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Urban Resilience in Africa: A Study of Land-Use Stresses on the Urban Environment in the Greater Accra Metropolitan Area, Ghana

Isaac K. Arthur[1,#], Ebenezer Nikoi[1,#], Aba O. Crentsil[2,#], Alex B. Owusu[1,#], Charlotte N. Wrigley-Asante[1,#] and Vera Baffoe[3,#]

[1]Department of Geography and Resource Development, University of Ghana, Legon
[2]Institute of Statistical, Social and Economic Research, University of Ghana, Legon
[3]National Development Planning Commission
[#]Centre for Urban Management Studies, University of Ghana, Legon

Abstract

The Greater Accra Metropolitan Area of Ghana is experiencing rapid urbanisation at the expense of the environment, with substantial pollution compromising the area's resilience. This article examines the spatial dynamics of pollution from land use in the area and its health-related impacts. Drawing on a desk review of the literature and a transdisciplinary empirical approach, this study employed participatory mapping and qualitative methods of analysis to examine the extent to which the Greater Accra Metropolitan Area is building resilience in the face of increasing environmental pollution induced by land use. The researchers found spatial variations in the phenomenon, i.e. community-specific land-use pollution and general land-use pollution. Community-specific land-use pollution comes from dust and fumes, quarries and sand weaning, historical preservations, and transport corridors. General land-use pollution found across the study area related to dusty areas, noise from markets and churches, contamination of water bodies, solid and liquid waste, as well as excessive spillage of lubricants and carbon monoxide from car engines – all of which poses a threat to human health. Although both local and successive national governments have initiated different actions and platforms to mitigate pollution from land use and its health impacts, Ghana must work harder to build a framework of more sustainable and robust urban resilience.

Keywords: Land use; Pollution; SDGs; Transdisciplinary research; Urban resilience

1.0   Introduction

Ghana's Greater Accra Metropolitan Area (GAMA) has witnessed significant socioeconomic development and improvements in living standards, but at the cost of severe modifications of the natural environment and escalating land transformation. This has resulted in major challenges

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✉ ikarthur@ug.edu.gh

related to land use, such as flooding, environmental degradation and resource depletion, severe waste management crises, urban heat island effect, and ballooning health challenges (Wemegah et al., 2020; Kanhai et al., 2021; Puplampu & Boafo, 2021).

Furthermore, the unprecedented rate of expansion of GAMA has impacted natural green space availability and ecosystem services delivery, with some studies highlighting poor planning and land tenure challenges as key constraints to green space maintenance (Owusu, 2018). Some estimates indicate that green spaces have alarmingly declined from 41% to 15% in 27 years (Puplampu & Boafo, 2021). Given the vigorous climate change debates; evaluating green space availability, accessibility and management in GAMA, as well as eliciting further interventions for strengthening GAMA's resilience is an absolute imperative (Owusu, 2018). However, understanding the dynamics of land-use activities and associated pollution is equally critical to tackling societal challenges in the areas of health, food security, climate change, and biodiversity loss.

This report derives from a scoping study conducted in GAMA, seeking to examine the spatial dynamics of pollution related to land use and its health-related impacts in the area. The report deepens understanding of the trajectory of patterns of land use, its related environmental pollution and how it relates to specific SDGs. It also identifies the reasons for as well as the manifestations of risk and vulnerability in disproportionately polluted urban communities and examines the existing institutional framework and innovative approaches to addressing the effects of poor urban environmental quality. GAMA is selected because it epitomises the confluence of diverse environmental and socioeconomic forces that explain the state of environmental change in Ghana and many other developing countries.

2.0   Literature Review

The unprecedented scope, intensity and impact of global land use have directly transformed more than 75% of the earth's ecosystem, resulting in huge biodiversity loss worldwide as greenhouse gas emissions from land use remain a major trigger of global climate change (Ellis, 2021). Furthermore, an estimated 25% of global greenhouse gas emissions have been blamed on existing negative land-use practices, with more than 1.3 billion people condemned to degraded agricultural land and climate stress that excludes them from harnessing the benefits of socioeconomic development (OECD, 2020; UNCCD, 2017). Winkler et al. (2021) estimate that in just six decades about a third (32%) of the global land area has been affected by land-use change, with geographical divergence between the Global North (which is affected more by afforestation and cropland abandonment) and the Global South, which is affected by deforestation and agricultural expansion. The compound effect of a soaring global population and shifts in patterns of consumption towards more carbon-rich foods are anticipated to exacerbate the strain on global land-use systems (OECD, 2020).

The traditional economic models adopted by many sub-Saharan African (SSA) countries for the supply of goods and services have simultaneously increased socioeconomic opportunities and degraded the environment (Imasiku et al., 2020). For instance, the combined effects of increasing population and land-use activities endanger the terrestrial ecosystem's capacity to deliver quality water for human consumption and maintenance of healthy practices. Malherbe et al. (2018) also observed that poor wastewater management by informal urban development shares the blame for nitrogen pollution of groundwater. Consequently, better adaptation strategies and responsible management of natural capital and land degradation, particularly in developing countries, will remain imperative to ameliorate diverse threats to human security (UNCCD, 2017). In 2015, more than 3.96 billion people lived in cities (ICLEI, 2016) – a figure projected to increase to about 66% of the global population by 2025 (Hernantes et al., 2019). While urbanisation confers several socioeconomic endowments, it also triggers unparalleled changes in land use and land cover because of the spatial expansion of construction lands (UNISDR, 2013; Li & Cao, 2019).

Several studies show that urbanised areas have extraordinarily large ecological footprints (ICLEI, 2019; Ortega-Montoya & Johari, 2020) and often exert an indirect multifaceted influence on their natural surroundings. Their 'dissipative structures' also imply the consumption of vast amounts of energy and material resources, leading to significant waste generation (Khan & Uddin, 2015). This has often subjected urban areas to increased vulnerability to a wider range of stressors including rising land-surface temperatures and heat waves, flooding, severe droughts, earthquakes, extreme climatic events, sea-level rise and social upheavals (Hernantes et al., 2019). According to a recent IPCC synthesis, these stresses will intensify and have an extremely significant impact on cities (IPCC, 2014). The sheer scale of concentration of people and wealth in urban centres may be intensifying disaster risks, thus substantially influencing local communities. It is a grave concern that not only are megacities located in areas prone to major environmental stressors, but smaller cities are also ill-prepared to manage disasters because of infrastructural challenges and weak institutions (UNISDR, 2013).

As one of the fastest urbanising regions, Sub-Saharan Africa (SSA) and its cities are largely ill-equipped to deal with hyper-urban growth, particularly due to its spontaneity. This is because its large and mostly poor urban residents generally live in informal settlements that are highly vulnerable to natural and human-made stressors. Given the wide-ranging accumulation of urban risks, developing the capacity of cities for reducing risk and planning resilience in many SSA cities has become even more urgent (Spaliviero et al., 2020).

To reduce these risks and enhance safety and well-being, there will be a need for cities to be more resilient and better prepared to deal with these stresses in a holistic manner (Collier et al., 2013; Hernantes et al., 2019). Three global frameworks, i.e. the Sendai Framework for Disaster Reduction, the Sustainable Development Goals (SDGs) and the Paris Agreement, all acknowledged the urgent need for resilience building at all levels (ICLEI, 2016). This will equip governments and all other stakeholders with the requisite mandate to act swiftly and boldly to create more resilient cities. Although building resilience in rapidly urbanising environments plagued by chronic violence, disaster and extreme poverty remains challenging, it is vital for attaining the SDGs (Patel & Nosal, 2016). According to Hernantes et al. (2019: 96), city resilience may be defined as the capacity to resist, absorb, adapt to, and recover from shocks and stresses, to keep critical services functioning, to monitor and learn from ongoing processes through the city and cross-regional collaboration, and to increase adaptive abilities and strengthen preparedness by anticipating and appropriately responding to future challenges.

The broad and complex nature of resilience means that cities can exhibit a wide range of resilience gradients, thus defying a one-size-fits-all approach to resilience building (Meerow et al., 2016; Hernantes et al., 2019). Understanding this resilient scale and the position of a city is an initial prerequisite for initiating action towards resilience building. Ghanaian cities may require an internal understanding of land-use stresses and levels of vulnerability in their quest to build resilience and achieve the SDGs.

3.0   Method

3.1   Study Area

Figure 1 provides an overview of the study area, i.e. GAMA, with Ghana inset. GAMA is an economic region consisting of 25 of the 29 Metropolitan, Municipal and District Assemblies (MMDAs) in the Greater Accra Region of Ghana (GAR), created in the 1990s because of their close geographical and functional links (Grant & Yankson, 2003). These MMDAs operate independently of one another and are led by Chief Executive Officers. GAMA has a population of approximately 5 million people (Clark et al., 2021).
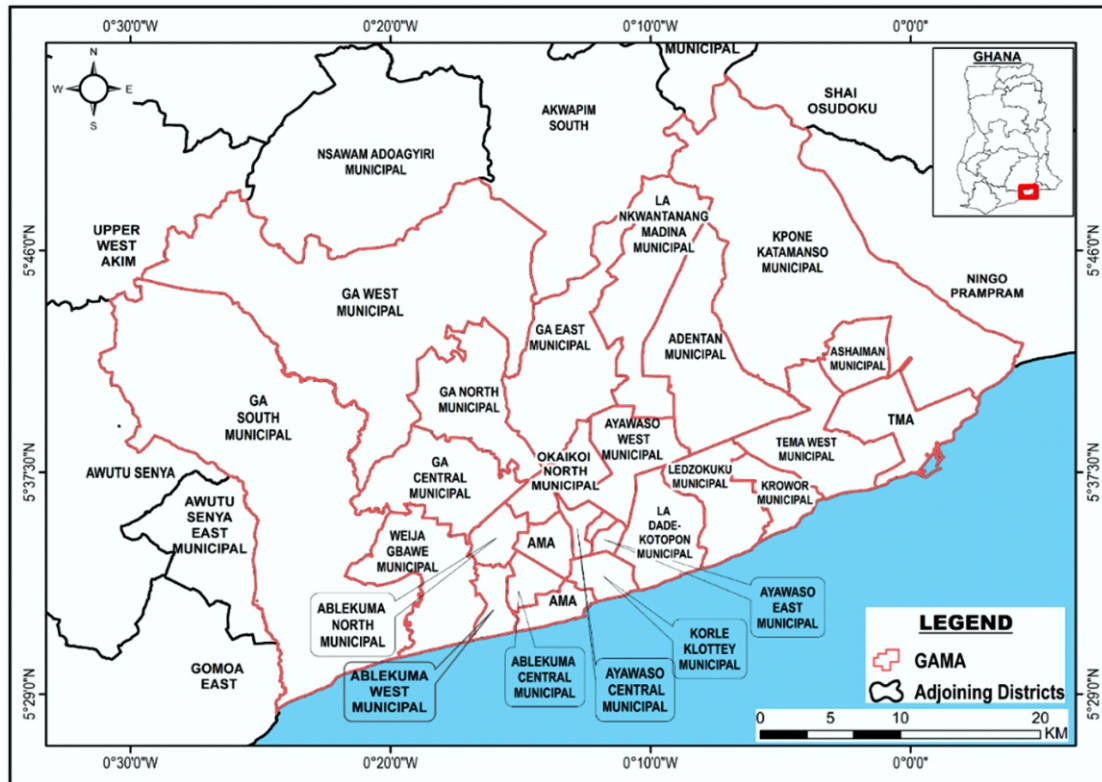
Figure 1: Map of the study area

Source: Authors' Construct (2023)

3.2   Study Approach and Data Collection

The study adopted a transdisciplinary approach, thus allowing for the integration of knowledge from across academic and non-academic spheres (Bergmann et al., 2012). Participants in the non-academic spheres included practitioners with local knowledge of pollution related to land use and its impact, including land-use types, the associated pollution, communities (location), institutional frameworks and innovations that have been either proposed or are being implemented. Both primary and secondary data were used. The secondary data were published and unpublished works, including statistics, inter-ministerial and agency reports, and other literature. The primary data were mainly the identified land-use pattern, pollution types, their location and impacts, as well as the existing institutional frameworks and innovations that were documented during a one-day stakeholders' workshop involving 25 participants. The participants consisted of six (6) experts selected from six (6) different fields of specialisation and 19 government employees and local community members with varying backgrounds residing in the area and working for different institutions and organisations.

Table 1: Summary of composition of workshop participants

Participant ID	Organisation of work	Area of specialisation	Sex	Age
1	University of Ghana	GIS and Spatial Planning	M	50+
2	University of Ghana	Urban and Development Planning	M	Upper 40s
3	University of Ghana	Gender and Development	F	50+
4	University of Ghana	Medical Geography	M	50+
5	National Development Planning Commission	Policy Expert	F	30+
6	University of Ghana	Development Planning	F	Upper 40s
7	University of Ghana	Project and Applied Management Specialist	M	50+
8	Zoomlion Ghana Limited	Waste Management Specialist	M	50+
9	National Development Planning Commission	Project Management and Policy Expert	M	Mid 40s
10	Ablekuma West Municipal Assembly	Development Planning	F	30+
11	Friends of the Earth (NGO)	Environmental Specialist	M	Upper 40s
12	Ga Traditional Council	Traditional Leader/ Herbalist	M	60+
13	Adentan Municipal Area	Community Task Force and Advocacy	M	Mid 40s
14	Social Welfare Market Women Association	Trading	F	Upper 40s
15	Accra Metropolitan Assembly	Planning	F	Mid 40s
16	Accra Metropolitan Assembly	Spatial Planning	M	Mid 40s
17	Accra Metropolitan Assembly	Environmental Management	M	30+
18	Environment Protection Agency	Environmental Protection Analyst	M	Mid 40s
19	University of Ghana	Geography/ Private Business Practice	F	30+
20	Land Use and Spatial Planning Authority	Spatial Planning	M	30+
21	National Service Scheme/University of Ghana	Geography	F	20+
22	National Service Scheme/University of Ghana	Geography	F	20+
23	University of Ghana	Organisational Leadership and Governance	F	Upper 40s
24	Ghana Real Estate Developers Association	Administration	M	Mid 40s
25	University of Ghana	Urban Geography	M	50+

Transdisciplinary Research Workflow
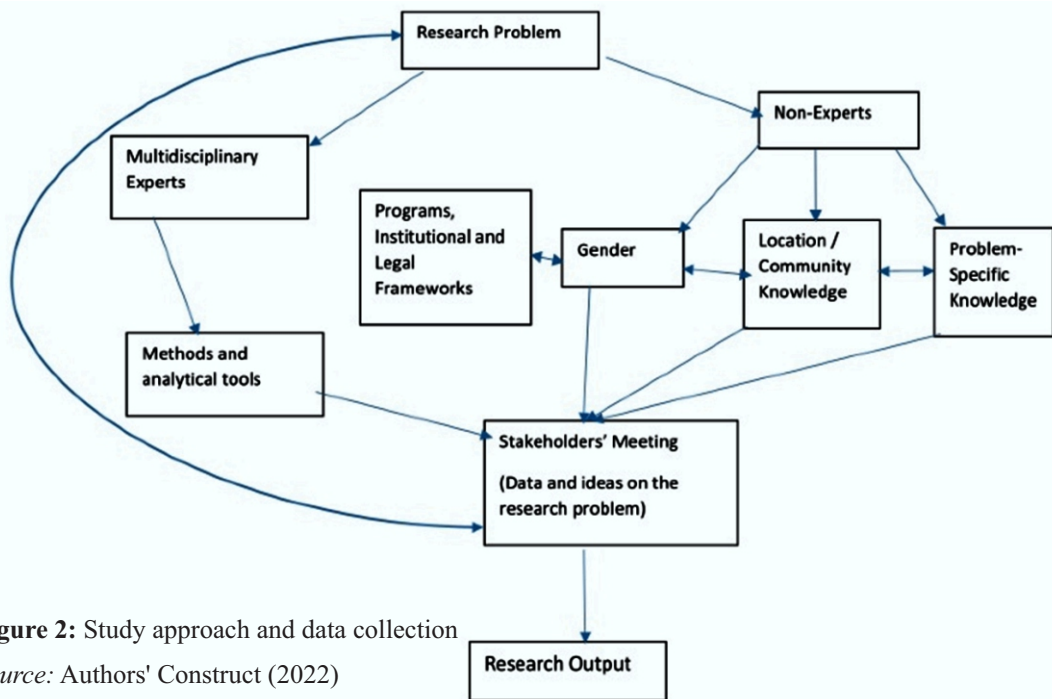
Figure 2: Study approach and data collection

Source: Authors' Construct (2022)

The participants were grouped into three (3) in a working session to address three thematic areas of the study. The thematic areas are:

Group 1: Determining the trajectory of environmental pollution related to land use in Accra, the types and location.

Group 2: Identifying and discussing communities that are more vulnerable to issues related to poor environments including health, food insecurity, safety and security, water shortage and natural disasters.

Group 3: Discussion of the existing institutional framework and innovative ways for addressing the effects of land use on urban environmental quality (Environmental Pollution).

Each group spent two hours discussing and documenting the results and data emerging from their discussions. Another hour was devoted to a plenary presentation of each group's discussion results. Each group's presentation was followed by a question-and-answer session. Another thirty minutes was devoted to synthesising the outcomes, which were documented in a scoping study report. Data on communities and types of land use related to pollution were mapped using Geographic Information Systems (GIS). Moreover, data on pollution types and state and their related impact were analysed qualitatively and presented as observations and opinions of nonexpert focus group discussion results. Similarly, existing institutional frameworks and innovations that are already being implemented and those in the proposal stage were all discussed and documented. This provided insights into the various resilience strategies being employed in GAMA and Ghana in general.

3.3   Results and Discussions

The scoping study from which this report emanated generated results on communities that are more vulnerable to environmental issues and implications deriving from negative land-use

practices including health, food insecurity, safety and security, water shortage and natural disasters. It also discussed the existing institutional framework and innovative ways for addressing the effects of land use on urban environmental quality (Environmental Pollution) in GAMA. Now we present the results and discuss types of pollution related to land use and their location differences, implications of pollution related to land use in GAMA, efforts in addressing the effects of such pollution as well as their implications and impact on efforts at achieving the relevant SDG goals.

3.3.1   Types of Pollution Related to Land Use and their Location Differences

In ranked order, land-use activities identified and discussed at the workshop are residential, industrial, mixed-use, commercial (markets), transportation, water bodies and wetlands, historical preservations, sanitary areas, and green areas/parks. The discussion revealed that the forms of pollutants produced by land-use activities are similar in certain cases, while others are unique to specific locations or communities.

Figure 3: Major types of pollution related to land use in GAMA

Source: Authors' Construct (2022)

Stakeholders at the workshop, especially those from the various MMDAs, held the view that the entire GAMA is polluted, although there are spatial variations in the types of pollution. Communities such as Gbewa, Amasaman, Abgogbloshie, Kwabenya, and Oyirifa were identified to experience more air pollution (dust and fumes). Noise pollution is common in all communities with markets and bus terminals. Water pollution is associated with the Ga Mashie area (James

Town, Chorkor, and Korle Gonno), Old Fadama, Glefi, Agblobloshie, Teshie and Nungua, while land pollution/degradation is common in Kwabenya Abuom, Gbawe, Amasaman, Oyarifa Gravel Pit, Prampram, Dawhenya, Shai Hills, etc., where quarrying and sand weaning activities are performed. The quarry and sand weaning produce stones and sand respectively for the building construction industry.

