Financing Net Zero Carbon Buildings in Nigeria

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CITIES CLIMATE FINANCE LEADERSHIP ALLIANCE

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1 Names in each sentence of the acknowledgements section are listed in alphabetical order of first name.

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ABOUT THE CITIES CLIMATE FINANCE LEADERSHIP ALLIANCE

The Cities Climate Finance Leadership Alliance is a coalition of leaders committed to deploying finance for city-level climate action at scale by 2030. Trillions of dollars will be required to help cities build the low-emissions, resilient infrastructure necessary to combat and react to climate change. The Cities Climate Finance Leadership Alliance is the only multi-level and multi-stakeholder coalition aimed at closing the investment gap for urban subnational climate projects and infrastructure worldwide.

ABOUT CPI

CPI is an analysis and advisory organization with deep expertise in finance and policy. Our mission is to help governments, businesses, and financial institutions drive economic growth while addressing climate change. CPI has six offices around the world in Brazil, India, Indonesia, the United Kingdom, and the United States.

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EXECUTIVE SUMMARY

Accelerating the mainstreaming of net zero carbon building approaches throughout Nigeria's built sector is critical. The country has a housing shortage of 17 million units,[2] and future estimated need of 700,000 units annually by 2050.[3]

Business-as-usual construction increases numerous risks, amplified by the expected pace of building construction in Nigeria. Scaling net zero building presents a major opportunity to tackle decarbonization, better resist climate shocks and stresses, and improve building life cycles.[4]

This report is part of a three-part series led by CCFLA to promote an understanding of financing barriers to net zero carbon buildings. This paper particularly focuses on Nigeria and assesses the current use of financial and policy instruments, and identifies how national, state, and local policy and regulatory frameworks can be improved to drive private and public investment in this sector.

We use CCFLA's recently developed taxonomy of 75 financial and policy instruments to help address 22 identified barriers to achieving net zero buildings. We have adapted this model to the Nigerian context, based on desktop research, stakeholder interviews, and a survey of 100 Nigerian built sector professionals. This enables us to present country-specific, high-impact implementation pathways for financial and policy instruments that can accelerate the shift to net zero carbon buildings.

KEY FINDINGS

- **Stakeholders perceive net zero carbon building measures to be more expensive than conventional ones.** This is not necessarily true. Construction and operational costs can be greatly reduced through innovative approaches and greater scale as the market develops.
- **There are significant challenges to implementing net zero carbon buildings in Nigeria.** Our survey of Nigerian construction and building sector professionals found four categories of barriers:

2 Realty, B. (2021) At 61, Nigeria should renew commitment to sustainable housing. Available online.
3 UN DESA (2018) World Urbanization Prospects: The 2018 Revision. Available online.
4 Building Green (2023) Resilient Design. Available online.

Table ES1. Barrier categories and their perceived priority

Four key barriers to net zero building	Perceived priority
Political barriers, rated by our survey respondents as the most severe among those identified, include a lack of building regulations, standard technologies, and information standards and labelling. These are barriers that make current regulations not suited to the deployment of the transition, per lack of support to net zero building specificities.	10
Financial barriers, which were also viewed as severe, include a lack of awareness of funding options and a lack of access to affordable finance. They limit the ability to source funding for investments in net zero carbon buildings.	9.6
Market readiness barriers, considered highly important by respondents, include limited experience with technical solutions, lack of expertise/skills, and limited technical product supply. These are barriers that slow down net zero carbon building deployment due to the low maturity or limited availability/supply of required technical solutions, and the lack of experience of actors involved in their deployment.	7.3
Investment risk/opportunity barriers were viewed as the least critical. These include perceived high investment costs, lack of awareness of opportunities, and high or uncertain maintenance/operation costs. These are barriers that deprioritize investment in net zero carbon buildings because of perceived risk profile or because they hinder opportunity identification.	4.3

Source: CPI, based on consultants' analysis.

Note: The "Perceived priority" assessment is based on the responses of 100 participants who were asked to rank 22 barrier types according to perceived priority in Nigeria's landscape (See Table 4 in Section 2 for a full of list of Barriers and their respective scores). The barriers are classified according to the severity score of 1 – (low) to 10 – (high) shown through a color gradient. The perceived severity score of each barrier is calculated based on the percentage of respondents who rated the barrier category as "3 = most challenging". The score of "3 = most challenging" of each barrier is calibrated according to the percentage ratio of the highest response result out of the complete set of responses.

- **Nigeria's policy environment with respect to net zero carbon buildings is fragmented. While there is no overarching strategy or policy on net zero carbon buildings, a range of policies contain some relevant provisions.** For example, while the 2017 National Building Energy Efficiency Code (BEEC) sets minimum efficiency requirements for new buildings, the 2021 National Climate Change Policy provides policy guidance on the retrofitting of buildings for energy efficiency. The identified 16 active policy instruments are generally nascent or early stage and mostly deployed on a small scale or through pilots. For example:
    - Import and use of extremely high-emitting materials is prohibited through the 2021 National Environmental (Air Quality Control) Regulation, and there is a federal ban on importing small electricity generators.
    - Four policy instruments are proposed for implementation soon, mainly relating to energy efficiency labeling. For example, the Federal Ministry of Environment is developing building energy performance standards under the BEEC.
    - There is also early-stage activity on energy efficiency and embodied carbon building codes through the BEEC, but states and LGAs have limited related regulatory frameworks or policies in place.

    - International organizations support the training of built environment professionals, but local government authorities (LGAs) do not have sufficient funds to expand this.

- **There are some well-established financial instruments for net zero carbon buildings in Nigeria, with strong potential for increasing the options available.** We found 17 financial instruments that support them. Around half of these are at a nascent or early stage, with piecemeal and small-scale deployment.
    - Nigeria has one of the most advanced green bond markets in Sub-Saharan Africa, with significant activity on sovereign and corporate bonds but less on municipal or state bonds.
    - Conventional debt financing instruments (e.g., market-rate and concessional debt) are well-established, including for sustainable buildings.
    - Grants are extensively used to support sustainable development, with technical assistance grants well-established for net zero carbon buildings. However, result-based grants are at an early stage.

RECOMMENDATIONS

Based on previous CCFLA research,[5] **we have identified five high-impact focus areas as priorities for scaling up action on net zero buildings in Nigeria (Table ES1)** and have expanded upon these through new Nigeria-focused research and stakeholder interviews.

Table ES2. High-impact focus areas for net zero buildings

Focus area	Action
Embodied carbon and materials[6]	Moving away from business-as-usual construction approaches, which make heavy use of concrete, steel, and imported equipment, can help reduce embodied carbon in buildings.
Appliances and lighting	Efficient appliances and lighting can significantly reduce electricity demand, mitigating GHG emissions, cutting operational costs of buildings, and alleviating pressure on the electricity grid. This can help to justify net zero building approaches in a context where climate impact is a low priority for government and businesses.
Cooling	Despite improvements in energy efficiency, the use of conventional air conditioning systems is expected to result in a considerable increase in energy consumption in Nigeria. It also creates GHGs related to coolants. Moving to greener cooling apparatus can help address these issues.
Electricity generation	Decentralized solar and wind energy generation can increase green electricity availability, helping to meet Nigeria's sustainable development and National Determined Contribution goals.
Clean cooking	Leveraging synergies between small-holder farming and cooking with biogas from organic waste can reduce Nigerian households' use of high-emission wood-fuelled cookstoves. This can have co-benefits for health, especially for women.

Source: CPI, based on consultants' analysis.

5 Climate Policy Initiative (2022a) Financing Net Zero Carbon Buildings: A Background and Scoping Paper. Cities Climate Finance Leadership Alliance. Available online.

6 Embodied carbon represents carbon emissions released during the lifecycle of building materials, including extraction, manufacturing, transport, construction, and disposal.

- **In addition, we identified several recommended policy and financial instruments that can help scale up net zero carbon buildings in Nigeria.** Table ES2 shows where these could support action in the five high-impact focus areas. It includes (i) instruments that are not yet active[7] in the net zero carbon building sector (tagged in green), which have been selected using the CCFLA model. It also includes (ii) other recommended instruments[8] to introduce, scale up, or improve the implementation based on what is working well and/or is likely to have a strong impact in Nigeria (tagged in blue). Section 3.4 goes into more detail by presenting not only instruments recommended by the CCFLA model, but also their respective implementation pathways, highlighting interdependencies between the 'end point' instrument and others in the taxonomy to achieve an ideal setting for scaling up net zero carbon buildings in Nigeria.

Table ES3. Recommended instruments for Nigeria

Recommend instruments	Thematic areas					
	General application	Embodied carbon and materials	Appliances & lighting	Cooling	Electricity generation	Clean cooking
Aggregation platforms			x		x	
Building energy performance standards (BEPS)	x		x		x	
Capital cost subsidy			x	x	x	
Carbon credits and markets						x
Credit lines			x		x	
Energy/carbon taxes			x			
Energy taxes				x		
Full or partial guarantees					x	
Green project/municipal bond	x	x				
Green sukuk		x				
Low-carbon/efficient equipment capital lease finance				x	x	x
Low-carbon/efficient equipment operating lease finance		x		x	x	x

7 The methodology was defined so that only end-point instruments that are not active (Proposed or Not Used) could have their instrument pathways recommended.
8 The additional recommended instruments were selected based on interview findings and desktop research, and account for both inactive and active instruments, except those that are well-established.

Recommend instruments	Thematic areas					
	General application	Embodied carbon and materials	Appliances & lighting	Cooling	Electricity generation	Clean cooking
On-bill financing (OBF) & repayment (OBR)				x	x	x
Pay-as-you-save (PAYS)	x		x	x	x	x
Pooled procurement of green financial products or buildings	x	x			x	
Property assessed clean energy (PACE) initiatives	x	x			x	
Result-based loans						x
Revolving funds		x				
Risk disclosure requirements.	x					
Securitization / Asset-backed securities (ABS)			x			
Service subsidies			x	x	x	
Tax incentives		x	x			x

Source: CPI, based on consultants' analysis

Further general recommendations to help create an enabling environment for net zero carbon buildings in Nigeria are listed below.

- **While state-level interventions are likely to be most effective in accelerating uptake, LGAs can contribute to the formation of state policy. City-led policies and initiatives are unfeasible in most of Nigeria**, given that there are next to no city-level governance structures. Each city is fragmented into multiple Local Government Authorities (LGAs), with coordination happening at the state level. State governments could assess the viability of creating a body to coordinate LGAs' action on net zero carbon buildings in a given state or area.
- **Establishing a national net zero carbon building policy or strategy and developing priority policies and incentives in collaboration with key stakeholders** can incentivize efforts and strengthen enforcement of existing policies.
- **All levels of government should lead by example** by driving development of public buildings and retrofits in ways that demonstrate net zero carbon building approaches. Governments can pilot such approaches in order to focus resources and ensure that learning points are captured and applied.
- **It is essential to increase awareness of the need for net zero carbon practices and develop the capacity to apply them in Nigeria's building sector.** It will also help to develop robust and up-to-date curricula on net zero carbon buildings that can be taught in higher education institutions.

- **Policies must also support the nexus between building affordability, net zero carbon aspects, and local job creation.** The principles of a just transition must therefore be applied, considering aspects including skills development, the gender dynamics of accessing finance, access to household-scale energy, and affordability of homes.
- **Adaptation to climate change impacts is also vital in Nigeria**, where desertification, water stress, and extreme heat are likely to increase. We should mainstream it through relevant aspects of the priority sectors above, such as increased and inclusive access to sustainable cooling.

CONTENTS

1. INTRODUCTION

Climate-conscious construction is needed to meet the building needs of Africa and Asia, where 90% of the world's urban population growth between 2020 and 2050 is projected to occur. Housing for three billion people will need to be built by 2030, in places where more than a billion people already live in poverty while facing severe effects of climate change. Nigeria has the highest demand for buildings in Sub-Saharan Africa, with expected growth in urban areas of 189 million people between 2018 and 2050.[9]

Climate finance in Nigeria is at just 11% of estimated needs, and a tiny fraction of this is going to buildings. In 2019/20, an average of USD 1.9 billion per year in public and private capital went to climate-related activities in Nigeria, with only 2% of this amount going to the building sector.[10] What's more, an estimated USD 17.7 billion needed annually to meet the country's conditional Nationally Determined Contribution (NDC) target of reducing emissions to 47% below business-as-usual by 2030. This NDC does not tackle strategies related to construction materials or design in the built sector but sets targets for energy efficiency and clean energy for buildings, as well as clean cooking.

This report builds on recent global research and methodologies conducted part of the Cities Climate Finance Leadership Alliance (CCFLA) net zero carbon buildings workstream (see Annex 1),[11] applying these to the Nigerian context. It applies CCFLA's taxonomy of 75 financial and policy instruments[12] as well as policy implementation pathways recently developed by CCFLA to understand the interdependency between policy and financing instruments, and barriers to implementation of net zero carbon building practices.

The objectives of CCFLA's deep dive in Nigeria are to:

- Understand the severity of barriers to financing net zero carbon buildings in Nigeria
- Assess the current use of financial and policy instruments in Nigeria
- Identify how current national, state, and local level policy and regulatory frameworks can be improved to drive private and public investment for net zero carbon buildings in Nigerian cities

9 UN DESA (2018) World Urbanization Prospects: The 2018 Revision. Available online.
10 Climate Policy Initiative (2022b). Landscape of Climate Finance in Nigeria. Available online.
11 Research on financing net zero carbon buildings was kickstarted by its paper Financing Net Zero Carbon Buildings: A Background and Scoping Paper (referred to hereafter as the 'scoping report') and followed by the paper Net Zero Carbon Buildings: Opportunities for Cities and how to Implement Them (referred to hereafter as the 'global report'). Alignment of the deep-dive with the global report is achieved by applying the same taxonomy system and policies implementation pathways developed in the global report.
12 The comprehensive taxonomy of 75 instruments (44 financial and 31 policy) was developed in: Climate Policy Initiative (2023) Net Zero Carbon Buildings Opportunities for Cities and how to Implement them. Available online.

This report is comprised of the following sections:

- **Section 2: Introduces the context in Nigeria**, including the current extent of net zero carbon building practice. It gives an overview of relevant policies and stakeholders and introduces the three deep-dive jurisdictions of Abuja, Lagos, and Ogun State. It also sets out typical barriers to net zero carbon buildings and summarizes key findings from stakeholder interviews.
- **Section 3: Presents analysis of the financial and policy instruments**, including on which are active in Nigeria, illustrated by a examples and case studies; what are the barriers to their increased use and scale. It also sets out **the proposed instrument implementation pathways, on how the policy and regulatory framework can be improved to drive private and public investment for net zero carbon buildings in cities**, which are based on international best practice and the findings of the modelling, along with contextualized findings from the Nigeria deep dive.
- **Section 4:** Sets out the overall conclusions of the study and the overall recommendations for policymakers in Nigeria.

2. CONTEXT IN NIGERIA

2.1 ROLE OF NET ZERO CARBON BUILDINGS IN NIGERIA'S DEVELOPMENT

Africa's building stock is expected to double by 2060, as emerging markets will experience the biggest growth in building floor area globally.[13] Nigeria also has the highest present and future demand for buildings in Sub-Saharan Africa.

Already Africa's most populous country, Nigeria is expected to double its population[14] and become the third-largest country in the world by 2050.[15] Its urban population is growing at an annual rate of 5.5%, with predictions that urban areas will grow by 189 million people between 2018 and 2050.[16] The country's urban population has grown organically,[17] as well as through significant rural-urban migration, driven by a lack of development and employment opportunities in rural areas and the prioritization of urban areas for infrastructure investment. Paired with current housing shortages, this is causing significant and growing demand for new buildings.

Nigeria currently has an estimated shortage of 17 million housing units,[18] and will need 700,000 units annually by 2050.[19] The construction industry accounts for 10.16% of the country's nominal gross domestic product (GDP).[20] However, there are many challenges in meeting the demand for housing and other types of building stock. These include weak legislation, property registration, risk sharing, absence of a national credit database, stable macroeconomic environment, knowledge gaps, licenses, taxes, poor enforcement of contracts and the high cost of building materials.[21] The cost of purchasing and renting housing is therefore high, with workers spending an average of about 60% of their disposable income on housing, which surpasses the UN recommendation of 20% to 30%.[22]

Meeting the enormous current and future demand through business-as-usual approaches would pose grave environmental and climate threats. In Nigeria, 2% of direct CO2 emissions and 7% of CO2 emissions related to electricity are attributed to buildings.[23] However, these figures do not capture all data, due to poor metering for electricity from the grid, and since most buildings generate electricity using unmetered

13 World Urbanization Prospects: The 2018 Revision. Available online.
14 UN DESA (2018) World Urbanization Prospects: The 2018 Revision. Available online.
15 WEF (2020) These countries will have the largest populations – by the end of the century. Available online.
16 UN DESA (2018) World Urbanization Prospects: The 2018 Revision. Available online.
17 National Bureau of Statistics (2020) Nigeria Living Standards Survey (2018/2019): A Survey Report by the Nigerian National Bureau of Statistics (in collaboration with the World Bank). Available online.
18 Realty, B. (2021) At 61, Nigeria should renew commitment to sustainable housing. Available online.
19 UN DESA (2018) World Urbanization Prospects: The 2018 Revision. Available online.
20 National Bureau of Statistics (2023) Nigerian Gross Domestic Product Report Q4 2022. Available online.
21 Nweke, M. (2016) Why government's commitment to sustainable housing's doubtful. Available online.
22 Realty, B. (2021) At 61, Nigeria should renew commitment to sustainable housing. Available online.
23 Climate Transparency (2020) Climate Transparency Report Nigeria's Climate Action and Responses to the COVID-19 Crisis. Available online.

fossil fuel generators.[24] Buildings are responsible for 55% of CO2 emissions in Lagos, Nigeria's most populous city, which is more than the waste sector (25%) and the transport sector (20%) combined.[25] Accelerating and mainstreaming net zero carbon buildings approaches through in Nigeria is therefore of critical importance.

2.1.1 OVERVIEW OF RELEVANT POLICY IN NIGERIA

Nigeria has a fragmented policy environment for net zero carbon buildings. For example, the 2017 National Building Energy Efficiency Code (BEEC) does not cover retrofitting buildings to increase energy efficiency, which is instead covered in the 2021 National Climate Change Policy. Despite the lack of clear overarching strategy or set of regulations, there are several federal policies on aspects of net zero carbon buildings. Some of the most relevant are described in Table 1. For a broader set of statutes, policies, and regulations, see Annex 3.

Table 1. Summary of relevant Federal policies in Nigeria

Policy title, date	Key aspects relevant to net zero carbon buildings
National Energy Policy, 2003	Aims to ensure sustainable energy supply and use in Nigeria, including through the promotion of renewable energy sources and energy efficiency. It provides a basis for encouraging the development of net zero carbon buildings by emphasizing the importance of reducing energy consumption and GHG emissions in the building sector through use of renewable energy, as well as energy-efficient building design and construction practices.
Electric Power Sector Reform Act, 2005	Aims to improve electricity supply and reliability, which can facilitate the adoption of zero carbon building practices that rely on renewable energy sources. By increasing access to reliable and sustainable energy, the Act can support the development of net zero carbon buildings that minimize carbon emissions and contribute to a more sustainable future.
National Building Code (NBC), 2006	Provides standards and guidelines for the design, construction, and maintenance of buildings in Nigeria, including provisions for energy efficiency. Although the NBC does not explicitly target the creation of net zero carbon buildings, it lays the foundation for promoting energy efficiency that can contribute to achieving this goal.
National Building Energy Efficiency Code (BEEC), 2017	Sets minimum standards for building energy efficiency in Nigeria, which can help reduce carbon emissions from buildings and move Nigeria towards the goal of achieving net zero carbon buildings.
National Climate Change Policy, 2021	Sets energy mitigation measures, including expanding the production and use of renewable energy, promoting innovative energy efficiency techniques in power generation, as well as retrofitting buildings and other infrastructure, facilitating transition to clean cooking fuel, and providing sustainable incentives and financial mechanisms to encourage and support use of renewable energy.

24 Federal Ministry of Power, Work and Housing of Nigeria (2016) Building Energy Efficiency Guideline for Nigeria. Available online.
25 GCoM (2022) Lagos City Dashboard. Global Covenant of Mayors for Climate & Energy. Available online.

Policy title, date	Key aspects relevant to net zero carbon buildings
Climate Change Act, 2021	The Act established the National Council on Climate Change, whose Secretariat is to formulate action plans to enhance energy conservation, efficiency, and use of renewable energy across multiple sectors. It also established the Climate Change Fund, which is yet to be operationalized, which can be used to incentivize private and public entities to transition to clean energy and reduce their GHG emissions.
Energy Transition Plan, 2022	The plan sets out a timeline and framework for the attainment of emissions reduction across five key sectors: power, cooking, oil and gas, transport, and industry. It aims to replace traditional firewood, charcoal, and kerosene with liquefied petroleum gas (LPG) by 2030. Beyond this date, it aims to facilitate a full transition to electric cookstoves and biogas, with the latter mainly in rural homes.

