INTERNATIONAL JOUNAL OF: BUILT ENVIRONMENT AND EARTH SCIENCE

TIMBOU-AFRICA ACADEMIC PUBLICATIONS
INTERNATIONAL JOURNAL, FEBRUARY, 2023 EDITIONS
VOL. 12 NO. 4 ISSN: 1881-2167

EXAMINATION OF THE CONCEPT OF RESILIENCE IN THE MANAGEMENT OF THE BUILT ENVIRONMENT OF KADUNA METROPOLIS IN NIGERIA

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ABSTRACT

Resilient cities are cities that have the ability to absorb, recover and prepare for future shocks in economic, social, environment and institutional issues. Resilient cities promote sustainable development, well-being and inclusive growth. The concept of resilient cities focuses on the economy, governance, society and environment. The aim of the study is to examine the concept of resilience in the management of the built environment of Kaduna metropolis in Nigeria based on the following objectives: the identification of concepts of resilient cities; establishing the barriers to the actualization of resilience city within

Introduction

Cities are complex socio-ecological systems that interact at the individual, community, local and national levels, before, during and after the onset of disasters. The capacity of a city to adapt and transform shapes the very nature of resilience (Esteban, 2020). Natural hazards such as flooding are one type of disturbance that prompt change in cities. Cities that have experienced a disaster often go through a series of transformations at different levels and scales. The growing concern about major threats, including climate change, environmental disasters, and other hazards, is matched with the increased interest and appeal of the concept of urban resilience (Shamsuddin, 2020).

The concept of resilience has captured the popular imagination and is increasingly utilized in cities and urban areas. Recent interest appears to coincide with growing attention and concern about threats like climate change, disease outbreaks, environmental disasters, terrorism, and other hazards (United Nations, 2015; World Bank, 2019). Resilient cities are cities that have the ability to absorb, recover and prepare for future shocks in economic, social, environment and institutional issues. Resilient cities promote sustainable development, well-being and inclusive growth. The concept of resilient cities focuses on the economy, governance, society and environment (Organisation for Economic Cooperation and Development, 2022). For resilient cities to be attained, there is the need to manage a collective capacity of the human actors in the socio-ecological system in achieving urbanization and habitable cities (Walker, Brian, Holling,

Kaduna metropolis; and determination of the drivers enhancing the management of resilience cities. A total of 200 questionnaires were distributed to respondents (i.e., Consultants, Contractors, Clients and End-users). A total of 113 valid questionnaires were retrieved from the survey which represents 57% of valid response rate and subsequently analysed using descriptive statistics with the aid of Statistical Package for Social Sciences (SPSS). It was established that, extensive coordination, maintaining adaptability, divergent time horizons, and diverse outcomes amongst others as barriers to the actualization of resilient cities. These barriers can be overcome by these established drivers; provision of essential resources required to meet a person's basic physiological needs, supports livelihoods and employment, integrated health facilities & services, & responsive emergency services, community engagement, social networks & integration, law enforcement, and contingency planning amongst others. Conclusively, these determined-drivers will play a significant role in *Enhancing Resilience of Environmental System* within cities/towns which will further help in achieving urbanization and habitable cities.

Keywords: Concept of resilient cities, drivers of resilient cities, barriers to resilient cities, built environment.

Carpenter and Kinzig, 2004; Folke, Carl, Stephen, Carpenter, Walker, Scheffer, Chapin and Rockstrom, 2010).

Over time, much attention in the area of resilience cities has focused more on the theoretical aspects of it without raising questions about its applicability (Shamsuddin, 2020). Researchers suggest the need to develop better links between urban resilience theory and practice to help in closing the implementation gap (Coaffee et al., 2018). This clearly indicates that the level of implementation/management of urban resilience ought not to be ignored or given less attention as it is being experienced. To this end, this paper seeks to examine the concept of resilience in the management of the built environment of Kaduna metropolis in Nigeria based on the following objectives: the identification of concepts of resilient cities; establishing the barriers to the actualization of resilience city within Kaduna metropolis; and determination of the drivers enhancing the management of resilience cities.

LITERATURE REVIEW

DEFINITION AND CONCEPT OF URBAN RESILIENCE

Urban resilience is a relatively new concept that still lacks a clear definition (Jabareen, 2012).