Table 2: Major pollution types related to land use in GAMA

Community	Pollution Type	Ranking
Gbawe	Dust and Fumes	Ver Poor
Amasaman	Dust and Fumes	Moderate
Abgogbloshie	Dust and Fumes	Very Poor
Kwabenya	Dust and Fumes	Low
Oyirifa	Dust and Fumes	Low
James town	Water pollution	Very Poor
Chorkor	Water pollution	Very poor
Korle Gonno	Water pollution	Very poor
Old Fadama	Water pollution	Very poor
Korle Gonno	Fumes and Flies	Very Poor
Glefe	Water pollution	Poor
Abgogbloshie	Water pollution	Very Poor
Teshie	Water pollution	Low
Nungua	Water pollution	Poor
Kwabenya Abuom	Quarry and Sand weaning	Moderate
Gbawe	Quarry and Sand weaning	Poor
Amasaman	Quarry and Sand weaning	Very Poor
Oyarifa gravel pit	Quarry and Sand weaning	Very poor
Prampram	Quarry and Sand weaning	Poor
Dawhenya	Quarry and Sand weaning	Moderate
Shai Hills	Quarry and Sand weaning	Poor
Tema	Industrial Pollution	Poor
North Industrial Area	Industrial Pollution	Moderate
Old Fadama	E-Waste	Very Poor
Ashiaman	E-Waste	Very Poor

Source: Authors (2022)

Residential pollution was a common type of land-use pollution affecting the entire study area. It manifested as solid waste; liquid waste mostly polluting water bodies due to poor sewage and drainage systems in many homes (both planned and unplanned communities) and the city; noise pollution emanating from various social events including parties and religious ceremonies/prayer events; air pollution typically associated with the burning of waste as well as biomass for cooking in many households; forest/vegetation loss/wetland loss housing construction; flooding (a common phenomenon in the city that is attributed to people building houses on waterways and other unapproved spaces); and the building of houses on designated parks and open spaces.

Industrial areas typified by different manufacturing and processing companies were noted for causing air, water and noise pollution. Some industrial establishments, according to a

participant, use old machines that are not environmentally friendly, while others simply ignore environment-related best practices. Machine emissions often contaminate the air, while noise pollution is caused by machine noise as various other forms of industrial waste pollute water bodies. Many mixed land-use areas in GAMA – comprising residential, commercial, institutional, recreational and industrial complexes – were identified to suffer from this type of pollution. They also contribute to the generation of solid waste, liquid waste and noise as well as air pollution, as previously discussed. The Tema-Ashiaman enclave, the Kwame Nkrumah Circle and the Kaneshie Industrial Area, as well as Accra Central, are just a few of the notoriously polluted communities.

Solid waste/land pollution, air pollution, liquid waste, noise pollution, inadequate safety and security (due to the nature of construction) and erosion were identified in commercial centres. Although commercial centres include stores, malls, banks and hotels, this study focused on open-air markets inside metro area communities. In Ghana, these marketplaces have a reputation for producing large quantities of solid waste, accounting for a considerable component of the urban waste stream (Asomani-Boateng, 2016). According to one participant, "the sheer overcrowding in our marketplaces contributes significantly to waste generation and other forms of pollutants."

The waste generated is poorly managed, resulting in overflows in open containers and waste pouring into street drains and roads facing the market (Asomani-Boateng 2016). The level of air pollution in and around commercial centres varies. Some are caused by various modes of motorised transportation, while others are caused by the smell of decomposing food, waste burning, and cooking. As for cooking, the source of pollution is the smoke emanating from the biomass used for cooking. Moreover, sewage sludge and wastewater from the washing of goods, vehicles and food items are examples of liquid waste identified in commercial centres. As for noise pollution, this was associated mostly with aircraft, road transport and heavy sound from music and loud speech (religious preachers, advertising vans and peddlers of various goods). This partly confirms Clark et al.'s (2021) finding that human speech and musical sound are often at higher decibels in residential areas, particularly in the high-density areas of Accra.

The study found that GAMA's increasing urban expansion means that most residents must commute long distances to work and other destinations – a situation that leads to rising levels of air pollution. This is coupled with the high incidence of emissions from old and ill-maintained vehicles. GAMA, like many other Ghanaian cities, is experiencing a rapidly expanding car-wash industry, driven by massive automobile imports into the country. Car-wash stations have been cited for using excessive amounts of water and leaking filth, heavy metals, disinfectants and toxic chemicals into the environment, especially into water bodies (Monney et al., 2020). Automobile repairers and service providers were also identified for improper disposal of wastes including oils, which ultimately affect the soil, vegetation and aquatic life.

Similarly, the study found that in GAMA water bodies, e.g., rivers, serve as sources of potable water, yet many of them encounter challenges of pollution due to agricultural, industrial and domestic activities. This phenomenon confirms a recent news item in which a traditional leader bemoaned the extent of pollution of water bodies in GAR through anthropogenic activities (GNA, 2021). The Odaw River in Accra, according to participants, is extremely polluted with human excreta as well as solid and industrial wastes, rendering it dead. Furthermore, wetlands in GAMA, which are naturally supposed to contribute to improving urban environmental quality, are also not spared in the barrage of pollution induced by land use. Two Ramsar sites, i.e. the Densu Delta wetland and the Sakumono lagoon, are both situated in very densely populated areas of GAMA and are endangered by pollution and housing encroachment resulting in wetland draining, deforestation, ecosystem degradation and biodiversity loss (Kondra, 2016).

Shrines, palaces, castles, statues, royal graves and other sites of historical preservation are

distinct and specific community-based land uses that generate pollution. In this study, however, the scope of historical preservation was limited to cemeteries, which were identified as an anthropogenic source of pollution and contamination of groundwater – for obvious reasons.

Participants, including former and current MMDA officials in GAMA, argued that, despite multiple efforts to efficiently manage waste in the city, local authorities remain overwhelmed by the city's rapid rate of expansion. Besides, it is difficult to find suitable land for managing waste since existing landfill sites are poorly engineered.

According to Hunter et al. (2017, Appendix 2, p.37), "urban green spaces, such as parks, playgrounds, riversides, green trails or urban gardening, can be applied as a spatial determinant to improve the quality of urban settings delivering diverse environmental, social and health benefits to the local community." Similarly, participants suggested that green spaces can improve urban air quality, beautify the environment and prevent erosion. However, others think there is a limited chance to achieve this in GAMA. As argued by one participant: "This will not work effectively since GAMA is fast becoming a concrete jungle filled with the construction of buildings."

The absurdity of this phenomenon is evidenced by the replacement of several zoned green spaces and parks with buildings (Owusu, 2018), resulting in myriad environmental challenges in the city. Even agricultural lands have not been spared, suggesting a failure in land-use plan enforcement and a veritable threat to urban food security. The emphasis on horizontal – rather than vertical – expansion in the face of growing urbanisation also has dire consequences on the city's green and open spaces, thereby threatening sustainable urban development.

3.3.2   Implications of Land-Use Pollution in GAMA

Thus far, pollution induced by land use has been identified to have implications for the urban climate, human health, food security and water availability. While the high concentration of vehicles and the vast asphalted road networks in Accra are expected to ease mobility, they were found to contribute to the formation of urban heat islands in GAMA. Given the fact that agriculture in Ghana is largely rainfed, high temperatures coupled with inadequate rainfall can also affect urban agriculture and worsen food insecurity (Dubbeling et al., 2019).

According to EPA (2018), as GAMA's population and housing density continue to grow on its limited land space, air pollution issues related to car emissions and cooking stoves are expected to increase. Some participants also expressed concern about Accra's ambient air pollution burden, which is projected to cause around 1,700 deaths per year (Mudu, 2021). Although the implications of water pollution are known to be multifaceted, this study emphasised accessibility. As indicated by a participant: "Pollution of water sources in Accra and Ghana in general may lead to water shortages soon. This can worsen the socioeconomic woes of the poor and everyone." Polluting waterbodies with solid waste and building on waterways and wetlands were also revealed to be key contributors to perennial flooding in the city. A notable flooding event happened on 3rd June 2015 and claimed numerous lives while destroying properties and livelihoods (World Bank, 2017).

On noise pollution, participants indicated that continuous noise exposure can lead to health challenges. This is consistent with Clark et al.'s (2021) finding that noise pollution can have a variety of negative effects on human health, including hearing loss, cardiometabolic disorders, sleep disturbance, reduced cognitive function, and causing stress/annoyance. The study also noted that day and night-time sound levels in most parts of the GAMA exceeded national and international health-based guidelines.

The overcrowded nature of open markets and stalls construction styles pose health, safety and

security risks (Adjokatse et al., 2022). This explains why very few goods are salvaged in the event of a market fire – a phenomenon that is rising in most urban areas of Ghana (Oteng-Ababio & Sarpong, 2015). Apart from economic losses, these market fires pollute the air and endanger human health.

3.3.3 Accra's Efforts in Building Resilience

Building urban resilience is a public good that requires government initiative and commitment to reduce risks and disasters. Ghana's National Environmental Policy underscores the State's willingness to build resilience via concerted conscious efforts at managing the environment using an integrated and holistic management system (Ministry of Environment Science and Technology, 2014). The policy encourages Ghanaians and institutions to work together to manage the environment in achieving sustainable development. This clarion appeal for a unified strategy for environmental management appears to have been heeded to some extent in GAMA. Multiple actors comprising state institutions (Greater Accra Regional Coordinating Council [GARCC] and MMDAs), civil-society organisations, the private sector and ordinary citizens play various roles in addressing environmental issues, including pollution, in GAMA. A notable activity in this regard is the introduction of a sanitation programme called "Operation Clean Your Frontage", which mandates all individuals and businesses to be accountable for cleaning and greening their immediate environs. The programme is complemented by clean-up exercises organised in communities and institutions by civil-society organisations and groups.

The MMDAs also hold monthly clean-up campaigns where citizens clean their neighbourhoods. However, this exercise has slowed down in recent times because of a lack of enforcement by the MMDAs. In general, all these clean-up campaigns have contributed to improving sanitation and reducing the risk of floods and disasters in vulnerable communities. In recent times, the MMDAs provided free waste bins to households as part of their efforts to manage sanitation in the city. Moreover, the MMDAs have demolished several structures built on waterways and unapproved locations, in addition to prosecuting individuals and organisations at the sanitation courts for various environmental offences.

There is also the Green Ghana programme and a tree planting programme aimed at addressing Ghana's reforestation needs to save its depleting forest reserves as well as ensure climate change adaptation. Consequently, various MMDAs in GAMA have planted different tree species. Undoubtedly, this exercise has many gains for the city's environment including the potential to contribute to reducing the formation of urban heat islands. The latter provides a framework for addressing many types of environmental concerns, including pollution. Private companies also collaborate with MMDAs in managing waste of various types. There are also sanitation policies and bye-laws of individual MMDAs, alongside environmental laws by the Environmental Protection Agency.

 The Land Use and Spatial Planning Authority has the mandate and prosecutorial powers to ensure proper spatial planning, prorogation of new land-use plans and building codes and enforcing existing ordinances and regulations. Participants believed that this would soon sanitise land use and enforcement of regulations. Similarly, the recent land records digitalisation programme has been hailed as a concrete effort by the government to sanitise the land market and enforce land ownership and tenure systems. This will facilitate land use by speedily resolving land disputes and squatter development issues in Ghanaian cities. Despite the efforts being made by government, city authorities and organisations to manage pollution in Ghanaian cities, the issue of pollution remains a key challenge. As indicated by a participant, "the issue of pollution continues to exist in GAMA because of the lack of resources and enforcement of the existing laws, regulations, and policies." Undoubtedly, this threatens the state's endeavour to build resilience.

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3.3.4 Implications of Pollution-Mitigating Efforts for Achieving the Sustainable Development Goals

Reflecting on the mitigation measures discussed earlier, it is evident that Ghana is making gains in achieving some of the SDGs. For example, the multi-actor approach to managing environmental issues has implications for achieving SGD 11, which aims at making cities inclusive, safe, resilient and sustainable. This approach demonstrates the state's support for inclusivity in environmental management, which has implications for building resilience and decreasing mortality while also assisting in reducing economic losses associated with pollution-related disasters.

SDG 6 focuses on ensuring the availability and sustainable management of water and sanitation for all persons. This resonates with Ghana's policies and regulations on protecting water bodies, as well as with the sanitation campaigns that are being undertaken in GAMA. Finally, SGD 13 encourages nations to take conscious and urgent action to combat climate change and its impact. The national tree-planting exercise and the enthusiastic participation of MMDAs in GAMA represent a clear attempt to fight climate change and its impact. This study considers the tree-planting exercise as timely, given the significant loss of vegetation to concrete buildings in GAMA.

4.0 Conclusion

The unprecedented urbanisation witnessed in GAMA is characterised by lateral expansion, making the city-region parasitic. Its accompanying land uses for residential, industrial, commercial and other anthropogenic-driven activities are causing pollution with major consequences for human well-being and survival. Efforts at addressing these challenges have culminated in national and local programmes aiming at building resilience. Major challenges are observed in poor law enforcement and lack of resource challenges, which undermine GAMA's resilience. However, institutional reforms and a participatory approach to implementing policies and programmes hold a good promise for GAMA in its drive to achieve the SDGs.

Following this study on the extent of pollution related to land use, as well as its environmental and health implications for GAMA and its residents, it is noted that the study's transdisciplinary approach helped the researchers to offer empirical, verifiable conclusions. The approach also created a shared learning mechanism for expert and nonexpert participants who were frontline workers of the resilience drive. This shared learning experience will drive efforts towards resilient community building in GAMA.

Similarly, the identified and mapped land-use pollution gives a tool for surveillance and the possibility of generating local solutions. Moreover, pollution ranking and the associated environmental and health implications serve as the first step for action. To a large extent, participants agreed that the MMDAs within the metropolitan area, as well as the regional administration and successive national governments, have initiated different actions and platforms for collectively addressing issues of land use as well as pollution and its impact, although more needs to be done. The fact that actions have been taken by successive administrations is an admission that a serious problem exists and that current solution models are not effective enough. Consequently, this study argues that, apart from ensuring that laws are adequately enforced and the necessary resources are made available by authorities to mitigate pollution, it is imperative to develop new approaches to building urban resilience.

We propose that instead of relying mostly on government initiatives, a bottom-up approach, e.g., a sustainable-communities initiative where local communities themselves initiate action and collectively create the environment they want, is imperative. Adequate collaboration and efficient coordination are needed among government agencies/departments, local communities and civil-society organisations to mitigate pollution related to urban land use. Moreover, more

financial investments are needed to promote environmental management and broaden the scope of educating people of all ages and social statuses on environmentally friendly practices for building resilience in GAMA. Indeed, there is no gainsaying the fact that GAMA needs to start building resilience and at the same time being sustainable in the drive to meet the SDG goals.

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Developers' Resilience in Land Acquisition Issues:
The Case of Igando-Oloja Community, Ibeju-Lekki, Lagos State

Esther Thontteh,[1] Osato Vine[2], Job Gbadegesin[3]

[1] Centre for Housing and Sustainable Development, University of Lagos, Nigeria
[2] Department of Estate Management, University of Lagos
[3] Department of Estate Management, Federal University, Oye-Ekiti

Abstract

Today, many real estate developers in Nigeria are confronted with confusing procedures for guaranteeing that acquisition of excised lands is free from encumbrances and pending disputes among landowning families' (locally referred to as 'omo onile'). Without diligent and exhaustive investigation, purchasing excised land for real estate development may be fraught with complications and uncertainties encompassing the excision process, compensation and issues of original ownership of such land. This study focuses on Igando-Oloja community of Ibeju-Lekki, Lagos State. The core question guiding the study is: How were real estate developers in the community able to address the uncertainty associated with land transactions for development? A case-study scenario was utilised, which involved interviews with Igando-Oloja community leaders and developers who have purchased land in the subject area. Three categories of developers' complicated land acquisition issues were unravelled. One is a category of developers that bought the same land that had been sold to a third party by a group of disgruntled landowning families, causing litigation and delaying development. In the second category, two developers bought excised land from members of a landowning family but not all stakeholders were represented in the payment/compensation process, thus land purchase discussions had to start anew. Finally, some developers were victims of governmental excision of already purchased lands. However, prompt out-of-court settlement resulted from the alternative dispute resolution mechanism deployed by the landowning families and the developers. This article thus offers insight into developers' adoption of an out-of-court resolution resilience strategy that expedites the process while protecting those involved and maximising the time value of money for developers and other parties in land transaction disputes.

Keywords: Developers; Land conflicts; Omo onile; Resilience; Strategy

1.0   Introduction

Land acquisition is not a one-off transaction, as it entails certain steps such as identifying available land, investigating the land title, making payment and registering the new land title.

✉ ethontteh@unilag.edu.ng

According to Omirin (2002), as cited in Owoeye and Adedeji (2015), land acquisition is premised on the availability of vacant lands, affordability of such lands, comfort of transaction over such lands and security of the owner's interest in the land. Developers frequently encounter challenges during the transaction process or sometimes after the transaction has been concluded, whether from the customary landowners or government. Given the rigour involved in acquiring excised land, experts in property development have come up with the term "developer's resilience." According to Southwick et al. (2014), resilience is the ability of a substance to spring back to shape quickly after overcoming difficulties. Resilience means different things to different professionals based on the parameters of its utility (Shi et al., 2018). In the development context, resilience refers to the ability of developers to bounce back after overcoming challenges associated with land acquisition and development.

Land acquisition through the communal land tenure system can pose serious problems if proper market investigation and research are not done (Olapade, Ojikutu & Aluko, 2022). This is because communities usually comprise different family households who are stakeholders to different degrees and measures when it comes to communal land. These individual family members might or might not have equal access to portions of such communal land but they must all be involved when acquisition and compensation surface, otherwise a null transaction and land uptake challenge may ensue.

The case study area, i.e., Ibeju-Lekki, used to be entirely customary (rural) land but it has become quite attractive to developers in the state (Obiefuna, Nwilo, Atagbaza & Okolie, 2013; Odunfa, Agboola & Oladokun, 2021). The administrative centre of Ibeju-Lekki Local Government Area is Igando-Oloja, a development that followed the creation of the Lekki Council Development Area (LCDA) in the year 2003 (Salau, 2022). This axis of Lagos State has been witnessing massive development, accompanied by infrastructure growth. Land can be acquired in the axis directly from the government, individual owners or the community head. The land market in Ibeju-Lekki is mainly informal, with the majority of buyers preferring it to the formal market (Agbato et al. 2018).

Landowners in the Igando-Oloja community comprise indigenes and their neighbours who have over time come to identify themselves as members of the community even though they may not have historically come from there (Interview Excerpts, 2021). Some of these neighbours reside in nearby communities but own portions of land in Igando-Oloja. Most of these types of acquisitions came about by marriage – for example, Igando-Oloja women marrying men from nearby communities and vice versa. In such situations land was apportioned to non-indigenes by virtue of marriage. Moreover, given its power over land in the state, the state government has also acquired land in the area for public purposes. Sometimes government can release portions of such land to the initial owners. This practice is known as excision. To be sure, issues of ownership complexity and acquisition of public land by the government through eminent domain tend to result in diverse conflicts and litigations on ownership claims.

The study addressed the following issues with regard to developers' resilience in matters of land acquisition: (i) assessing land classifications (ii) excised land acquisition procedures, compensation issues, emanating dispute and how they affect developers and (iii) developers' resilience strategies in land conflict management. Addressing these issues is necessary in the bid to identify and document strategies applicable to developers' resilience in land acquisition and conflict management.

2.0   Literature Review

2.1   The Land Use Act's Vested Rights and Limitations

Land availability, acquisition, sale and development are key factors in terms of national growth

in developing countries (Oluwatayo et al., 2019; Agboola et al. 2017). This is because of the unique characteristics of land, viz: fixity in supply, appreciation of value, immobility and indestructibility. The management, allocation and sale of land in Lagos State are done mainly through the government and landowning families, popularly referred to as "omo onile" (Adedire & Adegbile, 2018). The Land Use Act of 1978 vests land rights in the State Governor, who holds land in trust for the citizens. This means that the governor of a state has the right, power and authority to allocate and determine land rights to citizens as he deems fit. This was done to make land readily available for both the government and investors who wish to acquire land for development purposes.
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However, studies (e.g., Idhoko, 2016; Nubi, 2010) have shown that the purpose of enacting the Land Use Act has been defeated, as most governments make use of state lands for the benefit of government officials. Idhoko (2016) argues that it is improper to commit the responsibility of administering all state land to one citizen. He therefore suggests that the House of Assembly should enact legislation disallowing the governor to determine the overall land transactions in a State. Udoekanem, David and Onwumere (2014) also argue for a less bureaucratic and more transparent system of title transfer.