Source: CPI, based on consultants' analysis

2.1.2 OVERVIEW OF RELEVANT STAKEHOLDERS IN NIGERIA

The key stakeholders relevant to advancing the net zero carbon building sector in Nigeria are introduced in Table 2, with a more detailed list presented in Annex 4.

Table 2. Summary of key stakeholders in Nigeria's net zero carbon building sector

Stakeholders	Roles	Example organizations
Federal ministries	• Creating policies that incentivize builders to use low-carbon technologies • Regulating the building sector to ensure compliance with standards • Supporting R&D efforts for new technologies and materials	• Federal Ministry of Power, Federal Ministry of Environment • Federal Ministry of Works and Housing
Government parastatals	• Setting standards and regulations for construction and materials • Providing funding and incentives through the Bank of Industry • Raising awareness among developers, architects, and the public through programs like the Nigerian Energy Support Programme and the Energy Commission of Nigeria	• Rural Electrification Agency • Transmission Company of Nigeria • Nigerian Building and Road Research Institute • Standards Organization of Nigeria • Nigerian Energy Support Programme • Energy Commission of Nigeria • Niger Delta Power Holding Company Limited and Nigerian Electricity Regulatory Commission
Professional associations	• Providing education and training for building professionals • Advocating for policies that promote net zero carbon buildings, and raising awareness among the public and policymakers about their benefits • Developing certification programs and standards for net zero carbon buildings to establish benchmarks and encourage best practices for design and construction	• Green Building Council of Nigeria • Renewable Energy Association of Nigeria • Nigerian Institute of Architects • Nigerian Institute of Building • Nigerian Society of Engineers • Renewable Energy and Energy Efficiency Associations (Alliance) • Association of Consulting Architects Nigeria

Stakeholders	Roles	Example organizations
Non-governmental organizations (NGOs)	• Raising awareness and advocating for the adoption of net zero carbon buildings • Providing capacity building and technical assistance to building industry stakeholders • Leading pilot projects and demonstration buildings, and facilitating networking and collaboration among stakeholders, helping to showcase the benefits of net zero carbon buildings, encouraging best practices, and building partnerships	• The Energy and Resources Institute • Center for Climate Change and Environmental Studies • Clean Technology Hub, and Sustainable Use of Natural Resources and Energy Finance (Sunref) Nigeria program
Private sector entities	• Designing and constructing sustainable buildings • Providing financing for such projects, and educating and advocating for the benefits of net zero carbon buildings	• Sterling Bank • Green Energy International Limited • Africa Clean Energy Summit • Fencas Real Estate Development Company • Lagos Business School Sustainability Centre

Source: CPI, based on consultants' analysis

2.2 OVERVIEW OF THE BARRIERS AND OPPORTUNITIES IN NIGERIA

2.2.1 ABUJA, LAGOS, AND OGUN: SUBNATIONAL GOVERNMENTS OVERVIEW

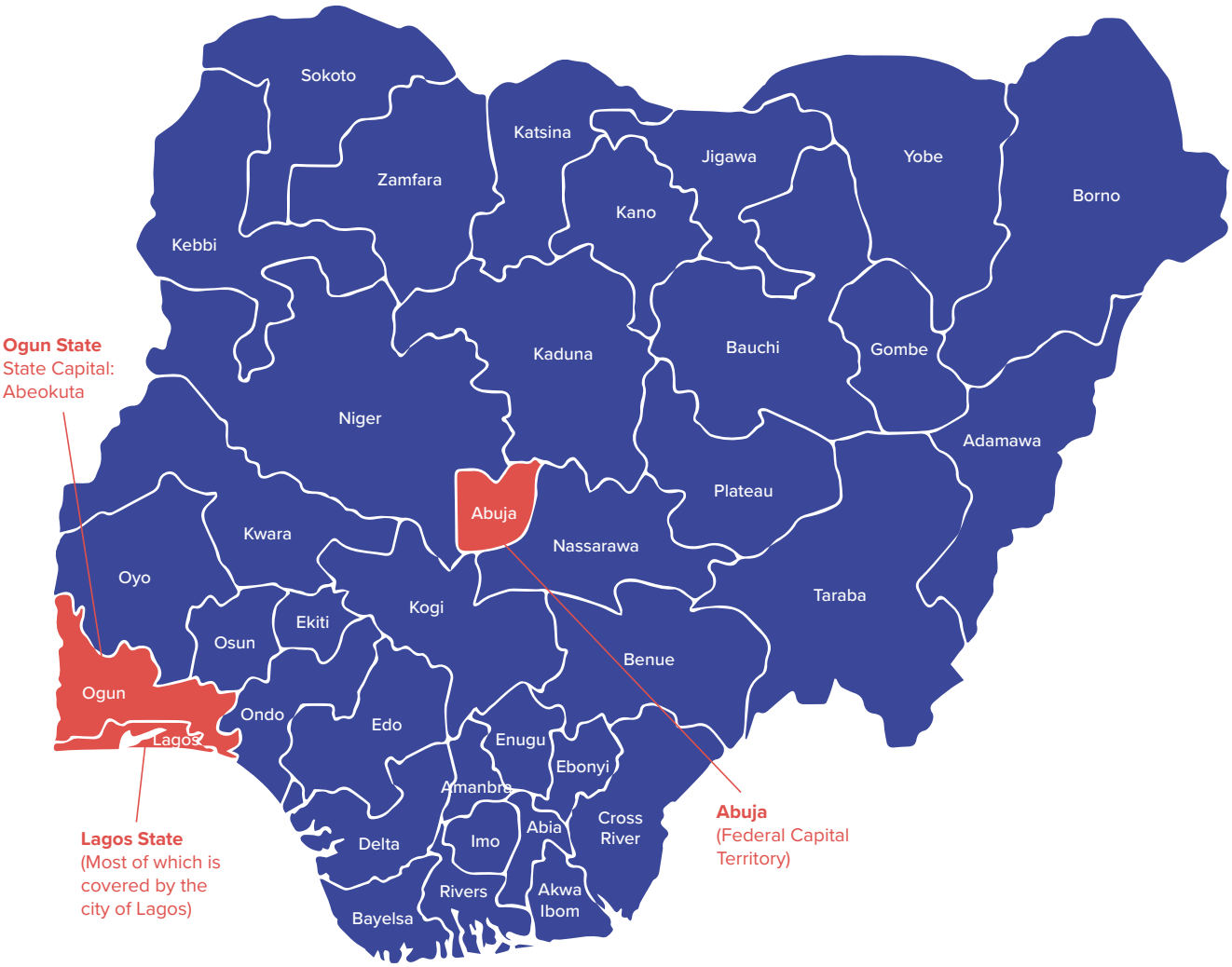
Interviews were held with 23 relevant public, private, and civil society stakeholders in the Nigerian states of Abuja (the Federal Capital Territory, FCT), Lagos and Ogun, as shown in Figure 1. These were selected for the reasons outlined below:

- **Abuja**, Nigeria's FCT, is undergoing significant growth in housing and commercial building stock. The city hosts most of Nigeria's national public institutions, including the three arms of government – Executive, Legislature and Judiciary. Unlike other states, which are headed by elected governors, Abuja is administered by the FCT Administration (FCTA), headed by a minister appointed by the president. As a result, the FCT adopts and implements all federal laws, regulations, and policies relating to net zero carbon buildings that are of general application in the whole country.
- **Lagos** is the commercial capital of Nigeria and a frontrunner in setting bylaws. The state is highly populated, with over 21 million people and there is significant urban development now and into the future with massive demand for residential, commercial, and industrial buildings. Buildings alone are responsible for 55% of CO2

emissions in Lagos city.[26] Lagos State has joined the global initiative of C40 Cities to develop and implement a Climate Action Plan.[27]

- **Ogun**, which borders Lagos State, is a new industrial hub that contains the rapidly growing cities of Abeokuta and Mowe. Many new residential, industrial, and commercial building developments are planned or under construction in the state, driven by the easy access to Lagos State, high population growth and growing GDP.

Figure 1. Map of Nigeria, showing deep-dive locations



Source: CPI

Details relating to the deep-dive locations are summarized in Table 3.

26 GCoM (2022) Lagos City Dashboard. Global Covenant of Mayors for Climate & Energy. Available here

27 In joining the C40 Cities network, Lagos State has committed developing and implementing an inclusive and ambitious Climate Action Plan to reach net zero by 2050, in line with the goals of the Paris Agreement. The Lagos Climate Action Plan (2020-25) includes an action to reduce emissions in the residential housing sector by promoting the development of energy storage technologies and incentivizing the deployment of microgrids in off-grid urban communities. This includes developing a finance mechanism and subsidies to support the uptake of renewables in residential housing units. The Climate Action Plan also includes the introduction of new building standards, which set requirements for energy efficiency and the adoption of renewables in new housing developments.

Table 3. Summary of deep-dive locations

Key aspects	Abuja	Lagos State	Ogun State
Governance	FCTA, headed by the Minister of the FCT	Lagos State Government led by the Governor	Ogun State Government led by the Governor
Legislative functions	House of Representatives	Lagos State House of Assembly	Ogun State House of Assembly
Adjudicatory powers	High Court of the FCT	Lagos State Judiciary	Ogun State Judiciary
GDP	USD 5.4 billion[28]	USD 29 billion[29]	USD 12.1 billion[30]
Population	3,839,646[31]	15,945,912[32]	6,379,500[33]

Source: CPI, based on consultants' analysis

Along with desktop research, findings from these interviews informed our understanding of the current use of financial and policy instruments in Nigeria (See Section 3) and the typical barriers to implementing net zero carbon building approaches in the country. The context and barriers presented below are drawn from public and private sector viewpoints of the overall sector.

Box 1: Building's Informality

It is important to note the role of the informal sector in Nigeria's built sector. Rapid growth of the country's urban population has resulted in chaotic and poorly managed urban development[34]. Each Nigerian city's informal sector has its own dynamics. Overall, informal construction activities account for 4.07% of the construction industry's contribution to national GDP.[35]

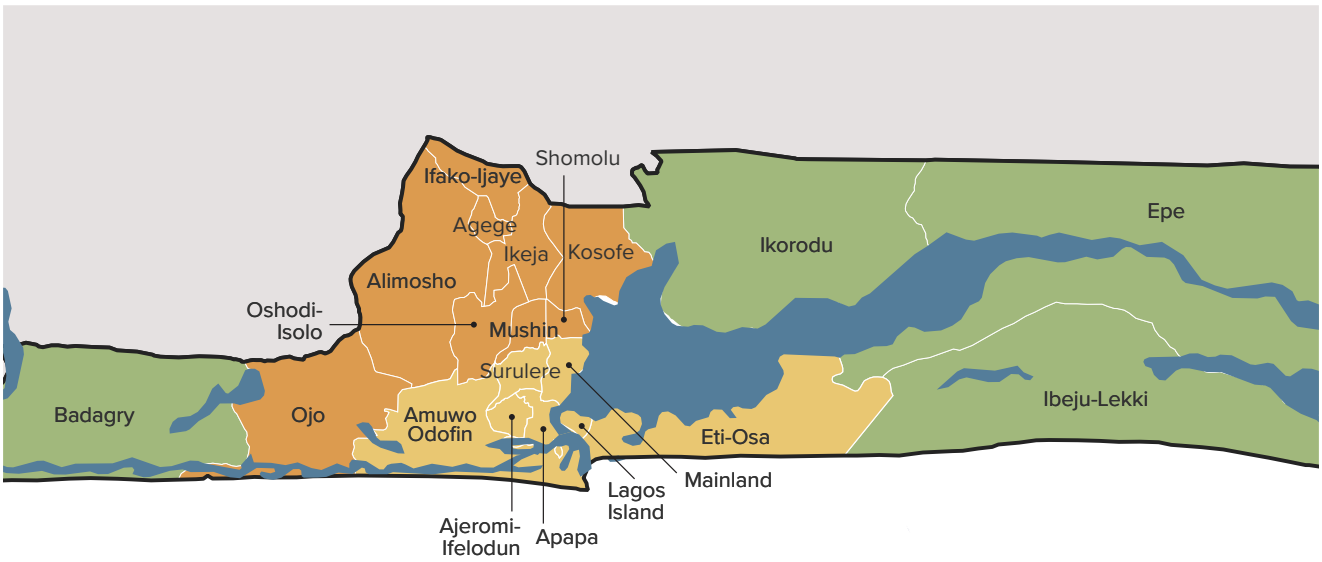
Federal- and state-level governments in Nigeria must play a vital role in accelerating net zero carbon buildings, despite their limited track record on such actions to date. Pressure from the top can force actors across the built sector to step up and implement new approaches related to net zero carbon buildings. Such a trend has been demonstrated recently by the growing shift to renewable energy in Nigeria.

There are three main levels of governance in Nigeria: Federal; State (36 states) and Local Government Authorities (LGAs). Apart from a few isolated cases, such as for the transport sector in Lagos city,[36] there are no city-level governance structures in Nigeria. Each city is fragmented into multiple LGAs, as illustrated in Figure 2, without any coordinating bodies such as a municipal government or a mayor's office. This means that cities lack the means to coordinate and implement unified strategies and

28 Kingmakers (2020) Abuja FCT - Gross Domestic Product (GDP). Available online.
29 Kingmakers (2020) Lagos. Available online.
30 Kingmakers (2020) Ogun. Available online.
31 World Population Review (2023a) Abuja Population 2023. Available online.
32 World Population Review (2023b) Lagos Population 2023. Available online.
33 City Population (2023) OGUN: State in Nigeria. Available online.
34 Nwaka, G.I. (2005) The Urban Informal Sector in Nigeria: Towards Economic Development, Environmental Health, and Social Harmony. Available online.
35 Julius, O.O. (2022) Estimation of Informal Sector of the Nigerian Construction Industry. Available online.
36 See Lagos Metropolitan Area Transport Authority (LAMATA) for example. Available online.

financial or policy instruments. These are legislated at the state level and should then be implemented and enforced by LGAs.[37]

Figure 2. Local Government authority Boundaries in Lagos State



Source: Lagos Map (Stock image)

Where there is buy-in, state governments can play an important role in driving policy, drawing on LGA engagement and inputs where possible. This can include designing investment portfolios for net zero carbon building projects. A mix of existing federal- and state-level policies can be leveraged to support net zero carbon buildings in cities. For example, the Lagos state government has set targets to install solar systems on public buildings, promote decentralized renewable energy in collaboration with the federal government, and to promote the development of energy storage technologies and microgrids.

Green procurement by the public sector is an important instrument to demonstrate net zero carbon approaches. This has been tried in Plateau and Lagos states, but only involves voluntary uptake and has not gained traction elsewhere. The federal government could encourage states to adopt green procurement in a meaningful way.

Incentives (financial, tax-based etc.) are key to driving uptake of net zero carbon building practices. Net zero carbon buildings (and components like materials and equipment) must also be equally or more cost effective than business-as-usual to be scaled up in Nigeria's current context. Reducing import tariffs for sustainable equipment

37 This is corroborated by our survey results: when asked "which governmental level would your company align with/has aligned with in the past to introduce or develop zero carbon buildings through your organization?", 50% of the respondents indicated the federal government, while 20% pointed to the state government, and 18% chose LGAs.

and materials can support net zero carbon buildings. This strategy has greatly supported renewable energy uptake in Nigeria. However, such incentives should not displace locally produced materials. Tax incentives could be offered for use of local sustainable materials to prevent this.

Encouraging local production of sustainable building materials will be vital. There is an important role for government to set the right policy frameworks and incentives to promote and enable local production of materials like low-carbon bricks, green concrete, green tiles, and recycled materials. This will also create jobs in what is currently a nascent market. Developers and construction companies will be incentivized to use local materials if these are of sufficient quality and cheaper than imports. This can help to avoid fluctuating and often high prices of imported materials.

It is also important to seek synergies between climate change mitigation and adaptation for the built environment in Nigeria. More consideration is needed on how to incentivize vegetation and nature-based solutions via financial and policy instruments for net zero carbon buildings. This can also be achieved by combining resilience, via robust building codes and risk informed spatial planning, with net zero carbon building approaches, policy, and financing.

A wide range of partnerships are needed to push the decarbonization agenda forward: Public-private partnerships are well-established in Nigeria and can offer solutions for net zero carbon buildings. Interviews found that the Lagos State Government is open to developing an affordable financing model implementing of public-private partnerships on microgrids for residential housing sector. Partnership between local governments and NGOs would also catalyze zero carbon building projects, realizing opportunities for local production of materials, boosting local skills, and even supporting implementation of net zero carbon building policy in the country.

There are some limited examples of net zero carbon building workforce training: For example, the Lagos State Government is collaborating with the International Finance Corporation (IFC) to train government-employees on green building approaches. Human capital is a vital element in the shift to net zero carbon buildings. There is a need to increase related training and education, such as on green system design and construction standards. This can help stakeholders recognize net zero carbon building considerations beyond energy efficiency, such as reducing embodied carbon of materials.

2.2.2 PRIORITIZATION OF BARRIERS IN NIGERIA

When asked how long it would take their organizations to adopt net zero approaches, 31% of respondents said five to ten years, and 27.8% said more than ten.[38] These long-term projections are correlated with the many barriers to implementation of net zero carbon buildings in Nigeria.

38 In response to the question: “In what time frame do you think that your organization will adopt zero carbon building approaches?”.

CCFLA has outlined a set of typical barriers[39], presented in Table 4 along with insights from how these apply in the Nigerian context. This is informed by the deep-dive interviews and desktop research. The barriers are classified according to severity, scored from 1 – (least severe) to 10 – (most severe), shown through a color gradient. The scoring is based on a survey of 100 representatives of private sector organizations in Nigeria across the built sector. Overall, the most severe barriers were political and financial in nature, while market readiness barriers were also viewed as highly important. Barriers related to investment risks and opportunities were seen as least critical.

1. **Political Barriers** are considered to be the most severe. These include a lack of building regulation support, lack of standard technologies and lack of information standards and labelling. As a result of these barriers, current regulations lack the support for and adaptability to address net zero building specificities.
2. **Financial Barriers** are also ranked as most severe. These include a lack of awareness of funding options and lack of access to affordable finance. These barriers limit cities' ability to source the necessary funding for net zero carbon buildings.
3. **Market Readiness Barriers** are considered to be highly important by respondents. These include limited experience with technical solutions, lack of skills and expertise and limited technical product supply. These barriers hinder deployment of net zero buildings due to the low maturity or limited availability/supply of required technical solutions, and the lack of experience of key stakeholders.
4. **Investment risk/opportunity Barriers** are seen as the least critical, however high investment costs compared to alternatives, lack of awareness on opportunities and high or uncertain maintenance/ operation costs stand out in Nigeria. These barriers deprioritize investment in net zero buildings because of perceived risks, or because they hinder opportunity identification.

Table 4. Prioritization of Barriers (1 is Low; 10 is High)

Barrier	Severity	Context in Nigeria
Financial barriers		
Lack of awareness of funding options	9	The lack of awareness and demand for net zero carbon buildings in Nigeria means that stakeholders are also not aware of the possible financing options.
Lack of access to affordable finance	10	Nigeria has high interest rates for debt finance, as well as forex risks for loans in USD. These increase construction costs and reduce access to affordable housing, particularly when it comes to adopting green building practices.
Limited supply of dedicated financing instruments	5	The implementation of relevant instruments is piecemeal and small-scale, with a lack of synergies between instruments, due to a fragmented policy environment.

39 Developed in CPI's global report: Climate Policy Initiative (2023) Net Zero Carbon Buildings Opportunities for Cities and how to Implement them. Soon to be published.

