false, as new kinds of constraints are forcing our society to rethink previous assumptions about population, technology, planning, and types of development.

The application of Systems Thinking has increasingly been considered given the limitations above, focusing on acquiring a more complete understanding of urban problems through the study of urban interactions. Problems can be viewed as products of the interactions within a city. Fundamentally, ST embraces the union of interdisciplinary, integrated, and holistic principles to create this mindset that addresses whole problems and not just the parts [19].

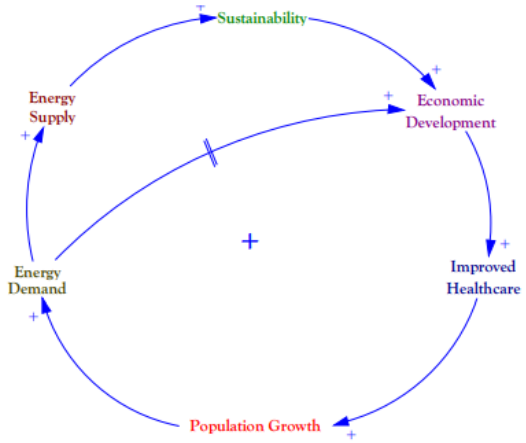

Figure 7. Positive Causation of Sustainability-Economic Development [5]

9. Methodology

This section discusses the methodological choice and the paper design process. It relied on the philosophical stance and the study problem to guide methodological choice. It explains why the mixed methods research approach is appropriate for the study. Additionally, the section set the procedures to collect, analyse, and report data. The literature on sustainable city proposes a variety of frameworks / models for sustainable development selection and for the assessment of sustainable development (SD), one of which is the Multi-Dimension Framework for Sustainability Assessment (Smith and Sheate, 2001, Devuyst et al., 2001, McAllister, 1980). There are, however, some limitations that may jeopardise the applicability and accuracy of MDFSA-based frameworks/models to SD assessment, thereby possibly compromising their impact on decision-making support for cities in developing countries.

The paper presents a systematic literature review of the literature on urban sustainability assessment. After a literature search, the paper employed content analysis to identify themes and organise qualitative data from the literature to better understand how sustainability assessment is applied in urban contexts. The paper then used Systems Thinking Methodology in analysing sustainable megacities as best practices of planning from a different aspect of analysis in as many megacities as possible in the (GS) as guided by the systems Thinking approach developed by Professor Jay Forester and Olaniyi, 2014 which allows us to improve our understanding of the compound system [20] [21].

Transition pathways are described as "a pattern of changes in socio-technical systems unfolding over time that leads to new ways of achieving societal function" according to [22] cited in Bowig, [23]. The approach- helps us to provide a holistic view and links between systems and complex decision-making on the understanding that elements of a system do not act in isolation and that the overall outcome will be the result of the various interactions among systems. ST allows us to have perspectives on the problem and potentially find solutions that benefit the whole system. Data will be collected from journal articles. STELLA software will be used to analyse the data and develop a model to create an understanding of how to better manage emissions in the cities of GS.

10. Analysis of Findings and Discussion

Findings in the literature revealed challenges that can be grouped into four major sustainability-related themes (and some miscellaneous findings): perceptions on sustainability and urban sustainability; issues and perceptions related to systemic and long-term thinking; barriers linked to local government powers and responsibilities; and issues in progress measurement and sustainability evaluation.

The paper was channeled on the planning and assessment of megacities of the Global South and proposes a holistic and novel sustainable assessment tool to enhance and embed sustainability principles into current practice. Hence the paper has identified and established the following findings that would be a valuable lesson and result that can be utilized and, also, that other researchers, academics, and practitioners could adapt for further study.

Despite the main premise that a sustainable city is to achieve environmental, social, and economic sustainability, the concept is widely criticised due to its disputable application in the cities of the south.

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This paper argues that the sustainable city discourse does not include the main problems of the cities in the GS, even though, as a goal, it's efficient and effective in the developed countries of the GN. Therefore, the paper concludes that a goal-based sustainable discourse of the GN will be misleading and inappropriate for sustainable megacity development in the cities of the GS.

The literature revealed an imbalance in the comprehensive approach to sustainability between the GN and the GS. There is a discernible bias toward the provision of technological innovations and strategies for environmental and economic domains of integration of the principle of sustainable development. Environment and economic strategies found and explored underpin a broader convergence on the reduction of GHG emissions in GS cities.

