A conceptual framework for evaluating public housing for resilience to rapid population growth

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Abstract. The concept of resilience is increasingly being used in discourses on cities. However, there is paucity of studies on the evaluation of public housing for resilience to urban population growth, especially in a developing country like Nigeria. This paper explored the concept of resilience on housing, and proposed a conceptual framework for the evaluation of public housing towards achieving resilience to the impacts of rapid population growth in cities. The methodology adopted included mapping the multidisciplinary data sources; reviewing the literature and categorizing the selected data; identifying and naming the concepts; deconstructing and categorizing the concepts and systematic integration of the concepts to form the framework. The basic concepts identified in the literature for studying housing for city resilience in the face of rapid population growth were the vulnerability, adaptability and systems thinking theories. Based on these construct of theories, the study developed the conceptual framework around four key components. These components were (i) the impacts of rapid population growth on the social, economic and environmental fabrics of the city, (ii) the strategies or interventions that the actors can adopt through design and development characteristics, and building adaptive capacities towards the impacts, (iii) the effect of these strategies and interventions on the design and development of public housing and (iv) the systemic approach towards optimising the capacity of public housing schemes to absorb the adverse impacts of rapid population growth. This study contends that theoretical approach is important in understanding the development of housing that would promote city resilience in the face of growing negative impacts of rapid urbanisation in developing countries. It suggests the adoption of the proposed conceptual framework as guidelines to architects and other housing development professionals, as an evaluation parameter for resilience research and solving housing delivery problems in cities of developing countries.

Keywords: Conceptual framework, evaluation of public housing, resilience, rapid population growth, theoretical framework.

1. Introduction

The concept of resilience is increasingly being used in current discourse on cities; hence, it is receiving research attention amongst the different stakeholders in the field of sustainable human settlements. Resilient cities are those cities able to respond and adapt to changing circumstances[1]; with strategies developed for coping with shocks and stresses associated with social, economic and environmental
challenges [2, 3, 4]. In addressing these shocks and stresses, a city becomes more able to respond to adverse events or threats, and is better able to deliver basic functions to all populations[5]. The Literature has identified rapid growth in human population in urban centres and growing mega-cities as a threat to city resilience [6]. Such threat is an indication of the need for more resilient cities that would have the capacity to withstand the shocks of population growth, economic crisis, rapid demographic shifts in population, and environmental catastrophes[7]. In this regard, planning for housing in the face of rapid population growth will require innovative strategies to foster a resilient city.

Hitherto, there have been research on the evaluation of public housing for adequacy of spaces, residents’ satisfaction, residents’ or developers’ perceptions of adequacy of services, policy development and so on. Frameworks for the evaluation of public housing have skewed towards the multidisciplinary approach to housing-related studies[8] and evaluating public housing for sustainability[9]. However, there is a paucity of empirical studies and literature on the evaluation of public housing for resilience to rapid population growth. Although theories exist which provide understanding on city resilience, empirical framework that can provide comprehensive understanding of the practical steps required in analysing and designing mass housing schemes that enhance the capacity of urban residential fabrics to absorb the impacts of rapid population growth are scarce[10]. Hence, the framework developed in this study seeks to offer a logical structure of broad ideas that can help in providing proper understanding of how mass housing schemes can improve city resilience to demographic forces.

This study views demographic factors as major threats to city resilience, particularly, in many developing countries in sub-Saharan Africa where rapid population growth has continued to exacerbate social, economic and environmental challenges. As part of the ongoing efforts to address these challenges and achieve sustainable, all-inclusive and safe human settlements, this study aims at developing a robust framework for evaluating public housing developments for resilience to impacts of rapid population growth in cities of developing countries such as Nigeria. This research is important because it suggests the adoption of the conceptual framework as an evaluation parameter for resilience research in housing development, with the view to help address the adverse impacts of rapid population growth on the city fabrics, as well as solving the housing delivery challenges in cities of developing countries.

2. The Concept of resilience
The review of literature identified three basic criteria of resilience. First, resilience means the presence of a trauma that acts on an entity[12]. The trauma could be flood, fire, earthquake, pandemic (e.g. CORVID-19), greenhouse gases, or rapidly population growth as is the case in this study. The entity acted upon could be persons, environments, cities or aspects of the city functions such as climate, economy or housing. Second, two approaches to resilience derived from the literature were resilience as recovery and resilience as adaptability [13, 14]. Resilience as recovery deals with the capacity of the entity or system to bounce back after a shock, stress or disturbance. This implies that the system yields to the stress, but has strategies for effective recovery. It is reactive, and thus mostly applied to trauma that is sudden, drastic and sometimes unpredictable such as flood, fire or earthquake disasters. Then resilience as adaptability connotes the ability of a system to persevere, adapt to or absorb a trauma, stress or disturbance, without breaking down, while still maintaining its functions. Hence, it is proactive, and applies to trauma that develops gradually over time, such as increasing human population in a given locality. Third, resilience is also seen as multidisciplinary [15, 16], comprising interdependent factors such as associational, political, economic and environmental factors that influence the morphology and spatial quality of human settlements with far-reaching implications on the quality of city residents[17]. Since all categories of human settlements have components that are interdependent on one another, any shock to a city even if it only directly impacts one aspect, will have ripple effects.
on other parts. Therefore, to achieve resilience, the whole system needs to be viewed holistically. Regarding the evaluation of public housing for resilience to rapid population growth, this study recognises that human settlements, especially urban areas are constantly under trauma due to the impact of increasing population on their social, economic and environmental fabrics. This means that urban areas are vulnerable to the impacts of rapid population growth. Consequent upon this, there is a need to explore various strategies for reducing or mitigating the impact of these on the city fabrics.