Barrier	Severity	Context in Nigeria
Inability to pay for upfront costs	3	Costs for green buildings can be higher than conventional ones due to the immature market for sustainable properties and lack of availability of related materials and technologies.
Investment risk/opportunity barriers		
High investment costs compared to alternatives	4	Sustainable building materials are considered premium goods and have not achieved the scale to make them more affordable.
Asset class has insufficient project scale	1	Projects are often too small to attract finance.
Low or fluctuating energy prices	2	Nigeria's underdeveloped and unstable electricity grid is a barrier, along with fluctuating energy prices. The population often resorts to using fossil fuel generators, which tend to be more accessible.
Long payback on investment	1	The nascent net zero carbon building market in Nigeria leads to higher costs than conventional buildings. While sustainable buildings command higher rents in Europe or the US, helping to recoup costs, this is missing in Nigeria.
Split incentives between landlords and tenants	0	Misalignment of incentives between landlords and tenants in terms of making energy-efficiency or sustainability-related improvements to a rented property can hinder willingness to invest in green retrofits. This issue is present in Nigeria, as in other countries, but is considered least important by survey respondents.
Perceived technical performance risk	2	There is a severe lack of awareness, capacity, and evidence of performance of net zero carbon buildings approaches, materials, and technologies in Nigeria, creating strong perception of technical performance risk and hindering uptake.
Low priority investment	1	With a significant range of development needs in Nigeria, affordable and decent housing and other building stock is a top priority. However, stakeholders often perceive net zero carbon options as separate to these needs.
Lack of awareness/ appropriate information on opportunity	4	There is a severe lack of knowledge about climate change, environmental impact, and the benefits of green buildings. As such, there is limited awareness and information related to net zero carbon building practices.
Lack of performance data	2	As mentioned, the underdeveloped net zero carbon buildings market in Nigeria results in a lack of evidence of how such approaches can reduce emissions and increase resource efficiency.
High or uncertain maintenance / operation costs	3	There is limited evidence of the performance of net zero carbon building approaches in Nigeria, leading to uncertain maintenance and operation costs.

Barrier	Severity	Context in Nigeria
Market readiness barriers		
Limited experience with technical solutions	7	There is a lack of knowledge of and interest in net zero carbon building technologies among public and private sector and the general public.
Lack of expertise / skills	7	There is a lack of green building knowledge among built environment professionals. There are also outdated curricula in higher education institutes, which do not capture innovative approaches.
Limited technical product supply	5	Limited locally produced sustainable building materials, due to lack of awareness and demand. High costs of imported materials and technologies, due to low demand and lack of scale.
Political Barriers		
Lack of building regulation support	10	Low green building policy and standard regulation. For example, the BEEC ignores embodied carbon. Where there is policy, there is often low awareness and poor enforcement at local government levels.
Lack of standard technologies	7	As the net zero carbon buildings sector is in its infancy in Nigeria, there is a lack of awareness of appropriate technologies and approaches. There is also minimal capacity to apply standards and to accredit developments.
Lack of information standards and labeling	7	There is little information on standards and labeling for net zero carbon buildings, equipment, and processes.
Long permitting / access to land	4	Access to land can be a significant constraint to development in Nigerian cities, particularly as land banking for investment purposes locks up land. Some of the reason are: limitation of suitable sites for constructing net zero carbon buildings, limitations on the design and layout of buildings, challenges to allocate space for solar panels or other technologies.
Social risk / community opposition	4	There is a general perception that rapidly increasing conventional affordable building stock must be prioritized rather than net zero carbon buildings. Addressing this by enabling affordable net zero carbon building solutions that create local jobs is key.

Source: CPI, based on consultants' analysis through surveys and interviews. Barriers Taxonomy developed by CPI.

Notes: The barriers are classified according to the severity score of 1 – (low) to 10 – (high) shown through a color gradient. The perceived severity score of each barrier is calculated based on the percentage of respondents who rated the barrier category as "3 = most challenging". The score of "3 = most challenging" of each barrier is calibrated according to the percentage ratio of the highest response result out of the complete set of responses.

2.3 NET ZERO CARBON BUILDINGS PRIORITIES FOR NIGERIA

Five high-impact action areas were identified as mitigation impact priorities in for scaling up action in Nigeria, based on findings from literature and interviews. These are i) embodied carbon and materials; ii) appliances and lighting; iii) cooling; iv) electricity generation; and v) clean cooking. These also inform the recommended financial and policy instrument pathways in Section 3.

2.3.1 EMBODIED CARBON AND MATERIALS

Nigeria is experiencing rapidly accelerating demand for building stock, particularly housing units. Business-as-usual approaches to construction, including heavy use of concrete and steel and reliance on imported equipment, will lock in significant GHG emissions. Embodied carbon must be displaced by alternative approaches and materials. This also poses significant opportunity for local job creation. Some examples of how reduced embodied carbon and materials can be achieved in Nigeria are:

- **Use of low embodied carbon and carbon sequestering materials:** Replacing standard materials with locally made low-carbon alternatives such as sandbags instead of bricks (Box 2), or concrete made of fly ash or slag, could reduce 12-17% of embodied carbon.[40] Standard concrete slabs can be replaced by hollow core slabs in construction and carbon-sequestering materials such as cement that absorbs CO2 will also be available in future.[41]

Box 2: Sandbag Houses, South Africa

Aiming to minimize housebuilding costs while saving valuable resources, the Sandbag Houses project replaced bricks with sandbags. This reduced carbon emissions from building construction and used locally sourced materials that were sustainably sourced without carbon emissions from transportation.[42]

Building and building material reuse: It can be beneficial to encourage and recognize developments that reuse existing buildings to minimize materials consumption. This includes guidance for and encouragement of designs that prolong use of existing products and materials. Recycling municipal waste as building materials such as pozzolanas (reinforcement materials in cement) can reduce emissions.

Traditional building techniques and materials: Use of materials such as rammed earth walls, bamboo, or coconut husk for fiber reinforcement of roofing tiles cuts carbon emissions and creates local jobs, building on traditional skills, contributing to a just transition.

40 Chen, Z et al. (2021) Carbonation of steelmaking slag presents an opportunity for carbon neutral: A review. Available online.
41 Aboidun, Y.O. et al. (2022) Cutting Cement Industry CO2 Emissions through Metakaolin Use in Construction. Available online.
42 ESI Africa (2022) Green Building Materials changing Construction Dynamics in Africa. Available online.

Lifecycle assessment (LCA): A comprehensive evaluation that assess the environmental impact of a building throughout its entire life cycle, from construction and operation to eventual demolition or end-of-life scenarios. This helps to identify the embodied carbon of specific materials, and to identify those with the least carbon impact. LCAs also help to identify the full lifecycle carbon burden of the building that will need to be offset. Incentives may be introduced to encourage builders to conduct LCAs.

2.3.2 APPLIANCES AND LIGHTING

Energy efficiency can reduce electricity demand on a severely dysfunctional grid, as well as reducing GHG emissions. Operational costs of buildings can be reduced, helping to justify net zero carbon building approaches in a context where climate impact is a low priority for government and businesses. Some examples of how this can be achieved in Nigeria are:

- **Installing smart, solar, and LED lighting systems:** Smart lights autonomously turn off in rooms where there is no movement. LED bulbs use 75% less electricity than incandescent bulb and lasting 25 times longer. In our survey, most respondents were aware of solar powered lights as energy-saving techniques for buildings.
- **Using artificial intelligence and machine learning in appliances:** This can help regulate energy use by controlling device activities, enhancing energy efficiency of buildings, and reducing overall energy consumption.

2.3.3 COOLING

Cooling is vital for improving quality of life in Nigeria, as well as for adaptation to rising average temperatures and periods of extreme heat. The city of Lagos, for example, could have temperatures at 40^{0}C or over 100 times more frequently in future.[43] Nigeria is the largest market for cooling products in Africa and one of the fastest growing in the world.[44] Nigeria's growing population, combined with improving lifestyle, urbanization and heatwaves, collectively contribute to a growing demand for ACs and other cooling devices.[45]

Conventional air conditioning, which is subject to energy efficiency standards in Nigeria, is forecast to increase energy demand significantly in the near future, along with GHGs related to coolants. Most air conditioners (ACs) used are inefficient and use refrigerants with high global warming potential (GWP).

Some examples of solutions for addressing the cooling issue in Nigeria are:

- **Nature-based solutions:** Domestic gardens, vertical greening systems, green roofs, parks, and urban forestry mitigate heat island effects, while capturing and sequestering carbon dioxide. These are useful for areas with high building density, particularly as an affordable option in the Nigerian context.

43 SE4All (2018) Cooling for All Current and Projected Cooling Demand. Available online.
44 CLASP (2020) Environmentally Harmful Dumping of Inefficient and Obsolete Air Conditioners in Africa. Available online.
45 U4E (2021) Energy-Efficient and Climate-Friendly Cooling in Nigeria. Available online.

- **Efficient ventilation systems:** Natural ventilation does not use energy and provides "free cooling", while mechanical ventilation supplies and extracts air throughout buildings. Using these in combined systems is useful in Nigeria, where the national power grid is dysfunctional.
- **Low energy cooling appliances:** Nigeria is Africa's largest market for inefficient cooling products, and one of the fastest growing in the world.[46] Accelerating the transition to green ACs would reduce use of electricity and GWP refrigerants. It is important that the cooling Minimum Energy Performance Standard and labels be revised, as is the development of an efficient monitoring, verification, and enforcement system.

2.3.4 ELECTRICITY GENERATION

Rapidly expanding electricity demand must be met with renewable sources to meet Nigeria's sustainable development needs and carbon mitigation commitments. Some examples of how this can be achieved in Nigeria are:

- **Renewable energy:** There are significant opportunities for decentralized solar and wind energy generation, given that the main source of direct carbon emissions in buildings in Nigeria is from use of fossil fuel energy generation.

Box 3: KARMOD Abicus One Project, Nigeria

KARMOD makes prefabricated, environmentally friendly, sustainable, and affordable green homes. These are equipped with a pair of solar panels and a small lithium battery with an inverter that can be metered. The project received EDGE[47] advanced certification for over 40% less energy consumption compared to similar business-as-usual projects in Abuja.[48]

2.3.5 CLEAN COOKING

An estimated 60% of Nigerian households burn wood for cooking, resulting in significant GHG emissions and related health issues. Gender inequalities also arise from loss of time collecting wood and tending fires. There are also synergies to be exploited between small-holder farming and cooking with biogas from organic waste. Some examples of how cleaner cooking methods can be achieved in Nigeria are:

- **Replacing traditional cookstoves with efficient cooking systems:** Sustainable cooking systems can be installed during building construction. This can be done by using ceramic liners, for example, that increase consumption efficiency and retain heat for longer. Increasing uptake of solar cookers and LPG, can also help, including

46 CLASP (2020) Environmentally Harmful Dumping of Inefficient and Obsolete Air Conditioners in Africa. Available online.
47 EDGE: Excellence in Design for Greater Efficiencies is an international green building certification system created by the International Finance Corporation.
48 Chieshe, T.M. (2022) KARMOD: Championing Prefabricated Green Buildings in Nigeria with EDGE, Housing Cable, February 28. Available online.

through investment in distribution infrastructure and effective consumer financing models.[49]

2.3.6 BARRIERS RELATED TO THEMATIC MITIGATION PRIORITIES

To score the severity of each identified barrier to adopting net zero carbon building approaches, we assessed which could hinder progress on the five thematic priorities described above. This analysis is presented in Table 5.

These barriers apply to the priority areas in different ways. For example, embodied carbon and materials are affected by the full range of finance barriers, while financing is less of an issue for renewable energy initiatives due to their significant funding and proven business models. Market readiness barriers are more severe for sustainable cooling approaches than clean cooking, which has greater awareness among the Nigerian public.

Table 5. Thematic Mitigation Priority Areas

Barriers	High-impact thematic focus				
	Embodied carbon & materials	Appliances & Lighting	Cooling	Electricity Generation	Clean Cooking
Financial Barriers					
Lack of awareness of funding options	■	■	■		
Lack of access to affordable finance	■	■	■	■	■
Limited supply of dedicated financing instruments	■	■			
Inability to pay for upfront costs	■		■	■	
Investment Risk/Opportunity Barriers					
High investment costs compared to alternatives		■	■	■	
Asset class has insufficient project scale		■	■	■	■
Low or fluctuating energy prices		■	■	■	
Long payback on investment	■	■	■	■	
Split incentive between landlords and tenants		■	■	■	
Perceived technical performance risk	■	■	■	■	■
Low priority investment	■			■	

49 Climate Policy Initiative (2021) Energizing finance: Understanding the Landscape, 2021. Available online.

Barriers	High-impact thematic focus				
	Embodied carbon & materials	Appliances & Lighting	Cooling	Electricity Generation	Clean Cooking
Lack of awareness/appropriate information on opportunity	■				
Lack of performance data	■				
High or uncertain maintenance / operation costs	■	■	■	■	
Market Readiness Barriers					
Limited experience with technical solution	■		■		
Lack of expertise / skills		■	■	■	
Limited technical product supply	■	■	■		■
Political Barriers					
Lack of building regulation support	■				■
Lack of standard technologies	■				
Lack of information standards and labeling	■				■
Long permitting / access to land				■	
Social risk / community opposition					■

Source: CPI, based on consultants' analysis

Note: Prioritization of barriers for the specific thematic areas is based on expert judgement and limited to the most impacted themes. Purple boxes indicate the relevance of the barrier to that thematic area.

3. ANALYSIS OF FINANCIAL AND POLICY INSTRUMENTS IN NIGERIA

3.1 OVERVIEW OF KEY FINDINGS

Previous research by CCFLA developed a comprehensive taxonomy of 75 financial and policy instruments for the promotion of net zero carbon buildings. This also analyzed the interdependencies between instruments that enable an objective to be realized. The current report assesses the extent of implementation of these instruments at all levels of Nigerian government through laws and/or regulations, the barriers that they can help to overcome, and their suitability for the city context.

The maturity of each financial and policy instrument in Nigeria is assessed as per the following categories:

Table 6. Categories for Instrument Maturity

Category	Definition
Not used	There is no evidence of the instrument being applied in the net zero carbon buildings sector in Nigeria.
Proposed	The instrument has not yet been applied in the net zero carbon buildings sector in Nigeria, but there is evidence that the concept has been proposed.
Nascent (0-2 years)	The instrument has been piloted and tested or rolled out on a small scale, although it remains uncertain if it can be scaled up and sustained.
Early stage (3-5 years)	The instrument has been deployed more widely and is generally supported with relevant policy, regulations, and processes.
Well established (5+ years)	The instrument has achieved scale and sustainability in implementation and there is a robust evidence base on the extent of its effectiveness in Nigeria.

Source: CPI

In Nigeria, 17 of the total 44 financial instruments in the taxonomy are active in supporting net zero carbon buildings. Four financial instruments have been proposed by stakeholders in Nigeria for implementation in the near future (green mortgages, catastrophe bonds / insurance pools, carbon credits, and energy/carbon taxes). Around half of these active financial instruments are nascent or at an early-stage, and are deployed on a small scale in a piecemeal way. Eight financial instruments are well established in Nigeria for net zero carbon buildings. These are: Concessional loans, Energy Performance Contracts (EPC) and Energy Service Companies (ESCOs), Energy Service Agreements (ESAs), Feed in tariffs, hybrid models for build / purchase / operate / transfer and lease of assets, and technical assistance grants.

Regarding the policy instruments, 16 policies are active and four more have been proposed for implementation in the near future, mainly relating to energy efficiency performance labeling for appliances and whole buildings. There is not a combined policy relating purely to net zero carbon buildings in Nigeria, but many relevant aspects are covered by a range of federal policies.

The active policy instruments are generally nascent or early-stage, and only two are well established (Prohibition of Extremely High-Emitting Materials[50] and Promotion of pilot projects).

An overview of each 'family' of instruments is provided in the following sections and a full summary of the implementation status is included in Annex 2.

3.2 CURRENT STATE OF FINANCIAL INSTRUMENTS

GRANTS

Grants have been used extensively in Nigeria for sustainable development objectives. In the net zero carbon buildings sector, **technical assistance grants** are well established. **Result-based grants** are at an early stage and are typically used for renewable energy mini-grids, via the Performance Based Grants Programme of the Rural Electrification Agency. Both types of grant are used in Sunref's project for energy efficiency investments and grants in Nigeria (Box 4). Grant instruments do not require a specific regulatory environment to be implemented. However, they depend on demand for support in this area from federal or state governments, which is often limited due to lack of awareness of the importance of net zero carbon buildings.

Box 4: Sunref Nigeria – Results-based grants and TA

Funded by the Agence Française de Développement and hosted by the Manufacturers Association of Nigeria and in partnership with local banks, United Bank for Africa, and Access Bank, SUNREF Nigeria offers the private sector competitive loans and technical assistance for structuring green investments in renewable energy and energy efficiency. Project sponsors can benefit from a grant of 5% to 20% of the loan amount, subject to the successful completion of their project.

DEBT FINANCING

More conventional debt financing instruments such as **market-rate debt**, and concessional debt are well established in Nigeria, including in the net zero carbon buildings space. The National Housing Fund Loan is an example of concessional

50 The National Environmental (Air Quality Control) Regulation 2021 clearly prohibits importation and use of high-emitting materials in Nigeria. In 2015, the Federal Government banned the import of small electricity generators because of their high emissions characteristics.

finance. The successful use of **credit lines** depends on the selection of competent and committed financial institutions. Experience from Sunref in Nigeria (See Box 4) shows that building technical assistance into the credit line helps lower the technical and financial risks of projects. **Results-based loans, revolving funds**[51] and **syndicated loans** are not yet applied in Nigeria's net zero carbon buildings sector.

Green mortgages, with discounted interest rates for net zero carbon design, are also not applied, though they have been proposed by several stakeholders. The Nigeria Mortgage Refinance Company (NMRC) recently pledged to back the adoption of net zero carbon buildings and to provide mortgages to net zero carbon building developers. IFC's EDGE green building certification, applied by the NMRC, helps developers to determine cost-effective ways to apply net zero carbon building principles, based on occupant behavior, building type and local climate. However, low incomes and savings across the country, constrain households' ability to take up mortgages. There is also a certification bottleneck, as independent assessment is often needed to verify that buildings qualify for green mortgages.

DEBT - BONDS

Nigeria has one of the most advanced **green bond** markets in Sub-Saharan Africa, with much recent activity on sovereign and corporate green bonds (See Box 5). However, there is not much activity at the municipal or state bond level.[52] **Green sukuk** – or Islamic bonds – have been used to fund the wider renewable energy sector, but not specifically for net zero carbon buildings. **Green bonds** and **green sukuk** also offer a solution for the aggregation of many smaller projects related to net zero carbon buildings, though there is a limited pipeline of feasible projects for this at present. There is a need for upfront communication with investors on green bonds and the projects these will fund, as well as clarity on plans for reporting in terms of format, frequency, and content.[53] Nigeria must also increase its stock of qualified verifiers as there is a bottleneck for independent assessment to ensure that green bonds and sukuk that meet the international standards laid out in the Green Bonds Principles.

There is little awareness among public and private stakeholders in the built environment sector of **catastrophe bonds**. Nigeria will soon be eligible to benefit from the African Risk Capacity climate catastrophe bond backed the Extreme Climate Facility, which could finance resilience aspects of buildings, such as better flood risk mitigation.

51 The Nigeria Trust Fund (NTF), established in 1976, is the earliest example of a revolving fund for development outcomes, albeit with a focus on other sectors.
52 FSD Africa (2022) Green Bonds in Nigeria: The Nigerian Green Bond Market Development Program Impact Report. Available online.
53 Green bonds should adhere to Climate Bonds Initiative Taxonomy and require public reporting of the use of proceeds and can involve other optional verification processes.

Box 5: Rooftop solar financing via a sovereign green bond

In 2017, Nigeria issued its first sovereign green bond. The proceeds from the 5-year, NAI 10.69bn (USD 29.7m) bond, issued with international support (World Bank, UNEP, Climate Bonds Initiative) in collaboration with the Federal Ministry of Finance, the Federal Ministry of Environment, and leading financial advisors from the Nigerian capital market, was used to finance rooftop solar renewable energy and other projects.

EQUITY

There is some early use of **private equity** as a financing instrument for net zero carbon buildings in Nigeria, particularly for student accommodation (See Box 6). However, private equity finance faces constraints, such as fiscal pressures with increasing shift to debt and quasi-equity transactions as investors look to hedge risks. Other barriers include regulatory bottlenecks and high fees and limited awareness and pipeline of feasible projects in the net zero carbon buildings sector, which could benefit from equity financing.

There is no evidence of **crowdfunding** or **public equity** for net zero carbon buildings in Nigeria. Crowdfunding platforms exist and can operate in the existing policy environment, but funds raised tend to be small, compared to the larger financing needs for net zero carbon buildings measures.

Box 6: Private equity finance for EDGE-certified student accommodation in Nigeria

Student Accommodat8 and Greenage are developers of student accommodation in Nigeria, backed by private equity finance, that are applying EDGE-certified measures to their purpose-built units, helping to reduce environmental impact and operating costs.

STRUCTURED FINANCE

Several **aggregation** initiatives exist in Nigeria, though at a nascent stage. The most relevant is the pilot carried out in Nigeria for GreenStreet Africa, an aggregation platform for rooftop solar, advocated by the Climate Finance Lab.[54] A lack of coordination between stakeholders often prevents aggregation models from succeeding, and the pipeline of relevant projects in the net zero carbon buildings sector is limited.