The Land Use Act divides land in a state into urban and non-urban lands. What constitutes both classifications are as determined by the State Governor. As such, no one can physically predict or assume what makes land urban or not. Lands classified as 'urban lands' are under the acquisition of a state government unless they are pronounced 'free' through an official document called a gazette (*Neighbourhood Review*, 2022).

2.2 Land for Development in Lagos State

Although substantial amounts of government acquisitions remain in Lagos State, especially in the Ibeju-Lekki axis, much of it is yet to be developed or assigned to users (Dan, 2018). As official records suggest, government last granted excision to land in the Ibeju-Lekki/Epe axis in the year 2012 (Dan, 2020). However, there is no doubt that economic growth will be enhanced in the area if government releases more land to real estate investors. Without the development of land, the housing deficit in Nigeria, which as of 2019 was put at 20 million units, cannot be tackled (Moore, 2019; Dan, 2018).

Acquired lands in a state are usually classified in two ways: committed acquisition and general acquisition (*Lagos Handbook,* 2014).

(i) Committed lands are those which have been expressly designated by the government of a state as being meant for developmental use for the benefit of all citizens. These types of lands cannot be excised or re-acquired by anyone, as acquisition or sale of such land by a private entity or community is at such person/persons' peril.

(ii) General/global acquisition can be acquired once they have been declared 'free' by the government. These types of lands are also under acquisition but not committed. Lands under this classification can be acquired through an 'excision' or 'regularization' process.

2.2 Excision and Gazette in Lagos State

The issue of excision in Lagos State began to gain recognition in 1994 during the regime of Brigadier Olagunsoye Oyinlola, who granted excision to some families, including the Olotos, Aworis, Isheris, and some land-owning families in Badagry. These families had appealed to the government for the excision of portions of their land for family succession heritage, as most towns and streets were already being named after affluent foreigners (Ogundana, 2004).

Land excision is a process whereby the government releases portions of already acquired land back to indigenes in communities or villages to compensate them for the larger acquisition done in overriding public interest.

The government must officially declare such release in the state's official gazette and in a widely read newspaper. A gazette is an official document owned by the government that reveals important information necessary for public awareness (*Lagos Handbook*, 2014). In Britain, for instance, the gazette can be likened to a newspaper which is mostly used to list the names of people under the government's employment (Longman, 2022). Information published in an official gazette is not limited to land transactions only but may include important information such as the enactment of new statutes as well as executive, legislative or judicial employments or misemployments, etc.

In the case of land transactions, a gazette will show the portions of land excised to communities or villages and the land sizes in plots, acres or hectares. Portions of land published in an official gazette can be sold to the public by the community to whom it was excised since such land now belongs to them. Nevertheless, this does not guarantee absolute ownership of land because the government, which has all authority on urban land, may decide to re-acquire such gazetted land if it is in public interest to do so. Under such circumstances, there must be compensation for the community from which acquisition was made (*Neighbourhood Review*, 2022).

2.4 Methods of Processing Excision

Excision can be voluntarily issued by a state government, but communities must apply for it once they are aware that portions of land in their community have been classified under "general acquisition". Excision, just like the process of getting land title registration in Nigeria, can be quite expensive and time-consuming (Thontteh & Omirin, 2021). Most times the high cost and delay result from the need for government to analyse the benefits and demerits of releasing such land to the community.

The following are steps to take when seeking excision from the government:

- Family representatives (this usually includes the local head in a community [Baale] and the secretary) apply for excision at the state land use allocation committee.
- Necessary documentation such as the land survey is submitted to the surveyor general of the state for review.
- Inspection by government officials (technical committee) is conducted to ensure that the application and requests of community members are accurate.
- The government officials then submit a report to the state land use allocation committee based on their research on the land.
- The state land use allocation committee meets to decide whether to approve or reject the report submitted by the technical committee. After a decision is reached, they then submit a report to the state governor based on their conclusion.
- If the excision request is approved and accepted by the state governor, the document will be forwarded to the surveyor general for him to prepare a survey on the excised land.
- Community members are then required to map out and submit a layout design to the state ministry of physical planning and development authority.
- The community makes unconditional settlement to the initial claims of the land and then proceeds for indemnity agreement on the excision.
- The excision is further published in the state's official gazette and any other widely read newspaper.
- Payment for issuance of a certificate of occupancy is expected and done within 30 days after publication in the newspaper.

● The State's land bureau office receives final documents, excision reports and administrative files, and then forwards same to the Registrar of Lands for entry into the official archives' excisions, surveys, maps, names and gazettes in the Excised Lands Agency.

2.5 Compensation Quagmire

Research shows that compensation in Nigeria is usually underpaid, especially when coming from the government (Adedire & Iweka, 2019). According to Olapade et al. (2022), most land acquisitions result in legal disputes owing to insufficient compensation payment and other factors (Nuhu & Aliyu, 2009). There have been frequent reports of compensated families requesting more money (*Daily Trust*, 2019).

According to Section 29(4) of the Land Use Act, compensation for compulsory acquisition by the government for overriding public interest is divided into three parts, viz:

(a) *the land, for an amount equal to the rent, if any, paid by the occupier during the year in which the right of occupancy was revoked;*

(b) *building, installation, or improvements thereon, for the amount of the replacement cost of the building, installation, or improvement, that is to say, such cost as may be assessed based on the prescribed method of assessment as determined by the appropriate officer less any depreciation, together with interest at the bank rate for delayed payment of compensation and in respect of any improvement of like reclamation works, being such cost thereof as may be substantiated by documentary evidence and proof to the satisfaction of the appropriate officer;*

(c) *crops on land apart from any building, installation, or improvement thereon, for an amount equal to the value prescribed and determined by the appropriate officer.*

It is commendable that Nigerian law recognises the need for compensation when land has been acquired in overriding public interest. However, the debate on this law over time has been the inefficiency in its implementation (Otubu, 2012). The conditions for compensation favour the government more than the landowners or developers (Akujuru & Deeyah, 2016). For instance, in the year 2021, the Lagos State Government paid a total of 16 family members in Epe the sum of 38 million naira for crop compensation (TVC, 2021). This implies that each family was entitled to the sum of 2 million naira only, a sum that might not even cover the cost of the land. Against the backdrop, compensation issues affect developers as narrated in the Act.

Land conflicts on all types of property	
Boundary conflicts	• Between individuals (over private land) • Between clans (over common property) due to oral tradition and physically unfixed boundaries • Between administrative units (villages, communes, municipalities, districts) • Between private individuals and the state (over private or state land)
Ownership conflicts linked to inheritance	• Inheritance conflicts within a family • Inheritance conflicts within a clan
Ownership conflicts due to legal pluralism	• Overlapping/contradictory rights due to legal pluralism (customary/indigenous rights vs. statutory law)
Ownership conflicts due to lack of land registration	• Several people claim the same property because a) no land registration exists, b) it is in bad conditions or c) it has been destroyed • Distribution of intermediate tenure instruments which cannot be registered • Due to unequal knowledge and financial means only the well-off register land – even that of others

Source: Wehrmann (2008)

Conflict is inevitable in everyday transactions but concerted efforts must be made to avoid it in land development transactions, especially given the huge capital outlay involved (Oghifo, 2021). In Nigeria, most land conflict issues, despite complaints about the weak judicial system, are resolved through time-consuming and expensive litigation (Esiri, 2021). At times, to speed up the process, the courts advise parties to consider out-of-court settlements or other alternative dispute resolution mechanisms. This approach has aided the efficiency of the court system and developers are increasingly subscribing to it. As Wehrmann (2008) noted, land conflict can adversely affect the physical, economic and social development of land. Most international, interstate and intrastate conflicts originated from land matters. Luckily, these conflicts may be resolved via the courts or other dispute resolution methods (Wehrmann, 2008).

3.0   Methodology

The research adopted a case-study approach with the use of interviews to elicit information from the Igando-Oloja community leaders and developers who have acquired land in the study location. A desktop study was initially conducted to collect information from published documents, books, articles, journals, conference papers, reports on the subject matter, and web searches. Thereafter, the researchers discussed key points from several schools of thought and identified best practices. The entire process supports the study in analysing the existing situation, discussing findings and drawing a conclusion.

The second stage involved visitation to the site by the authors and two research assistants to identify the developers through their mounted advertisement signage. Telephone calls were made to introduce the study and book interview dates. One of the interviews was conducted in the developer's office (following all COVID-19 protocols), while others were conducted through WhatsApp calls and Zoom meetings in the third quarter of year 2021. The interviews held in developer's office complied with COVID 19 distancing guidelines. We were also permitted to attend some of the land dispute settlement and renegotiation for compensation proceedings involving land developers, community members and their solicitors. The interview process and tracking of respondents lasted for four months. Out of the ten (10) developers identified, only seven consented to talk about their experiences, with others declining for privacy reasons.

The recorded interview was transcribed and checked for credibility, authenticity and reliability of the responses through data triangulation, this involves gathering information from interviews, observations and documents to enhance a meaningful conclusion (Moon,2019; Santos et.al, 2020). A qualitative approach was adopted for this study with a view to delivering quality sample cases and narratives to achieve the research objectives (Olapade, Ojikutu & Aluko, 2022).

3.1   Study Location Description

Figure 1: Map of Lagos highlighting the Ibeju-Lekki axis

Source: https://commons.wikimedia.org/w/index.

The research study area is in the Ibeju-Lekki axis of Lagos State. Igando-Oloja is one of the 81 communities under Ibeju-Lekki (Oladokun et al.,2011) and it comprises six indigenous families, namely Agbaraojo, Apena, Akinnigan, Akomolafe, Noibi, Talemu and Ibilola. The progenitors of

the Igando-Oloja community used to settle by the seaside and every family had land apportioned to them. As time went by, the families began to further inland to the present location (Igando-Oloja), as their farms were situated there. Their movement became necessary because it became too stressful for people to journey from their place of abode (seaside) to the farm (present Igando-Oloja). Gradually, several other people outside the families began to migrate to Igando-Oloja.

Empirical Findings and Discussions

4.0   Developers' Practical Experiences and Reflections at Igando-Oloja Community

As the developers did not grant consent for publishing their names, we categorized the seven developers into three according to the similarity of their experience using letters of the alphabet (A, B, C). Their experiences illustrate developers' resilience in the course of land acquisition.

4.1   Developer A

Conversations regarding interest in the purchase of some portions of Igando-Oloja land by Developer **A** commenced in 1997. The community informed the developers about the government's intention to compulsorily acquire portions of vacant land in the community but assured them that the portion of land sold to them was about to be excised, as evidenced by letters sent by the land agency to the community. This further buttressed the fact that the portion of land to be sold to Developer **A** was not classified under "the committed land" of the state. With this assurance (the developers were shown correspondences between government and the community), the developers commenced acquisition conversations pending publication of the excision in the state's official gazette and a widely read newspaper. Series of meetings were held with community members as to parties to be compensated, what amount of compensation would be paid to each family, the mode of payment and the documents to be exchanged. These meetings were held at the Baale's palace with principal members of each family. The 35-hectare excision was eventually published by Lagos State in the year 2004, with the agreed sum running into hundreds of millions of naira being paid to the community representatives.

Development on land cannot commence without a title document known as a Certificate of Occupancy (C of O). Developer **A** had commenced processing of the title in 2005 but the title document was not received until after seven (7) years. According to Thontteh et al (2020), land regularisation is one of the major challenges faced by developers in land acquisition and transaction processes, mostly owing to institutional factors. Meanwhile, as a check against delayed release of the title document, developers often opt to fence off the expanse of land from encroachers and intruders. The next stage was the application for a planning permit. During this process, land ownership conflict ensued.

4.1.1   Issues, Compensation and Conflict Management Process

Developers began facing issues right from when the land was being fenced. They were challenged by several people who claimed to be stakeholders in the land matter. While trying to resolve the matters, the developers discovered that the land in question originally belonged to two families, Apena and Abudo, before it was excised to the Igando-Oloja community. In fact, only the Apena family was from the Igando-Oloja community; it was only over time that the Abudo family became slightly related to the community through children's marriages. It is worth noting that the initial land purchase by Developer **A** was spearheaded by the Baale of the community, who died shortly after the transaction was concluded. Evidently, the newly installed community head knew nothing about the transaction. As expected, the death of the former community head brought about complexities in the already concluded land transactions. This led to disputes premised on multiple sale transactions by omo onile and incomplete representation of those deserving compensation.

The aggrieved parties claimed that they had commissioned a surveyor to obtain excision because of the acquisition of their lands by the Lagos State Government but that the surveyor died suddenly. However, the solicitor who was working with the late surveyor began dealing with a section of the Apena family without the consent of other family members. Meanwhile, the late Baale was from the Apena family. The solicitor and developers had assumed that the excision was to be for the Apena and Abudo families, who rightly owned the land. However, they were informed by the Lagos State Lands Bureau that the excision would be made in the community's name. This was a tough and complex challenge for the developers, who had to resort to litigation.

Expectedly, the litigation process hampered the progress of Developer A's plans, as aggrieved parties filed an application for "interlocutory injunction", which forbade anyone from entering the disputed land or carrying out any development on it until the court gave its verdict. However, to fast-track resolution of some of the legal matters, the developer had to engage parties in an out-of-court settlement and compensate them as agreed. The developers reasoned that resorting to alternate dispute resolution (ADR) would help to save time and money for the good of all the parties. Consequently, parties agreed to enter into negotiation. In some of the court proceedings, adjudicators equally supported the idea of including all qualified families in the land compensation deal in order to avoid possible voiding of disputed land transactions (Interview Excerpts, 2022).

4.1.2 Resilience Strategies for Safeguarding Investments

In trying to avoid risk for his investment, Developer A opted to transact peacefully and amicably with the omo onile. As part of his strategy, he would present gifts to community members during festive seasons and offer employment to unskilled youths in the community.

Thus, for Developer A, resilience in the land transaction was all about responding to changes as they came and continuing with development or adjusting same as issues arose. To safeguard his investment, Developer A paid almost the same amount made to the first party to the new set of aggrieved family members and also excised five hectares of land to the community. This was adopted as the court judgement and the matter was resolved. The entire land dispute lasted for over four years.

4.2 Developer B1

Developers B1 falls under the category of those who were not compensated for the purchase of land from the community after excision. In this case, Developers B1 own a portion of land in a neighbouring community for agricultural purposes in 1972, but the government excised the land in 1990 and demolished all structures on it. The Agric Land Holding Authority re-allocated Five (5) hectares to them inside Igando-oloja community as a means of compensation for the lost land. In 1998, developer B1 requested for additional five (5) hectares and was approved by Agric Land Holding Authority because they were the authority or agency in charge of allocating agricultural land to people at the time. However, after many years, the government also excised portions of land belonging to Igando oloja community. Developers B1 were not aware of these developments until 2006, by which time the Agric Land Holding Authority no longer existed. The community were also not able to help because they were just in the same position as Developers B1. Moreover, the community did not sell the land to Developers B1. Hence, Developers B1 lost the land without any form of compensation.

Those in the Developer B2 category were those who had bought vast expanses of land directly from the government but were unaware that the said land had been acquired from landowning families in the Igando- Oloja Community prior to their purchasing the land. Although they sued the encroachers, the developers lost in court after seven years of litigation. They realised that part of their land was classified as general acquisition and the remainder was classified as committed acquisition.

Since Developer B2 had acquired the land directly from the government, they should have been the first to benefit from compensation by the government since they had crops and structures on the land. For some reason, however, they were denied compensation. Developer B counted their losses and began the process of repurchasing the same land from the new owners, to whom the land had been excised by the current government. However, the new owners declined to re-sell the land to the Category B developers.

4.3   Developer C

Those in the Developer C category were those to whom the omo onile had sold already purchased land. According to them, selected persons in the community who claimed ownership of the land had sold about five acres of land to them in 2017. While processing the title document in 2018, they had discovered that the land had been registered by another party. Consequently, they engaged a lawyer and took the matter to court, where it was found that the land had actually been sold to them by the real owners. The sellers claimed that the previous sale had been done by some dubious members of the family. Two years into the case, the developers opted for an out-of-court settlement that took just one year to conclude. The developers then proceeded to register the land after the encroachers had transferred the necessary title to them.

Those in the Developer C category were fortunate to have had the backing of community members. Although they did not have to re-acquire the land, they paid for every court appearance and contingency expenses incurred by the family members. They were also violent in dealing with the landowning families (omo onile) who sold the land to them. They equally arrested principal members of the family who sold the land to them and took them to the Abuja Police Division for questioning. A series of meetings took place in Abuja before they pleaded that the matter be transferred to Lagos for ease of settlement. Developer C believed that the tactical and drastic approach adopted was what helped to secure their investments from landowning families and their dubiousness.

5.0   Conclusion

This study on the Igando-Oloja community focused on different categories of developers. Some purchased land from landowning families (omo onile) but later realised that the same land had been sold to a third party previously, hence the emergence of land disputes resulting in litigation and pause in development plans due to interlocutory injunctions. Other developers had purchased excised land from landowning families under circumstances where not all parties were represented in the payment/compensation process, leading to cases of fresh negotiations on land purchase. Yet others had purchased land in the community before the government declared such land as being under acquisition, thereby halting all developmental plans and leading to revenue loss. One important thing for most of the developers was actualising their developmental plans, hence their resort to strategic means of resolving the issues, especially through litigation and alternative dispute resolution mechanisms. Thus, this study has assessed developers' dispute resolution approaches that allowed them to access disputed land while staying in business amidst land acquisition and registration challenges.

Land acquisition should be accompanied by immediate development. Most times, however, avoidable delay in the processing of certified titles frequently hinders immediate development, forcing developers to resort to fencing off their land (Thontteh, Omirin & Nubi, 2020). Although section 28 of the Land Use Act gives the State Governor the right to revoke any land with or without a title document for overriding public interest, research has shown that government sometimes acquires land as a way of generating revenue rather than in overriding public interest (Lawanson & Agunbiade, 2017). This usually poses serious concern for landowning communities and results in conflict. The study also identified the two types of land ownership: the statutory and customary land tenure systems. The need to strengthen the customary land

institutional system is expedient to remove the bitter controversies and conflicts that often emanate from land transactions. Most often, these conflicts are between the customary landowning families and individuals, developers or the government. As observed in the case of the Igando-Oloja community, the government, after acquiring land without due compensation, often leaves developers with two hard choices: restarting the whole acquisition process afresh with the landowning families or completely backing out and losing their investments.

Based on these observations, the following recommendations are made:

The study brings forward the necessity to amend the law so that it can account for land already purchased by developers. Moreover, the question of justification needs to be addressed, that is, whether it is right for the government to acquire land belonging to one party and excise to another is a question that should be investigated by legal experts and others. It is true that Section 47 of the Land Use Act states that no court or judicial authority has the right to question the governor of a state as to how to compulsorily acquire land, excise same and compensate parties. However, Udoekanem et al. (2014) fault this law as oppressive while calling for its amendment in the interest of peace and justice.

Developers should be encouraged to secure their investment through intergenerational compensation (Olapade, Ojikutu, & Aluko, 2022). This can be done through annual remittances to landowning families, presentation of gifts to the community, provision of employment to the unemployed in the community, and supporting small-scale infrastructure projects (e.g., provision of borehole water) as well as undertaking of corporate social responsibility (CSR) projects.

