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Methods of Building Resilience Valuation: A Literature Review

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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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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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