Land banking has become a popular investment option in Nigeria, especially for corporate real estate investors. Purchased land is banked until its value increases substantially as the result of rezoning, population growth or municipal expansion. However, the practice has not been used to foster adoption of net zero carbon buildings. By acquiring and holding land with sustainability goals in mind, land banking can help to promote eco-friendly construction and to create more sustainable communities.

54 Climate Policy Initiative (2020) GreenStreet Africa Development Company. Available online.

Land readjustment is not yet practiced, and it needs strong local institutions and a sound legislative framework to be implemented effectively, both of which are lacking in Nigeria. Land readjustment relies on detailed records of land ownership and plot size to facilitate easy adjustment plans. Compulsory land sale for landowners in project areas is also usual, but these aspects are lacking in Nigeria.

Pooled procurement has not been used for net zero carbon buildings although there are precedents for this instrument in Nigeria, including for vaccines. The procurement process in Nigeria is typically not sufficiently transparent to enable pooled procurement.[55] There is also a lack of coordination between public sector entities to enable effective public pooled procurement. Likewise, there is no evidence of **Securitization/asset-backed securities** to finance net zero carbon buildings, although this is used for aggregation via the Mortgage Warehouse in Nigeria.[56]

FISCAL INSTRUMENTS

There are eight fiscal instruments in CCFLA's taxonomy. Of these, **feed-in tariffs** are well established and **tax incentives** are at a nascent stage in Nigeria. The Feed in Tariff Regulation of 2015, by the Nigerian Electricity Regulatory Commission, requires electricity distribution companies to source at least 50% of power from renewables. Owing to challenges in the energy sector, there is an inherent tension between maintaining policy stability for investor confidence and recalibrating existing policies when new information or challenges emerge in relation to the feed-in tariff. There is need for a policy that allows for scalability, escalation, and adjustment of the feed-in tariff in response to prevailing circumstances, either in light of new information or changes in the sector. Feed-in-tariff guaranteed prices are also unaffordable for many citizens.[57]

None of the other fiscal instruments are implemented yet for net zero carbon buildings, although **carbon credits and markets** and **energy and carbon taxes** are proposed in the country.[58] While Nigeria's 2050 Long Term Vision acknowledges the need for carbon credits and markets, there is no framework that outlines and governs carbon credits in Nigeria. The Carbon Tax Act 2019 governs the implementation of **carbon taxes**, and the Climate Change Act 2021 recognizes carbon taxes as the source for the Climate Fund provided in the Climate Change Act. There was no implementing agency for carbon taxes in Nigeria until the creation the National Council on Climate Change by the Climate Change Act 2021. There has been some progress since, but with little or no focus on its application to net zero carbon buildings.

There is no evidence of other fiscal instruments being used for net zero carbon buildings in Nigeria: **capital cost subsidies, service subsidies, financial penalties, property assessed clean energy (PACE) initiatives, tax, or fee-based land value capture (LVC)**. All **PACE** initiative startups require public finance to first fund PACE assessments, so a prerequisite for cities implementing PACE is the availability of public finances to this end.

55 Williams-Elegbe, S. (2014) A Comparative Analysis of the Nigerian Public Procurement Act Against International Best Practice. Available online.
56 DLM Group (2020) Securitization in Africa: Highlighting the Benefits to Investors in Nigeria. Available Online.
57 Kabir, A. (2020) Protest in Lagos over electricity tariff, fuel price hike, Premium Times. Available Online.
58 Data from key informant interviews.

Legislation is required to kickstart PACE programs in states (which can then be cascaded to cities), and qualified providers and fitters of PACE technology are required.

LVC is not practiced in Nigeria and cities will need regulatory authority over managing property tax in order to implement it. Efficient and effective land-valuation tools are also essential for determining who is eligible to pay the tax and what amount. Some degree of political appetite is required to implement LVC taxes, as they are often unpopular among landowners and prolonged revenue collection can be difficult.[59]

RISK MITIGATION

Of the four risk mitigation instruments, only **collateral** is currently used for net zero carbon buildings throughout Nigeria. However, collateral is generally limited in Nigeria by low ownership of high-value assets and a decline in value of the collateralized assets overtime.

No evidence was found of the use of the other three risk mitigation instruments, **currency exchange funds, credit guarantees or risk insurance**, for net zero carbon buildings in Nigeria. Credit lines could be deployed to help de-risk investments in this sector through existing facilities such as InfraCredit, DBN, IFC, Climate Bond Initiative and NSIA/GuarantCo. The services of credit guarantee companies are limited to loans to micro-, small-, and medium-sized enterprises by financial institutions licensed by the Central Bank Nigeria. There is high potential to adapt Nigeria's existing risk mitigation enabling environment, developed for renewable energy, to green building projects, especially for affordable housing. However, a strong focus on risk mitigation for renewable energy projects may be crowding-out attention for green buildings.[60]

ASSET FINANCE MODELS

Hybrid models of build / purchase / operate / transfer and lease of assets, applied through public-private partnership (PPP) or concession models have been widely used in Nigeria to deliver infrastructure and digital platforms used by government agencies. A robust regulatory environment is already on place for such models in Nigeria. In the buildings sector, public-private partnerships are used by the University of Ilorin to finance accommodation through a build-own transfer model with eventual transfer of assets to the university. There is limited use of public private partnerships for net zero carbon buildings, though an example is provided by Echostone Nigeria in Lagos state (See Box 7).

59 Walters, L.C. (2013). Land value capture in policy and practice. Available online.
60 Data from key informant interviews.

Box 7: Green housing public-private partnership with Echostone Nigeria in Lagos State

The Lagos state government has partnered with Echostone to deliver over 100,000 affordable homes in 10 years. Of these, the Peridot Parkland Estate, comprising 252 units, is the first green building estate constructed by Echostone in Lagos state. This is certified by the IFC's EDGE standard in 2020. EchoStone plans to construct a total of 182,000 EDGE-certified homes by 2023.[61]

There is no evidence of use of the other three asset finance models for net zero carbon buildings in Nigeria. There is no enabling framework for, nor legal definition of, **development-based LVC** in the country. Major gaps exist regarding the updated status, accuracy, or completeness of land registry records and land values in urban areas, although Lagos and Kaduna have engaged specialists to determine property values. LVC relies on land sale or lease methods, as implemented in Hong Kong, Tokyo, and Istanbul, which are only suitable for cities that have large amounts of municipal land available to use. Low-carbon/efficient equipment **capital lease and operating lease finance** is largely constrained by lack of creditworthiness of most small- and medium-sized enterprises and households. There is also little government support to assist solar equipment suppliers in the case of non-compliance of lessees. Capital lease and operating lease finance requires well-developed market dynamics to ensure robust contractual arrangements and legal recourse if necessary.

OTHER INNOVATIVE INSTRUMENTS

There is a range of other innovative financial instruments identified in the CCFLA taxonomy. Three of these are well-established in Nigeria. These are: **Energy performance contracts (EPC) and ESCOs, energy service agreements (ESAs) and power purchase agreements for clean energy.** All contractual engagements in Nigeria in the power sector are underpinned by an ESA. There is also a wide range of power purchase agreements for clean energy, and the instrument is used to enhance the green building sector as well (See Box 8). There are many opportunities for ESCOs to improve their offering with access to data. However, there are also many barriers to scaling these instruments, which correlate with the general challenges in the Nigerian Electricity Supply Industry. These challenges include: infrastructure constraints; insufficient end-user tariffs/pricing; inability to reduce aggregate technical, commercial and collection losses; sector's liquidity crisis and cash shortfalls, debts, electricity theft, and non-payment culture of the public and sector governance problems.

61 International Finance Corporation (2019) Green Buildings: A finance and policy blueprint for emergency markets. Available online.

Box 8: Nigerian Breweries Plc partnership with Konexa

Nigerian Breweries Plc has partnered with Konexa and signed a historic power purchase agreement to deliver 100% renewable energy to its Kaduna Breweries. The supply of clean, renewable energy to its Kakuri and Kudenda breweries will take the company closer to becoming carbon-neutral. Under the terms of the ten-year agreement, Nigerian Breweries Plc outsourced the power supply for its critical loads for the breweries, converting from fossil fuels to hydro-power sources.[62]

While as-a-service models in the building sector are nascent in Nigeria, the renewable energy-as-a-service market is estimated to grow exponentially.[63] Barriers to this include difficulty in sourcing capable implementation partners where there is lower private sector capacity. There is no evidence of the use of **on-bill financing or on-bill repayment; pay-as-you-save (PAYS) or payment for ecosystem services (PES)** for net zero carbon buildings in Nigeria. Proactive engagement and cooperation between various parties involved is necessary for PAYS, and OBR requires a well-developed local government system for collection of tax or rates, which is often lacking in Nigeria.

3.3 CURRENT STATE OF POLICY INSTRUMENTS

MANDATES: STANDARDS AND CODES – PROCESS

None of the three standards and codes for processes have been identified in Nigeria. These are **mandatory construction waste landfill diversion, mandatory pre-demolition audits and landfill diversion, and net zero carbon construction sites.** There is no legal framework for a mandatory landfill diversion of construction waste in Nigeria or mandatory pre-demolition audits and landfill diversion. However, there is typically much informal activity around construction waste recycling. There is no policy in Nigeria that mandates or incentivizes net zero carbon building sites. Building developers are not yet encouraged to substitute GHG-emitting equipment such as diesel trucks or heavy machinery for electric or biofuel vehicles, electric battery, or biofuel powered machinery. In addition, there is no mandate for developers to transition from GHG emitting energy sources to renewable electricity.

MANDATES: STANDARDS AND CODES – BUILDINGS

In terms of standards and codes for buildings, there is early-stage activity in Nigeria's net zero carbon building sector on **energy efficient building codes and embodied carbon building codes**, encouraged by the BEEC. For energy efficiency, the BEEC specifies the minimum energy required to achieve energy-efficient building status. The BEEC also sets the minimum efficiency requirements for new buildings to achieve reductions in energy use and emissions over the life of the building. However, there

62 Tena, N. (2022) Nigerian Breweries signs renewable energy power purchase agreement. Available online.
63 Data from key informant interviews

is little regulation or policy in place to support embodied carbon reduction, at state or local government level.

Building energy performance standards (BEPS) are proposed in Nigeria under the BEEC. These mandatory building energy performance standards would cover both operational energy and embodied carbon and would apply to new construction as well as major renovations of existing buildings.

Also connected to energy efficiency, **audits, tune-ups, and retro-commissioning** are at a nascent stage. While there is provision for these processes in the BEEC, there is a lack of drive by the responsible government agency, the Energy Commission of Nigeria (ECN), to implement them at scale beyond public buildings. The ECN has led the audit of public buildings and states have also conducted energy audits over the years. The Lagos State Electricity Board, an agency under the state's Ministry of Energy and Mineral Resources, in 2020 conducted an energy audit of all public buildings and government-owned facilities. This instrument is best administered by states, given that building construction approvals are issued by their responsible ministries or agencies.

Hazard-specific building code amendments are also at an early stage. The National Environmental Soil Erosion and Flood Control Regulations 2011 require that all new construction and substantial improvement in erosion- and flood susceptible areas must be in compliance with the Zoning Act, Municipal Development Guidelines and Building Codes, as well as standards set from time to time by relevant agencies. In addition, the NBC has mandates for any building construction in regions subject to seismic disturbances. States and their responsible agencies are required by the Nigerian Regional and Urban Planning Act 1992 to prepare land use plans based on the findings of climate vulnerability risk assessments. However, implementation of this requirement varies greatly. A key barrier is a lack of adequate studies and data on environmental features of localities.

There is no policy on **mandatory material take-back** for construction waste in Nigeria. Cities seeking to implement such a policy should have mandates, standards and codes reviewed and supported by major stakeholders. There should be a mechanism or forum instituted by municipalities and governments to address developing issues, redress, and amendments. Lack of adequate inspection and monitoring of construction sites is also a barrier. There is also no policy on renewable energy **(RE) generation or off-site purchase.** This would require cities' capacity to monitor and enforce compliance, as well as for effective data collection and quality assurance, and data verification tools.

MANDATES: STANDARDS AND CODES – COMPONENTS

Several policy instruments focus on energy efficiency and reduced GHG emissions of components and equipment. **Advanced metering infrastructure (AMI)** is at an early stage in Nigeria; the key enabling policy is the Nigerian Electricity Smart Metering Regulation by the Nigeria Electricity Regulation Commission. While 'smart' meter technology is available, utilities must have technicians to install them and must be able to manage follow-on smart grid policies. Energy distribution companies have had to part with billions of Naira, due to vandalism and theft of metering infrastructure. People are

also unwilling to pay the upfront costs, and the government has subsidized or in some cases paid for meters.

There is also early-stage progress on **minimum energy performance standards**, as recently rolled out by the Standards Organisation of Nigeria (SON) to support energy efficiency of refrigerators and AC, etc. However, there is little awareness of appliance standards and labeling among professionals, and performance data is lacking.

One of the key decarbonization strategies of the Nigeria Energy Transition Plan is to move by 2030 from traditional firewood, charcoal, and kerosene cookstoves to LPG, efficient wood, electrification, and biogas, particularly in rural areas. The National Environmental (Air Quality Control) Regulation 2021 clearly **prohibits the importation and use of high-emitting materials** in Nigeria. There are early-stage policies and efforts to **phase out fossil fuel-based appliances and equipment**. However, progress is constrained by a lack of enforcement, corruption and smuggling of banned high-emitting materials and equipment, as well as an influx of sub-standard appliances. There is also a lack of technical know-how to detect high-emitting materials and equipment. Alternatives are also constrained by a lack of confidence in the quality of emerging non-fossil-based equipment.

MANDATES: INFORMATIONAL

Informational mandates are important for scaling up net zero carbon buildings in Nigeria, though there is little progress in this area to date. An exception is the early progress in **construction materials efficiency declaration and lifecycle carbon calculation and reporting.** For lifecycle assessment, for example, the Building Energy Efficiency Guideline for Nigeria 2016 introduced the IES virtual environment tool. This tool integrates lifecycle assessment (on environmental impact) with lifecycle cost analysis, facilitating coordinated decision-making for low-impact design. This enables consideration of a particular solution's embodied carbon vis-a-vis its operational benefits throughout the building life cycle. The tool requires submission of a material calculation sheet as part of the building approval process. However, its use is constrained by a lack of technical know-how and skills for using the calculation software, and a lack of enforcement on new building projects.

Benchmarking and labelling for equipment, as well as for whole buildings, are proposed by the government for use in Nigeria. The National Building Efficiency Code provides minimum energy efficiency requirements, however, legislation to promote and enforce these has not been adequately created, except for the provision of the BEEC in relation to labeling (but not benchmarking). There appears to be no relevant regulatory environment for building passports or risk disclosure requirements in Nigeria in relation to green buildings.

NON-FINANCIAL INCENTIVES

Non-financial incentives cover several instruments to help move towards carbon efficient approaches. There are several **awards** in Nigeria's net zero carbon buildings sector, particularly, relating to energy. For example, the annual Nigeria Model Green States Awards, established by The Mary-Elika Foundation, include "project of the

year" categories for eco-friendly buildings/infrastructure, carbon reduction, and green investors. Building projects that adopt **green certification systems** such as LEED[64], BREEAM[65] or the IFC's EDGE are publicized on online platforms. However, there is a lack of incentives to participate in awards or publicize the adoption of such practices.[66]

Three of the instruments incentivize net zero carbon through spatial planning. The first, **density bonus for carbon efficiency**, is not implemented in Nigeria, though Ogun State Ministry of Urban Planning is exploring this. There is no clear policy on **expedited permitting or zoning use exemptions** in Nigeria. However, building certification standards are gaining momentum and can be leveraged for zoning use exemptions.

CAPACITY DEVELOPMENT

Several instruments in the CCFLA taxonomy focus on developing capacity among public and private sector stakeholders. **Promoting pilot projects** is well-established in Nigeria, including for green and affordable homes.[67] There is scope to link this more clearly to **promoting design and construction best practice** as well as to develop training programs in collaboration with international institutions and NGOs. **Workforce training**, via collaboration with international organizations, does exist for built environment professionals in Nigeria, albeit on a small scale. However, LGAs in cities lack the budgets for such training and workshops. Limited access to technology, knowledge, and lack of specified standards for net zero carbon buildings also present challenges to workforce training. **Comprehensive enforcement** is not prioritized in net zero carbon buildings sector at present. There are a lack of institutions to implement this. Authorities such as Nigeria's Corporate Affairs Commission use comprehensive enforcement in other sectors and can align with relevant stakeholders to develop it for the building sector. There is state-level interest to study and **publish hazard and risk open data** for building and construction practices in Lagos and Ogun.[68] However, progress on this is nascent across Nigeria.

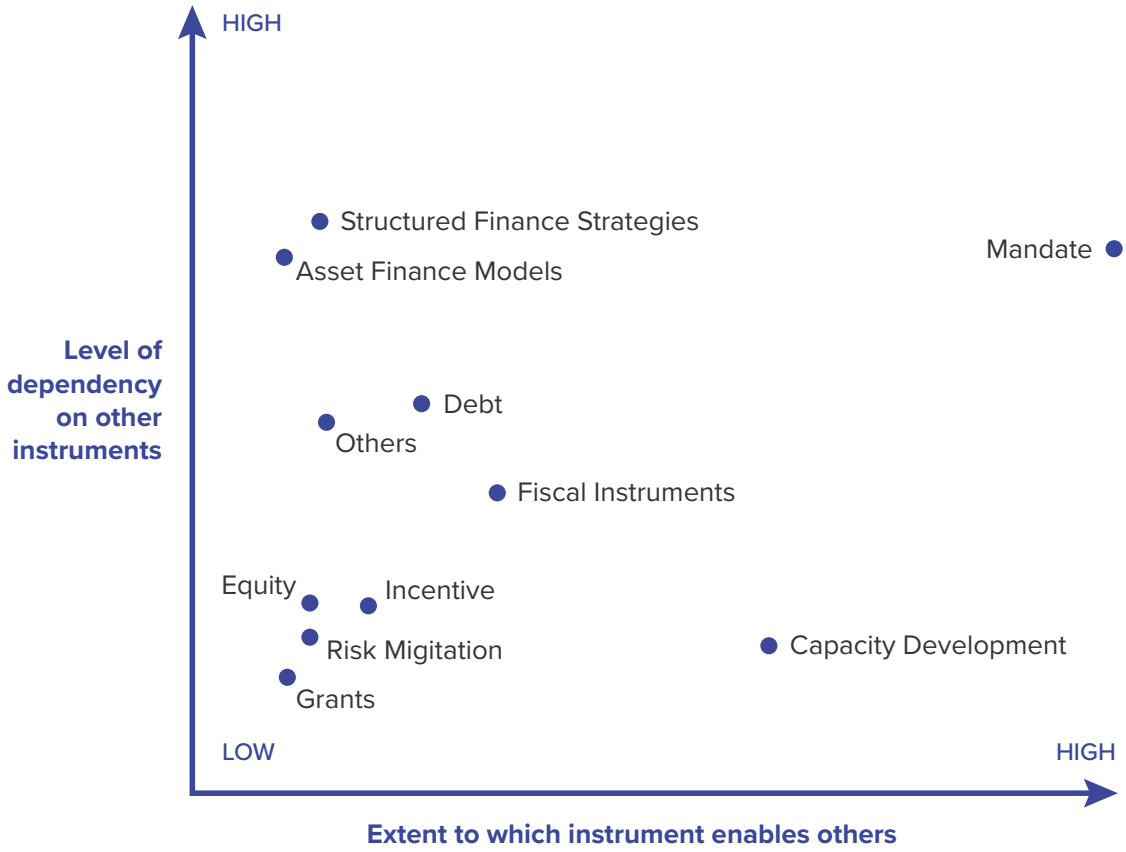
3.4 RECOMMENDED INSTRUMENT IMPLEMENTATION PATHWAYS FOR NIGERIA

CCFLA has used inputs from the Nigerian context in its model to devise country-specific implementation pathways for different combinations of financial and policy instruments. Most of the recommended end-point instruments have interdependencies with one or more of the others in the taxonomy (Figure 3). The model recommends instruments and also their respective implementation pathways, highlighting interdependencies between the 'end point' instrument and others in the taxonomy to achieve an ideal

64 Leadership in Energy and Environmental Design (LEED) is a green building certification program used worldwide developed by the U.S. Green Building Council.
65 Building Research Establishment Environmental Assessment Methodology (BREEAM) is science-based suite of validation and certification systems for sustainable built environment.
66 Data from key stakeholder interviews.
67 BNRCC. (2011) Reports of Pilot Projects in Community-based Adaptation – Climate Change in Nigeria. Available online.
68 Data from key informant interviews.

setting for scaling up net zero carbon buildings in Nigeria. For example, implementing building energy performance standards requires seven other instruments in the taxonomy for success.