It is also recommended that community land titles be revoked once the government receives reports of multiple sale of the same land by landowning families (omo onile). This will help to safeguard developers' investment in land and curb the rate of omo onile's dubiousness in land transactions. Impliedly, family members would be more sincere with investors/developers over land transactions. Moreover, the rate at which some family members are neglected during compensation would be minimised, since those engaged in illegal land sale would not want to forfeit their share from land transactions.

Conclusively, this will therefore increase the disposition and resilience of developers towards real estate developments, and the benefits of this include safe and dependable investments, improves productivity, building mutual trust between developers and communities while ensuring good return on investment.

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Methods of Building Resilience Valuation: A Literature Review

Christian Osita Ifediora[1] and Abel Olaleye[2, 3]

[1] Department of Estate Management, Delta State University of Science and Technology, Ozoro, Delta State Nigeria
[2] Department of Estate Management, Obafemi Awolowo University, Ile-Ife
[3] Department of Finance and Investment Management, University of Johannesburg, South Africa

Abstract

Resilience valuation appears to be gaining ground in the real estate and built environment profession globally, although its level of acceptance may not yet have been ascertained in Nigeria and other emerging economies. More than at any other time it has become imperative to examine investors' commitment to making buildings resilient in valuation practice. Today many countries are battling with the effects of extreme weather conditions, even as they confront the aftermath of the COVID-19 pandemic. Against this backdrop, this article reviews the literature on the valuation of building resilience with a view to deepening the understanding and knowledge of valuers and other stakeholders. In achieving this aim, we undertake a review of different perspectives on resilience valuation methodologies and initiatives as well as their applications and the challenges faced in the valuation process. We found varying approaches to valuing resilience that cut across disciplines. Moreover, issues of green buildings and sustainability were also found to be prominent in the literature. While some approaches e.g., RDVM model, etc. are seen to be at infancy, others have been applied to specific situations. We therefore suggest a multidisciplinary approach to valuation of resilience in buildings.

Keywords: Energy saving; Green building; Resilience; Resilience valuation and sustainability

1.0   Introduction

Over the years building valuation has focused on mainly the physical characteristics of buildings as a measure of their marketability, with the abstract attributes of buildings being largely neglected. More recently, however, the valuation industry has been paying more attention to other value-adding aspects of buildings, e.g., their 'green' properties (i.e., overall sustainability and resilience). Jacques, Norman and Page (2015) report that the building industry frequently needs data on the financial and sustainability value of various sustainability measures for the developer, builder or homeowner. Bosher et al. (2007) examined a range of human-induced emergencies in the built environment and suggested ways to mitigate them. For their part,

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✉ ifedioraco@dsust.edu.ng

Adomatis (2013) reported growth in the market for high-performance homes, hence the need for appraisers to update themselves on the latest green concepts and home features as well as the organisations supplying them.

The Resilience Valuation Initiative (RVI) makes an important contribution to the issue of systemic disaster risk and the need to mitigate future risks in investment decisions (Martin, 2021). In the past two decades there has been significant growth in green, sustainable valuation. As Jacques et al (2015) observed, the year 1996 was epochal in introducing the theoretical basis for integrating sustainability considerations into the property valuation process. Isaksson (2018) suggested that valuation of greenery in urban areas should include recognition of uncertainty while safeguarding ecosystems. According to Stukel and Scheu (2014), many regions and communities have adopted residential energy efficiency goals as part of their sustainability plans, leading consumers to demand high-performing homes that significantly cut energy costs.

Similarly, it has become imperative to capture the impact of disasters and shocks vis-a-vis the ability of buildings and other assets to withstand such shocks (e.g., the COVID-19 pandemic). Current valuation discourse pays attention to the costs and benefits of making housing more resilient against events such as flooding and impact damage, as well as on building with more durable materials that cost less to maintain. Jacques et al (2015) noted that there is a gap in understanding what value going "beyond code" could be delivering. According to the authors, the concept of energy efficiency has been appraised by professionals in the utility, real estate and financial industries, as well as by policy and regulatory agencies. In other words, there is growing appreciation of resilience valuation, which seeks to understand the value of resilience in building assets, networks and activities.

Resilience valuation concerns the processes involved in the valuation of buildings designed to withstand disasters and occurrences. It involves describing, measuring and analysing costs, risks, benefits and the impact of resilient assets and activities and how they perform (Genevieve, n.d.). Resilience valuation is especially important in the light of natural disasters, extreme weather conditions and climate change, hence the need to consider the vulnerability of buildings vis-à-vis approaches to building construction. Some builders are already incorporating sustainability and resilience as standard features in their specifications (Jacques et al, 2015).

Since disasters and shocks are global occurrences, initiatives about building resilience and its consequent valuation have become increasingly relevant in developing countries. However, it has not been ascertained those valuers and other stakeholders in Nigeria and other emerging countries have adequate knowledge of the approaches and steps to follow in resilience valuation. Nevertheless, according to Courtland (2013), studies done in an American context suggest that sustainable buildings, technology and labelling are important considerations for stakeholders in the market. Against this backdrop, the chapter offers an overview of approaches to resilience building valuation that should necessarily capture 'green' properties such as energy savings and sustainability.

2.0   Understanding Resilience: A Multidisciplinary Perspective

Resilience is a common concept in many domains (Rahi, 2019), covering communities, organisations, projects and systems, amongst others (Bhamra, Dani & Urnard, 2011). Among the fields where resilience features are ecology (Holling, 1973), climate change (Hallegatte & Engle, 2018), critical infrastructure (Hémond, 2013; Therrien, 2010), organisational science (Sapeciay, Wilkinson & Costello, 2017; Somers, 2007) and psychology (Coutu, 2002). The American Psychological Association (APA, 2022) defines resilience as the process and outcome of successfully adapting to challenging life experiences, through mental, emotional, and behavioural flexibility and adjustment to external and internal demands. It is the process of effectively negotiating, adapting to, or managing significant sources of stress or trauma (Windle,

2010). While both definitions may be similar in terms of word choice, the former focuses on the idea of adapting well, while the latter highlights 'negotiating'.

In the view of Masten (2007), resilience involves the following:

(i)   developing well in the context of high cumulative risk for developmental problems (beating the odds, better than predicted development);
(ii) functioning well under currently adverse conditions (stress-resistance/coping) and
(iii) recovery to normal functioning after catastrophic adversity or severe deprivation (bouncing back, normalisation).

According to Bonanno and Diminich (2013), it is better to conceive resilience in terms of moving forward, not returning. Resilience is the process of harnessing resources to sustain well-being (Panter-Brick, 2014); it is the capacity of a dynamic system to adapt successfully (Masten, 2014). These three perspectives are anchored on the concepts of adaptation, moving forward and well-being, hence their emphasis on survival.

Resilience may also be viewed as the ability to restore capacity and continuously adapt to changes (Geambasu, 2011). For Schroeder and Hatton (2012), it is the capacity to evolve in response to risks emerging after the project planning stage. Resilience could mean the capacity to maintain purpose and integrity under external or internal shocks (Hillson, 2014). For Turner and Kutsch (2015), resilience is the art of noticing, interpreting, containing, preparing for and recovering from disruptions; it can also be described as the capacity to overcome unexpected events (Giezen et al., 2015). For Zhu (2016), it is the ability to cope with uncertainty. Bay (2017) views it as the capability to respond to, prepare for and reduce the impact of disruptions caused by changes in the project environment.

According to Pietrzak and Southwick (2011), resilience more likely exists on a continuum across multiple domains of life. For Irish Aid (2013), resilience is the ability of people, communities and countries to withstand problems such as extreme weather events, violence or an unexpected dip in income. It is the ability of individuals, communities, states and their institutions to absorb and recover from shocks, while positively adapting and transforming their structures and means for living in the face of long-term changes and uncertainty. The Organisation for Economic Cooperation and Development (OECD, 2011) defines disaster resilience as the ability of countries, communities and households to manage change by maintaining or transforming living standards in the face of shocks or stresses, e.g., earthquakes, drought or violent conflict, without compromising their long-term prospects. For USAID (2012), resilience is the ability of people, households, communities, countries and systems to mitigate, adapt to and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth.

Resilience is the ability of individuals, households, governments, regions and systems to mitigate, resist, absorb and recover from the effects of shocks and disasters in a timely, sustainable and efficient manner (Canada Department of Foreign Affairs, Trade and Development, 2014). It is the ability of individuals, households, communities, countries or regions to withstand, adapt to or quickly recover from stresses and shocks (European Commission, 2012). It is the ability of countries, communities and households to manage change by maintaining or transforming living standards in the face of shocks or stresses without compromising their long-term prospects (DFID, 2011). According to DFID (2011), resilience is multi-sectoral. It is an agenda shared by actors concerned with threats to development in all ramifications. The inadequacy of humanitarian responses to human suffering has been a strong driver in the recent conceptualisations of resilience globally.

According to the Resilient Design Institute, resilient design involves the intentional design of

buildings, landscapes, communities and regions in response to vulnerabilities to disaster and disruption of normal life. It incorporates elements of maintenance and restoration for buildings and general infrastructure (Albuquerque, 2013; Jennings, Vugrin & Belasich, (2013); Herrera, Abraham & Stoianov, 2016). Resilience has also been discussed in relation to urban land. According to the Urban Land Institute, resilience is the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.

3.0   Perspectives on the concept of resilience valuation and methods of valuation

Resilience valuation in relation to buildings involves issues such as energy and water sources, disaster fortitude design, passive systems, reduced environmental effects and floodplain evaluation of building location. On its part, sustainability highlights issues of energy reduction, renewable energy production, recycled/reclaimed water, local sourcing of materials, community responsibility, access to transportation, indoor environmental quality and brownfield restoration. Their linkage relates to energy and water independence, renewable resources, resource storage, environmental effects, and community support. Resilience valuation efforts cut across matters of energy, stock, building, business, finance, asset and other aspects of projects that may be affected by shock or stress. Within economic systems, resilience is linked to the concept of option value (Whitten et al., 2012; Norton, 1995). Baumgartner and Strunz (2014) observed that the value of resilience derives from the insurance properties of the system, which increase with the degree of resilience.

3.1   Engineering and Energy

Writing from the perspective of energy efficiency, maximisation and sustainability, Weimar et al. (2018) noted that valuation methodology consists broadly of a five-step approach for estimating the costs and benefits of discrete, additive resilience measures. The five steps are as follows: establishing a baseline condition of the site's infrastructure and assets; assessing vulnerability and risk to those assets; developing a resilience plan involving alternative measures that mitigate the harm; undertaking cost-benefit analyses and developing a decision portfolio for investment in alternatives. Despite its apparent focus on engineering and energy in valuation, the study is equally useful for estate surveyors and valuers as well as other financial experts. Weimar et al. (2018) is particularly important because of its multidisciplinary approach. The authors suggested that specialists engaged in site resilience valuation must begin by determining the probability of a hazard's occurrence, the impact associated with the hazard for the baseline and alternatives, and the monetary value of impacts to the infrastructure from the hazard.

Banfi, Farsi, Filippini and Jakob (2008) investigated willingness to pay for energy-saving measures in Switzerland's residential buildings. Their study provided useful benchmarks for possible capitalisation of the value of sustainability features. Dastrup et al. (2012) noted that, although the residential solar home market continues to grow, there is little direct evidence on the market capitalisation effect. Using hedonic pricing and a repeat sales index approach, the study found out that solar panels are capitalised at roughly a 3.5% premium. This study provided quantitative values based on economic analysis.

CNT Energy and the National Home Performance Council (2013) found a disconnect among energy efficiency programme implementers, real estate agents (REA) and homebuyers as well as sellers. They further stated that making information about energy efficiency improvements visible to homebuyers and others involved in a home sale transaction will play a crucial role in ensuring that improvements are fairly valued at sale.

3.2   Infrastructure, assets, buildings, sustainability and energy

The valuation of resilience in buildings concerns energy efficiency and matters of green

construction. In their bid to provide valuation procedures, proponents of Resilience Valuation Initiative (RVI) stated thus: "While currently there is no agreement within sectors nor within applications on standard ways to measure resilience benefits and then assign values to them, growing agreement and alignment seems likely to emerge first around avoided loss and damage to assets." As noted earlier, Weimar et al. (2018) suggested that specialists valuing resilience must begin by determining the monetary value of impact to the infrastructure from the hazard. For building projects, Bond et al. (2017) noted that RDVM allows for estimating the value of the components of a project. The study also observed that when projects have multiple mechanisms that affect the system, the value of each part may be important in and of itself regardless of the value of the larger project (or portfolio of projects). They further stressed that the general principle is as with all project evaluations, since estimating the resilience dividend for a project will be most successful when done as part of the project planning process. However, it is not clear whether these are building projects.

For intangible benefits, Marftin (2021) stated that the RVI uses a systems approach and seeks to value intangible benefits and novel value flows. Proponents of RVI sought for an approach that will produce outputs reflecting both tangible and intangible risks as well as costs and benefits, which can be quantified and monetised where possible. Proponents also seek information quadruple bottom line measures covering environmental, social, economic and governance factors, as well as costs and benefits from resilience building assets that would be important to the initiative.

For their parts, Griffin and Kaufman (2009) and Page (2009) focus on energy. Page (2009) considered the cost benefits of a variety of sustainable retrofits for the existing housing stock in New Zealand, focusing mainly on energy and water issues. The study investigated the economic value to the owner. The economic value to the owner is more of theoretical matter, since it is more about the gain that the next homeowner would realise on the same house. The study by Griffin and Kaufman (2009) analysed the market performance of third-party certified sustainable residential properties in the Portland and Seattle metropolitan areas of... A sample of third-party certified homes was selected and comparable homes were found. This study was particularly useful for addressing a wider range of sustainability issues.

On residential properties and sustainability and energy concerns, Stukel and Scheu (2014) noted, among other things, that many regions and communities have adopted residential energy efficiency goals as part of their sustainability plans, that consumer demand for high-performing homes has increased in recent years and that successful energy efficiency programmes have contributed to the growing inventory of efficient homes. However, the study also reported that energy efficiency is still largely invisible in residential real-estate markets owing to the disconnect among programme implementers, the real-estate community, appraisers and homebuyers as well as sellers. The study noted that these gaps prevent high-performing homes from being fairly valued at the time of sale and ultimately limit the investment potential for residential energy efficiency.

Austin (2012) argued that the valuation of properties with "sustainability" aspects does not imply new property types or require a deviation from traditional valuation methods for the appraisal of income-producing properties. The work provided a systematic procedure for evaluating sustainable properties with practical guidance for the integration of this procedure into the valuation process for all consumers of appraisal services. The proposed procedure is consistent with the "valuation process" provided by the Appraisal Institute and in the methodological and conceptual valuation literature. The work notably recommended that appraisers should expand the scope of their work to fully integrate sustainability aspects into the valuation process, consulting sustainability experts as required, providing the client with a cause-and-effect relationship between sustainability features and the valuation adjustment factor, and avoiding general statements and assertions that certified buildings always command a value premium

across all property types, areas and market conditions. Kok and Kahn (2012) found a widespread adoption of green labelling in housing as enabling the price premium to be quantified**.**

Studies such as Adomatis (2013), Appraisal Institute (2013) and Courtland (2013) have also examined residential buildings and green valuations. Adomatis (2013) noted that the market for high-performance homes is growing, meaning that competent appraisers will need to be familiar with the latest green terms, home features, and organisations. The study added to the existing addendum form for appraisal reports on residential green and efficient buildings as developed by the Appraisal Institute. The residential green and energy efficiency addendum of the Appraisal Institute (2013) is a formalised appraisal proforma addendum for real-estate appraisers that was created to provide a central place in a report for green and energy efficiency features, thus helping to standardise the reporting process, organise and expand the description sections of the residential form, provide a basis for comparable sale selections, proactively prepare appraisers for the proposed legislation known as the Sensible Accounting to Value Energy (SAVE) bill, and contribute to a proactive movement to prepare for the SAVE bill, which may become law in the near future. Courtland (2013) noted that green housing is a solid investment, with the report focusing more on the value of sustainable buildings.

3.3 Resilience efforts in Nigeria

In Nigeria, valuation of resilience appears to cuts across only a few areas, especially the agricultural sector where land contamination is a major issue, as can be seen in Adegoke, Ibe and Araba (2014). Evidence suggests that Lagos has been making efforts to address resilience. Adegoke, Ibe and Araba (2014) suggested the need for multidisciplinary efforts aimed at designing an agricultural resilience national programme in the country. Part of the effort is centred on evaluation and introduction of risk transfer and risk management options into the agricultural sector and rapid/widespread deployment of same through communication technologies. However, little attention has been paid to valuing for resilience or how to measure risk.

Among the extant literature on resilience is Akujuru and Ruddock (2016), which reported that professional valuers and property owners are dissatisfied about the absence of a standard framework in the field. The authors therefore suggested a novel approach to disaster resilience that utilises a multidisciplinary problem-solving approach to determine the value of damaged property. Accordingly, they developed a framework for determining the economic value of damage to property due to contamination, especially human-caused oil spill disasters in the Niger Delta. The study used a mixed-method involving questionnaires and expert interviews to ascertain the valuation of contaminated wetland property and identify the professionals involved and their respective roles. According to Akujuru and Ruddock (2016), the applicable valuation methods are the Comparable Sale Method, Depreciated Replacement Cost Method, Use of Pre-determined Compensation Rates, Income Capitalisation Method, Subdivision Development Valuation Method, Land Value Extraction Method, Discounted Cash Flow Technique, Contingent Valuation Method and the Hedonic Pricing Model. Although the study focused on contamination and oil spillage, it makes significant contributions to the valuation practice.

According to Lagos Resilient Office (2020), the Lagos Resilience Strategy is an integrated approach for addressing the shocks and stresses that the city experiences or might experience. Among such shocks and stresses, from a valuation perspective, are forced evictions, building collapse, riots and unrest, storm surges, flooding and severe storms, inadequate physical and social infrastructure, etc. However, the document does not quite specify how to value these identified aspects but it suggests how to avoid or mitigate them. With respect to housing, the suggestion is made for the standardisation of land valuation. Indeed, it is a welcome development that efforts are being made in the country to promote the discourse of resilience and valuation. It is important to connect professionals such as real estate valuers to the Lagos State Government's efforts in the area of resilience.

4.0   Summary of Key Points in the Resilience Valuation Literature

Below are highlights from the extant literature on valuation:

	Concern for cost-benefit analysis	Project evaluation and economic valuation	Identification of system approach	Useful methodology
RDVM	✓	✓		✓
Weimar et al. (2018)	✓			
Resilience Valuation Initiative (RVI)			✓	

In developing Residual Dividend Valuation Model (RDVM), Bond et al. (2017) shared similar though with Weimar et al. (2018) on concern for cost-benefit analysis – an area with which valuers and economists are more familiar, RDVM combines elements of project evaluation and economic valuation; it also lays the foundation for valuing resilience dividends in a manner similar to traditional cost-benefit analysis whereas the RVDM model offers a useful methodology.

Weimar et al. (2018) captures cost-benefit analysis as essential and identified decision portfolios for investment alternatives. It addresses issues of structural survey, schedule of dilapidation and condition, as well as the monetary value of infrastructure. In terms of energy and related issues, Weimar et al. (2018) argues for a methodology that can be applied in resilience valuation.

Other efforts or valuation methodologies, e.g., contingent valuation, have been applied and proved effected. Resilience Valuation Initiative (RVI) identifies a systems approach and seeks to value intangible benefits and novel value flows, but this is still at a formative stage. RVI also considers costs and benefit that users may seek to measure.

The literature also considers energy concerns, especially in relation to development of decision portfolios for investment alternatives. Identified also is sustainability concerns and going green, green housing being the major focus of some studies. Most of the studies use a multidisciplinary approach in determining value.