Urban sustainability – Research findings	Case studies: major themes in findings	Holistic urban productivity – A systemic lens
• Environmental impact reduction • Financially maintain infrastructure • Good land use planning • Energy efficiency	Sustainability perceptions	• Ecological restoration • Resource regeneration and circularity • Energy and material consumption reduction • Net-zero built environment
• Dependence on electoral cycle • Reactive action • Siloed operations • Disconnect between local government and citizens	Systemic and long-term thinking	• Whole-system, synergistic, and long-term planning and impact evaluation • Inclusive, multi-level, cross-sector partnerships throughout the policy process; equity
• Inability to influence decision-making • Limited power and mandate • Municipal resource constraints • "Bedroom communities"	Local government power	• Truly complete communities with local opportunities • Community-based initiatives; Indigenous, traditional knowledge • Formal Constitutional status for Canadian local governments
• Data: not adequate, timely, and reliable • Insufficient human resources • Disconnected monitoring programs from goals/vision • Reluctance to assign data-related work to staff	Assessing urban sustainability	• Long-term outlook for goal setting linked to progress assessment • Regular, inclusive, community-wide assessments • Holistic urban productivity indicators (in addition to mainstream indicators)
• Low awareness of non-local matters • Focus on short-term, local ones	Localising the SDGs	• Long-term, multi-level outlook • Education and awareness for all stakeholders and decision-makers

Figure 8. Urban Sustainability Development Goals, Sustainability planning, implementation, and assessment in cities [6], [7]

This figure links the principles and generic goals of the holistic urban productivity concept and the proposed framework with the urban sustainability shortcomings as identified in the research findings to suggest a direction for the future development of cities.

In this urban century, planetary realities and increased environmental and social awareness have led to significant international agreements and the recognition that human activities play a crucial role in successfully implementing long-term sustainability goals. The paper discusses the factors that seem to hinder and those that seem to help sustainability planning, implementation, and assessment; either way, these findings helped shape the Urban Productivity Framework and recommendations for future research and practice.

Urban issues are interconnected and cannot be tackled without systemic (broad and deep) analyses and iterative policy-making. The recent development of metropolitan cities, especially in GS, needs an effective integrated management of city services, infrastructure, and communication networks at a metropolitan level. Systemic analysis for effective decision-making also needs all-inclusive and dependable data but issues in data availability, collection, management, and related municipal capacity are a reality. An initial step towards a proper organisational and management strategy of the metropolitan city is the analysis, benchmarking, and optimisation of the metropolitan areas through a set of indicators coherent with the overall sustainability objective of the metropolitan city.

This paper proposes the use of the Systems Thinking Planning Paradigm decision-making technique for application in the smart metropolitan city context, to analyse the sustainable development of energy, water, and environmental systems, In the context of the mega-city and urban projects, decisions are made on three main levels: strategic, tactical and operational. ST governance is used as an analytical framework to analyse how mega-city authorities deal with complex issues, and how stakeholders are connected through a set of objective performance indicators.

The strategic level of decision-making is the basis for tactical and operational decisions, it includes processes and activities for setting long-term goals, policy development, visions, or values for the overall development of the city as a whole. The tactical level considers medium-term mid-level decisions to achieve the results specified at the strategic level. This level denotes the development of concrete green space-related agendas and all actors that regularly deal with programs, funding, and the establishment of networks and partnerships. These actors include planners, universities, etc.

Finally, the operational level corresponds to experiments and actions with a short-term vision which involves the implementation of goals and execution of concrete projects. Operational decisions are mostly used to give operational solutions or to assess results obtained by low-level managers in smart cities.

11. Results

The analysis of the selected literature was commenced by classifying them according to their publication year. This disclosed during the last couple of years the attention given to the topic has increased dramatically. The results show the major challenges of megacities in delivering sustainable results: (a) mega-city policies are characterised by heavy techno-centricity; (b) mega-city practices involve complexities, and; (c) mega-city notions are conceptualised in an ad-hoc manner. The findings

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show evidence that the current mega-city practice fails to incorporate a principal sustainability goal that is advanced and genuine. This, therefore, highlights the need for a post-anthropocentric approach in practice and policymaking for the development of truly sustainable cities. The paper seeks to stimulate potential research and further critical debates on this topic.