Figure 3. Instruments' tendency to depend on or enable the use of others



Source: CPI, 2023

The following subsections present recommended implementation pathways for selected 'end-point' instruments. Section 3.4.1 outlines pathways identified for the net zero carbon building sector in general. Section 3.4.2 then presents the relevant instruments for five thematic priorities identified for Nigeria (embodied carbon and materials; appliances and lighting; cooling; electricity generation; and clean cooking), and also outlines a further instrument implementation pathway from those that have not already been covered. For brevity, we have limited the explanation to one further pathway for each thematic priority.

We note that the methodology was defined to only recommend end-point instruments that are not active (i.e., that are not used, or have so far only been proposed). Policies that are already in place (i.e., nascent, early stage, well established) will be valuable for scale and replication in Nigeria, but have not been included in the modelling. The suggested pathways from the model are also supported and caveated by findings from our interviews and desk research.

3.4.1 GENERAL IMPLEMENTATION PATHWAYS

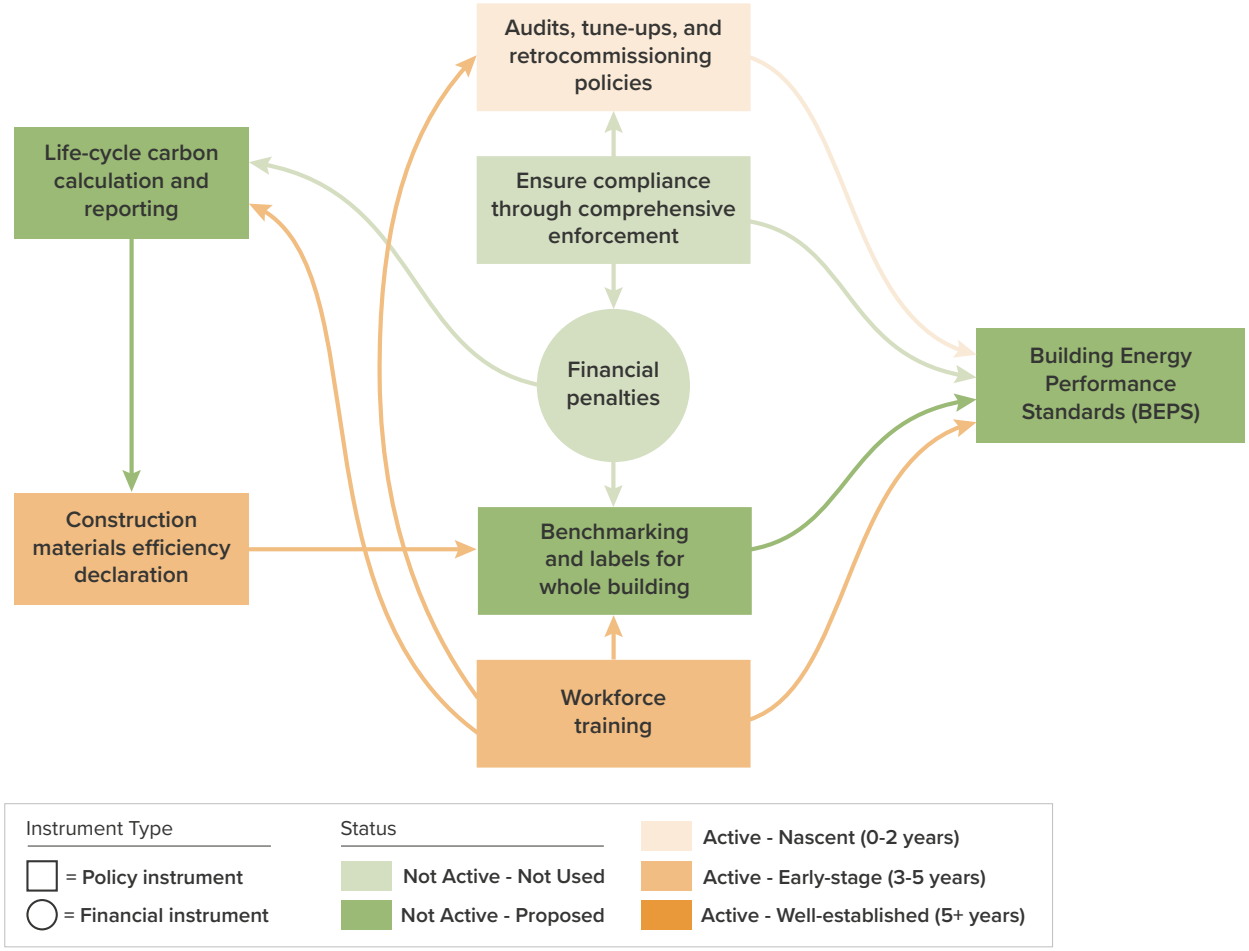
The following implementation pathways have been suggested by our model as high priorities in Nigeria's net zero carbon buildings context. In each diagram below, green instruments indicate those that are not place, while orange ones are active.

BUILDING ENERGY PERFORMANCE STANDARDS

BEPS require seven other instruments for effective implementation (see Figure 4), but could result in significant GHG emissions reduction. First, lifecycle carbon calculation and reporting, and construction material efficiency declaration are required, though these are not yet widely practiced in Nigeria. The second step requires audits, tune-ups and recommissioning policies, comprehensive enforcement, whole building benchmarking and labeling, and workforce training, all of which are nascent or non-existent in Nigeria.

The development of these standards is being led by the Federal Ministry of Environment, in collaboration with other government agencies and industry stakeholders. In addition, the Building Energy Efficiency Guideline is relevant. These can be implemented by the Federal Ministry of Works and Housing, as well as state-level responsible ministries and government agencies. Per the constitution, this would fall under the concurrent legislative list implementable by all tiers of government. However, the policy would be best implemented by states, which are responsible for issuing building approvals at the state (city) level.

Figure 4. Implementation pathway for Building Energy Performance Standards (BEPS)

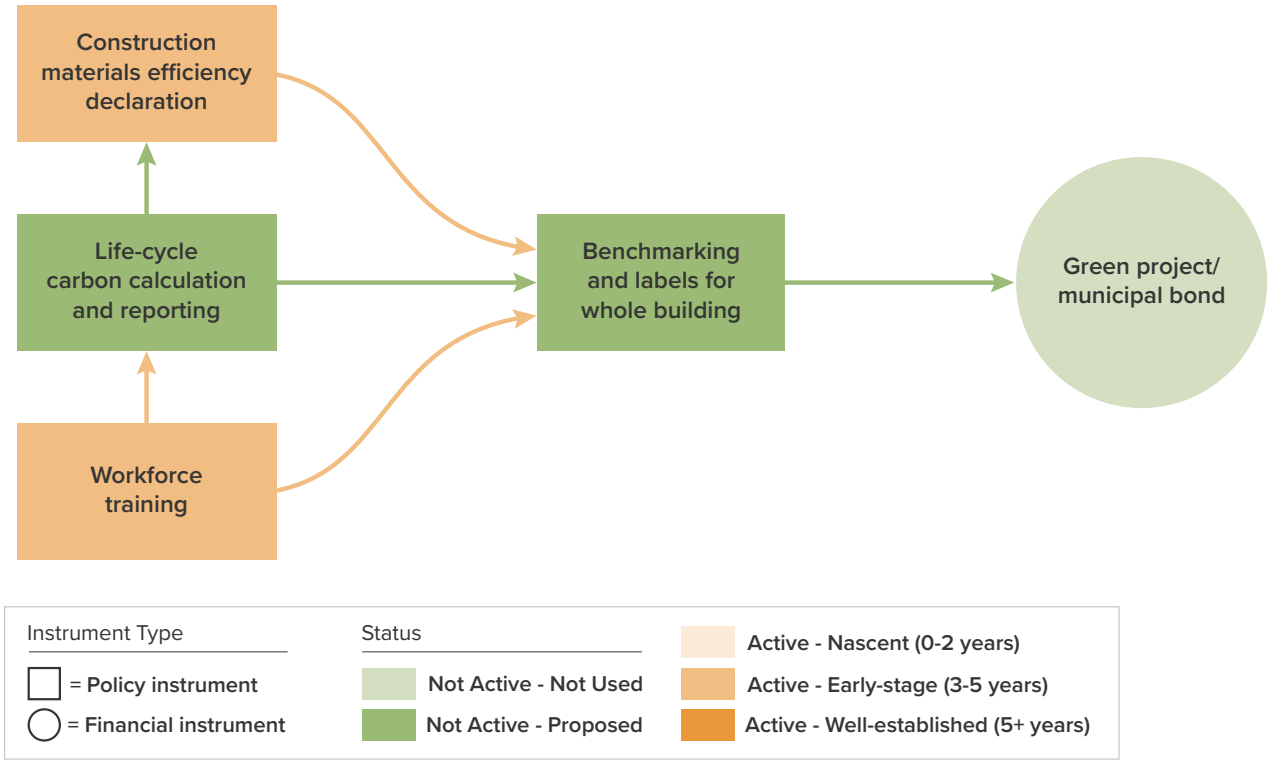


Source: CPI

GREEN PROJECT/MUNICIPAL BONDS

Implementing green bonds to finance of net zero carbon buildings would require at least four other instruments: lifecycle carbon calculation reporting for materials and subsequent buildings, workforce training and materials efficiency declaration (see Figure 5). These instruments can enable low carbon benchmarking and labels for buildings, so that they can become eligible for green bond finance.

Figure 5. Implementation pathway for green project / municipal bonds



Source: CPI

Nigeria's three tiers of government (federal, state and LGA) can issue bonds, subject to approval of the Securities and Exchange Commission (SEC).[69] Most bonds issued to date have come from federal and state governments. Given that they are most responsible for administrating cities, state governments are best suited to implementing green bonds for sustainable buildings in Nigeria. This does not detract from the power of the federal government to do so.

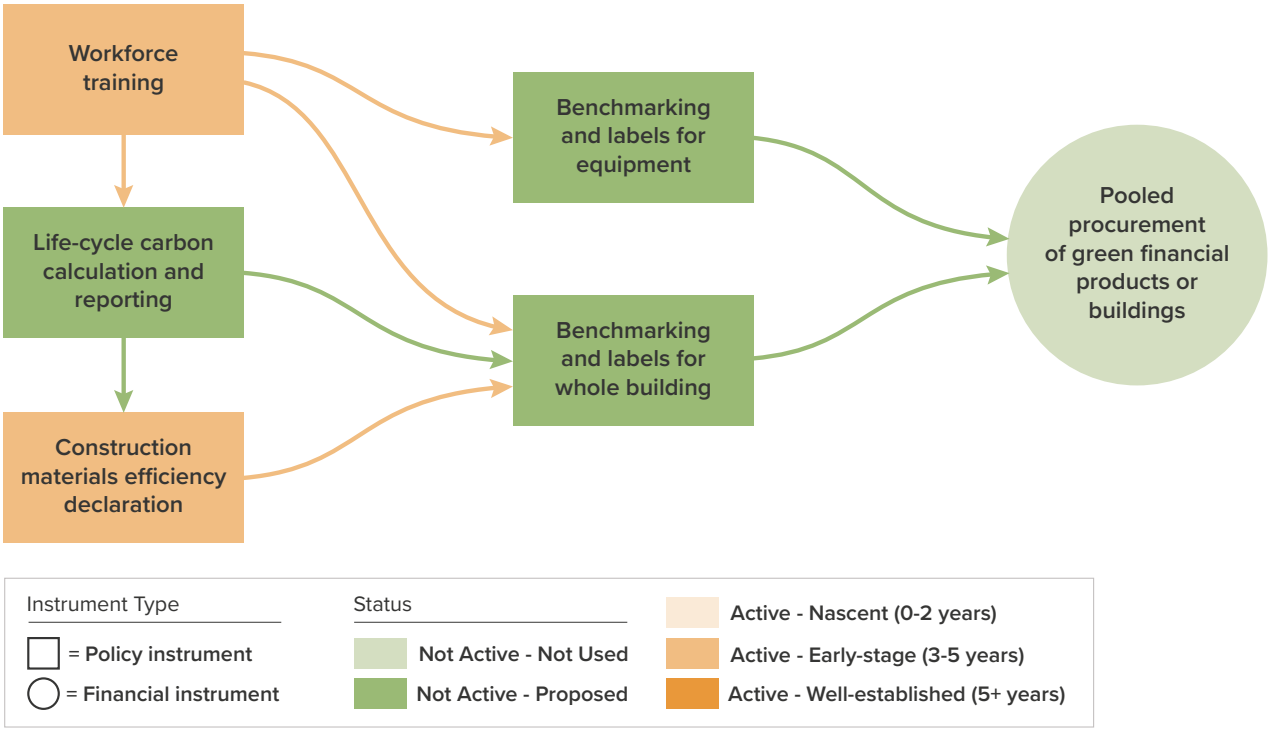
Existing bond funding mechanisms in Nigeria should be adopted at scale for green buildings. Nigeria is the first country in Africa and the fourth globally to issue a security that raises funds for environmental projects following the launch of its NGN 150 billion (USD 352 million)[70] Sovereign Green Bond Programme. This is directed at assisting Nigeria to meet its NDC target. In 2017, the federal government issued its first sovereign green bond for the fiscal year to the amount of NGN 10.69 billion (USD 25m). A huge chunk went to the Rural Electrification Programme to develop off-grid independent power for federal universities and hospitals. The Renewable Energy Micro Utility program is under the Sovereign Green Bond and is also executed by the Ministry of Power.

69 In line with the provision of the Investment and Securities Act, 2007
70 Official FX conversion rates for NGN to USD from World Bank. Available here. Exchange rate (Year – NGN/USD): 2022 – 425.98.

POOLED PROCUREMENT OF GREEN FINANCIAL PRODUCTS OR BUILDINGS

Pooled procurement allows a larger group of buyers to purchase green financial products or buildings together, helping to lower transaction costs. This can make it easier and more cost-effective for developers to build net zero carbon buildings, which typically have higher upfront costs. This instrument would require at least five others to create an enabling environment. These are: lifecycle carbon calculation reporting, construction material efficiency declaration, workforce training, benchmarking and labels for whole building and benchmarking and labels for equipment (see Figure 6).

Figure 6. Implementation pathway for green procurement



Source: CPI

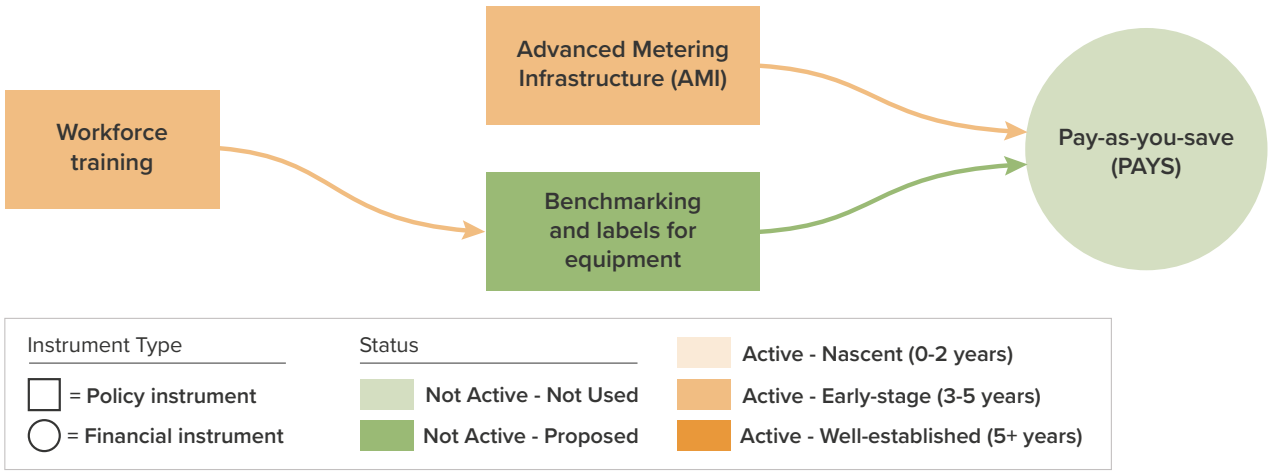
The Bureau of Public Procurement[71] provides a legal and institutional framework for public procurement in Nigeria. There are also similar agencies at the state level. Pooled procurement can be implemented by all three tiers of government. With respect to the private sector, the basic principles of contract and business laws in Nigeria will apply.

PAY-AS-YOU-SAVE

PAYS would enable building owners to invest in energy efficiency upgrades without upfront costs. Three other instruments would help to achieve this: Advanced Metering Instrument, workforce training, and benchmarking and labels for equipment.

71 The Bureau of Public Procurement was established The Public Procurement Act 2007

Figure 7. Implementation pathway for Pay-as-you-save (PAYS)



Source: CPI

Nigeria has adopted and used the Advanced Metering Instrument over the years,[72] for smart metering systems in the electricity supply industry. The cost of this instrument has been subsidized by the government, and in some instances provided for free. This is a form of PAYS, to effectively address the barriers of upfront costs.

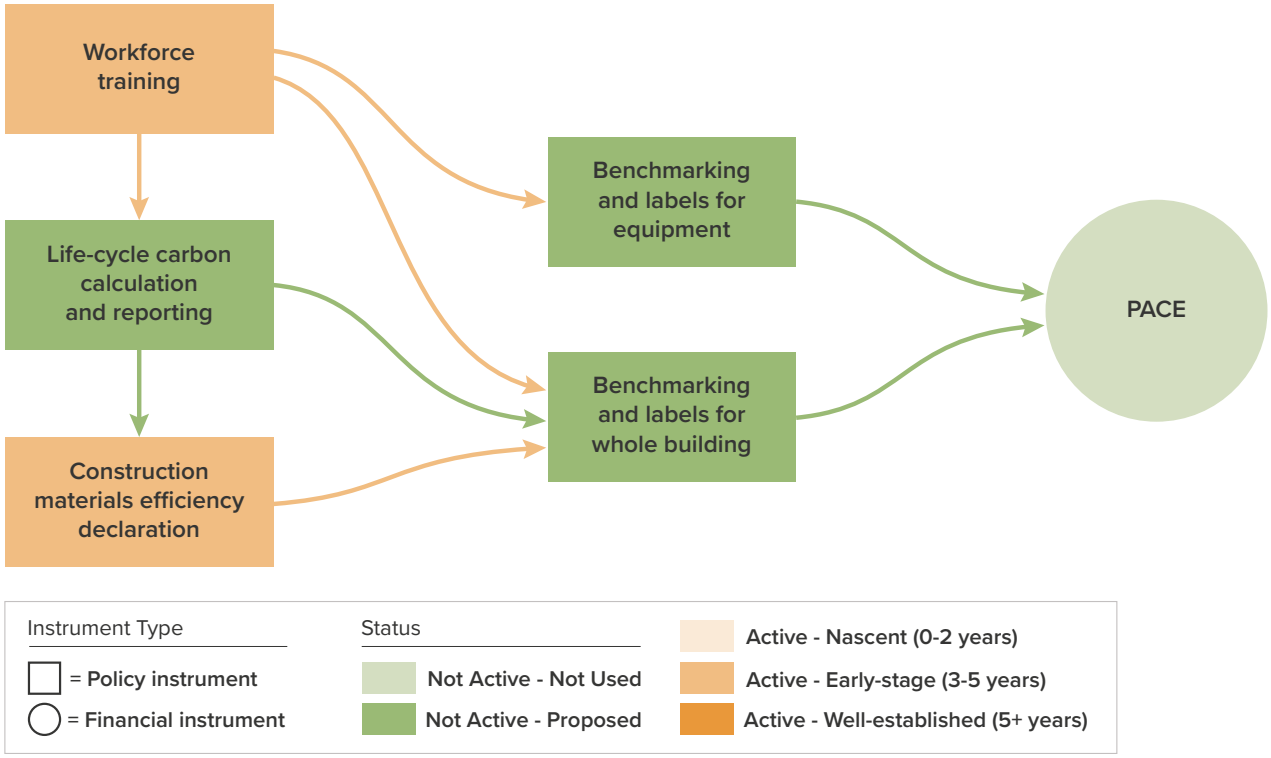
This measure can only be implemented by the federal government, as energy and electricity are in the exclusive legislative list of the Constitution of the Federal Republic of Nigeria. States and LGAs cannot legislate or make policies in relation to electricity in Nigeria.

PROPERTY ASSESSED CLEAN ENERGY

PACE initiatives rely on five supporting instruments to become effective: Benchmarking and labels for whole-building, Benchmarking and labels for equipment, Life-Cycle Carbon Calculation and Reporting, Construction Materials Efficiency Declaration, and Workforce training. None of these are established in the Nigerian context, although there are some precedents for construction material efficiency declaration and workforce training.