5.0   Conclusion

The discussions on resilience valuation appears to have become subject of discourse worldwide and even Valuers inclusive, with this paper focusing on efforts in this regard by researchers, corporate organisations and government, especially in line with sustainability principles and green concepts. Through the increasing efforts of researchers, corporate organizations, and governments, there appears to be a growing emphasis on incorporating resilience into decision-making processes, promoting sustainable and green practices with a view to ensuring the long-term well-being of societies and the planet.

Also, there appears to be consensus on adopting a multidisciplinary approach to measuring or valuing resilience (Adegoke, Ibe & Araba, 2014; Akujuru & Ruddock, 2016; Wiemer et al. 2018). Indeed, Nigerian Valuers must join the global community in devising a universal solution to the valuation problem. By adopting a multidisciplinary approach, stakeholders can gain a deeper understanding of resilience. This approach is believed to enhance the accuracy and reliability of resilience measurements and valuations, enabling better decision-making in policy formulation, resource allocation, and risk management. Besides, it is expected to help in developing strategies as well as interventions that can enhance the resilience of systems and promote sustainable development.

While this study has created the necessary foundation for the understanding of resilience valuation in buildings, this exploration could involve investigating their knowledge of resilience concepts,

methodologies, and available tools for valuation. Additionally, a study of the current practices of Valuers can help in ascertaining whether and how resilience is currently incorporated into building valuation. Further study will be needed to examine the perception of Valuers and their practice with regards to valuation of resilience in buildings; including the challenges that such practice may involve. Identifying and understanding the challenges faced by Valuers in the valuation of resilience in buildings is imperative in addressing any perceived barriers or existing limitations.

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Flood-Risk Insurance in Flood-Prone Areas of Nigerian Cities: A Case Study of Agiliti, Ketu, Lagos

I. O. Ogbonna and Obinna Umeh

Department of Estate Management, University of Lagos

Abstract

Flooding, one of the effects of climate change, has become recurrent in Nigerian cities that are situated on floodplains. To recover from economic and financial losses after the flooding incidents, affected residents of such areas have been relying heavily on government relief efforts as well as assistance from family, friends and philanthropists. However, these sources have not always been reliable in terms of being available, coming in the right amounts as well as being timeous. There is therefore the need for more reliable and sustainable strategies for helping flood victims of Nigerian cities to recover economically and financially from flood incidents. Flood risk insurance is one of such more reliable and sustainable strategies. Unfortunately, empirical evidence points to a low level flood risk insurance by insurance companies, culture in parts of Nigerian cities that are prone to flooding. Agiliti, Ketu, a part of Lagos State that lies in close proximity to Ogun River, is known to have been affected by annual flooding in recent times. This paper has used this community as a case study to consider the level of flood-risk insurance culture among residents of flood-prone parts of Nigerian cities. The survey research method was adopted, with a structured questionnaire administered on 398 households. Based on descriptive statistics involving simple percentages, the researchers found a low level of life and property insurance in the study area. Accordingly, the study recommends education of residents on the key role of insurance in city resilience alongside increased marketing of flood-risk insurance by insurance companies, reduction of public mistrust of insurance companies and reduction of the burden of payment of premium by government and charitable organisations.

Keywords: Agiliti; Flood-prone areas; Flood-risk insurance; Ketu; Nigerian cities

1.0　　Introduction

In recent times, cities have been facing rising threats from natural disasters especially in the light of climate change (Schanz, 2021). In Nigerian cities, flooding has become recurrent (Nkwunonwo, Malcolm & Brian, 2015; Adelekan, 2016; Adelekan & Asiyanbi, 2016), with the attendant loss of lives and property. According to the Federal Government of Nigeria, flooding loss across the nation amounted to $9.12 billion in 2022. Thus, cities with flood-prone areas need to be resilient in all ramifications (Bueno, Bañuls & Gallego, 2021). In Nigeria, government has

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✉ ogbonnaubaha@gmail.com

been assisting in this regard through the Ecological Fund and the National Emergency Management Authority. However, empirical evidence shows that most of the interventions have failed to reach victims at adequate amounts and on time. Consequently, most flood victims have had very little resilience and have been unable to bounce back financially.

Insurance has been identified as a dignified, timely, adequate and sustainable way of managing flood risk (UN Office for Disaster Risk Reduction [UNDRR], 2021; Orimisan, 2020), since insurance aims to restore every insured to the same level they were before the loss. The pertinent question around resilience building in flood-prone parts of Nigerian cities should be: How many property owners in the areas have insured their properties against flooding risk? Put in another way: How engrained is the insurance culture among property owners in flood-prone areas of Nigerian cities? The chapter attempts to answer these questions for Agiliti-Ketu, Lagos, identifying the reasons for the low flood-risk insurance culture in the area and proffering solutions.

2.0   Review of Literature

Globally, cities have been facing exposure to recurrent flooding disaster, hence their need for building resilience (Centre for Climate and Energy Solutions, no date; Duy, 2018), the most affected being coastal cities and those situated on floodplains. The Lagos Bureau of Statistics (2016), in a study on flooding in Lagos, found that 19% of residents had experienced flooding within the previous year. Similarly, Adelekan and Asiyanbi (2016) found that residents perceived flooding as the second most important hazard in the city, after crime. Much of the flooding results from rainfall and storm surges, largely during the rainy season (Adelekan, 2016; Adelekan & Asiyanbi, 2016). With climate change, fluvial flooding (flooding which occurs when rivers and streams break their banks and water flows out onto the adjacent low-lying areas), is expected to worsen in Lagos in the years to come – an expectation that also holds true for coastal flooding resulting from climate change-induced sea level rise (Moghalu, 2018).

Cities with high flood risk should develop sustainable strategies for, not only mitigating flooding but also for adapting to it; indeed, they should plan for bouncing back (Bueno, Bañuls & Gallego, 2021). In this connection, insurance has been identified as a dignified, timely, adequate and sustainable way of managing flood risk (United Nations Office for Disaster Reduction [UNDRR] (2021); Orimisan, 2020). Insurance aims to restore the insured to the same level he/she was before suffering the loss in question. Dror and Piesse (2014) observed that insurance involves a contract under which an insurer undertakes to pay an insured person a predetermined amount when they sustain financial loss caused by a predefined event, on the arrangement that the insured person makes an upfront payment of premium.

How many property owners in cities have insurance policies against flooding risk on their properties? Put in another way, how engrained is insurance culture among property owners in the flood-prone areas of cities? Such questions have been raised for Italy, with researchers querying the rate of natural hazards insurance penetration in the country (Gizzi, Potenza & Zotta, 2016). Wang, Liao, Yang, Zhao, Liu and Shi (2012) is also a study on the willingness of Chinese city residents to buy natural disaster insurance.

In Africa, city flood disaster management efforts have largely neglected insurance in their post-disaster recovery path (Onuoha, 2012; Adelekan, 2015). For economic recovery, city flood victims at regional and country levels tend to rely on personal resources, family, friends and community members, as well as on aid from government and donor agencies. However, such assistance is mostly inadequate, unsustainable and hardly gets to victims at the appropriate time (Adelekan, 2016; Ogunwusi et al., 2017; Moghalu, 2018; Idoko et al., 2020). According to Adelekan (2016) the Nigerian insurance industry is not playing an effective role in flood risk management; in fact, the study identified only 0.8% of insurance cover for properties facing flood risk in Lagos State.

If the target of creating "a world in which it is unacceptable not to have planned in advance" (University of Cambridge Institute for Sustainability Leadership, 2017) is to be achieved, then the present level of insurance culture must be raised. Accordingly, there have been renewed calls for the insurance industry to wake up to its responsibility as society's traditional risk manager (SwissRe, no date; European Insurance and Occupational Pensions Authority, 2021). In this regard, the International Council for Local Environmental Initiatives [ICLEI] (2020) and Sasson et al. (2021) suggest constructive partnerships between cities and insurance companies. The insurance industry should also seize the new opportunities presented by flood-risk insurance (Bueno et al., 2021; ThisDay, 2021). For Kaushalyaa et al. (2014), other suggested measures include sensitisation exercises for property owners and making flood insurance policies compulsory (Adelekan, 2015). While many people mistrust insurance companies on claims payment, Ogunwusi et al. (2017) identifies recent positive efforts at claims settlement, e.g., the 2017 claims settlement of holders of flooding risk insurance policies in Lekki, Lagos.

It has been shown that to achieve sustainable flood insurance coverage the limitations of the private insurance market for some very high-risk exposures require governmental collaboration with the private sector for insurance risk-sharing (Kleffner, 2022; Schanz, 2021). Microinsurance programmes such as Afat Vimo in India and Proshika in Bangladesh are being implemented in cities with large numbers of low-income earners (Mechler et al., 2006; Bhatt & Pathak, 2014; Islam, 2015). This initiative appears to be worth exploring for parts of Nigerian cities with low-income residents.

Moreover, certain international lines of assistance are available to Nigerian governments for scaling up flood-risk insurance across the country. A case in point is the yet-to-be-utilised African Development Bank's Africa Disaster Risk Financing Programme, run in collaboration with African Risk Capacity Group. The initiative promotes disaster response mechanisms and support for ADB-member countries for coverage of their insurance premiums (African Development Bank [ADB], 2021; Moghalu, 2018).

3.0   Research Method

3.1   The Study Area

The study area is Agiliti which is located in the Kosofe Local Government Area of Lagos State. It is a community situated behind Mile 12 International Food Market, Ikorodu Road, Ketu/Mile 12. Founded by the Ijebus, it is bounded to the North by Magodo, Mile 12 to the South, Maidan River and Maidan Community to the East and Agboyi-Ketu to the West (Aluko & Fadamiro, 2015). The Lagos State Government has identified it as one of the specific areas of the Lagos megacity that are particularly vulnerable to fluvial flood (Olisah, 2020).

3.2   Research Design

The study is cross-sectional, as it is "designed to look at how things are without any sense of whether there are trends and patterns of trends, with many cross-sectional studies being "exploratory or descriptive in purpose" (Umeh, 2008). Babbie (2013) notes that such fact-finding work investigates phenomena, situations, problems, attitudes or issues by focusing on a cross section of them at any one time.

Questionnaires were administered to heads of households in the area, and they answered questions regarding knowledge that Agiliti is flood-prone as well as life and property insurance coverage. To determine the solutions to the problem of envisaged low insurance culture/penetration in that flood-prone area, another research question posed was on awareness of factors that should motivate them and other Agiliti residents to take up flood-risk insurance policies. The data obtained were analysed using simple percentages.

3.3   Research Population, Sampling Design and Technique of Data Analysis

There is no current official population figure for Agiliti. However, according to Aluko and Fadamiro (2015), the area's population for the 1991 census was 8,297 – at a growth rate of 6.5%. The formular, $P(1 + i)^n$ (where P is the principal amount, i is the rate of increase and n is the number of years) has been adopted in compounding it to 2022 (31 years later). This translating to $8,297(1.065^{31})$, we have adopted 58,447 as the estimated population of Agiliti as at the time of writing (2022). We also wanted to determine the number of households/household heads. From Aluko and Fadamiro (2015) we obtained data (Table 1) from which we made extrapolations (Table 2) to arrive at our adopted number of households and their heads.

Table 1: Occupancy ratio (%) of dwellings

No. of persons per room	Agiliti (%)	Average (%)
1-2	10.47	15.13
3-5	55.43	51.45
5 and above	34.10	33.41
Total	**100**	**100**

Source: Aluko & Fadamiro (2015)

Table 2: Accommodation Type/No. of Households in Agiliti

Accommodation Type based on No. of persons per room (A)	Percentage of total Agiliti population (B)	Population of Accommodation Type (Total Agiliti Population 58,297 x B) (C)	Adopted Average No. of People within the Accommodation Type (D)	No. of Households (C/D) (E)
1-2	10.47%	6,119	2	3,060
3-5	55.43%	32,397	4	8,099
5 and above	34.10%	19,931	6	3,322
Total	**100%**	**58,8,297**	**N/A**	**14,481**

Source: Authors' extrapolation of data from Aluko & Fadamiro (2015)

From Table 2, the number of households in Agiliti is 14,481; therefore, 14,481 is the estimated number of heads of households in Agiliti. Consequently, the researchers have taken the study population to be 14,481 heads of households. The sample for the research was calculated using the Taro Yamane formula (Yamane, 1967):

$$\frac{N}{1 + N(e)^2}$$

where n= sample size required; N = number of people in the population and e = allowable error (%). With a 95% confidence level adopted, the research arrived at a sample size of 398 household heads in Agiliti for the study. This compares well with the sample size of 300 household heads in Agiliti, used in Aluko and Fadamiro (2015).

3.4   Technique of Data Analysis

The data analysis technique adopted is descriptive statistics, using simple percentages.

3.5   Data Presentation, Analysis and Discussion of Results

3.5.1   Data Presentation and Analysis

To determine how well the household heads know that Agiliti is vulnerable to annual flooding, the relevant question was posed to them. Table 3 shows the result.

Table 3: How well household heads know that Agiliti is liable to annual flooding

How well household heads know that Agiliti is vulnerable to annual flooding	No. of Household Heads
Very Well	319 (80.15%)
Well	70 (17.59%)
Somehow	4 (1.00%)
Not Quite	5 (1.26%)
Not, at all	0 (0%)
Total	**398 (100%)**

Source: Field Survey, 2022

Table 3 shows that almost all the household heads (over 97%) know that Agiliti is vulnerable to annual flooding.

To investigate the level of flood-risk insurance culture/penetration in Agiliti, the question was posed to the household heads as to which of the various flood risk-related insurance covers they have.

Table 4: Flood risk-related insurance covers held by households in Agiliti

Type of insurance policy	No. of households that have it	No. of households that do not have it	Total
Life Policy	40 (10.00%)	358 (90.00%)	398 (100.00%)
General household Property Insurance	0 (0.00%)	398 (100.00%)	398 (100.00%)
Policy against loss of/damage to building due to flood	0 (0.00%)	398 (100.00%)	398 (100.00%)
Policy against loss of household properties due to flood	0 (0.00%)	398 (100.00%)	398 (100.00%)
Policy against loss of income in time of flood	0 (0.00%)	398 (100.00%)	398 (100.00%)
General flood risk policy	0 (0.00%)	398 (100.00%)	398 (100.00%)

Table 4 shows that, except for life insurance cover which is held by only a negligible proportion of households (10.00%), none of the household heads (0%) had any insurance cover relating to flood risk.

Regarding the solution to the low level of flood-risk insurance culture/penetration, another question was posed to respondents on their perception of certain suggested solutions. The result is presented in Table 5.

Table 5: Factors that can make households and other Agiliti residents to take insurance policies

Factors that can make Households and other Agiliti residents to take insurance policies	No. of Household Heads that saw it as Very High	No. of Household Heads that saw it as High	No. of Household Heads that saw it as Average	No. of Household Heads that saw it as Low	No. of Household Heads that saw it as Very Low	Total
Awareness campaign on the importance of insurance to residents of flood -prone areas.	160 (40.20%)	81 (20.35%)	39 (9.80%)	37 (9.30%)	81 (20.35%)	398 (100.00%)
Intensive marketing of flood -risk insurance by insurance companies to Agiliti residents	107 (26.88%)	176 (44.22%)	0 (0.00%)	47 (11.81%)	68 (17.09%)	398 (100.00%)
Erasing of the perception Nigerians have about insurance companies not being trustworthy regarding payment of claims	214 (53.77%)	125 (31.41%)	5 (1.26%)	43 (10.80%)	11 (2.76%)	398 (100.00%)
Sharing of the burden of paying insurance premium between the residents and any other agency such as government or philanthropists	166 (41.71%)	81 (20.35%)	39 (9.80%)	37 (9.30%)	75 (18.84%)	398 (100.00%)

As Table 5 shows, respondents agreed with some of the solutions to various levels, namely: (i) Erasing of the perception Nigerians have about insurance companies not being trustworthy regarding payment of claims (85.18%); (ii) Intensive marketing of flood-risk insurance by insurance companies to Agiliti residents (71.10%); (iii) Sharing of the burden of paying insurance premium between residents and any other agency such as government or philanthropists (62.06%), and (iv) Awareness campaign on the importance of insurance to residents of flood-prone areas (60.55%).

3.5.2   Discussion of Results

That almost all the household heads (over 97%) know that Agiliti is vulnerable to annual flooding shows that the problem is real. However, the discovery that a very negligible proportion of the households (10%) has life insurance and none holds the other flood-risk-related insurance covers is a confirmation of the findings in UNDRR (2021), Orimisan (2020) and University of Cambridge Institute for Sustainability Leadership (2017). Generally, insurance companies in West African cities have been accused of failing to play their expected role in flood-risk management. The finding is also a confirmation of Adelekan (2016), which shows that the insurance industry has not played a significant role in flood-risk management in Lagos and the country at large. Also confirmed is the study conducted across all Local Government Areas in Lagos State which found that only 0.8% of respondents insured their properties against flood risk.

These findings implicate the managers of Nigerian cities at the Local and State levels of governance. Huang and Fan (2020) criticized such managers for not ensuring the existence of resilience-based post-disaster recovery plans or guidelines, as well as for not focusing on financial costs in choosing a recovery path. Oladokun and Proverbs (2016), Nkwunonwo et al. (2015) and Adelekan (2015) also faulted the city managers in Nigeria for not combining the usual structural measures to flood-risk management with non-structural measures, such as insurance, advocacy, education, stakeholders' participation and consultation.

The implication of this low flood-risk insurance culture in Agiliti is that if the trend is not checked, for economic recovery, flood victims in the area will continue to rely heavily on individual resources, family, friends and community members, as well as on relief from government and donor agencies - support which most times, has proved to be inadequate, unsustainable and does not reach victims at the right time (Ouikotan et al., 2017; Adelekan, 2016; Ogunwusi et al., 2017; Moghalu, 2018; Idoko et al., 2020).

In the light of the foregoing, it would be necessary to suggest a few solutions. One, there is need to work on Nigerians' perception of insurance companies as hesitant about paying claims. Two, there should be intensive marketing of flood-risk insurance to Agiliti residents. Three, governments/philanthropists and residents may split the cost of premiums. Five, awareness campaigns should be launched on the importance of insurance to residents of flood-prone areas.

The suggestions on intensive marketing of flood-risk insurance to Agiliti residents and the launching of awareness campaigns on the importance of insurance are in line with SwissRe (no date), Bueno et al. (2021) and *ThisDay* (2021), who called for the insurance industry to seize the new opportunities presented by flood-risk insurance. Furthermore, Sasson et al. (2021) suggested drawing up an effective city resilience plan, in collaboration with the insurance industry, while ICLEI (2020) suggested engaging the insurance sector around urban needs, capacities and data. Further studies in this area are Adelekan (2015) and Kaushalyaa et al. (2014), which suggest that property owners should be sensitised on the need to insure their assets, even as government is expected to make flood insurance policies compulsory for residents. As for dealing with the image problem of insurance companies, this agrees with Ogunwusi et al. **(2017),** wherein it is suggested to highlight the high payment of claims as happened in the 2017 Lekki flooding case.

Regarding the sharing of insurance premium between residents and government/philanthropists, this study agrees with Kleffner (2022) and Schanz (2021) on the need for public-private partnership on risk sharing and development of microinsurance programmes such as Afat Vimo and the Scaled-up Proshika scheme shown in Mechler et al. (2006). It also speaks to the call on the Nigerian government to leverage on international financing, such as through the ADB's ARC (ADB, 2021; Moghalu, 2018).