Overtime, several Scholars/Researchers have defined resilience cities from different perspectives. Manyena, et al. (2011) note that "resilience originates from the Latin *resilio, resilire or reseller*, meaning to bounce back or bounce-forward." Broadly speaking, different academic disciplines invoke resilience to describe the response of a given system to a disturbance of some kind (Vale, 2014). The term resilience has been derived from biology discipline. A biological system is defined living creatures' ability to resist and recover against a shock, disaster, disease or other changes.

The definition of urban resilience "generally refers to the ability of a city or urban systems and resistance against a set of widespread shocks and stresses" (Wikström, 2013). Urban resilience

can be considered as" the ability of a city against changes before reorganizing around a new set of structures and processes" (Alliance, 2007).

Urban resilience is the capacity or the ability of a city to digest disturbance or is the amount of disturbance that a system can digest it before the structure is changed by changing variables (Holling, 1995). Buckle (2000) views resilient cities as the quality of people, communities, agencies, and infrastructure and the capacity to reduce vulnerability. Not only lack of vulnerability but the capacity to prevent and reduce damage and then at the next stage maintenance of ideal conditions in cities as much as possible in case of incidence of harms, and then in third stage to recover from the effects. Urban resilience is called to absorption capacity and basic and special performances, as well as capacity of recovery, "Return to Balance", after disaster (Cutter, 2010).

Urban resilience is considered "capacity of damaged communities or ecosystems to digest the negative effects and rehabilitate them" (Birkmann, 2013). Concept of resilience can summarily be described as the interaction and interlinkages in human and natural systems, and the continuous adaptive cycles of growth and restructuring (Gunderson and Holling, 2002). Resilience represents a dimension of the adaptive cycle consisting of entrepreneurial exploitation, organisational consolidation, creative destruction, and restructuring (Gall, 2013).

PRINCIPLES OF RESILIENT CITIES

i. Maintaining Performance
ii. Being long-term of process
iii. Ability to learn and adapt
iv. Resiliency as dimension opposed to vulnerability

Source: Schmidt and Gardlnd (2012).

Hence, a city will be considered fully resilient when all indices, components and dimensions of resilience in that city to be placed in a better situation and in growth and promotion mode. Perhaps an uneven promotion of different dimensions in the route of urban resilience will not much be led to the overall resilience of a city and its people. Leading socio-economic dimension as the dimension that has the most relationship with people and citizens is very important in resilience of cities, but is not sufficient in any way and should not cause neglect of planners and experts to help promoting the situation, and improving other dimensions in the route of resilience of cities Rezaei, et al. (2016).

CHARACTERISTICS OF RESILIENT CITIES

McEntire (2014) has stated the characteristics of resilient cities characteristics as follows:

i. Effectuation: Reliable and validated, tolerant, being reliable.
ii. Redundancy: Having overcapacity and appropriate precautionary reserve.
iii. Consciousness and being wise: Ability to adapt and having a precaution.
iv. Responding to hazard: Ability of community to move quickly, ability to decide to reorganize in specific time in times of crisis.
v. Revival: Adaptability, correct the situation and rehabilitation.

Resilience in the long-term requires a greater ability to rebound to the first place from the shock to the system, and requires the ability to adapt to subtle changes over time and development of the city in long-term and flexible way (Clark, Huang and Walsh, 2010).

QUALITIES OF RESILIENT SYSTEMS

Resilient systems withstand, respond to, and adapt more readily to shocks and stresses to bounce back stronger after tough times, and live better in good times. Rockefeller (2015) has averred that resilient cities demonstrate seven qualities as highlighted below:

i. Reflectiveness
ii. Resourcefulness
iii. Robustness
iv. Redundancy
v. Flexibility
vi. Inclusiveness
vii. Integration

Reflectiveness and resourcefulness are about the ability to learn from the past and act in times of crisis. Individuals and institutions that are reflective use past experience to inform future decisions, and will modify standards and behaviours accordingly. For example, planning processes that are reflective are better able to respond to changing circumstances.

Resourceful people and institutions are able to recognise alternative ways to use resources at times of crisis in order to meet their needs or achieve their goals. For example, although households in cities in Chile's Central Valley use water provided by municipal networks on a daily basis, the service is often interrupted after strong earthquakes. As a response, many households maintain wells to continue provision of water.