72 The Advanced Metering Instrument is backed by the NIGERIAN ELECTRICITY SMART METERING REGULATION NO: NERC/REG/4/2017 by the Nigeria Electricity Regulation Commission ("NERC"), made pursuant to its powers to develop standards and make regulations conferred by Sections 81 and 96(1) of the Electric Power Sector Reform Act 2005 (Act No. 6 of 2005).

Figure 8. Implementation pathway for PACE



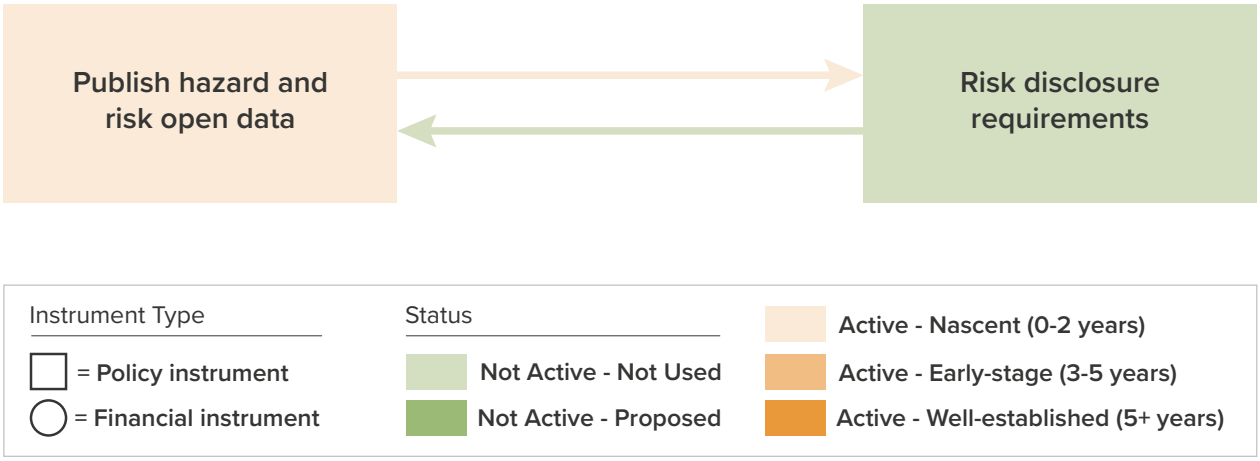
Source: CPI

There is no legislation regarding PACE in Nigeria. In addition, energy efficiency, standards and labeling and minimum energy performance, which are required to support PACE, are still relatively new in the country. Legislation required to promote and enforce such concepts has not yet been adequately created. So far, the Standards Organization of Nigeria (SON) published standards related to energy efficiency, such as a code of practice for the deployment of outdoor solar lighting systems, and standards for self-ballasted lamps, electrical installations of buildings and for safety and performance of compact fluorescent lamps. There are also skeletal provisions made in the Building Energy Efficiency Guideline. The Green Building Council of Nigeria is working to develop and deploy a local green building standard and rating system, which will provide a base for (benchmark), as well as and context-based guidance and criteria to developers, professionals, and construction companies. PACE can be effectively implemented by Nigerian states if the requisite legislation or policy is made.

RISK DISCLOSURE REQUIREMENTS

In comparison to the instruments above, risk disclosure requirements are relatively simple to implement, relying on the publishing of hazard and risk open data, of which there are some early examples in Nigeria.

Figure 9. Implementation pathway for Risk disclosure requirements



Nigeria's Factories Act of 2004, the Employee Compensation Act of 2010, the Minerals Oil Safety Regulation of 1999, and the Harmful Waste Act of 1990 all include provisions for the safety, health, and welfare of workers. In addition to the Constitution of the Federal Republic of Nigeria 1999, and the Labour Act of 2004, all of these pieces of legislation apply to risk disclosure, with requirements for publishing hazard and risk open data. The federal government also ratified the International Labour Organization Convention No. 155 on Occupational Safety, Health, and Working Environment in 1994. The abovementioned legislation can be domesticated by states and applied as appropriate. There is state-level interest to study and publish hazard and risk open data for sustainable building and construction practices in Lagos and Ogun. However, progress on this is nascent across Nigeria.

3.4.2 PRIORITY THEMATIC AREAS

In addition to the above recommended instrument pathways, which are general to the net zero carbon building sector, the following thematic areas and corresponding implementation pathways are also suggested to be prioritized in Nigeria. The priority thematic areas were mapped through previous CCFLA research and expanded upon through new Nigeria-focused research and stakeholder interviews to identify high-impact focus areas as priorities for scaling up action on net zero buildings.

EMBODIED CARBON AND MATERIALS

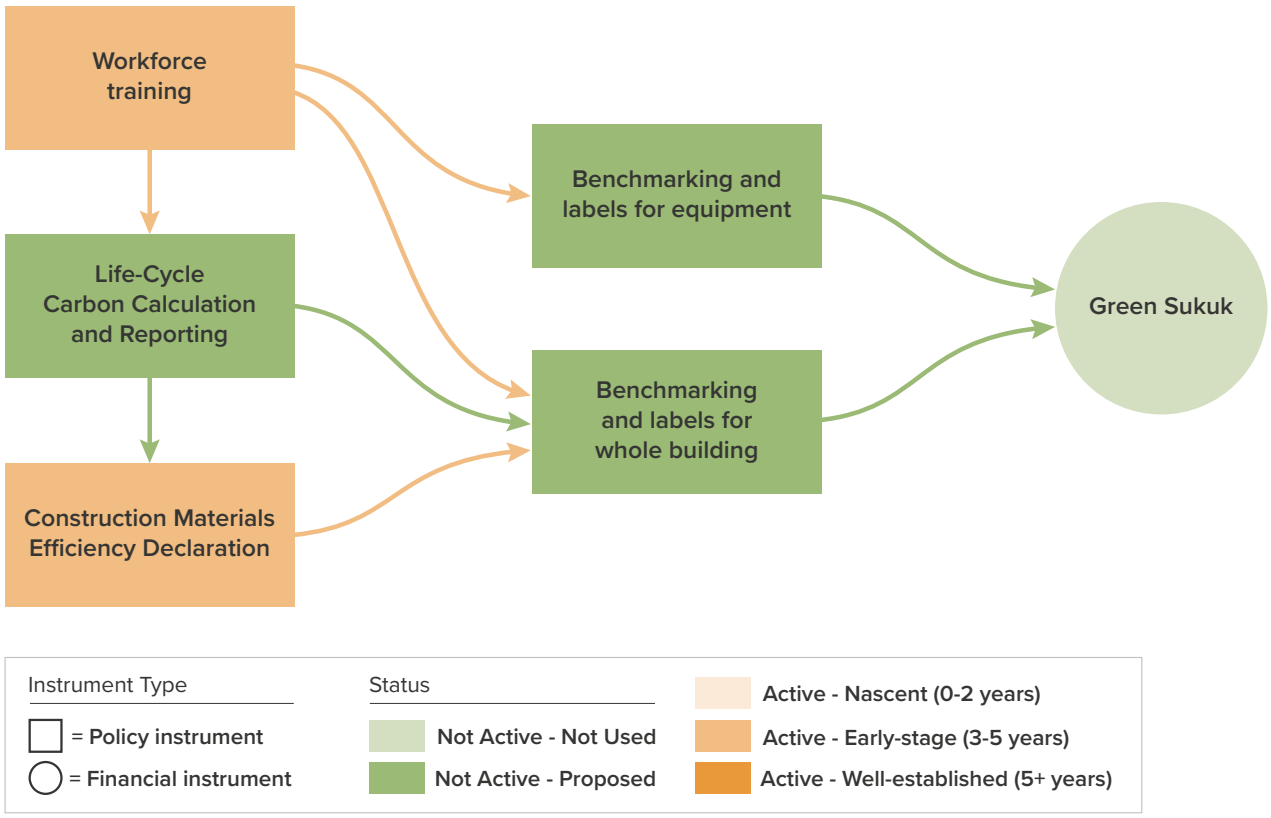
Nigeria's accelerating demand for building stock, particularly housing, means that business-as-usual approaches and use of unsustainable materials in construction will lock in significant GHG emissions in the form of embodied carbon. Our modelling indicates that the following four 'final objective' instruments will be the most effective in adopting low-carbon approaches:

- Green project/municipal bonds (Figure 5)
- Pooled procurement of green financial products or buildings (Figure 6)

- PACE (Figure 8)
- Green sukuk (Figure 10)

The first three instruments are covered in section 3.4.1 above, on recommended general implementation pathways. The remaining measure, green sukuk, relies on the same supporting instruments as green project / municipal bonds. We outline an implementation pathway for green sukuk below.

Figure 10. Implementation pathway for green sukuk



Source: CPI

Sukuk is regulated by the provisions of the Nigerian SEC Rules 2013 (as amended) (the SEC Rules) and the Investments and Securities Act. The primary regulator is the SEC. In addition, the Nigerian Exchange Limited, FMDQ Exchange Limited and FMDQ Private Markets Limited have also rules and regulations governing the listing of sukuk on their respective platforms. Pursuant to the SEC Rules, public companies, special purpose vehicles, the government, state governments, local governments, and government agencies, as well as multilateral agencies, are eligible to issue, offer or make an invitation of sukuk upon seeking SEC approval. This instrument can be applied by the three tiers of government, but states are best placed as they have issued sukuk in other sectors.

Returning to the thematic area of embodied carbon, the following instruments are recommended for new, scaling up and improved implementation, based on the Nigeria deep-dive interviews and desk research:

- **Revolving funds** are an effective financing mechanism for energy efficiency projects, including for net zero carbon buildings. They enable capital to be repaid and reused for future projects, meaning that more projects can be financed with the same initial investment.
- **Low-carbon/efficient equipment operating lease finance** can be a valuable financial instrument for net zero carbon buildings in Nigeria, as it can provide building owners and operators with access to energy-efficient equipment without significant upfront investment.
- **Tax incentives** can help to reduce upfront costs and offset the tax burden on investments, making net zero carbon buildings options more economically viable for building owners and operators.

ENERGY EFFICIENT APPLIANCES AND LIGHTING

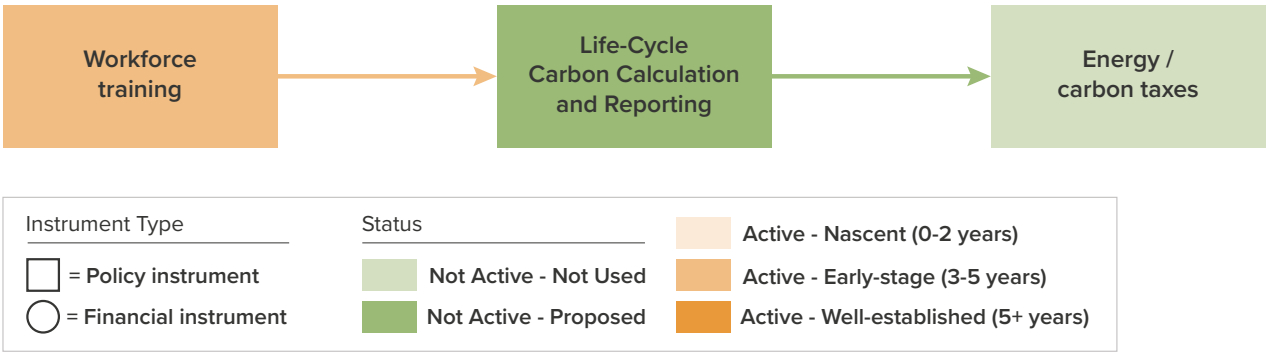
Energy efficiency reduces electricity demand on a severely dysfunctional grid, as well as reducing operational costs of buildings. This can help to justify net zero carbon building approaches even when these are not prioritized for environmental reasons. To help achieve this in Nigeria, our modeling suggests the following 'final objective' instruments as the most effective:

- Building Energy Performance Standards (Figure 4)
- Pay-as-you-save (Figure 7)
- Energy/carbon taxes (Figure 11)
- Capital cost subsidies (Figure 12)
- Service subsidies

The first two instruments are covered in Section 3.4.1, and we provide an assessment of energy/carbon taxes below.

Energy/carbon taxes can incentivize a widespread shift towards energy efficient appliances and lighting. The only enabling policy instrument needed to support such taxes is workforce training, to enable lifecycle carbon calculation and reporting, which can in turn enable relevant tax incentives to be designed and enforced.

Figure 11. Implementation pathway for Energy / carbon taxes



Source: CPI

The Nigeria Carbon Tax Act came into force in 2019, requiring companies operating emissions-generating facilities to register as taxpayers. In simple terms, business activities that directly emit GHGs will be taxed per carbon ton equivalent. However, this act has been largely inactive due to the lack of an enforcement body.

The Climate Change Act 2021 also makes provision for carbon tax and emission trading. Matters relating to energy and carbon tax are the exclusive preserve of the federal government, under the constitution.

Based on the Nigeria deep-dive interviews and desk research, the following instruments are also recommended for scaling up and improved implementation of energy efficient appliances and lighting:

- **Credit lines** can provide building owners and operators with access to flexible funding when needed for buying energy efficiency appliances.
- **Aggregation platforms** pool demand from multiple building developers, owners and operators and match them with suitable finance providers. This could help reduce transaction costs for building owners and operators who may not have the financial resources to implement sustainable building practices on their own. These platforms can also promote collaboration and knowledge-sharing on sustainable building practices among building owners and operators.
- **Tax incentives**, as noted above, encourage building owners and operators to invest in and operate net zero carbon buildings.
- **Securitization/asset-backed securities (ABS)** can be used to bundle a portfolio of sustainable building assets, including pooling debt obligations to efficient appliances and lightning, into tradeable securities that can be sold to investors. This could help to mobilize large pools of capital to finance sustainable building projects.

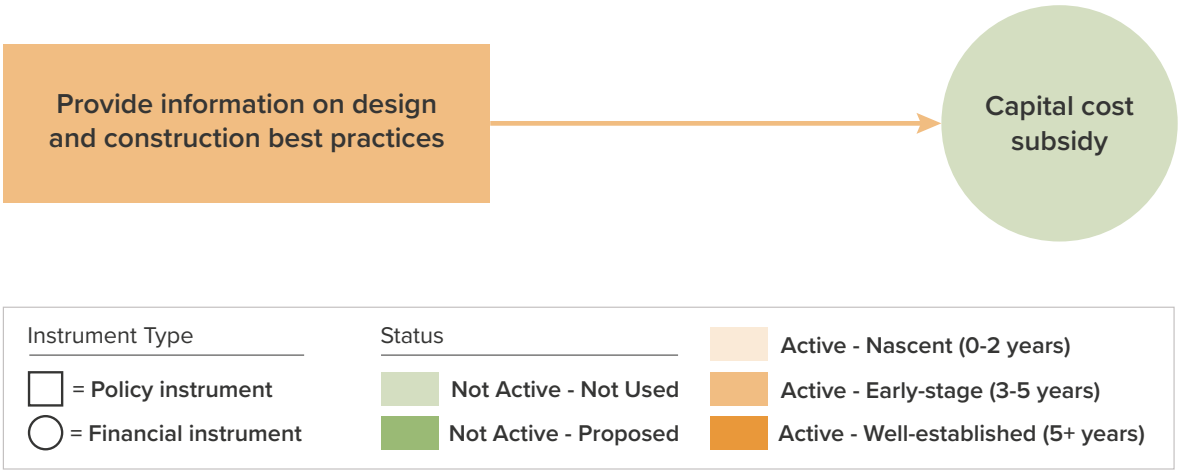
COOLING

To help shift to sustainable cooling infrastructure for buildings in Nigeria, our model indicates the following 'final objective' instruments as most effective:

- Pay-as-you-save (Figure 7)
- Capital cost subsidies (Figure 12)
- Low-carbon/efficient equipment operating lease finance (Figure 13)
- Low-carbon/efficient equipment capital lease finance
- On-bill financing and on-bill repayment
- Service subsidies

Capital cost subsidies would help to overcome barriers such as high upfront costs to installing or retrofitting energy efficient cooling appliances. It is relatively simple to implement and would require robust information on design and construction best practices, much of which is being disseminated by the Green Building Council of Nigeria and other stakeholders. This in turn would inform the high-impact products and solutions which could benefit from capital cost subsidy.

Figure 12. Implementation pathway for Capital cost subsidy



Source: CPI

The President of Nigeria can by executive fiat or government policy introduce capital cost subsidy in this regard. The government has over the years subsidized the importation of petroleum products, for example, and can do the same for the green cooling devices. The federal government is best placed to implement this policy as it controls the Nigerian Customs Service, which will be the implementing agency especially in relation to importation of energy efficient materials.

Based on the Nigeria deep-dive interviews and desk research, **Carbon/Energy taxes** are also recommended for scaling up sustainable cooling. These have been described above.

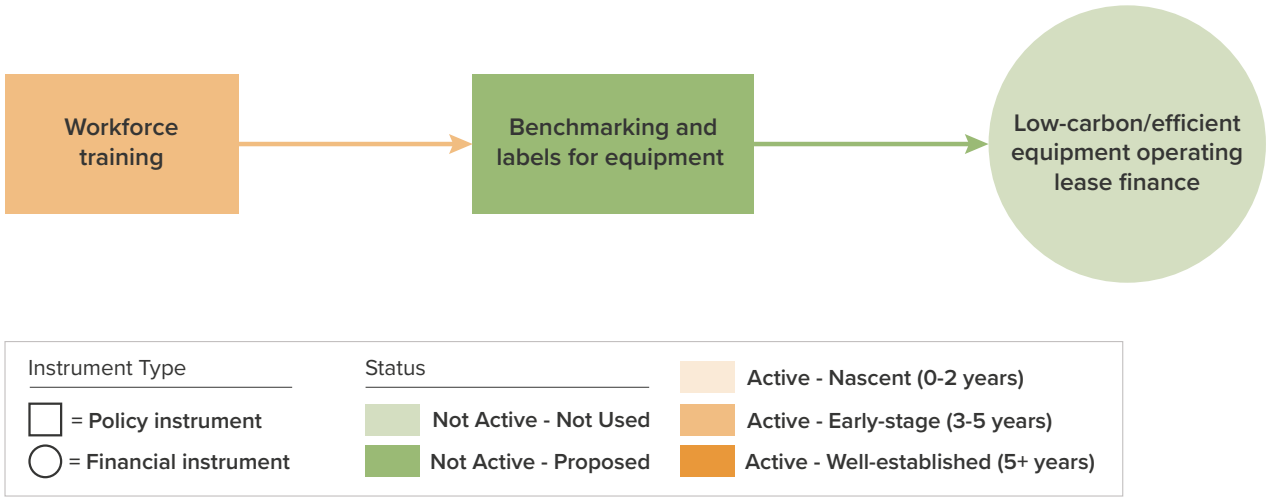
ELECTRICITY GENERATION

To help achieve increased sustainable energy access in Nigeria, our model suggests the following 'final objective' instruments as most effective:

- Building Energy Performance Standards (Figure 4)
- Pooled procurement of green financial products or buildings (Figure 6)
- Pay-as-you-save (Figure 7)
- PACE (Figure 8)
- Low-carbon/efficient equipment operating lease finance (Figure 13)
- Low-carbon/efficient equipment capital lease finance
- On-bill financing & repayment
- Service subsidy

Low-carbon/efficient equipment operating lease finance can be a valuable financial instrument for expanding clean energy generation in buildings, as it can provide building owners and operators with access to clean energy equipment without significant upfront investment.

Figure 13. Implementation pathway for Low-carbon/efficient equipment operating lease finance



Source: CPI

Low-carbon lease finance is governed by the laws of contract, case law and company law. Fiscal legislation (relating to stamp duty on secured transactions), and insolvency legislation (applicable to bankruptcy and insolvency) also apply to these transactions in Nigeria. Laws governing the specific sector in which a project finance transaction is being executed also apply, in this instance the electricity sector, which is under the exclusive legislative list.

The following instruments are also recommended for scaling up and improved implementation of sustainable energy access:

- **Credit lines**, as described above, could also help to promote access to clean energy generators.
- **Capital cost subsidy** could be used to reduce the upfront costs of renewable energy installations for net zero buildings.
- **Aggregation platforms**, as described above, could also help to promote access to clean energy.
- **Full or partial guarantees:** This could be used to reduce the risk associated with financing sustainable energy projects or initiatives in the Nigerian net zero carbon building sector, thereby increasing access to finance.