3. Theories in resilience research
From the survey of literature, a number of theories identified to be relevant in resilience research include, but not limited to, the vulnerability theory, adaptability theory and system theory.

3.1. Vulnerability theory
Vulnerability is a condition in the social system that is unsafe, and poses potentials for harm; or a condition that increases the susceptibility for disaster to occur [6, 18]. It expresses the degree to which a system is susceptible to damage. Some researchers view vulnerability as the opposite of resilience while others see vulnerability as being a component of resilience. According to [19], resilience is a negative function of vulnerability and a positive function of adaptive capacity, where vulnerability reduces and adaptive capacity increases, in order to achieve resilience. Mapping of vulnerabilities, therefore, becomes significant for identifying risks, disasters and future uncertainties in cities [20]. To support this assertion, the vulnerability analysis matrix developed as part of the conceptual framework for resilience planning [16] involves examining quantitative as well as qualitative variables of demography of vulnerability; informality; uncertainty; and spatial distribution of vulnerability. It will be important to identify vulnerabilities of housing to stresses of rapid population growth, in order to help suggest strategies to promote housing for resilient cities.

3.2. Adaptability theory
In resilience research, adaptability is referred to as the capacity of actors, people, groups or individuals in a social-ecological system to influence, manage, or build resilience through collective actions [21, 22]. This study works with this definition of adaptability in the field of social-ecological systems and also in housing research. Adaptability in these fields explains adaptability as actions that may be necessary to cope with unforeseen changes and vulnerabilities. The capacity of humans to manage resilience determines whether they can successfully avoid crossing into an undesirable state or succeed in crossing back into a desirable one. To apply adaptability in resilience studies, [23] explained that adaptability must be made to correspond with the identified aspects of resilience. Furthermore, [21] posited that while resilience is required to absorb change; adaptability among actors (architects, urban planners, housing developers, policy makers) is required to reinforce, reorganize and sustain desired social-ecological states in the face of such changes. This implies that proactive strategies that could be adopted by the housing design and development professionals to respond, adapt and cope with the identified vulnerabilities fall under adaptive measures. This ability to respond to, and shape ecosystem dynamics in an informed manner [21] makes adaptability theory relevant in studies that seek to investigate housing development strategies that can promote resilience. Moreover, [21] also stated that adaptability requires capacity building, incentives and learning capabilities in institutions and organizations for a governance structure that allows adaptive management of ecosystems.

3.3. Systems Thinking Theory
A system is an interconnection of elements or sets of elements, in such a way that changes in some elements produce changes in other parts of the system [24]. Noting that changes in one element of the system may induce changes in another element, systems thinking thus anticipates and predicts outcomes of connections between the elements of the system and how to avoid catastrophic events that may arise thereof. Thus, because of its dynamism, a system’s behaviour can be understood by looking at the entire system and not its elements in isolation [25]. In cities, which are complex living systems...
undergoing numerous dynamic changes at any given time, systems thinking provides a platform for a more holistic approach of development [25, 26]. Therefore, in evaluating public housing development strategies that can promote resilience in the face of rapid population growth, it is important that the patterns that connect the social, economic and environmental stresses of the system be analysed. This would promote coherent diagnoses of the system and create a harmonious integration of the various components.

The foregoing implies that evaluation of public housing for resilience to rapid population growth would view the systems thinking concepts of resilience drawn from the multiplicity of socio-economic and environmental factors that characterise housing for resilient city, since factors of resilience are not evaluated in silos but holistically. That is, the simultaneous association of the social, economic and environmental factors of the impact of rapid population growth on the city. In this regard, based on the consideration of risks exposure, adaptive capacity and holistic consideration for solutions, vulnerability, adaptability and system thinking theories are the theories considered as the concepts of resilience applicable for the evaluation of selected for this study.

4. Conceptual Framework Building Process

In the development of the conceptual framework presented in this paper, the study consulted the stages in the building of a conceptual framework as outlined by Eizenberg and Jabareen[11]. These involved (i) mapping the multidisciplinary data sources (ii) reviewing the literature and categorizing the selected data (iii) identifying and naming the concepts (iv) deconstructing and categorizing the concepts (v) integrating the concepts (vi) synthesising and re-synthesizing the (vii) validating the conceptual framework. However, the last stages involving synthesizing and validating of the proposed conceptual framework are beyond the scope of this paper.