4.0   Conclusion

This study addresses the role of insurance in ensuring that victims of flood disasters are able to recover economically in a timely, dignified and sustainable manner. In the case of Nigeria's Agiliti, located in the Ketu area of Lagos State, residents of flood-prone areas are grossly under-invested in flood-risk insurance. Given the severe threat from climate change, concerted efforts must be made towards improving resilience in African cities. As city managers, government should drive the needed change by increasing their capacity for handling issues of city resilience and taking full advantage of external flood-risk insurance financing, such as that provided by the African Development Bank's ARC. As this study found, the Nigerian insurance industry needs to shore up its image as a veritable source of solutions on flooding risk. Moreover, residents of places such as Agiliti, need to show more interest in flood-risk insurance matters.

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Economic Resilience of Mass-Housing Project Delivery in Lagos, Nigeria

Olajide Julius Faremi[1*], Uche Emmanuel Edike[2], Patricia Omega Kukoyi[1], Adegboyega Sunday Sotunbo[1], Kudirat Ibilola Zakariyyah[1] and Zulaikhah Oyindamola Agoro[1]

[1] Department of Building, University of Lagos State, Nigeria
[2] Department of Building Technology, Bells University of Technology, Ota, Ogun State, Nigeria

Abstract

The study investigates mass-housing development projects and their economic resilience in terms of affordability for medium-income and low-income earners in Lagos State, Nigeria. The qualitative study utilised data collected through in-depth literature review and structured interview sessions with twenty (20) stakeholders in the delivery of mass-housing projects comprising property developers, real-estate managers and construction executives operating in Lagos, Nigeria. The data were processed and analysed using both the quantitative data coding and thematic qualitative data analysis techniques. The study revealed that the predominant financing models for mass-housing projects include mortgage financing, public-private partnerships, private equity funds/loans, private developer funds, housing bonds, contractual savings schemes, and land-based financing. The study concludes that the economic resilience of mass-housing developments is quite low, as low and medium-income housing schemes are difficult to actualise because private-developer funding is the most frequently available means of funding mass-housing projects. Inevitably, mass housing schemes are frequently priced beyond the reach of low-income earners. Moreover, the limited implementation of Federal Housing Schemes is a major threat to the economic resilience of low- and medium-income housing projects. Therefore, the study recommends specific strategies that can improve the economic resilience of mass-housing projects, including instalment plans, off-plan sales, buyer savings schemes and crowdfunding.

Keywords: Affordability; Development; Economic resilience; Low income; Mass housing

1.0   Introduction

Adequate housing is a vital aspect of urban living. For residents of any country to live happy, safe and fulfilling lives, they must have access to affordable and conducive living environments. Consequently, it is necessary for responsive governments to invest in this critical social

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✉ ofaremi@unilag.edu.ng*

infrastructure. Where there is sufficient and affordable housing, government will incur less expenditure on health care, crime prevention, recreation, and pollution (Ezennia & Hoskara, 2019).

According to Adabre and Chan (2019), housing deficits remain a pressing global crisis. However, their effects are most profoundly felt in populous countries such as Nigeria. As rural and urban migrations increase yearly, rapid urbanisation and expanding urban populations lead to increased housing shortages (Kabir et al., 2014). Across Asia, Latin America and Africa, 200 million urban households live without shelter (Onyemaechi et al., 2015). Nigeria's accommodation crisis is one of the most acute globally, with the country harbouring the largest number of global residents living in substandard housing (Bredenoord, 2016).

In Nigeria, the national demand for housing grossly outweighs supply (Festus & Amos, 2015). According to Alaba and Adegoke (2015), the national housing deficit in Nigeria was estimated to be 17 million in August 2012. In their own study, Ezennia and Hoskara (2019) found that 85% of Nigeria's urban residents spent over 40% of their income on house rent. Over the last decade, there has been little improvement in the living quality of Nigeria's economically underprivileged groups. No doubt, poor housing conditions negatively impact urban health and infrastructure in major ways. Some of these consequences include criminal behaviour, health challenges, as well as social and political instability in extreme cases (Ezennia & Hoskara, 2019).

Lowe et al. (2022) posit that although government efforts in mass housing have in recent times been well complemented by private-sector housing developers, the overall output has remained grossly inadequate. Indeed, the country's housing deficit continues to rise as the majority of recent housing schemes are priced beyond the reach of low- and medium-income earners. Despite the rising concerns about inadequate housing in Nigeria, the financial industry has had a negligible impact on the construction sector. From its inception till 2007, the Nigeria Housing Finance programme invested only USD$58.3 million into the housing market (Yinusa et al., 2017), whereas the sector requires at least USD$15.4 billion to finance its deficit (Makinde, 2014). Scanlon et al. (2015) assert that the limited accessibility of low-credit facilities is the most challenging aspect of housing development in Nigeria. It is worth noting, nevertheless, that Nigeria has witnessed excellent reorganisation of its national housing financing programmes over the past twenty years, including introducing the National Housing Policy, which creates an enabling atmosphere for the emergence of housing finance.

These efforts notwithstanding, low- and middle-income earners continue to face barriers concerning accessing lendable funds to support private-housing development projects or outright acquisition of housing units from mass-housing development companies. The constraints in fund accessibility for the procurement of housing units by low- and middle-income earners is conceptualised in this study as a useful measure of the economic resilience of mass-housing schemes.

Many of the past and existing housing finance schemes and interventions, as well as mass housing developments by private developers, have excluded the lower tiers of the socioeconomic pyramid (Alaba & Adegoke, 2015). Despite this scenario, the literature has been inadequate on strategies for the development of housing schemes that are solely targeted at low-income and middle-income earners within the study area. Therefore, this study seeks to examine the economic resilience of mass-housing developments in Nigeria. Thus, the study aims to investigate mass-housing development schemes and the extent to which they are economically resilient, with a view to recommending strategies for housing delivery that are more economically sustainable.

2.0   Literature Review

Alaba and Adegoke (2015) suggest that for housing to be considered affordable it must meet certain stipulated standards of safety and living, in addition to being priced within the purchasing

power of the targeted socioeconomic group. Affordable housing, as defined by the Australia National Affordable Housing Summit Group, is a type of housing that is sufficient in standard and location for the accommodation of low- and middle-income-earning families, and does not cost so much that the family is unable to provide other basic needs on a regular basis. Ajayi et al. (2020) observe that affordable housing, especially that provided by the government, refers to accommodation that is distributed outside of market mechanisms according to the needs of subscribers rather than the ability to pay. Such schemes are also referred to as Social Housing Programme once they are developed and financed by government and targeted at low- and middle-income earners (Coupe, 2021).

Scanlon et al. (2015) note that social housing is similar in meaning to public housing. Any rental housing that is owned and operated by the government or a non-profit organisation – or that is a combination of the two – and has the aim of providing affordable housing may be described as social housing. Rationing of social housing is usually done by means-testing or the administrative assessment of housing needs (Gopalan & Venkataraman, 2015).

Owing to government inability to bridge the rising gap in the provision of affordable housing, in recent times there has been an increase in the level of private-sector participation in the development of mass housing (Anacker, 2019). Private-sector housing projects are financed mainly through traditional real-estate financing options that hinder the economic resilience of majority of private-sector driven schemes. According to Ezimuo et al. (2014) and Makinde (2014), finance is a big concern in real estate growth and investment. Also addressed in the literature are a myriad of challenges and factors that independently affect the cost and pricing of privately-driven mass-housing projects (Ajayi et al., 2020; Wijburg & Waldron, 2020).

Traditional real-estate financing consists of equity (Equity Funds), loan capital (Debt Funds) or a blend of both strategies (Ezimuo et. al, 2014). Kabir et al. (2014) further affirm that real-estate development has traditionally relied on equity funds. Private equity is broadly defined as non-public accessible funds that are often likewise exempt from reporting (Duvisac et al., 2020). In real-estate financing, the private equity industry is populated by traditional banks, institutional investors and home developers (Scanlon et al., 2015).

In the Nigerian context, popular sources of private equity are personal or business fund reserves, which may include retention income and aggregated individual savings (Makinde, 2014). Public equity is a product of an invitation to buy stakes in a property development organisation created solely for such commercial intentions (Ezimuo et. al., 2014). Gopalan and Venkataraman (2015) report two popular public equity forms: shared equity ownership and equity loans. Shared equity ownership is generally defined as a form of limited ownership model where each resident has a restricted stake in the property (Scanlon et al., 2015). There are four generally known models of Shared Equity Ownership (Makinde, 2014): Community Land Trusts, Limited Equity Housing Cooperatives, Resident-owned Communities, and Deed-Restricted Units.

Kabir et al. (2014) opine that the cornerstone of housing development is mortgage financing. Yinusa et al. (2017) define a mortgage as a loan secured by income-producing property such as retail space, office space, a hotel or a multifamily building. Makinde (2014) examines Nigeria's mortgage market and categorises it into primary and secondary markets. The primary operator within the mortgage space in Nigeria is the Federal Mortgage Bank of Nigeria (Odoyi & Riekkinen, 2022). Through the Primary Mortgage Institutions, the FMBN provides loans to property developers (Ozurumba, 2011). Madichie and Madichie (2009) report that the Federal Mortgage Bank of Nigeria is also charged with management of the National Housing Fund, from which pool it distributes capital to the PMIs. Adedokun et al. (2012) further observe that all registered Nigerians in the employment of the National Civil Service are obligated to contribute to the National Housing Fund, hence their entitlement to loans from it (Ozurumba, 2011).

Ozurumba (2011) notes that the role played by the public finance industry in Nigeria's housing finance market has been negligible at best and ineffective at worst. Madichie and Madichie (2009) report that Nigeria has had a remarkable reform of its housing finance system in the last two decades, including introducing the National Housing Policy, which was designed to create an enabling atmosphere for the generation of housing finance. However, this has not provided a long-term solution to the difficulties that low- and middle-income people face in obtaining loanable funds to help them finance their own homes. Adedokun et al. (2012) agree that Public-Private Partnerships are a laudable form of providing housing in the country, while Onyemaechi et al. (2015) believe that these frameworks are insufficient on their own to meet the country's housing demands. For Gopalan and Venkataraman (2015) the private sector is already weighed down by various internal challenges, hence causing demand for affordable housing to overtake supply.

According to Ezimuo et al. (2014), mortgage banks encounter various obstacles in the course of dispensing funds. On the other hand, low- to middle-income earners also experience considerable difficulty in accessing the services of Primary Mortgage Institutions because they lack the vital formal documentation required to disburse the loan funds. Moreover, the capital provided by these institutions also attracts exorbitant interest rates that are often outside the capacity of the low-class economic group (Bredenoord, 2016).

The study consolidates the factors affecting the affordability of low-income housing and the methods of financing that have been identified in the literature and enumerated in this section as a guide to assessing the affordability of low-income housing units within the study area.

3.0   Research Methods

The qualitative research design was employed for the study to allow the researchers explore the complex phenomena of housing unaffordability for low- and medium-income earners. The design affords the opportunity of engagement with key industry actors by leveraging their experience based on their widely differing stakes and roles in the delivery of mass-housing projects. The primary data for the study were collected through a series of structured interview sessions. The targeted population for the study consisted of construction project executives involved in mass-housing development and operating in Lagos, Nigeria. A sampling frame was developed from public listings of property and construction firms based in the state. Given the occupation-specific nature of the population being considered, the purposive sampling technique was employed for the study. As the interview session became saturated after the twentieth session, the data were coded and analysed accordingly.

The structure of the interview was such that each interviewee was asked questions aimed at eliciting information related to the aim of the study. The interview schedule was subdivided into two sections. Section one covered questions on the sources of finance for mass-housing development in Lagos, while section two sought to examine and understand the different factors affecting the affordability of low-cost mass housing in Lagos. The interview comprised of open- and closed-ended questions. For the open-ended question part of the interview, respondents were encouraged to answer in their own words. Data collected from the interview sessions were transcribed. Responses to the closed-ended questions were analysed using quantitative coding analysis, while responses to the open-ended interview questions were analysed using thematic analysis.

For the open-ended data analysis, a verbatim transcription of each interview session was done and the data was subsequently coded comprehensibly and methodically. From the transcribed text, only the relevant segments that addressed specific themes of the research topic were captured and coded.

Open coding was used in the analysis, implying that no predetermined codes were utilised.

Codes were created and adjusted as the data analysis moved through code iteration during the coding process. Subsequently, the generated codes were distributed into larger themes correlating to the research questions. These themes are largely descriptive and describe trends in the data that are relevant to the research goals.

4.   Data Presentation, Analysis and Discussion

The demographic data of the interviewees are presented in Table 1.

Table 1: Demographic data of survey participants

Demographic Data	Frequency	Percentage (%)
Designation of participants		
Real Estate Firms Founder	6	30
Chief Executive Officer	4	20
Head of Business	2	10
Head of Sales	2	10
Sales Manager	1	5
Business Manager	2	10
Real Estate Manager	3	15
Total	20	100
Work Experience		
1-5 years	7	35
6-10 years	10	50
11-15 years	3	15
16-20 years	0	0
Above 20 years	0	0
Total	20	100
No. of Completed Mass Housing Projects		
1-5 projects	2	10
6-10 projects	5	25
11-15 projects	8	40
16-20 projects	4	20
Above 20 projects	1	5

Table 1 shows the characteristics of the participants in the study. The respondents' demographics comprise the respondent's designation, work experience and respondent's number of completed projects.

The results from Table 1 show that 50% of the participants were either founders of real estate firms or Chief Executive Officers. A total of 65% of the participants had had more than five years of working experience in the delivery of mass housing. At least 65% of the participants had completed over 10 mass-housing projects. The result implies that the respondents are the top managers responsible for developing and operating the buildings; as such, their responses may be deemed valid. It further implies that most of the respondents possess a significant level of work experience and should be able to provide appropriate responses to the research questions.

In pursuit of the aim of the study, the methods of financing mass-housing projects were investigated to determine the most predominant one. The results of the analysis are presented in Table 2.

Table 2: Methods of financing and their rankings

Method	Frequency	Ranking
Mortgage financing	11	2
Public-private partnerships	4	5
Private Equity Funds/Loans	6	4
Private Developer Funds	20	1
Housing Bonds	2	6
Contractual Savings Scheme	7	3
Land-based financing	1	7

Table 2 shows that Private Developer funds ranked as the most predominant method of funding mass-housing projects. The next most utilised method considered for the development of mass-housing projects is mortgage financing, with contractual savings schemes being the third, private equity loans ranking fourth, public-private partnerships ranking fifth, housing bonds ranking sixth, and land-based financing ranking the least with only one mention.

According to many of the interviewees, the factor that most influenced this ranking scale was the ease with which these sources of funds was made available. Below are samples of this opinion:

> These are the sources that we have available to us; they are the most convenient options. (Respondent 1, male)

> This choice is based around our business model. (Respondent 3 male).

> Well, availability certainly played a huge part. We only have easy access to our own pool of funds, so it is convenient for us to use. (Respondent 4, male).

The study also evaluates the factors influencing the affordability of mass housing for low- and medium-income earners. The interviewees were presented with factors that were identified from the literature, before being asked to rate the significance of each of the factors on a scale of 1 to 5, where 1 means least significant and 5 means most significant. The results of the analysis are presented in Table 3.

Table 3: Factors influencing the affordability of low and medium-income mass housing

Factor	5	4	3	2	1	Sum	Mean Ranking	Rank Position
High Interest rate of Mortgage Loans	11	4	3	1	1	80.00	4.000	6th
Inconsistent Federal Housing Policies	6	10	2	1	1	69.00	3.450	9th
Weak Public Private partnership systems	5	11	2	1	1	66.00	3.330	10th
Inefficiency of Mortgage banks	13	2	4	0	1	84.00	4.200	5th
Foreign exchange fluctuation affecting market prices	6	10	2	1	1	69.00	3.450	9th
Illegal transfer of titles	1	4	10	2	3	49.00	2.450	12th
High cost of land and materials	5	10	3	1	1	75.00	3.750	7th
Sub-sale and subletting of properties	7	8	3	1	1	71.00	3.550	8th
Defaulting tenants and buyers	15	3	2	1	0	91.00	4.550	3rd
Long and expensive property approval process	2	3	7	5	3	49.00	2.450	12th
Stringent requirements for loans and mortgage approval	6	11	1	1	1	71.00	3.550	8th
Weak and unrecognised informal housing funding structures	17	2	1	0	0	87.00	4.350	4th
High capital requirement	18	1	1	0	0	92.00	4.600	2nd
Exclusion of grassroots government from housing policy development	4	10	2	2	2	69.00	3.450	9th
Low and inadequate infrastructural development in residential areas	0	0	10	4	6	50.00	2.500	11th
Low implementation of Federal Housing Schemes	19	1	0	0	0	96.00	4.800	1st

The results shown in Table 3 show that 'low Implementation of federal housing schemes' is the most significant factor affecting the affordability of low- and medium-income housing.

The interviewees were also asked to suggest alternative strategies and tools that could be implemented to aid the affordability of low-income and middle-income housing. They recommended strategies that have been distilled into four clear pathways: Instalment plans, off-plan sales, buyer savings schemes, and crowdfunding.

> *The way we currently use instalment plans in the construction industry can be improved. Prospective tenants can be able to pay monthly contributions toward the cost of owning a home. This removes the high barrier of capital that discourages most people from buying homes. (Respondent 1, male)*

> *I think more private developers should adopt crowdfunding property development schemes. This will allow investors to gain high returns and at the same time ensure that capital is readily available for low-cost developments. (Respondent 3, male)*

> *The best strategy would be provision of long-term mortgage loans for individual home buyers and private, real estate developers. (Respondent 5, male)*

> *Some alternative financial tools that can be considered are peer-to-peer lending, grants and traditional loans. (Respondent 7, male)*

> *Instalment plans are one of the more interesting recent developments in real estate, particularly in this side of the world where debt is like a taboo topic. Personally, I believe many low- and middle-income earners will benefit greatly from properly-structured instalment payment plans with great added incentives. For example, the industry could look into the possibilities of combining the formal with the informal. So, instruments like contribution circles are very common among middle-class Nigerians. There is a lot of potential in combining the benefits of these contribution arrangements with a typical real-estate instalment plan. (Respondent 4, male)*

The study reveals that there is low implementation of Federal Housing Schemes, while private-sector participants lack access to funds that could guarantee the delivery of affordable housing units. The results further show that there are seven main methods of financing mass housing for private-sector participants, especially for the low- and medium-income housing schemes. These comprise mortgage financing, Public-Private Partnerships, private equity funds/loans, private-developer funds, housing bonds, contractual savings schemes, and land-based financing. This is in consonance with the findings reported by Ezimuo et al. (2014), who noted that traditional real-estate financing consists of equity (equity funds), loan capital (debt funds) or a blend of both strategies. Kabir et al. (2014) further affirm that real-estate development has traditionally relied on equity funds.

The results further reveal that Private Developer funds are the most adopted method used for the financing of low-cost housing in Lagos, a choice that is heavily influenced by availability and convenience of use. This differs from the conclusion reached by Ozurumba (2011) that mortgage financing is the primary source of finance for most housing projects. Adedokun et al. (2012) likewise reached a contrary conclusion while evaluating housing finance strategies among developers using a case study of Abuja and Kaduna. They concluded that the most prevalent source of housing finance was Public-Private Partnership (PPP).

The present study also shows that the most effective strategies for the delivery of affordable low-income housing are distilled into four clear pathways: instalment plans, off-plan sales, buyer savings schemes, and crowdfunding.

5.0 Conclusion

Given the results of the analysis, the study concludes with the following observations. The economic resilience of mass-housing projects is quite low owing to the low implementation of

Federal Housing Schemes and the hostile nature of the available financing models by which private-sector developers execute their projects. The seven methods currently being deployed for the financing of low- and medium-income housing in Lagos by private-sector developers include mortgage financing, Public-Private Partnerships, Private Equity Funds/Loans, private-developer funds, housing bonds, Contractual Savings Schemes, and land-based financing. Of these seven methods, private-developer funding is the most adopted among low-income housing developers in Lagos, owing largely to its wide availability and convenience of use. This is a major challenge to the actualisation of economically resilient mass-housing project delivery by private-sector developers. Furthermore, factors impeding the affordability of low- and medium-income housing include low implementation of Federal Housing Schemes and high capital requirements for mass-housing projects. Subsequently, the most effective strategies for the delivery of affordable low-income housing are instalment plans, off-plan sales, buyer savings schemes and crowdfunding.