CLEAN COOKING

To help increase installation of clean cookstoves in Nigerian buildings, our model suggests the following 'final objective' instruments as the most effective:

- Low-carbon/efficient equipment operating lease finance (Figure 13)
- Low-carbon/efficient equipment capital lease finance
- Pay-as-you-save (Figure 7)
- On-bill financing and On-bill repayment
- Result-based loans (See in-depth assessment below)

Result-based loans have multiple connections with other instruments and are therefore not illustrated with a graphic. Commercial banks are supervised by the Central Bank of Nigeria pursuant to its powers from the Central Bank of Nigeria Act. All three levels of Nigerian government can implement this instrument as they have equal access to financial institutions, including the World Bank, International Monetary Fund, and others.

The following instruments are also recommended for scaling up and improved implementation:

- **Carbon credits and markets** could provide financial incentives for investment in clean cookstoves, helping to provide additional revenue beyond the sale of stoves to households.
- **Tax incentives** such as reduced import duties and value-added tax exemptions can be provided to manufacturers, distributors, and consumers of clean cooking technologies and fuels.
- **Low-carbon/efficient equipment capital and operating lease finance** can help to reduce the upfront costs of investing in energy-efficient equipment such as cookstoves.

4. CONCLUSION

This deep dive into Nigeria's net zero carbon building landscape has assessed the maturity of financial and policy instruments in the country, as well as related factors that can create an enabling environment. This has yielded the following key findings:

- **Where the active instruments are used, they are applied in a piecemeal and fragmented way. A significant number of instruments (16 financial and 14 policy of the total 75) are already supporting net zero carbon buildings in Nigeria.** A further 18 instruments, mostly financial, are active for other sectors, but not applied to the net zero carbon buildings sector.
- **The country has no overarching policy or strategy for net zero carbon buildings.** However, sustainable building practices are included in the regulations of the state-level ministries of environment in Ogun and Lagos, two of our focus states.
- **City-led policies and initiatives are unlikely to be feasible in most cities, given that they are governed by multiple LGAs, with the coordinating mechanism at the state level.** Lagos State is the exception, with several city-wide bodies. Generally, state-level interventions are therefore likely to be more effective and will cover larger areas, though LGAs can contribute to the formation of state-level policy.
- **Stakeholders perceive net zero carbon building measures to be more expensive than conventional ones.** A vital policy focus must be supporting the nexus between affordability, net zero carbon aspects, and local job creation.
- **It is also vital to apply the principles of a just transition,** including skills development, local job creation, and gender dynamics regarding access to finance, access to energy, and affordable homes.
- **Nigeria requires adaptation to the impacts of climate change,** where desertification, water stress, and extreme heat are likely to increase. This should be mainstreamed through relevant aspects of the priority sectors above, such as increased and inclusive access to sustainable cooling.

4.1 OVERALL RECOMMENDATIONS

We suggest the following strategies and steps for policymakers in Nigeria for advancing the net zero carbon buildings sector in Nigeria:

- Establish an **overall national policy or strategy** for net zero carbon buildings to coordinate relevant actions and incentives across all levels of government.
- Develop a suite of **priority policies and incentives in collaboration with relevant stakeholders,** to incentivize affordable and net zero carbon building approaches, manufacturing, and use of locally produced sustainable building materials. (We covered implementation pathways for identified thematic priorities in Section 3.4).

- **Develop awareness and capacity of the needs and approaches for net zero carbon buildings in Nigeria** for state and local government representatives, as well as built environment professionals (investors, property developers, architects and engineers, construction companies, etc.).
- **Develop a robust and updated curriculum on net zero carbon buildings,** which schools can teach in higher education courses on topics relating to sustainable built environment.
- **Lead by example** by procuring public building development and retrofits to demonstrate net zero carbon building approaches.
- **Consider piloting the above approaches in selected states,** including Abuja (Federal Capital Territory - FCT) and Lagos State, to focus resources and ensure learning points are captured and applied.
- Strengthen **enforcement of existing policies** relating to net zero carbon buildings, such as building codes, energy efficiency, etc.
- **Building certification schemes** such as LEED, BREEAM, or EDGE should be encouraged to motivate developers to adopt sustainable practices in their building designs.
- **Assess the viability of creating a coordinating body to align the different LGAs in a state or a particular urban area,** helping to improve awareness and coordination of net zero carbon buildings.

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ANNEX 1: CCFLA NET ZERO CARBON BUILDINGS WORKSTREAM

CCFLA kick-started its net zero carbon buildings workstream in 2022, with a scoping paper laying out a structured approach to analyzing the challenges and priorities relevant to cities in decarbonizing the built sector.[73] This 2022 paper also provided the first deep dive into Nigeria's building sector.

CCFLA has since undertaken research on financing net zero carbon buildings, to be published in its upcoming report: Net Zero Carbon Buildings: Opportunities for Cities and how to Implement Them.[74] This built in-house and member knowledge and will guide future CCFLA work.

CCFLA aims to bridge the theory-to-practice gap using network analysis to reflect the interdependency between policy and financing instruments, and barriers to implementation. Understanding such relations allows policy makers and other stakeholders to identify what levers cities can more effectively use to support the sector's transition.

73 Climate Policy Initiative (2022a) Financing Net Zero Carbon Buildings: A Background and Scoping Paper. Cities Climate Finance Leadership Alliance. Available online.
74 Climate Policy Initiative (2023) Net Zero Carbon Buildings Opportunities for Cities and how to Implement them. Soon to be published.

ANNEX 2: OVERVIEW OF TAXONOMY OF INSTRUMENTS

Table A1. Summary of the CCFLA Taxonomy financial Instruments and the extent of their implementation in Nigeria

Instrument	Instrument Category	Use in Zero Carbon Buildings Sector	Use in Other Sectors in Nigeria	Description
Result-based grants	Grants	Early stage	Yes	Intervention that provides rewards to individuals or institutions after agreed-upon results are achieved and verified. It helps to shift the focus towards outcomes and aims to strengthen ownership and provide incentives to perform. Results-based funded programmes serve to accelerate the pace of existing programmes and are often add-ons to other programmes and can include or be implemented in complementarity to additional capacity building activities or technical assistance.
Technical assistance grants	Grants	Well established	Yes	A technical assistance grant helps communities participate in Superfund cleanup decision-making. It provides funding to community groups to contract their own technical advisor to interpret and explain technical reports, site conditions, and Environmental Protection Agencies proposed cleanup proposals and decisions.
Concessional loans	Debt Financing	Well established	Yes	A loan made on more favorable terms than the borrower could obtain in the marketplace. The concessional terms may be one or more of the following: a lower interest rate below (the most common) deferred repayments. income-contingent repayments.
Credit lines	Debt Financing	Nascent	Yes	A line of credit is a flexible loan from a financial institution that consists of a defined amount of money that you can access as needed and repay either immediately or over time.
Market-rate debt	Debt Financing	Well established	Yes	The Market Value of Debt refers to the market price investors would be willing to buy a company's debt for, which differs from the book value on the balance sheet.
Results-based loans	Debt Financing	Not used	Yes	An umbrella term referring to any program or intervention that provides rewards to individuals or institutions after agreed-upon results are achieved and verified. Development agencies have started using results-based financing as a tool to improve the effectiveness of their aid to developing countries.

Instrument	Instrument Category	Use in Zero Carbon Buildings Sector	Use in Other Sectors in Nigeria	Description
Revolving funds	Debt Financing	Not used	Yes	A fund that is continually replenished as withdrawals are made.
Syndicated loans	Debt Financing	Not used	Yes	A syndicated loan is one that is provided by a group of lenders and is structured, arranged, and administered by one or several commercial banks or investment banks known as lead arrangers.
Green mortgage	Debt Financing	Proposed	N/A	A mortgage specifically targeted at green buildings. As an incentive for the borrower to either buy a green building or to renovate an existing one to make it greener, the bank would offer them either a lower interest rate or an increased loan amount.
Catastrophe bond / Insurance pool	Debt Bonds	Proposed	Yes	Risk-linked securities that transfer a specified set of risks from a sponsor to investors.
Green corporate / obligation bond	Debt Bonds	Nascent	Yes	A green bond is differentiated from a regular bond by this label, which signifies a commitment to exclusively use the funds raised to finance or refinance “green” projects, assets, or business activities.
Green project / municipal bond	Debt Bonds	Not used	Yes	Any type of bond instrument where the proceeds will be exclusively applied to finance or refinance in part or in full new and/or existing eligible projects that provide clear environmental benefits - assessed and quantified by the issuer where feasible.
Green sukuk	Debt Bonds	Not used	Yes	The “Green” label means that sukuk is compliant with green bond standards (also called principles and framework). Proceeds of green bonds are used to finance climate change mitigation, climate change adaptation, and environmental projects.
Crowdfunding	Equity	Not used	Yes	The practice of funding a project or venture by raising money from many people who each contribute a relatively small amount, typically via the internet.
Private equity	Equity	Early stage	Yes	Investment partnerships that buy and manage assets before selling them. They operate investment funds on behalf of institutional and accredited investors.
Public equity	Equity	Not used	Yes	Ownership of assets in the form of stock, bonds, or cash as a ‘shareholding’. For building properties, it is a measure of the difference between the market value of a property minus what the owner must pay on the mortgage.
Aggregation platforms	Structured Finance	Nascent	Yes	Platform for a group of companies or local institutions to partner together to buy energy from a single developer, or multiple developers, at smaller volumes while retaining the economic advantages of a high-volume purchase.

Instrument	Instrument Category	Use in Zero Carbon Buildings Sector	Use in Other Sectors in Nigeria	Description
Land banking / land readjustment	Structured Finance	Not used	No	Land readjustment is an effective tool in allowing local governments to take on regeneration projects through increased land values while engaging and involving the original residents and landowners as stakeholders.
Pooled procurement for green financial products or buildings	Structured Finance	Not used	Yes	Pooled procurement cooperatively combines the financial and other resources of purchasing authorities to improve efficiency and create greater purchasing power for green financial products or buildings.
Securitization / Asset-backed securities (ABS)	Structured Finance	Not used	Yes	An asset-backed security (ABS) is a type of financial investment that is collateralized by an underlying pool of assets—usually ones that generate a cash flow from debt, such as loans, leases, credit card balances, or receivables.
Capital cost subsidy	Fiscal Instruments	Not used	Yes	A subsidy that covers a share of the upfront capital cost of an asset (for example, a solar water heater).
Carbon credits & markets	Fiscal Instruments	Proposed	Yes	A mechanism to reduce GHG emissions by creating a market in which companies can trade in emissions permits.
Energy / carbon taxes	Fiscal Instruments	Proposed	Yes	A carbon tax is a type of penalty that businesses must pay for excessive GHG emissions.
Feed in tariff	Fiscal Instruments	Well established	Yes	A payment made to households or businesses generating their own electricity using methods that do not contribute to the depletion of natural resources, proportional to the amount of power generated.
Financial penalties	Fiscal Instruments	Not used	Yes	The obligation to pay a sum of money on conviction of a criminal or administrative offence.
PACE	Fiscal Instruments	Not used	N/A	Property Assessed Clean Energy (PACE) initiatives allow local governments to support building owners carrying out energy efficiency retrofits or installing renewable energy in their properties. This entails conducting special assessments for eligibility and providing upfront funding for the improvement, which is paid back through property tax bills.
Service subsidy	Fiscal Instruments	Not used	Yes	Service subsidies include payments, tax breaks, or other forms of economic support given to individuals and industries. This subsidy is designed to promote infant industries, secure the achievement of universal access objectives (health, education, and sanitation), and encourage more sustainable patterns of production and consumption (energy and transport) as well as need to respond to market failures and their potentially undesirable social and developmental consequences.

Instrument	Instrument Category	Use in Zero Carbon Buildings Sector	Use in Other Sectors in Nigeria	Description
Tax incentives	Fiscal Instruments	Nascent	Yes	Tax incentives (credits, rebates, reductions, exemptions) are designed to offer financial incentives to property owners to install energy efficiency saving equipment, renewable energy systems and meet green building certification standards. Tax incentives can be based on specific low embodied-carbon criteria such as energy efficiency building codes or green building certification standards.
Tax or fee-based land value capture (LVC)	Fiscal Instruments	Not used	No	The value of privately held land often increases due to public investments in the area. Land value capture (LVC) methods usually seek to harness a portion of these unearned rents to help finance public infrastructure or improvement projects. Betterment taxes can be implemented to levy tax on total land value or on the incremental value in the neighborhood of the public investment.
Collaterals	Risk Mitigation	Early stage	Yes	Pledge to offer security for a loan repayment or credit line. (Energy collateral is the money grid operators require energy suppliers to post in order to actively supply electricity or natural gas to customers on that grid).
Currency exchange funds (TCX)	Risk Mitigation	Not used	No	A Currency Exchange Fund is designed to mitigate currency and interest rate risks to attract and lock in long-term private equity and private debt in local currency. TCX act as an intermediary between borrowers and investors by giving borrowers in developing and emerging countries access to long-term financing in their own currencies and risk management products that help manage exchange rate risks thereby reducing the market risk associated with currency mismatches.
Full or partial credit guarantees	Risk Mitigation	Not used	Yes	Guarantees are credit-enhancement tools that can provide investors with the ability to leverage more capital to address social and environmental challenges. Credit guarantees could come in form of a partial guarantee where a third party covers a part or percentage of a loss/default or a full guarantee where a third party covers the entire amount of the loss/default.
Risk insurance products	Risk Mitigation	Not used	Yes	Risk insurance refers to the risk or chance of occurrence of something harmful or unexpected that might include loss or damage of the valuable assets.
Development-based land value capture	Asset Finance Models	Not used	Yes	Land value capture mechanisms seek to absorb increases in value of private land due to public infrastructure projects to fund those projects [for more general information on LVC see the instrument card Tax or fee-based land value capture (LVC)]. Development-based LVC mechanisms differ from tax-based in that cities do not levy taxes on land value increments.

Instrument	Instrument Category	Use in Zero Carbon Buildings Sector	Use in Other Sectors in Nigeria	Description
Hybrid models of build / purchase / operate / transfer and lease of assets	Asset Finance Models	Well established	Yes	A project funding model based on a financial agreement between a private contractor and public organization.
Low-carbon/ efficient equipment capital lease finance	Asset Finance Models	Not used	No	A simple financing structure that allows a customer to use energy efficiency, renewable energy, or other generation equipment without purchasing it outright.
Low-carbon/ efficient equipment operating lease finance	Asset Finance Models	Not used	No	A contract that permits the use of an energy efficient asset without transferring the ownership rights of said asset.
As-a-service models	Other Innovative Instruments	Nascent	Yes	Customers pay for an energy service without having to make any upfront capital investment.
Energy performance contracts (EPC) and ESCOs	Other Innovative Instruments	Well established	Yes	Energy performance contracts are innovative financing schemes offered by contractor energy service companies (usually ESCOs) to clients (e.g., a municipality), who need energy efficiency improvements but have limited financial means or technical capacities to implement such projects on their own.
Energy service agreements	Other Innovative Instruments	Well established	Yes	An Energy Service Agreement (ESA) is a pay-for-performance, off-balance sheet financing solution that allows customers to implement energy efficiency projects with zero upfront capital expenditure.
On-bill financing (OBF) & repayment (OBR)	Other Innovative Instruments	Not used	No	A method of financing energy efficiency improvements through a customer's utility bill. The customer receives an upfront loan to make energy efficiency or renewable energy improvements to his or her property, then repays that loan through a surcharge on his or her utility bill.
Pay-as-you-save (PAYS)	Other Innovative Instruments	Not used	No	Enables building owners or tenants to purchase and install money-saving resource-efficient measures with no upfront payment and no debt obligation.
Payment for ecosystem services (PES)	Other Innovative Instruments	Not used	No	Payments for ecosystem services (PES) policies compensate individuals or communities for undertaking actions that increase the provision of ecosystem services such as water purification, flood mitigation, or carbon sequestration.
Power purchase agreements for clean energy	Other Innovative Instruments	Well established	Yes	A power purchase agreement is a long-term contract under which a business agrees to purchase electricity directly from a renewable energy generator.

Table A2. Summary of the CCFLA Taxonomy policy instruments and the extent of their implementation in Nigeria

Instrument	Instrument Category	Use in Zero Carbon Buildings Sector	Use in Other Sectors in Nigeria	Description
Mandatory construction waste landfill diversion	Mandates: Standards and Codes: Process	Not used	N/A	Waste diversion is the process of diverting waste from the landfill. In order to divert waste, all construction materials are separated by type and disposed accordingly. Materials that are recyclable are separated from materials that are not recyclable.
Mandatory pre-demolition audits and landfill diversion	Mandates: Standards and Codes: Process	Not used	N/A	A pre-demolition audit is an inventory of materials and components arising from future demolition or renovation projects and their management and recovery options.
Net zero carbon construction site	Mandates: Standards and Codes: Process	Not used	N/A	A construction site with net zero carbon building protocols for highly energy efficient construction powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset.
Audit, tune-ups, and retro-commissioning	Mandates: Standards and Codes: Buildings	Nascent	N/A	Assessment of the current state of building's energy system to help owners identify specific strategies and investments that can improve the energy performance of their buildings.
Building energy performance standards	Mandates: Standards and Codes: Buildings	Proposed	N/A	Policies that establish performance levels for buildings and drive all buildings that BEPS covers to achieve these levels in the long-term with required progress at regular intervals in the interim.
Embodied carbon building codes	Mandates: Standards and Codes: Buildings	Early stage	N/A	Embodied carbon building code is aimed at quantifying, evaluating, and achieving practical reductions in climate impact by selecting lower embodied carbon materials. According to International Energy Agency, embodied carbons contribute to 11% of the global emission, and as urbanization increases embodied carbon from new buildings, renovations, and infrastructure until 2060 may exceed 230 gigatons.
Energy efficient building codes	Mandates: Standards and Codes: Buildings	Early stage	N/A	Energy codes are a subset of building codes, which establish baseline requirements and govern building construction.
Hazard specific building code amendments	Mandates: Standards and Codes: Buildings	Early stage	N/A	Design and construction requirements to ensure safe and resilient structures.

Instrument	Instrument Category	Use in Zero Carbon Buildings Sector	Use in Other Sectors in Nigeria	Description
Mandatory material take-back program	Mandates: Standards and Codes: Buildings	Not used	No	A mandatory material take-back program looks to increase material reuse by forcing suppliers to take back unused construction materials. This has a significant benefit over policies such as landfill diversion, as take-back materials require much less processing compared to recycled products to be given new use, and often characterizes a large portion of construction waste.
Require RE generation or off-site purchase	Mandates: Standards and Codes: Buildings	Not used	No	Renewable energy generation/purchasing requirements seek to encourage greater use of renewable energy sources by requiring buildings to comply with a minimum percentage of renewable energy in its energy mix. This can be achieved either by energy generation on-site, via solar panels or wind turbines, or off-site through energy providers.
Risk informed spatial plans, land use plans, and zoning	Mandates: Standards and Codes: Buildings	Nascent	N/A	Cities can change zoning regulations or planning requirements to incorporate physical risk factors. Changes in zoning regulations could work in tandem with amending building codes to reflect hazards.
Advanced metering infrastructure (AMI)	Mandates: Standards and Codes: Components	Early stage	N/A	An integrated system of equipment, communications, and information management systems for utilities to remotely collect customer energy usage data in real time.
Minimum energy performance standards	Mandates: Standards and Codes: Components	Early stage	N/A	A specification, containing several performance requirements for an energy-using device, that effectively limits the maximum amount of energy that may be consumed by a product in performing a specified task.
Phase out fossil fuel-based appliances and equipment	Mandates: Standards and Codes: Components	Early stage	Yes	Replacing fossil fuels with sustainable energy sources in sectors such as transport and heating.
Prohibiting extremely high emitting materials	Mandates: Standards and Codes: Components	Well established	Yes	Setting a near-zero-emission requirement for the production and use of certain products.
Benchmarking and labels for equipment	Mandates: Informational	Proposed	N/A	A marker used to discover what is the best performance being achieved in terms of energy efficiency for equipment.
Benchmarking and labels for whole building	Mandates: Informational	Proposed	N/A	A marker used to discover what is the best performance being achieved in terms of energy efficiency for a whole building.