The researchers conducted a preliminary search in Google scholar to find academic papers on resilience, evaluation of public housing and rapid population growth, with other terms such as conceptual framework, city, urban planning, vulnerability, adaptability and systems thinking. These were the words and phrases used as the key words in the searches conducted. A majority of the publications on city resilience reported on climate change and natural disasters, and some other on conceptual framework on other aspects of housing. Even though the search found few publications on conceptual framework for housing development and delivery, the applicable publications were analysed to distil resilience related criteria. The review also included the reference section of the publications to find related publications. In all, a total number of 204 publications including review articles, research articles, conference proceedings, books and book chapters were acquired. This paper draws on insights from 48 of those publications.

Multidisciplinary data sources for this study came from different fields of study such as sociology, psychology, ecology, urban planning, economics, housing studies and architecture. The review and classification of the literature covered the social, economic and environmental aspects of housing for resilience to rapid population growth. The concepts of evaluation of public housing for resilience to rapid population growth were identified through the vulnerability, adaptability and system thinking theories. The literature identified a number of vulnerability, adaptability and system thinking variables that influence housing for resilient cities. These variables were integrated into a conceptual framework having four key components. These components were (i) the impacts of rapid population growth on the social, economic and environmental fabrics of the city (ii) the strategies or interventions that the actors have adopted through design and development characteristics (3) the effect of this strategies and interventions on the design and development characteristics of public housing, and (4) the systemic approach towards optimising the capacity of public housing schemes to absorb the adverse (social, economic, environmental) impacts of rapid population growth in the study area.
4.1 The conceptual framework

The study developed a conceptual framework (Figure 1) based on the tenets of the identified theories and other relevant concepts in resilience and housing research. The framework proposes that if the vulnerabilities associated with the social, economic, and environmental effects of rapid population growth on housing are identified, through building of knowledge of adaptability, actors (architects, designers, and urban planners) would manage, or build resilience through collective action on the adaptive capacities towards such vulnerabilities. The elements (social, economic, and environmental) of such adaptive capacities would be regarded holistically through systems thinking, and not each element in isolation. The framework identified a number of vulnerability, adaptability and systems thinking variables that can influence housing for resilient city. These variables were integrated into a conceptual framework to include (i) the impacts of rapid population growth on the social, economic and environmental fabrics of the city (ii) the strategies or interventions that the actors would adopt through design and development characteristics, as building adaptive capacities towards the identified vulnerabilities; (iii) the effect of this strategies and interventions on the design and development characteristics of public housing; and (iv) the systemic approach towards optimising the capacity of public housing schemes to absorb the adverse (social, economic, environmental) impacts of rapid population growth.

A thorough examination of the conceptual framework displayed in Figure 1 reveals that the key assumption study is that the impact of rapid population growth on residential neighbourhoods are in three key dimensions: social, economic and environmental. Consequently, these three dimensions of impacts should be taken into consideration at the design, planning and development stages of public housing projects by the developers, if the intention is to adequately meet the need of the target population and contribute to the resilience of urban neighbourhoods. The study also assumed that the need to contain the identified three dimensions of impacts should ideally form part of the key determinants of housing delivery strategies engaged in the development of public housing projects. Therefore, the framework also proposes that the right combination of the social, economic, demographic and environmental features of housing projects as well as the housing delivery strategies can have a significant influence on the design and development of public housing schemes. The implication of this is that the proposed framework sought to establish that among the factors that determine the extent to which housing can contribute to the capacity of the public housing to absorb the impact of rapid population growth, are the design and development characteristics of such housing schemes.

In addition, viewed from the lens of systems theory, the conceptual framework also proposed that housing for resilient city is a product of several factors. These include the nature of the impact of rapid population growth; the social, economic, demographic and environmental contexts of the neighbourhoods where public housing schemes are located; the housing delivery strategies used in the development of the housing schemes; as well as the housing units and neighbourhood characteristics. Another basic assumption of the conceptual framework is that there is a relationship between the nature of social, environmental, and economic impacts of rapid population growth, the housing delivery strategies, housing characteristics, location of housing projects and the capacity of housing schemes to contribute to city resilience when it comes to absorbing the impacts of rapid population growth. Emanating from this is the view that among the factors that determined the extent to which housing can contribute to the capacity of the residential neighbourhoods of cities to absorb the impact of rapid population growth, are the design and development characteristics of such housing schemes.
5. Conclusion

This study developed a conceptual framework for the evaluation of public housing development towards achieving resilience to the impacts of rapid population growth in cities. Three basic theories for studying housing for city resilience identified in the literature reviewed are the vulnerability, adaptability and systems thinking theories. The framework developed based on the different strands of literature from these three theories and key concepts associated with resilience and housing research. The basic assumption of the conceptual framework is that there is a relationship between the nature of social, environmental, and economic impacts of rapid population growth, the housing delivery strategies, housing characteristics, location of housing projects and the capacity of housing schemes to contribute to city resilience when it comes to absorbing the impacts of rapid population growth. This study, thus, implies that theoretical approach is important in understanding the development of housing that would promote city resilience in the face of growing negative impacts of rapid urbanisation in developing countries. It suggests the adoption of the framework as an assessment parameter for resilience research in the field of housing, as contribution towards solving housing delivery problems in cities of developing countries.
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