12. Authors Primary Contribution

This paper mainly contributes to the area of sustainability and sustainable megacity development by developing and implementing an innovative sustainable composite city environmental evaluation and designing a tool to enhance the present practice, prose a novel assessment, and deliver neighborhood sustainable projects. Past studies on sustainability assessment of megacity sustainability have received little attention in general and in the context of developing countries in particular.

The ST assessment method is designed to be holistic, effective, and robust to respond to the needs of megacity design, planning, and management within developing countries, specifically, in Nigeria context. The ST is designed to assess sustainability performance within four sustainability dimensions, Environmental, Economic, Planning, and social/cultural dimension. Overall, it looks at enhancing sustainability in megacities and enables a critical understanding of sustainability assessment and implementation within the context of developing countries by testing and validating the tool in a case study in Nigeria to achieve a sustainable megacity. The main result achieved from this paper is that a sustainable megacity and its theory can be achieved through the use of ST techniques.

13. Summary, Conclusion, and Recommendations

This paper provides an overview of sustainable megacities initiative in Gs and aim to promote sustainability. The paper explored an extensive array of literature on megacity assessment and planning that has been peer-reviewed in scientific journals and conference proceedings, government documents, and international studies.

In the present era of urbanisation, a sustainable city is a common expectation to both developing and developed nations. However, in this unequal world, the same policy “one size fit for all” of a sustainable city and its ubiquitous applicability as a goal is arguable. From this point of view, this paper focuses on the process of making a sustainable city in the GS, that follows the sustainable discourse of the GN.

The paper provides a conceptual framework to explore this contestation from the perspectives of the cities of GS. Sustainable city discourse originated through the concept of Sustainable Development Agenda 21. Several countries (Members of the UN), organisations, and communities have adopted it as a common development goal. But the development policies, more than likely to be fulfilled by achieving certain goals, are debatable. Payne (2005) in his analysis of MDGs and consideration for urban population growth argues that a target-driven policy agenda detracts attention from real issues that need to be addressed. Constantino David (2004) admits that the problem with the concept of sustainable development is that, it implies movement towards a goal. A run after achieving a certain goal becomes misleading or appears to be achievable for a minority of the urban society in the perspective of cities of the south where socio-economic disparities are explicitly visible.

Many cities have set varying types of GHG emissions reduction targets, while many have set carbon neutrality goals. This paper joins many other research and reports that show that we are a long way off from attaining the goals set by the Paris Agreement. The paper suggests that key emitting sectors should be identified and targeted for more effective mitigation strategies. For example, the differences in the roles that stationary energy use, transportation, household energy use, and waste management treatment play for cities should be assessed.

Secondly, the development of a methodology consistent with global GHG emission inventories is also needed, to track the effectiveness of urban GHG reduction policies. Lastly, cities should set more ambitious and easily traceable mitigation goals. At a certain stage, carbon intensity is a useful indicator showing the decarbonisation of the economy and provides better flexibility for cities with fast economic growth and an increase in emissions. But in the long run, switching from intensity mitigation targets to absolute mitigation targets is essential to achieve global carbon neutrality by 2050."

14. Future Work

The sustainability of megacities is paramount to ensuring economic growth and societal development. It is agreed that policymakers and megacities face more dynamic decision sets driven by complex interactions in the systems and uncertain environments with divergent stakeholders’ views on sustainable megacity development. However, these decisions are often based on a single part of a whole, but not the entirety of the complex megacities system.

It must be said here that large uncertainties persist around the analysis presented here and the referenced papers. Major factors of uncertainty persist around emissions and their geographic distribution,

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particularly, their future projections, and the extent and evolution over time of megacities. The principal tool for the assessment of megacity impacts on composition are models, a fact that contributes not insignificantly to the overall uncertainty in the impact assessment presented

In addition, decisions on current mental models that are based on assumptions to evaluate the current situation, predict possible outcomes, and decide how to influence the future, may not always deliver desired sustainable outcomes. To succeed in building the sustainability of the megacity, it is crucially important to align stakeholders' views and to equip decision-makers and megacity managers with the required abilities and skills to make proper decisions. Further research is needed to fully understand the role that megacities play in the Earth system.

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