Instrument	Instrument Category	Use in Zero Carbon Buildings Sector	Use in Other Sectors in Nigeria	Description
Building passports	Mandates: Informational	Not used	N/A	A building passport is a digital or physical record of information about a building, including basic characteristics, construction materials, systems, energy use, renovations, and other building information. A building passport makes the information needed by building owners and users to track and maintain building performance available in a centralized location.
Construction materials efficiency declaration	Mandates: Informational	Early stage	N/A	Declaration for efficient use of energy, natural resources, and materials to use construction materials with less impact on the environment and natural resources.
Lifecycle carbon calculation and reporting	Mandates: Informational	Proposed	No	A total product carbon footprint is a measure of the direct and indirect GHG emissions associated with all activities in the product's life.
Risk disclosure requirements	Mandates: Informational	Not used	No	Requirements to disclose "material" risks, those to which reasonable investors would attach importance in making investment or voting decisions.
Awards and publicity	Non-Financial Incentives	Early stage	Yes	Act or device designed to attract public service to gain public attention and support.
Density bonus for carbon efficiency	Non-Financial Incentives	Not used	N/A	In cities that have limits on how large a building can be on a certain plot of land, a density bonus for carbon efficiency allows developers to increase the size of their planned building if they reduce the embodied carbon in construction.
Expedited permitting	Non-Financial Incentives	Nascent	N/A	Expedited license means a full and unrestricted medical license granted by a member state to an eligible physician through the process set forth in the compact.
Zoning use exemptions	Non-Financial Incentives	Not used	N/A	Zoning use exemptions provide a non-financial incentive to investors and project developers by proving special zoning exemptions to projects which include carbon mitigation or resilience solutions in their building design.
Ensure compliance through comprehensive enforcement	Capacity Development	Not used	Yes	State of being in accordance with established guidelines or specifications, or the process of becoming so.

Instrument	Instrument Category	Use in Zero Carbon Buildings Sector	Use in Other Sectors in Nigeria	Description
Promote pilot projects	Capacity Development	Well established	Yes	Pilot projects work by taking cutting edge technology or practices and incorporating them into a real development project to showcase their success. Sometimes pilot projects are differentiated from demonstration projects. Pilot projects focus on testing new technologies whereas demonstration projects focus on engaging stakeholders to demonstrate these technologies.
Provide information on design and construction best practice	Capacity Development	Early stage	N/A	Adoption of policy, self-assessment and/or benchmarking for design and construction best practices for net zero buildings.
Publish hazard and risk open data	Capacity Development	Nascent	Yes	Publishing data on hazard and risk that can be freely used, re-used, and redistributed by anyone.
Soil and materials coordination for mass storage and reuse	Capacity Development	Not used	N/A	Cities can help coordinate mass transit of soil and other materials from sites to storage locations. They can also provide land for storage sites of materials and keep inventories of soils and materials and forecast supply and demand.
Workforce training	Capacity Development	Early stage	Yes	Postsecondary activities (seminar, workshop, course, customized training, etc.) that develop or enhance the skills of existing employees or members of any business or industry.

Source: CPI

ANNEX 3: KEY LAWS, POLICIES AND GUIDELINES IN NIGERIA

The following statues, laws, policies, and guidelines in Nigeria are relevant to the net zero carbon buildings sector.

STATUTES - LAWS

Policy title, date	Key aspects relevant to net zero carbon buildings
The Constitution of the Federal Republic of Nigeria, 1999 (as amended)	A legal framework for the governance and regulation of all aspects of the Nigerian society. Although it does not specifically address net zero carbon buildings, it provides a general mandate for the protection and preservation of the environment and public health, which are key considerations in the design and construction of sustainable buildings. Additionally, the constitution empowers the government to regulate and enforce building standards, which can influence the adoption of energy-efficient and renewable energy technologies in buildings.
The Land Use Act, 1978	A law that governs the use and ownership of land in the country. It can indirectly impact the development of net zero carbon buildings by regulating land use and zoning, which can influence the location and design of new buildings. Additionally, the act can impact the adoption of renewable energy systems in buildings, as it regulates the use of land for such purposes. Compliance with the provisions of the Land Use Act may be necessary for development of net zero carbon buildings in Nigeria.
Electric Power Sector Reform Act, 2005	Arose from the need to reform the sector to introduce private sector participation in the industry to enhance operational efficiency, attract new investment and offer better service delivery that unlocks the massive entrepreneurial and industrial potential that has remained constrained for decades by the inability to provide clean electricity at steady voltages across the country. In November 2005, in accordance with the reform measures mandated by the Electric Power Sector Reform Act, 2005, PHCN was unbundled into eighteen new successor companies (six generation companies, one transmission company and eleven distribution/marketing entities). Nigeria Electricity Regulation Commission pursuant to the Act under consideration made the feed-in tariff regulation 2015.
Climate Change Act, 2021	Seeks to provide a framework for achieving low GHG emissions and to mainstream climate change actions into national plans and programs. The Act established the National Council on Climate Change (NCCC), which shall have the power to make policies and decisions on all matters relating to climate change in Nigeria. It also provides for the creation of a fund which will warehouse amounts paid by way of carbon taxes and emission trading (yet to be implemented); appropriations from the National Assembly; funding from international organizations; fines and charges issued to private and public entities; subventions, grants, donations, and fees etc. The proceeds of the Fund are to be disbursed to fund climate change mitigation initiatives, incentivizing private and public entities that meet their GHG emission reduction targets, conducting climate change impact assessments, and running the NCCC.

Policy title, date	Key aspects relevant to net zero carbon buildings
National Environmental Standards Regulations and Enforcement Agency (Establishment) Act (NESREAA), 2007	A Nigerian law that establishes an agency to regulate and enforce environmental standards. While the act does not specifically mention net zero carbon buildings, it provides a framework for promoting sustainable development and reducing GHG emissions, which are key objectives of zero carbon building design. NESREAA can therefore play a role in encouraging and enforcing compliance with building codes and standards that promote energy efficiency and the use of renewable energy sources in buildings.

POLICIES

Policy title, date	Key aspects relevant to net zero carbon buildings
Energy Transition Plan by the FGN, 2021	This plan showcases the country's pathway to achieving net zero emissions by 2060, while also ending energy poverty. The power and cooking sectors concern green buildings, in particular; the intention is to reduce emissions by providing power through a generation mix of renewables and by moving people from the use of firewood, and coal to liquified gas.
Nigeria's Nationally Determined Contribution (NDC), 2015	The country's NDC does not tackle strategies in the buildings sector related to construction materials or design but has established targets for clean energy and energy efficiency for buildings and clean cookstoves.
National Building Code (NBC), 2006	A document containing both mandates and recommendations adopted by development authorities, to formulate building bylaws. It provides guidelines for regulating building materials, services, systems, and processes, including administrative and environmental provisions in relation to pre-design, construction, and post-construction requirements. However, there are many shortcomings in the effectiveness of this code. For example, it does not include provisions for renewable building materials sustainable design and construction, carbon emissions, energy preservation, or embodied carbon in materials, including cement and steel.
National Energy Policy, 2003	Implemented by the Energy Commission of Nigeria (ECN) to ensure an optimal, adequate, reliable, and secure supply of energy, and its efficient utilization in the country. The ECN is set to release an amendment to the National Energy Policy within 2023. This includes updates to transport, buildings, industry, CO2 removal and gases, electricity, land, bioenergy, and waste. The ECN, the Federal Ministry of Environment and the British Embassy in Abuja have launched the updated version of the Nigeria Energy Calculator 2050, with mandates for entities to reduce their GHG emissions.
National Building Energy Efficiency Code (BEEC), 2017	The BEEC mandate creates opportunities for energy efficiency applicable to new buildings based on the climatic conditions of different zones in Nigeria. Implemented by the Federal Ministry of Housing, it sets minimum efficiency requirements for new buildings to achieve reductions in energy use and gas emissions over the life of the buildings. There is a disconnect in the BEEC in Nigeria, as it does not recognize residential renewables, in the context of more or less efficient lighting, for example. As such, there are some details in the BEEC that could be easily amended to achieve greater net zero carbon building impact.
National Climate Change Policy, 2021	Implemented by the Federal Ministry of Environment, this sets out Nigeria's climate change policy direction, addresses conditions required to attain its vision of becoming a climate resilient economy, and sectoral measures for mitigating the effects for climate change in the country.

Policy title, date	Key aspects relevant to net zero carbon buildings
Nigeria's National Adaptation Strategy and Plan of Action (NASPA), 2020	The NASPA recommends measures relating to green roofs and sustainable building materials. This has not yet been enacted into law.
Long-term low emissions strategy, 2021	The federal government, through the Department of Climate Change (DCC) has developed the first contribution towards the elaboration of the full Long-Term Strategy for Climate Change. The Long-term low emissions strategy provides clear direction to all stakeholders for a well-managed transition to a low-carbon economy that grows existing and new sectors and creates jobs and economic opportunities for the nation. It makes high-level mention of the importance of green buildings.
2050 Long Term Vision	The 2050 Long Term Vision is a comprehensive document for Nigeria, embodying Nigeria's policy-related response to climate change and its vision as it relates to energy, oil and gas, water, forest, industry, urban settlement, waste and is focused on the development of Nigeria's long-term low-emissions development strategy.

GUIDELINES

Policy title, date	Key aspects relevant to net zero carbon buildings
Building Energy Efficiency Guideline (BEEG), 2016	Provides guidance on the design and construction of energy-efficient buildings in Nigeria. The BEEG is a useful tool for achieving zero carbon building design by promoting the use of renewable energy sources, reducing energy consumption, and improving building performance. Additionally, it can help to raise awareness and encourage stakeholders to adopt sustainable building practices.
Nigeria Energy Emission Calculator (NEEC), 2022	A tool that helps to estimate GHG emissions from energy use in different sectors, including buildings. It can be used to assess the carbon footprint of buildings and identify opportunities for reducing emissions through the adoption of renewable energy sources and energy-efficient technologies.
The Lima Call to Climate Action, 2014	A global agreement reached in 2014 by countries committed to addressing climate change. The agreement recognizes the role of the building sector in reducing GHG emissions and encourages the adoption of zero carbon building design and construction practices. It can serve as a rallying call for policymakers, industry professionals, and stakeholders to prioritize the development of net zero carbon buildings.
National Renewable Energy Action Plan (NREAP), 2016	A policy document that outlines the country's strategy for increasing the share of renewables in its energy mix. NREAP can promote the use of renewable energy technologies such as solar photovoltaics and geothermal systems to power buildings. It also provides guidance on energy-efficient technologies and building design strategies that reduce energy consumption and associated carbon emissions.
Nigeria Greenhouse Gas Inventory, 2020	An inventory that provides a comprehensive assessment of GHG emissions in Nigeria, including from buildings. The inventory can help to identify the sources and magnitude of carbon emissions from buildings, which can inform the development of policies and strategies to reduce them. This can provide a baseline for measuring and tracking progress towards carbon neutrality in the building sector.

ANNEX 4: KEY STAKEHOLDERS IN NIGERIA

The following stakeholders in Nigeria are particularly relevant to the net zero carbon buildings sector, although this is a non-exhaustive list.

PUBLIC SECTOR: FEDERAL AND ABUJA / FEDERAL CAPITAL TERRITORY

Stakeholders	Description
Federal Ministry of Power	The BEEC and BEEG (described in Annex 3) were co-developed by the Federal Ministry of Power and the Federal Ministry of Works and Housing, which were sister ministries in the past. The Ministry of Power also executes the Sovereign Green Bond, which funds the renewable energy micro utility program. The Ministry also developed the National Building Energy Efficiency Guideline (described in Annex 3).
Federal Ministry of Works & Housing	The Federal Ministry of Works & Housing is mandated to formulate and implement the policies, programs and projects of the federal government related to road transport; highways construction, rehabilitation, planning and design; monitoring and maintenance of federal roads and bridges, nationwide; provision of infrastructure as well as survey and mapping of the nation's internal and international boundaries (works); and habitat and affordable housing for Nigerians (housing). It administers the National Housing Programme, which is committed to the provision of adequate and affordable housing for all Nigerians. The ministry co-created the BEEC and the BEEG with the Federal Ministry of Power, and has stated that all buildings it has executed post the BEEC are energy efficient.
Federal Ministry of Environment	The Federal Ministry of Environment presides over the Department for Climate Change (DCC), which is focused on greenhouse gas inventory, mitigation, vulnerability and climate adaptation, education, and awareness. In 2021, the DCC produced the 2050 Long Term Vision comprehensive document for Nigeria. The DCC is working on the intensification of national efforts to develop low-carbon and energy-efficient technologies and alternative sources of energy and is pursuing a long-term decarbonization pathway, especially through the carbon market. At the ministerial level, there has been the implementation of the Renewable Energy Programme in 2016 with the objective of promoting collaborations for the deployment of resources to achieve Nigeria's renewable energy plans.
National Council on Climate Change (NCCC)	The NCCC is the implementing body of the Climate Change Act and was inaugurated in 2021 by the President of Nigeria. The NCCC the main anchor of the federal Energy Transition Plan (described in Annex 3).
Energy Commission of Nigeria (ECN)	The ECN has the statutory mandate for the strategic planning and coordination of national policies in the field of energy in all its ramifications. It is the custodian of the country's Energy Policy and is the apex government body responsible for energy sector planning and policy implementation, promotion of diversification of energy resources through the optimal utilization of all new and alternative energy sources. It is also the country's energy data bank and responsible for energy audits, tune-ups, and recommissioning in Nigeria. In the last few years, the ECN has conducted an energy audit of most public buildings in Nigeria.

Stakeholders	Description
Niger Delta Power Holding Company Limited (NDPHC)	The government-owned NDPHC is the foremost power generation company in Nigeria, including heavy investments in renewables. It was incorporated as a Limited Liability Company under the Companies and Allied Matters Act, 2004 Cap 20 LFN, as a special purpose vehicle, with the mandate to build 10 power plants, critical transmission, distribution, and gas infrastructure while pursuing a divestment strategy of all the investments it makes. It is owned by the three tiers of government (federal, state, and local), with states holding the local governments' shares on their behalf.
Nigeria Electricity Regulatory Commission (NERC)	The NERC is the apex regulatory body in the Nigerian electricity supply industry. It is an independent regulator created pursuant to the Electric Power Sector Reform Act of 2005, mandated to proffer codes and standards in the market, license operators, set cost-reflective tariffs, and market rules and establish the rights and obligations of consumers. The NERC approves the licensing and investment windows for renewable energy projects that are connected to the grid – the feed-in tariff for the renewable energy sources, net metering for small capacities and competitive tender for those capacities that can only be procured from Nigeria Bulk Electricity Trading Plc, the electricity bulk trader in Nigeria. In line with its mandate, the Commission has also made regulations on renewable energy generation.
Transmission Company of Nigeria (TCN)	The TCN is responsible for electricity transmission and system operations in Nigeria, following the exclusive licenses issued to it. The role of power transmission is the exclusive preserve of the TCN, as no other agencies of government or private companies are licensed to transmit power in Nigeria.
Rural Electrification Agency (REA)	The REA is a Nigerian government agency established in 2005 with the mandate to provide access to reliable and affordable electricity to rural communities across Nigeria. It is responsible for designing, promoting, and implementing rural electrification projects in the country. In terms of net zero carbon buildings, the REA provides off-grid renewable energy solutions to rural communities, including deployment of solar mini grids through its Solar Power Naija program. This aims to deploy five million off-grid solar connections to homes, schools, and businesses across Nigeria. The REA also collaborates with other government agencies, development partners, and stakeholders to promote sustainable building practices in rural communities. This includes advocating for the use of energy-efficient building materials, promoting the adoption of green building standards, and providing technical assistance to builders and homeowners.

ASSOCIATIONS, NGOS AND OTHER RELEVANT STAKEHOLDERS

Stakeholders	Description
Green Building Council of Nigeria (GBCN):	The GBCN is an NGO that advocates, educates, sets standards, and provides certification in green, safe, and sustainable human settlement environment and industrial installations in Nigeria. The GBCN bridges knowledge and capacity gaps, which are viewed as major obstacles to green building development in Nigeria. It also provides courses, seminars, and other programs to develop local capacity to deliver a greener built environment. It is also championing the development and deployment of a local green building standard and rating system that will provide context-based guidance and criteria to developers, professionals, and construction companies. GBCN's certification systems, based on its green building rating system, provides designers and developers with objective recognition, provided by an independent third-party assessment of the sustainability of their design and/or building in comparison with others. The GBCN also offers product endorsements to vendors and manufacturers, providing assurance to designers and specifiers on the sustainability of a product.
Nigerian Institute of Buildings	A professional organization established in 1969 to promote excellence in building construction and maintenance in Nigeria. It provides a platform for members to enhance their skills, knowledge, and professionalism in the construction industry. It also works to promote sustainable development and the use of appropriate technology in the building industry.
Renewable Energy Association of Nigeria (REAN)	A membership-based NGO that promotes local content in the renewable industry. It provides a platform for the exchange of information regarding the development and use of renewable energy in Nigeria.
Association of Housing Corporations of Nigeria (AHCN)	An umbrella organization for all federal and state housing agencies, housing research institutes, mortgage establishments and private property developers. It works to ensure the increased availability of dwelling houses in Nigeria; provide the means for consultation among government departments or ministries, and organizations related to the provision of adequate housing; foster, promote and stimulate through joint or individual action, the planning, construction, and financing of real estate and dwellings and; provide means of communication and consultation and where feasible, joint action with public and private organizations of other countries, and with international organizations or agencies, for the provision of housing and infrastructure.
Clean Technology Hub	A pioneering hybrid hub for researching, developing, demonstrating, and incubating clean energy ideas, technologies, and resources for clean energy organizations and environment and climate-friendly initiatives across Africa.
Lagos Business School Sustainability Center	The center brings together theory and practice on sustainability, builds leadership skills and supports constructive dialogue and collaboration between business, government, civil society, and academics to find solutions to critical sustainability challenges.

Other relevant entities identified but not described in detail are as follows. Associations: Sustainable Energy Practitioners Association Nigeria; Nigerian Building & Road Research Institute (NBRRI); and Real Estate Developers Association of Nigeria. **NGOs**: Center for Climate Change and Environmental Studies; Centre for Climate Change and Development; Nigeria Energy Support Programme II; Renewable energy and energy efficiency Associations (Alliance); Nigeria Climate Innovation Center; Circular Economy Innovation Partnership; and the Connected Development Initiative.

LAGOS STATE: GOVERNMENT

Particularly relevant state government entities are:

Stakeholders	Description
Lagos State Ministry of Physical Planning and Urban Development	Statutory responsibilities include: 1) Initiation, formulation and implementation of physical planning, urban development and urban renewal policies and programs; 2) Preparation of regional, master, model city plans, action, and development plans for excised villages; 3) Granting of approval and monitoring of layouts and development schemes for both government and private estates.
Lagos State Ministry of Housing	Responsible in Lagos state for formulating, reviewing, and implementing housing policies; provision of quality housing, as well as infrastructure in government housing estates; supervision of the maintenance of existing housing estates; intervention in real estate transaction matters including tenancy and rent; collaboration with the private sector on provision of housing; promotion of artisanal skills development in housing production, and research on the use of local building materials.
Lagos State Building Control Agency	Responsible for: inspecting building works and the certification of various stages of building construction and keeping of such records; removal of illegal and non-conforming developments; identification and removal of distressed buildings to prevent collapse; and the insurance of certification and fitness for habitation.

Other relevant entities identified but not described in detail include Lagos State Ministry of Environment and Water Resources; Lagos State Ministry of Energy and Natural Resources; Lagos State Ministry of Works & Infrastructure; Lagos State Ministry of Waterfront Infrastructure Development; Lagos State Building Control Agency; Lagos State Urban Renewal Agency; and New Towns Development Authority.

OGUN STATE: GOVERNMENT

Particularly relevant state government entities are:

Stakeholders	Description
Ogun State Ministry of Environment	Overall responsibility for prevention, conservation and amelioration of the various components and resources in the environment towards enhancing the quality of life of all state citizens. This involves the monitoring of environmental changes, predicting future changes, to maximize human benefits and minimize environmental degradation due to anthropogenic activities.
Ogun State Ministry of Urban and Physical Planning	Responsible for the formulation of physical planning policies and the coordination of physical development within the state.

Other relevant entities identified but not described in detail include Ogun State Ministry of Works and Infrastructure; Ogun State Urban and Regional Planning Board; Ogun State Investment Promotion Agency; Ogun State Property and Investment Corporation.

PRIVATE SECTOR STAKEHOLDERS

A sample of private sector organizations, related to the selected cities and states, including property developers/constructors, building owners, architects / planners, construction materials industries (concrete, metals, wood, brick), independent power producers and utilities.

Stakeholders	Description
Fencas Real Estate Development Company	The company seeks to promote the adoption of building standards, systems and processes that support the uptake of net zero carbon buildings, green and sustainable infrastructure and low-carbon technologies while lowering the built, natural, and social environment. The company has formed a partnership with BRE Group to facilitate the introduction of BREEAM certification to the Nigerian housing sector.
Echostone Housing Nigeria	Construction company that specializes in the design and construction of affordable and sustainable housing units. The company uses innovative technologies and building materials to create high-quality homes that are energy-efficient, durable, and comfortable to live in. Echostone Housing Nigeria is committed to addressing the housing deficit in Nigeria by providing affordable homes to low and middle-income earners.

Other examples of private sector entities identified but not described in detail include: Greenage Development Managers; Alpha Mead Development Company; African Capital Alliance; and Propertymart Nigeria Limited.

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