Robustness, redundancy and flexibility are qualities that help to conceive systems and assets that can withstand shocks and stresses as well as the willingness to use alternative strategies to facilitate rapid recovery. Robust design is well-conceived, constructed and managed and includes making provision to ensure failure is predictable, safe, and not disproportionate to the cause. For example, protective infrastructure that is robust will not fail catastrophically when design thresholds are exceeded. Redundancy refers to spare capacity purposively created to accommodate disruption due to extreme pressures, surges in demand or an external event. It includes diversity where there are multiple ways to achieve a given need. For example, energy systems that incorporate redundancy provide multiple delivery pathways that can accommodate surges in demand or disruption to supply networks.

Flexibility refers to the willingness and ability to adopt alternative strategies in response to changing circumstances or sudden crises. Systems can be made more flexible through introducing new technologies or knowledge, including recognising traditional practices. For example, in times of crisis, cities may redeploy public buses for emergency evacuations. Inclusive and integrated relate to the processes of good governance and effective leadership that ensure investments and actions are appropriate, address the needs of the most vulnerable and collectively create a resilient city – for everyone.

Inclusive processes emphasise the need for broad consultation and 'many seats at the table' to create a sense of shared ownership or a joint vision to build city resilience. For example, early warning reach everyone at risk will enable people to protect themselves and minimise loss of life and property.

Integrated processes bring together systems and institutions and can also catalyze additional benefits as resources are shared and actors are enabled to work together to achieve greater ends. For example, integrated city plans enable a city to deal with multidisciplinary issues like climate change, disaster risk reduction or emergency response through coordination.

Table 1: Drivers of Resilient Cities

S/N	Drivers of SC
1	Meets Basic Needs: Provision of essential resources required to meet a person's basic physiological needs.
2	Supports Livelihoods and Employment: Livelihood opportunities & support that enable people to secure their basic needs. Opportunities might include jobs, skills training, or responsible grants & loans.
3	Ensures Public Health Services: Integrated health facilities & services, & responsive emergency services. Includes physical & mental health, health monitoring & awareness of healthy living & sanitation.
4	Promotes Cohesive and Engaged Communities: Community engagement, social networks & integration. These reinforce collective ability to improve the community & require processes that encourage civic engagement in planning & decision-making.
5	Ensures Social Stability, Security and Justice: Law enforcement, crime prevention, justice, & emergency management.
6	Fosters Economic Prosperity: While Driver 2 is about individual livelihoods, Driver 6 is about the economy on a wider scale. Important economic factors include contingency planning, sound management of city finances, the ability to attract business investment, a diverse economic profile & wider linkage.
7	Enhances and Provides Protective Natural & Man-Made Assets: Environmental stewardship, appropriate infrastructure, effective land use planning & enforcing regulations. Conservation of environmental assets preserves the natural protection afforded to cities by ecosystems.
8	Ensures Continuity of Critical Services: Diversity of provision, redundancy, active management & maintenance of ecosystems & infrastructure, & contingency planning.
9	Provides Reliable Communication and Mobility: Diverse & affordable multimodal transport networks & systems, ICT & contingency planning. Transport includes the network (roads, rail, signs, signals etc.), public transport options & logistics (ports, airports, freight lines etc.).
10	Promotes Leadership and Effective Management: Relating to government, business & civil society. This is recognisable in trusted individuals, multistakeholder consultation, & evidence-based decision-making.
11	Empowers a Broad Range of Stakeholders: Education for all, access to up-todate information, & knowledge to enable people & organizations to take appropriate action. Along with education & awareness communication is needed to ensure that knowledge is transferred between stakeholders & between cities.
12	Fosters Long-Term and Integrated Planning: Holistic vision, informed by data. Strategies/plans should be integrated across sectors & land-use plans should consider & include different departments, users & uses. Building codes should create safety & remove negative impacts.

Source: Rockefeller Foundation (2015).

Table 2: Barriers to Resilient Cities

S/N	Barriers to Resilient Cities
1	Extensive coordination.
2	Maintaining adaptability.
3	Diverting time horizons.
4	Diverse outcomes.
5	Availability of resources.
6	The relationships between (and within) government agencies.

7	The commitment of officials.
8	Reporting procedures and mechanisms.
9	Timing.
10	Interpret messages.

Sources: Shamsuddin (2020); (Grindle, 2017).

MATERIALS AND METHODS

MATERIALS

Conference papers, academic research journals and text books were extensively used in the review of literature.