Therefore, this study recommends that private developers adopt crowdfunding property development schemes, since such schemes allow more individuals to participate in the construction industry as investors and thus allow them to gain high returns. Furthermore, stronger relationships should be forged between the public and private sectors for the provision of infrastructure, particularly low-cost housing. Finally, the study recommends the use of properly facilitated instalment plans as effective tools to make housing more accessible to low- and middle-income earners. Such plans would involve a monthly contribution model where prospective buyers can put aside a stipulated percentage of their income towards the cost of buying and maintaining a home.

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Office Sustainability Assessment for Endearing Resilience in an Academic Environment

Temilola Oluseyi[1], Aliu Soyingbe[2], Abdulganiyu Adelopo[3]*, Afolasade Nubi[3], Adetinuke Aina[3], and Aisha Abdulkareem[4]

[1] Analytical/Environmental Chemistry Research Group, Department of Chemistry, University of Lagos, Nigeria
[2] Department of Building, University of Lagos, Nigeria
[3] Works and Physical Planning Department, University of Lagos, Nigeria
[4] Department of Community Health, Lagos University Teaching Hospital

Abstract

Office conditions are crucial to assessing the sociocultural, economic, environmental and public health of the majority of the urban population. The office is a built environment that takes up the bulk of the time and energy of society's elite. As such, the quality of office spaces has a significant effect on the health, comfort, satisfaction and productivity of office workers. No doubt, inadequate indoor environmental quality will impede workers' productivity and well-being. Sustainability in the office addresses the interface through which resilience in both the biotic and abiotic components of the indoor working micro-environment can be measured and transformed for full productivity. In the light of this, this article evaluates the factors driving infrastructural, health and economic resilience in academic institutions.. The study reviews the literature on the theory of human behaviour, with a view to establishing the link between key concepts in infrastructural, health and economic resilience *and* office sustainability within an academic environment. It identifies office sustainability as a major determinant in the effective measurement and development of resilience in academic environments. It was observed that the dimensions of infrastructural, health and economic resilience are in-built features which academic institutions should adopt to achieve overall resilience in the academic environment. This assessment should bring about major social and economic benefits, given the quantum of time that members of the university staff spend in their offices.

Keywords: Academic institution; Indoor environment; Office sustainability index and resilience

1.0   Introduction

There are growing concerns about how the built environment contributes to the global goals of environmental sustainability and resilience. The built environment comprises buildings and living spaces that are created or modified by humans. Clearly, the infrastructural utilities

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✉ aadelopo@unilag.edu.ng*

designed to serve built spaces relate in one way or another to the 17 Sustainable Development Goals (SDGs) (Larsen & Jensen, 2019). For example, SDG Goal 7 (affordable clean energy), SDG Goal 8 (decent work and economic growth), SDG Goal 9 (industry, innovation and infrastructure), SDG Goal 11 (sustainable cities and communities), SDG Goal 12 (responsible consumption and production) are significantly influenced by design and management practices within the built environment. Beyond the immediate social, economic, health and environmental benefits of infrastructures for the present generation, the needs of future generations must also be anticipated. Indeed, the nature, location and roles of the built environment (homes, buildings, offices, streets, sidewalks, open spaces, transportation options, etc.) are critical to determining their sustainability contributions (Bergefurt et al., 2022).

Office buildings are often specifically designed to consume higher quantities of energy compared to commercial and domestic buildings. (Xue et al., 2016). Additional features such as daylighting, natural ventilation, natural view, open space and places of respite (Bergefurt et al., 2022) help to boost worker health, well-being and productivity via optimisation of such elements. While there are at least eight established office building design and construction standards, the choice of office design for most organisations will depend on issues of cost and staff needs for optimum performance (Akadiri et al., 2012).

In academic institutions, various office designs are adopted to achieve teaching, research, technical and administrative objectives within built environment. For example, a medical laboratory office will differ in design from a mechanical engineering laboratory office, even when both office types are managed by technical officers. Academic institutions provide an opportunity to evaluate diverse office types – in terms of operations and performance output.

Tertiary institutions are pivotal to the drive towards sustainability (Leal et al., 2018; Zuo et al., 2016), as active drivers of the SDG agenda through multi-disciplinarity. However, to achieve the required education and training on sustainability principles, higher institutions need to strategically incorporate sustainability into their curricula, modus operandi and organisational culture (Dedeurwaerdere, 2013). For a start, there should be assessments of the sustainability ratings of office buildings within the academic environment. This process should involve students as key actors in the broader environmental sustainability drive.

2.0   Literature Review

Not much multidisciplinary research has been undertaken on sustainable academic office structures in Nigerian academic institutions. Although a number of works on individual sustainability parameters such as indoor air quality and energy efficiency in higher institutions have appeared, most of them fail to focus on sustainability measurements. For example, Otolorin et al. (2018) reported a correlative relationship between total volatile organic compound content in academic offices at a university and staff productivity performances.

For this study on office sustainability assessment, the general building sustainability evaluation reports are used as premises for the literature review. According to the World Business Council for Sustainable Development, buildings could be generating up to 42.4 billion tons of carbon globally by 2023 – an increase of 43% since 2007 (Khan et al., 2021). Therefore, buildings can play a critical role in the evaluation, monitoring and reduction of carbon emissions to control the adverse impact of global warming (Bulut et al., 2020; Zuhaib et al., 2017). Mannan and Al-Ghamdi (2021) reported that the indoor greenhouse gas generated in developing countries is more contaminated than outdoor air. Indoor activities such as smoking, use of domestic machinery and vehicular activities within the compound are also considered as possible sources. Greenhouse gas and other air quality elements (e.g., Total Volatile Organic Carbon [TVOC]), formaldehyde, Volatile Organic Compounds [VOCs], mould, benzene, particulates, radon) of

buildings have been linked with health, well-being and the productivity ratings of occupants (Losacco & Perillo, 2018). At different times, the built environment contains both established and transient microorganisms in different spaces, with both being affected by practices such as cleaning and remediation. Akadiri et al. (2012) identified nature of materials, quantification and design for infrastructure longevity, as well as adaptive utility and futuristic innovative use, as core sustainability measures of resource conservativeness in buildings.

Prominent green building rating tools, such as Leadership in Energy and Environmental Design (LEED) (US) and Building Research Establishment Environmental Assessment Method BREEAM (UK), incorporate special tools for office building types. Similarly, the Green Building Council of Australia (GBCA) has released three rating tools for office buildings: Green Star – Office Design, Green Star – Office As Built, and Green Star – Office Interior (Zuo et al., 2016). In Africa, only South Africa has a national approved green building rating, known as Green Star SA; the country is also a full member of the World Green Building Council. Although Kenya, Ghana, Mauritius, Morocco, Namibia and Nigeria have each established National Green Building Councils, they continue to adopt South Africa's Green Star SA rating for buildings.

In this regard, the study reviews research on the nexus of infrastructural, health and economic resilience in academic institutions by assessing their systemic office sustainability monitoring and adaptation practices. The study will thus be able to determine the international assessment system that is most suitable for offices locally. Furthermore, the evaluation will provide baseline information for the assessment of different offices in academic institutions in order to bridge the gap of local content in the national green building assessment tool.

According to Park et al. (2017), building rating tools are systematic frameworks that enable the assessment of buildings with established criteria to measure and compare their compliance towards more sustainable forms of design, construction, operations, and dismantlement. Building rating tools are rigorous assessment methodologies involving diverse elements, i.e., environmental, economic, social, cultural, and value-based ones. Sustainable building certifications are often used as approved documented quantifications of the sustainability compliance of buildings that support integrated design and interdisciplinary collaborations. Although there are over 600 building rating tools globally, the most prominent are BREEAM-UK, LEED-USA, GBI-Malaysia, GREEN STAR-Australia, and GREEN GLOBES (Park et al., 2017). [Table 1 provides a summary of the indicators used by the prominent certification standards.]

Table 1: Summary of indicators used by the prominent certification standards

Building Tools	Sustainability Dimensions				
	Environment	Social	Economic	Culture	Governance
LEED	Location and transportation Sustainable sites, water efficiency Energy and atmosphere, material and resources, indoor environment quality	Location and transportation Material and resources Regional priority	Management		Integrative process
BREEAM	Health and wellbeing, energy Transport, water, material Waste, land use and ecology Pollution	Health and wellbeing Transport	Management		
GREENSTAR	Management, indoor environment quality, energy, transport, water Material, land use and ecology Emissions	Indoor environment quality, transport Material, emissions			Management
CASBEE	Indoor environment, energy Resources and material, off-site environment Quality of service	Quality of service On-site environment			Quality of service
DGNB (97)	Global and local environmental impacts Resource consumption and waste Quality of technical implementation Quality of construction, site quality	Health comfort and user-friendliness, functionality, aesthetic quality Quality of technical implementation Site quality	Life cycle costing Financial performance		
SEED (100)	Location and transportation Sustainable sites, water efficiency Energy and atmosphere, material and resources, indoor environment quality	Location and transportation Sustainable sites, indoor environment quality		Sustainable sites	
Athena	Embodied primary energy use, global warming potential, solid waste emissions, pollutants to air, pollutants to water, natural resource use.				
Envest 2	Resource consumption, environmental loading.	Indoor air quality	Whole life costs		

Source: (Khan et al., 2021)

Regarding office assessment for contractors and other stakeholders, this study adopts "a common EU framework of core sustainability indicators for office and residential buildings". The manual provides a guide to using any of the micro-objectives as they relate to specific sustainable indicators (Dodd et al., 2021); it also identifies definite indicators to be measured. [Table 2 specifies the detailed indicators measurable for each micro-objective.]

Table 2: Detailed EU framework of core sustainability indicators for office and residential buildings for each micro-objective

Micro-objective	Indicator	Unit of Measurement	Summary Information
1. Greenhouse gas and air pollutant emission along a building's life cycle	1.1 Use stage energy performance	Kilowatt hours per square metre per year (KWh/m^2/yr)	This indicator measures the primary energy demand of a building in the use stage. In a life cycle approach, this energy demand is also referred to as 'operational energy consumption'. It takes into account the benefits of generating low carbon or renewable energy.
	1.2 Life cycle Global Warming Potential	Kg CO_2 equivalents per square metre per year (kg CO_2 eq./m^2/yr)	This indicator measures the greenhouse gas (GHG) emissions associated with the building at different stages in its life cycle. It therefore measures the building's contribution to emission that cause the cause the earth global 2warming or climate change. This is sometimes also referred to as 'carbon footprint assessment' or 'whole life carbon measurement'.
2. Resource efficient and circular material life cycles	2.1 Bill of quantities, materials and lifespans	Unit quantities, mass and years	This indicator measures the quantities and mass of construction products and materials necessary to complete part of the building. It also allows for the estimation of the lifespans of defined pats of the building.
	2.2 Construction and demolition waste and materials	Kg of waste and materials per m^2 total useful floor area	This indicator measures overall quantity of waste and materials generated by constructed, renovation and demolition activities. This is then used to calculate the diversion rate to reuse and recycling, in line with the waste hierarchy.
	2.3 Designs for adaptability and renovation	Adaptability score	This indicator assesses the extent to which the design of a building could facilitate future adaptation to changing occupier needs and property market conditions. It therefore provides a proxy for the capacity of a building to continue to fulfils its function and for the possibility to extend its useful service life into the future.
	2.4 Designs for deconstruction, reuse and recycling	Deconstruction Score	This indicator assesses the extents to which the building could facilitate the future recovery of materials for reuse of recycling. This includes assessment of the ease of disassembly of minimum scope of building parts and their associated sub-assemblies and materials.
3. Efficient use of water resources	3.1 Use of stage water consumption	m^3/yr of water per occupant	The indicator measures the total consumption of water for an average building occupant, with the options to split this value into potable and non-potable water that is supplied. it also supports the identification of water scare locations.
1-3 Full LCA	n/a	10 impact categories	Climate change; Ozone depletion; Eutrophication aquatic freshwater; photochemical ozone formation; depletion of abiotic resources- minerals and metals; Depletion of abiotic resources –fossil fuels; water use.
4. Healthy and comfortable spaces	4.1 Indoor air quality	Parameters for ventilation, CO_2 and humidity Targets list of pollutant: TVOC, LCI ratio, mould, benzene, particulates, radon	The indicator measures a combination of indoor air conditions and target air pollutants. Æ The design indoor air condition relates to the ventilation rate and how this is adjusted to keep CO_2 and humidity at healthy levels. Æ The target air pollutant can be controlled by selecting and reporting on low pollutant fit out materials, controlling the risk of mould growth and specifying ventilation systems with adequate filters for polluted outside air.

	4.2 Time outside of thermal comfort range	% of the time out of range during the heating and cooling seasons	The indicator measures the proportion of time during the year when building occupiers are comfortable with indoors thermal conditions. It measures the ability of a building (with & without building services) to maintain pre-defined thermal comfort specs during hot & cold weather.
	4.3 Lightning and visual comfort	Level 1 checklist	The indicator measures the availability and quality of light, considered in items of a combination of installed electric lighting systems and penetration of natural light into a building.
	4.4 Acoustics and protection against noise	Level 1 checklist	This indicator measures the potential for disturbance from unwanted noise in the form of impact and airborne transmission of sound between residential dwellings and office specs, reverberation sound in office spacers and in both types of building external sources of noise disturbance.
5. Adaptation and resilience to climate change	5.1 Protection of occupier health and thermal comfort	Projected % time out of range in the years 2030 and 2050 (see also indicator 4.2)	This indicator measures the potential for a deviation of the thermal comfort simulated using projected weather conditions in 2030 and 2050 from present conditions. The indicator relies on the same methodology as indicator 4.2.
	5.2 Increased risks of extreme weather events	Level 1 checklist (under development)	This indicator assesses the potential for extreme weather events in the future (e.g., storms, rainfall, snowfall, and heatwave) and their impact on the service life of a building component or materials.
	5.3 Increased risk of flood event	Level 1 checklist (under development)	This indicator measures all building element costs incurred at each life cycle of a project for the reference study period and, if defined by the client, the intended service life.
6. Optimized life cycle cost and value	6.1 Life cycle costs	Euros per square metre per year (e/m^2/yr)	The indicator measures all building element costs incurred at each life cycle stage of a project for the reference study period and, if defined by the client, the intended service life.
	6.2 Value creation and risk exposure	Level 1 checklist	This indicator assesses the potential for the building design to have a positive influence on property valuation and risk in the main areas: Reduced overheads (by minimizing operational costs). Increased revenues and more stable investments (by making properties more attractive). Reduced risk (by anticipating future exposure)

Source: Dodd et al. (2021)

In recent years, resilience has become a prominent topic in the planning and design industry. The OECD Indicators for Resilient Cities (Indicators for Resilient Cities, 2018) relate a structure's resilience to four key dimensions: Health and well-being – ensuring the health and well-being of everyone living and working in the entity; economy and society – the social and financial systems that enable users to live peacefully and act collectively; Infrastructure and environment – artificial and natural systems that provide critical services, protect and connect users; and leadership and strategy – the need for informed, inclusive, integrated and iterative decision-making in the facility (Storms et al., 2019). Structural resilience is associated with four dimensions and 12 goals that are considered as the bedrock of endearing resilience. [Figure 1 shows the interrelationship between the dimensions and the goals.]
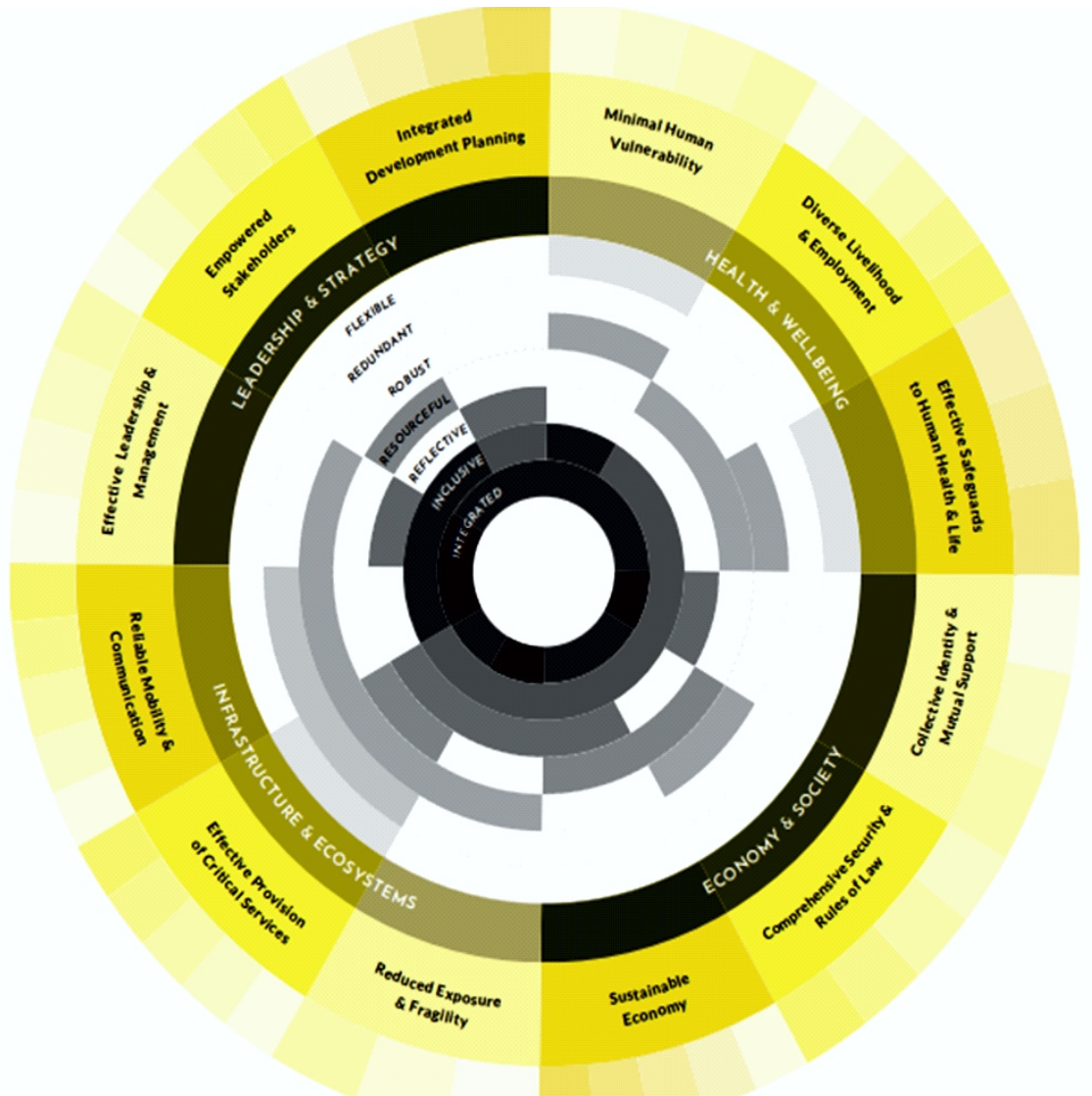
Figure 1: The interrelationship between the dimensions and goals of resilience ("Indicators for Resilient Cities," 2018)

The resilience dimensions are closely linked with the sustainability criteria under health and well-being, economy and society, leadership and strategy, infrastructure and ecosystems (see Figure 2). It could be inferred that the critical features of resilience are a measure of sustainability stability, flexibility, and changing features.
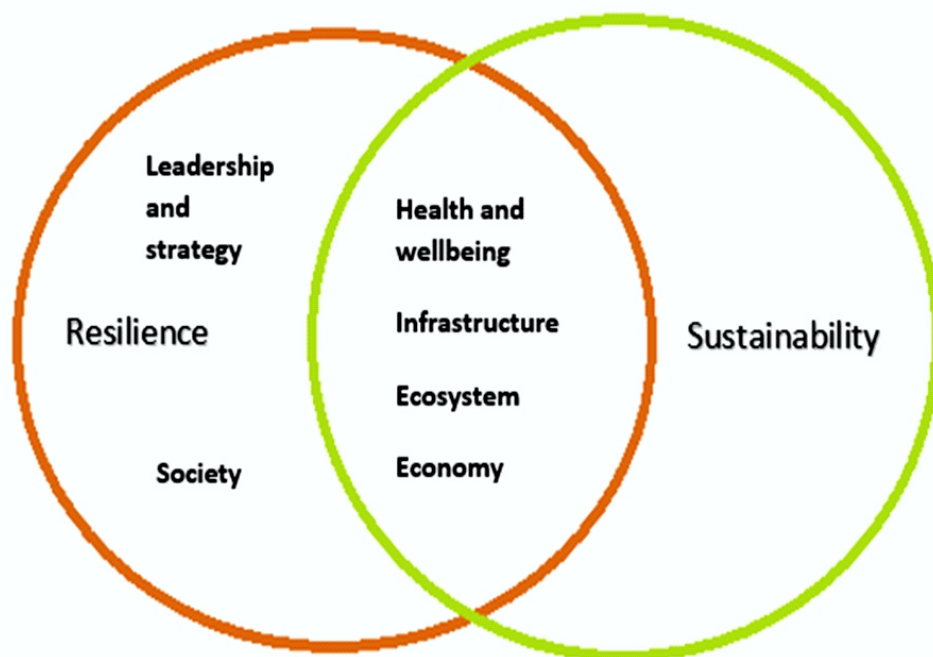
Figure 2: Overlap between resilience and sustainability

Source: Authors (2022)

This provides a nexus that could be explored for evaluation and determination of stability, flexibility and adaptability of sustainability of structures to withstand resilience demands.

