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Author(s):
Carbone, Carmelo; De Filippi, Francesca; Becchio, Cristina; Campagnaro, Cristian

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The benefits of building adaptability as a strategy for Sustainable Affordable Housing

Carmelo Carbone[1*], Francesca De Filippi[1], Cristina Becchio[2], Cristian Campagnaro[1]

[1] Department of Architecture and Design, Politecnico di Torino, Torino, Italy
[2] Department of Energy, Politecnico di Torino, Torino, Italy

[*]E-mail: carmelo.carbone@polito.it

1. Introduction

By 2030, UN-Habitat estimates that 3 billion people will need access to adequate, safe and affordable housing (AH) (1). Current building solutions often exhibit low affordability, quality and sustainability. As a result, researchers and organizations are advocating for Sustainable Affordable Housing (SAH) to address the environmental, social and economic challenges (3).

Housing inadequacy, user dissatisfaction and the effects of climate change limit the achievement of the SDG target for AH, which, in many cases, lacks resilience to adapt to both social and environmental changes (4), constraining the attainment of other related targets. Buildings that fail to meet -or cannot be easily adapted to- evolving needs may prompt informal interventions or result in significant increases in energy consumption and emissions, disrepair, vacancy or health risks. The adaptability of housing to future needs has been identified as an effective strategy for achieving a SAH (8) and a critical factor in the assessment of sustainable housing programs (5) in response to environmental and social changes.

Nonetheless, research on building adaptability in AH is limited, often focusing on specific aspects, while practical implementation occurs through isolated actions or case studies, lacking a systematic approach and knowledge. This research identifies potential benefits of implementing adaptability in AH through a systematic approach - the first step toward understanding the rationale and methods for its systematic and holistic integration. It moves beyond the prevailing practice that views affordability through an economic lens and advocates for a broader approach, considering multiple factors for quality of life, as envisioned by some authors (6).

2. Methods

A Systematic Literature Review (SLR) was conducted in January 2024 following the Prisma methodology and using the Scopus database to identify key and effective strategies for achieving a SAH. The term strategy is one of the most frequently used terms to describe concepts to address housing challenges for low-income earners (7) and achieving a SAH.

The following search string was used: ‘sustainab* affordable housing’. Additional sources were retrieved from Scopus, Google Scholar, and snowball sampling using the string “sustainab* AND affordable AND housing AND strateg*”, resulting in a pool of 212 sources, of which 86 were deemed relevant. Documents were included if they addressed affordable housing and housing affordability in relation to sustainability, and excluded those that did not meet criteria, duplicates, out-of-scope journals, or inaccessible documents, with accessible abstracts included.

Potential strategies were mapped through co-occurrence analysis. Finally, this study further investigates design for adaptability, which demonstrates synergies with other strategies and has emerged as an effective approach for SAH. Through thematic analysis, this study then explores its potential benefits that contribute to the development of SAH.

3. Results and Discussion

Introduction to building adaptability - Building adaptability has been explicitly experimented since the early 20th century and can be broadly defined as the "ability to be changed or modified to make suitable for a particular purpose" (9), or as "the capacity of a building to accommodate effectively the evolving demands of its context, thus maximizing value through life" (10).

The drivers of change can be either external or internal to the building and can be related to environmental, social, economic, legislative and technical factors (11). These drivers trigger physical changes within - and to - the building and can be categorized into six main types: task, space, performance, function, size, and location - although numerous other taxonomies have been proposed in the literature. These categories correspond to distinct adaptability strategies, namely adjustable, versatile, refitable, convertible, scalable and movable (12).

The practical implementation of building adaptability is fostered with different approaches including standards, regulations, protocols and evaluation methods – such as rating systems or evaluation methods from scientific literature. However, specific actions and requirements for different adaptability types are not clearly defined. Nevertheless, empirical evidence from built case studies demonstrates both the feasibility and acceptability of building adaptability.

The benefits of adaptability for a Sustainable Affordable Housing - In general, according to the literature, building adaptability offers a range of benefits including improved change efficiency (efficiency and impacts of modification), reduced lifecycle costs, improved investment (asset) value, improved stability & transformation (permanence and change), improved operational efficiency (easier management), improved user satisfaction, legislative incentive (easier compliance), increased building longevity (13).

Specifically, in AH, adaptability provides several benefits, aligned with the definition of AH - "housing which is adequate in quality and location and does not cost so much that it prohibits its occupants from meeting other basic living costs or threatens their enjoyment of basic human rights" (14). For housing to be considered adequate, it must, at a minimum, meet a set of criteria: Security of tenure; Availability of services, materials, facilities and infrastructure; Affordability; Habitability; Accessibility; Location and Cultural adequacy (15).

In this context, building adaptability can enhance housing adequacy in many ways. By potentially reducing running costs such as energy costs or refurbishment costs (16), it contributes to improving affordability. Design strategies to favour incremental housing, which help mitigate overcrowding, and improvements in structural robustness and indoor environmental quality (11) increase habitability. Accessibility can be increased by favouring age-friendly design or the ability to accommodate emerging disabilities (17). Additionally, adaptability fosters cultural adequacy by favouring adaptation to user preferences and needs (18).

Beyond housing adequacy requirements, a SAH must also provide climate change resilience, as mentioned in the Social Determinants of Health by WHO, where protection from climate change is recognized alongside housing adequacy criteria. Building adaptability strengthens climate resilience through robustness and resilience, improving thermal comfort and reducing energy consumption, particularly in response to temperature-related impacts (19).

Finally, by defining the framework of transformation, adaptability serves as a key strategy in mitigating housing informality and promoting long-term sustainability (20).

4. Conclusion

The research highlighted the potential of Design for Adaptability as a strategy for achieving a SAH, given its capacity to provide housing solutions that are robust and resilient to evolving social, environmental, economic, legislative and technical needs, arising during the building lifecycle. This calls for the need to develop guidelines and tools for long-term sustainability through future-proof design, minimizing environmental impacts, ensuring adequate quality and limiting costs.

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