METHODS

Literature review and questionnaire survey

The study adopted two approaches (*literature review* and *questionnaire survey*) in gathering secondary and primary data with a view to achieving the research aim. Extensive *literature review* helps in getting relevant information on definition and concept of resilient cities, principles and characteristics of resilient cities, drivers of resilient cities and barriers to resilient cities that are established around the globe. The drivers and barriers identified from literature were employed to construct the *questionnaire*. A questionnaire is mostly used for descriptive and analytical surveys to find out the opinions, facts, expectations and aspirations, membership of various groups, and attitudes and perceptions and views of respondents relevant to the study (Siniscalco and Auriat, 1998; Naom 1998; Enshassi et al., 2010). Another reason for adopting questionnaire survey is because it offers researchers the opportunity to reach a large number of potential respondents in different locations (Russell, 2006).

POPULATION OF THE STUDY

The population for this study comprises the consultants, contractors, clients/end-users and staff of development agencies involved in the construction business.

SAMPLE

Inferences about the population for this research was made on the basis of a properly designed and well selected sample. Moreover, in this research, samples were drawn from the target population based on a statistically determined, efficient sample size so as to estimate some parameters of the population.

SAMPLE SIZE DETERMINATION

There is no documented evidence that indicates or shows the total number of consultants, contractors, clients and end-users within the area of this study. Therefore, the population for this study is considered as infinite (unknown). Based on the foregoing, Cochran's (1977) formula for the determination of sample size was adopted as expressed below:

Assumption

In order to obtain the most efficient, representative sample, for the research, the study used the following Cochran's formula for sample size determination.

$$n = \left(\frac{Z_{\alpha/2}}{2\delta} \right)^2$$

TIJBEES
ISSN: 1881-2167

Where;
n=Sample size to be determined
$\delta = 0.08$ (The chosen margin of error for the survey)

The value of the standard normal ordinate at $\alpha\%$ level of significance is $Z_{\alpha/2}$. At the 5% level of significance $Z_{\alpha/2} = Z_{0.025} = 1.96$. The sample size is finally determined as follows:

$$n = \left(\frac{Z_{\alpha/2}}{2\delta}\right)^2 = \left(\frac{1.96}{2 \times 0.08}\right)^2 = 200$$

That is, we need a sample size of at least *200* to arrive at a sample with a sampling error of at most 8%.

STRATIFIED RANDOM SAMPLING

Stratified random sampling was used in determining of the sample size. This is because the population of the study is not known. In stratified random sampling, the population units are divided into a number of strata. Samples of predetermined sizes are drawn independently from each stratum by simple random sampling. Since a stratified random sampling consists of units selected separately from each stratum (respondents' category), such a sample is expected to be better representation of the population (Levy & Lemeshow, 2008). The following table summarizes the sample allocation in this stratified random sampling:

Table 3: Sample Sizes in Each Stratum

Strata (Type of Respondents)	Sample size
Clients	50
Consultants	50
Contractors	50
End-users	50
Total	200

RESULTS AND DISCUSSIONS

RESULTS

Survey on respondents' status in the construction industry

The survey shows that out of the two hundred (200) questionnaires administered, a total of 113 valid questionnaires were retrieved from the survey which represents 57% of valid response rate. The responses from each category of the respondents are as follows: Clients constitute 24 (21.23%), consultants form 28 (24.78%), Contractors form 29 (25.67%) and end-users form 32 (28.32%).

Survey on respondents' qualification

The data collection on respondents' qualification shows that the respondents with Ordinary National Diploma (OND) constitute 10%, respondents with Higher National Diploma (HND) form 13%, respondents with Bachelor of Science (BSc) form 39%, respondents with Masters of Science (MSc) constitute 29% and respondents with PhD form 9%. That shows majority of the

respondents are educated. That would further authenticate the reliability and validity of data obtained from the survey.

Survey on respondents' experience in the construction industry

Respondents who are below 5 years constitute 21%, 5-10years forms 29%. 11-15years form 19%, 16-20years form 18% and above 20years constitute 13%. That has shown majority of the respondents are highly experienced in the construction industry. That has also helped the validity and reliability of data obtained in this study.

The results of the assessment are provided below.

Table 4: Ranking on the Drivers of Resilient Cities

The rating scales for weighted mean values are as follows: 0-1.49= Not Important (NI), 1.5-2.4= Least Important (LI), 2.5-3.4= Fairly Important (FI), 3.5-4.4= Important (I), 4.5-5.00 = Most Important (MI).