Over the years, universities have played leading roles in proffering solutions to issues of resilience and sustainability in society (Storms et al*.,* 2019). Now they need to provide similar leadership in addressing resilience on campuses. In the literature there is little evidence of studies on university campus resilience, probably because most university and college campuses remain more focused on sustainability and less involved with the notion of resilience. It is therefore not surprising that there are few examples of resilient campus planning and operational implementation in tertiary institutions. Although some institutions have faculties and centres studying resilience within the framework of urban and regional planning, policy and governance stability and disaster management, there is an urgent need to link theory with practice via empirical studies showing the nexus of structural sustainability and resilience.

3.0 Methodology of Assessment

The researchers undertook a desktop review of the literature on office sustainability parameters and the theoretical framework for their measurement. The search focused on identification and broad grouping of parameters and development of measurement via the theoretical framework.

3.1 Identification and Broad Grouping of Parameters

The Science Direct web page was searched for information on review journals focusing on office sustainability objectives and indicators in the field of environmental science and engineering between 2012 and 2022. The search was in three phases to enhance the identification of stakeholders' participation and the identification of experts' assessment areas. The groupings are as follows:

(i) office infrastructural and economic sustainability assessment
(ii) office environmental sustainability assessment
(iii) office health and social sustainability assessment.

3.1.1 Development of Measurement via the Theoretical Framework

In order to investigate the theoretical link between behavioural concepts and sustainable office productivity, the researchers selected and reviewed 15 articles on human behavioural theories and sustainability measurements. The theories present systematic ways of evaluating human behaviour, events and/or situations (Kwon & Ahn, 2019), with a set of interrelated definitions, concepts and propositions that predict or explain events or situations by specifying relationships among variables (Abusafieh & Razem, 2017). For each bit of evaluation, human behaviour is key to achieving the desired sustainability. Three human behavioural theories that align with each broad grouping were evaluated: Environmentally Responsible Behaviour (ERB), Health Belief Theory, and the SBToolPT model. An inference analysis was used to establish parameters such as aggregation, Sustainable Office Score (SOS) and the resilience integration overview.

3.1.2 Results and Discussions

Table 3 provides details on sustainability objectives, expert of interest, indicators and the related human behaviour theory and journal source.

Table 3: Assessment grouping and building sustainability objectives

Assessment grouping	Objectives	Faculty of expert required	Indicators	Theory
1. Building infrastructural and building economics	Resource efficiency and circular material life cycles	Engineering/ Environment science/ Quantity surveyors/ Architectural / Economist	Bill of quantities, materials and lifespans Construction and demolition waste and materials Design for adaptability and renovation Design for deconstruction, reuse and recycling	SBToolPTeH model (Mateus & Bragança, 2011)
	Efficient use of water resources		Use stage water consumption	
	Optimised life cycle cost and value		Life cycle costs Value creation and risk exposure	
Assessment group	Objectives from the EU	Faculty of expert required	Indicators	Theory
2. Building environmental	Greenhouse gas and air pollutant emissions along a building's life cycle	Environmental chemist, environmental science,	Life cycle Global Warming Potential Use stage energy performance	Environmentally Responsible Behavior (ERB) (Abusafieh & Razem, 2017)
	indoor air quality		Target list of pollutants: TVOC, formaldehyde, CMR VOC, LCI ratio, benzene, particulates, radon	
	Waste management		Office waste management index	
Assessment grouping	Objectives from the EU	Faculty of expert required	Indicators	Theory
3. Building health and social	Healthy and comfortable spaces	Public Health, Microbiologist, Sociologist	Time outside of thermal comfort range Lighting and visual comfort Acoustics and protection against noise	Health Belief Theory (Abusafieh & Razem, 2017)

Based on the sustainable assessment office data in Table 3, the builders, quantity surveyors and architect are crucial to office infrastructural design and economic evaluation. They are able to assess the structural and economic implications of academic offices using life cycle assessment. They will provide resource demand and utility analysis, building adaptability and land-use assessment. With the indicators measurement, researchers can measure the overall potential quantity of waste and materials that will be generated by construction, renovation and demolition activities, as well as the estimated diversion rate to reuse and recycling, in line with the waste hierarchy.

3.1.4 Environmental Sustainability Assessment in Offices

The design of the office indoor air condition will affect the targeted air pollutants, which can be selectively measured and reported, thus avoiding the impact of polluted outside air. Determining the role of the ventilation system, as well as how this is adjusted to keep CO_2 and humidity at healthy levels, will also be essential. An environmental chemist is best qualified to measure air quality parameters such as levels of carbon footprint, greenhouse gas emission and pollutant emission in academic offices and buildings.

3.1.5 Health and Social Sustainability Assessment in Offices

The office occupier's thermal comfort with indoor conditions during seasonal variations is evaluated based on microbial load and temperature functionality. The effects of office wall colour and illumination on mental and eye comfort are also evaluated. Experts in public health, sociology and microbiology will focus on the parameters of buildings that affect health and comfort. No doubt, office space quality has something to do with productivity and challenges, social integration and inclusion, as well as privacy and performance. The relevant faculties might consider supplying staff and students for the evaluation, as a way to ensure project ownership and sustainable knowledge transfer.

3.1.6 Environmentally Responsible Behaviour (ERB)

Proponents of the theory of Environmentally Responsible Behaviour (ERB) argue that having the intention to act is a major factor influencing ERB. The ERB model suggests that a person's adaptation of environmentally positive behaviour will depend on the following variables: intention to act, locus of control, attitudes, sense of personal responsibility, and knowledge. Figure 3 presents a complex of interactions likely to emerge as ERB. According to proponents of the theory, the control centre directly affects an individual's attitudes, leading to an improved intention in acting and improving behaviour. Thus, the theory concentrates more on existing interactions among parameters that influence a person's behaviour than on the singular impact of a single variable.
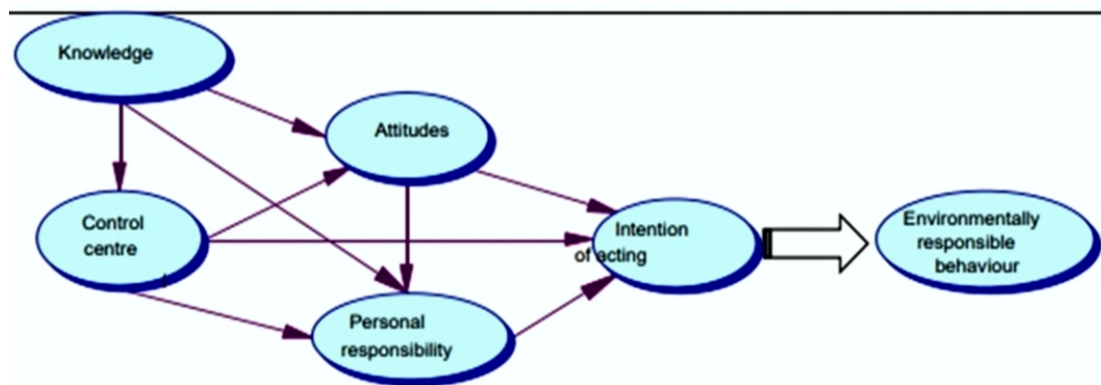

Figure 3: Interaction parameters in development of ERB

Source: Abusafieh & Razem (2017)

The theory helps to establish an evaluation scheme that rates users' knowledge of office indoor air pollutants (KP), value of indoor air quality (IAQ), greenhouse gas source (Gs), office green gas generation value (Ogg), waste generation index (WGI) and willingness of office users to transit to sustainable behaviour in greenhouse gas and air pollutant generation (Tg). The rating focuses on office sustainability based on users' knowledge, contributions and transition potential. This can be expressed as follows:

$$OEA = \frac{OAP + IAQ + Gs + Ogg + OWGI}{Ot} \qquad \ldots\ldots\ldots\ldots \quad (1)$$

3.1.7 Health Belief Theory

The Health Belief Model (HBM) evaluates positive human behaviour based on health and behaviour. According to the model, whenever there is increased potential in an individual's assessed level of risk, there is an increased possibility that the individual will adhere to preventive behaviour. HBM has been well applied to evaluate environmentally-friendly behaviour and healthy consumption behaviour in the built environment. The HBM contains four factors for predicting health-related behaviour: perceived benefits, threats, barriers, and susceptibility. Three factors (perceived benefits, threats, and barriers) were used in developing the research framework. Perceived susceptibility was not considered in the current concept owing to difficulties associated with linking disease source to individuals based on only office activities. Perceived benefits describe the positive outcomes that a person receives from healthy behaviour. Perceived threats include potential negative consequences as a result of not adopting the healthy behaviour. Perceived barriers are factors such as time, effort and structure, which prevent one from performing the healthy behaviour. Figure 4 provides a summary of the proposed concept, which is similar to the method proposed by Kwon and Ahn (2019).
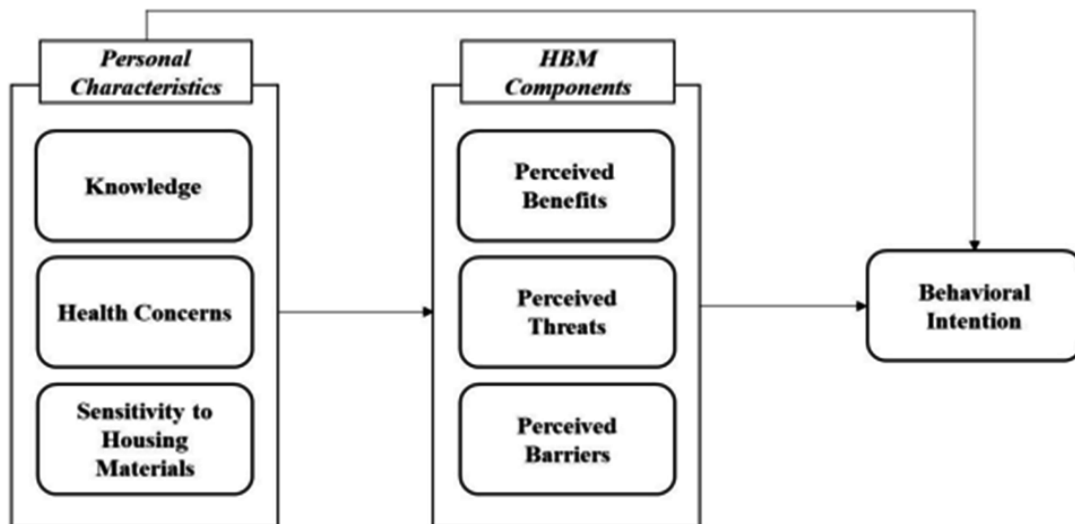

Figure 4: Parameters for Health Belief Theory (Kwon & Ahn, 2019)

Office health and social assessment has measurable parameters for Office Health Prevalent issue (OHP), Office Perceived Threat (OPT) and Office Health Barriers (OHB). OHP issue is evaluated based on Office Microbial Burden (MB), Illumination Factor (IF), Temperature Comfort (TC), and Noise Level (NL) in the respective offices. This is expressed as follows:

OHP = MB + IF + TC + NL   ………………… (2)

The World Health Organization standards and the local regulation standards for each of the measurements is used as a reference rating for conformity. OPT is rated based on values from office health prevalence measurement against identified potential disease. OPT ranged from Low, Moderate, High to Severe based on health issue prevalence rating and health severity evaluation.

The OHBs evaluate the structural, economic, cultural and operational factors that might prevent a positive transition to the reduction of the healthy condition. Hence, Office Health and Social Assessment (OHA) can be expressed thus:

$$OHA = \frac{OHPXOPT}{OHB}$$ ………………………………... (3)

3.18   SBToolPT Model

The SBToolPT model is a global indicator that summarises building performance at the level of a key-sustainability aspect. The SBToolPT model is an innovative approach for developing building sustainability assessment and rating, evolving from the generic methodology while increasing the understanding of the different dimensions of sustainability through its accounting style. The SBToolPT has nine sustainability categories: Climate change and outdoor air quality; Land use and biodiversity; Energy Efficiency; Materials and waste management; Water efficiency; Occupant's health and comfort; Accessibilities; Education and awareness of sustainability; and Life cycle costs.

The SBToolPT model is deployed for infrastructural and economic assessment, given the indicators and parameters that align with the model. It allows for a combination of material and economic evaluation for the office infrastructure. In the quantification of material lifespan and construction and demolition waste from a completed building, a Life Cycle Assessment (LCA) is recommended using databases with the LCA data for the most commonly used building materials and components. For areas without well-developed building LCA, local compensation figures are provided within six categories of environmental impact on building lifespan. [Table 4 presents the unit of measurement for these factors.]

Table 4: The unit of measurement for the factors use in Life Cycle Analysis

Environmental impact categories	Unit/declared unit	LCA methods
Depletion of abiotic resources	[kg Sb equiv.]	CML 2 baseline 2000
Global warming potential (GWP)	[Kg CO_2 equiv.]	IPCC 2001 GWP 100a
Destruction of atmospheric ozone (ODP)	[Kg CFC-11 equiv.]	CML 2 baseline 2000
Acidification potential (AP)	[Kg SO_2 equiv.]	CML 2 baseline 2000
Eutrophication potential (NP)	[Kg PO_4 equiv.]	CML 2 baseline 2000
Photochemical ozone creation (POCP)	[Kg C_2H_4 equiv.]	CML 2 baseline 2000
Non-renewable primary energy	[MJ equiv.]	Cumulative Energy Demand
Renewable primary energy	[MJ equiv.]	Cumulative Energy Demand

Source: Mateus & Bragança (2011)

The Construction and Material Recycled Potential is rated for each parameter and converted into grades (see Table 5). The lower the value, the less sustainable the observation for the parameter, with the least scale being E (less sustainable/below the conventional practice) and the highest A+ (more sustainable/above the best practice).

Table 5: The construction and material recycled potential rating

Grade	Values
A+	$\overline{P_i} > 1.00$
A (Best practice)	$0.70 < \overline{P_i} \leq 1.00$
B	$0.40 < \overline{P_i} \leq 0.70$
C	$0.10 < \overline{P_i} \leq 0.40$
D (Conventional practice)	$0.00 < \overline{P_i} \leq 0.10$
E	$\overline{P_i} \leq 0.00$

Source: Mateus & Bragança (2011)

Economic performance is based on the market value of the materials and on their operational costs (costs relating to water and energy consumption). Value per square meter is provided based on the building or area size currently in use. For share facilities, the average person's utility is computed per office or area in use.

Utility value. Ec = material estimate x cost per unit + operational cost
Hence, office infrastructural and economic assessment (OIE) can be expressed as follows:

OIE = Ma + Ec ……………………… (4)

3.1.9 Aggregation of Parameters

Each office assessment will be an aggregate for each of the objectives highlighted above; that is, the summation of Office Health Assessment (OHA), Office Infrastructural and Economic Assessment (OIEA), and Office Environment Assessment (OEA). In the summation, data normalisation is adopted to ensure values are not over- or underrated. A confident error curve is generated using predicted values from standard organisation such as LEED and BREAM as benchmarks for offices having similar features.

3.1.10 Sustainable Office Score (SOS)

The SOS of the office is based on the three broad categorisations of office health and social assessment (OHSA), office infrastructural and economic assessment (OIEA), and office environment assessment (OEA). The SOS will be determined from two dimensions of performance score and weighted score. The performance score is the value rating achieved by each office for OHA, OIEA and OEA respectively. The weighted score is the rating of the importance of each assessment unit to productivity and survival with the office. The global assessment weights of the environment, society and economy dimensions is in the order of 40%, 30% and 30% respectively. In the assessment, the highest value of 40% is attached to importance of issues of human survival within the assessed location, which is similar to the factors considered under OHA in this assessment. As such, the weighted scores of 40%, 30% and 30% are for OHSA, OEA and OIEA respectively.

4.0   Conclusion

Based on a review of literature, this paper has focused on parameters for evaluating the sustainability assessment of academic offices. It has presented an assessment method that incorporates an occupier's behavioural influence and their willingness to transit to sustainable action. Academic institutions are considered to be at the heart of knowledge discovery and demonstration globally, acting as a mini-laboratory for the larger society. Issues of sustainability and resilience have been keenly discussed across disciplines in academic institutions, although there has been limited application of their prescriptions in tertiary institutions in developing countries. While some institutions have made efforts to include sustainability in key sections of their operations, most have not considered campus resilience as a subject of strategic interest. This situation subsists despite resilience thinking being intended to bridge the conceptual divide between the natural and social sciences, as well as to connect knowledge of ecosystems with societal actions in the bid to meet the SDGs.

The paper discussed linkages and overlaps that make it possible to drive resilience through stable, flexible and adaptable sustainable strategies. The four goals of resilience (health and wellbeing, infrastructure, ecosystem and economy) align with the three major objectives driving sustainability (building infrastructural, and economics, building environment and building health and socials). Factors of office design and occupant behaviour were considered as pivotal to sustainable and resilience evaluations. The fact that employees represent the highest cost centre in office operation compels organisations to pay more attention to office design and operational conditions. Healthy office design strategies with economic values correlate with the higher productivity and sustainability needed to boost human and material resilience over time.

The office sustainable objectives and indicators were grouped into three assessment units to enhance stakeholder participation and identification of experts' focus areas during the assessment of academic offices. These were Office infrastructural and economic sustainability assessment (OIEA), Office health and social assessment (OHSA), Office environment assessment (OEA). For each of the evaluation concepts, three human behavioural theories that align with each broad grouping were evaluated. The theory of Environmentally Responsible Behaviour (ERB), Health Belief Theory and the Sustainable BToolPT model were respectively adopted in the calculation. Findings from this study may be applied in academic contexts to determine the sample number required to account for least-error factors. It is also necessary to account for the uncertainty associated with change in office occupant as well as for the institutionally allowed changes within offices.

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