S/N	Drivers of Resilient Cities	Weighted Mean
1	Meets Basic Needs: Provision of essential resources required to meet a person's basic physiological needs.	4.77
2	Ensures Public Health Services: Integrated health facilities & services, & responsive emergency services. Includes physical & mental health, health monitoring & awareness of healthy living & sanitation.	4.72
3	Supports Livelihoods and Employment: Livelihood opportunities & support that enable people to secure their basic needs. Opportunities might include jobs, skills training, or responsible grants & loans.	4.72
4	Ensures Social Stability, Security and Justice: Law enforcement, crime prevention, justice, & emergency management.	4.61
5	Promotes Cohesive and Engaged Communities: Community engagement, social networks & integration. These reinforce collective ability to improve the community & require processes that encourage civic engagement in planning & decision-making.	4.54
6	Promotes Leadership and Effective Management: Relating to government, business & civil society. This is recognisable in trusted individuals, multistakeholder consultation, & evidence-based decision-making.	4.35
7	Fosters Economic Prosperity: Important economic factors include contingency planning, sound management of city finances, the ability to attract business investment, a diverse economic profile & wider linkage.	4.08
8	Enhances and Provides Protective Natural & Man-Made Assets: Environmental stewardship, appropriate infrastructure, effective land use planning & enforcing. regulations. Conservation of environmental assets preserves the natural protection afforded to cities by ecosystems.	4.04
9	Ensures Continuity of Critical Services: Diversity of provision, redundancy, active management & maintenance of ecosystems & infrastructure, & contingency planning.	3.78

10	Provides Reliable Communication and Mobility: Diverse & affordable multimodal transport networks & systems, ICT & contingency planning. Transport includes the network (roads, rail, signs, signals etc.), public transport options & logistics (ports, airports, freight lines etc.).	3.65
11	Empowers a Broad Range of Stakeholders: Education for all, access to up-to date information, & knowledge to enable people & organizations to take appropriate action. Along with education & awareness communication is needed to ensure that knowledge is transferred between stakeholders & between cities.	3.36
12	Fosters Long-Term and Integrated Planning: Holistic vision, informed by data. Strategies/plans should be integrated across sectors & land-use plans should consider & include different departments, users & uses. Building codes should create safety & remove negative impacts.	3.18

Source: Research survey (2022).

Table 5: Ranking on the Barriers to Resilient Cities

The rating scales for weighted mean values are as follows: 0-1.49= Not Severe (NS), 1.5-2.4= Least Severe (LS), 2.5-3.4= Fairly Severe (FS), 3.5-4.4= Severe (S), 4.5-5.00 = Very Severe (VS)

S/N	Barriers to Resilient Cities	Weighted Mean
1	Extensive coordination.	4.65
2	Availability of resources.	4.58
3	The relationships between (and within) government agencies.	4.43
4	Timing.	4.43
5	Maintaining adaptability.	3.96
6	The commitment of officials.	3.84
7	Reporting procedures and mechanisms.	3.75
8	Interpret messages.	3.56
9	Diverse outcomes.	3.43
10	Divergent time horizons.	3.38

Source: Research survey (2022).

CONCLUSION

The management of built environment based on the concept of 'resilient cities' within Kaduna metropolis is affected by some barriers which include: *extensive coordination, availability of resources, the relationships between (and within) government agencies, timing, maintaining adaptability, the commitment of officials, reporting procedures and mechanisms interpret messages, diverse outcomes and divergent time horizons*. And these barriers hinder the smooth management and implementation towards achieving resilient cities. However, it was found that, the following drivers enhance the smooth implementation of resilient cities: *meets basic needs, ensures public health services, supports livelihoods and employment, ensures social stability, security and justice, promotes cohesive and engaged communities, promotes leadership and effective management, fosters economic prosperity, enhances and provides protective natural & man-made assets, ensures continuity of critical services* among others. Although, the drivers influence is in order of priority as ranked by the respondents in Table 4. The adoption

of the drivers of resilient cities will help in enhancing resilience of environmental system within cities/towns which will further help in achieving urbanization and habitable cities.

RECOMMENDATIONS

It can be deduced that, the determined barriers to resilient cities can be overcome by appropriate utilization of drivers and frameworks for the management of resilient cities. A way forward to an effective implementation of resilient cities requires a multifaced collaboration among the key stakeholders within the built environment. Also, there is the need for advocacies and sensitization of the key stakeholders within the built environment on the benefits of urbanization and habitable cities. Subsequent work in this area should validate the findings of this research or otherwise.

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