HOUSING TRANSFORMATION IN SEARCH OF WELL-BEING

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ABSTRACT

Transformations of houses have been studied over a long period in the world. Many Post-Occupation-Evaluations (POEs) demonstrate the alterations occurring in social housing (SH), both in self-built, and public projects in Brazil. These transformations have specific objectives, such as increased space, refurbishment, and improvement, or upgrading. However, the resulting conditions may present losses in environmental comfort, which can affect the well-being of dwellers. Forty-four studies were analysed through a critical study using a Systematic Literature Review (SLR) method to understand what desires stimulate SH projects' upgrading and how transformations impact well-being. The motivation for this study is confirmed by results that show a need to guide improvements in SH through a participatory process to reduce costs, both construction and social costs, to improve the quality of life of low-income families.
Keywords: Transformation; Social Housing; Upgrading; Well-being; Brazil.

RESUMO

As transformações de habitações têm sido estudadas ao longo dos anos, em todo mundo. As Avaliações Pós-Ocupação (APOs) evidenciam a ocorrência de alterações em Habitações de Interesse Social (HIS), tanto em projetos de autoconstrução, quanto em HIS no Brasil. Estas transformações têm objetivos específicos, tais como: aumento de espaço, reformas e melhoria, ou *upgrading*. Entretanto, as condições resultantes dessas transformações afetam o conforto ambiental, e consequentemente o bem-estar dos moradores. Quarenta e quatro pesquisas foram analisadas através de um estudo crítico usando o método de Revisão Sistemática da Literatura (RSL), com o propósito de avaliar quais requisitos estimulam melhorias em projetos de HIS, e como as transformações impactam o bem-estar dos moradores. A fundamentação para este estudo é reiterada por resultados que demonstram a necessidade de orientar melhorias em HIS, por meio de um processo participativo, de modo a reduzir custos, tanto de construção como sociais, e proporcionar melhorias na qualidade de vida das famílias de baixa renda.
Palavras-chave: Transformação; Habitação de interesse social; Upgrading; Bem-estar; Brasil.

1. INTRODUCTION

The transformation of houses is an age-old human activity, and numerous studies investigate the types of alterations executed and their reasons. The literature on housing discusses a wide range of issues to improve living conditions by altering existing buildings, especially for social housing (SH). Various terms are used to describe alterations, such as refurbishment, retrofit, renovation, and upgrading to express an increase in quality, both technically and in terms of quality of life for dwellers. For official refurbishment programs, mainly in developed countries, increasing energy efficiency and adapting to climate change are the primary objectives.

Other motivations for intervening in the existing housing stock are changes in comfort standards, ways of living, and lengthening the functional service life of buildings to avoid waste that generates financial and ecological burdens. In many cases, construction maintenance demands are coupled to infrastructure improvements in public SH, such as kitchen and bathroom reforms. Also, safety and security are essential, as are adequately heated and well-insulated homes in cold climates, for instance (POORTINGA et al., 2017; ORRELL et al., 2013; THOMSON et al., 2013). Health and well-being, including harmonious family and community life, are major goals in housing upgrading programmes. Most studies on upgrading of SH have technical goals. According to Watson et al. (2016), investigations with social goals are fewer in number, although considered essential to address issues of well-being and environmental comfort with social dividends.

In developing countries, such as Brazil, housing transformations take different forms, and challenges exist to elevate low-income families' living standards. The reduction of the housing deficit is the main aim of government housing programmes, which often have political and economic goals and therefore favour new constructions (MASTRODI; ZACCARA, 2016). However, data shows that upgrading the existing stock in many countries can indirectly alleviate housing deficits (BUCKLEY; KALLERGIS; WAINER, 2016; MASTRODI; ZACCARA, 2016). Transformations occur both in self-built and public SH. Self-building of houses is a common practice in many parts of the developing world. Such constructions are built over time, with multiple, often continuous changes introduced, considered transformations (TIPPLE, 2000; KOWALTOWSKI; PINA, 1995). Public SH is also transformed by users, although not necessarily legally.

To investigate the transformations (upgrading) phenomenon of SH is our motivation for the study presented here. Our research questions are:

- What are the main types of transformations found in SH in Brazil?

- What are the main declared reasons for transformations and desired improvements?
- How do transformations affect dwellers well-being and environmental comfort conditions?
- What are possible upgrading actions or opportunities to improve conditions and respond to desires?

The study identified and structured Brazilian SH transformations revealed in the literature, and discusses implications. A question was added due to the ongoing pandemic: Does the latest literature address upgrading of SH due to the pandemic of Covid-19?

2. STATE OF THE ART

The literature on housing transformations is extensive. For the last fifty years, research shows an interest in the changes introduced to houses, as self-initiated actions or as official refurbishment programs of SH. For refurbishment, retrofit, and renovation, the literature discusses a wide range of issues of improving SH projects' sustainability performance and living conditions. Numerous case studies show that the technical process to refurbish is complex, demanding a feasibility analysis, detailed design project, survey of costs, legislation, project approval, and various steps that include the building occupants during renovation activities (MORAES; QUELHAS, 2012).

In many countries, government-sponsored financial incentives boost refurbishment activities to achieve higher sustainability ratings to comply with new global demands (EC, 2016). In developed countries, transformations are often coupled to maintenance programs and upgrading goals, on neighbourhood scales (POORTINGA et al., 2017). In contrast, the reasons for upgrading SH in developing countries, mainly through individual initiatives, are related to the predominantly poor design and construction quality of these projects (KOWALTOWSKI; GRANJA, 2011; SOARES et al., 2014; TRIANA; LAMBERTS; SASSI, 2018). In the developing world, many studies investigate transformations as social phenomena to gain knowledge on user needs and desires to support new housing projects' planning and design. Further reasons are developing assistance programs to attain positive results from transformations, to avoid waste and prevent reduced well-being. Non-economic arguments for the introduction of change in existing SH through careful and impact-sensitive processes should be explored (STENBERG, 2018). For instance, in many countries introducing improvements in SH neighbourhoods can alleviate housing deficits and social tensions (MORAES; QUELHAS, 2012; MOURATIDIS, 2020).

Users give specific reasons for intervening in their houses. Ways of living change over time. Family structures are affected, and people increasingly work from home, enabled by technology. This phenomenon is at present amplified for many by the on-going pandemic. Increasingly, a large variety of activities performed in living spaces has implications on SH design (LEDENT, 2017). Typical SH projects based on small room dimensions and multicellular house designs no longer support such new functions (DE PARIS; LOPES, 2018). Most transformations add space. In the 1990s, comparisons of self-built houses and SH projects showed a 30% difference in size, with SH dwellers intervening to gain space (KOWALTOWSKI; PINA, 1995). Many studies show that rooms are too small, and the number of rooms is considered inadequate (TAUBE; HIROTA, 2014).

Studies of housing in countries such as India and South Africa documented transformations in the 1980s. In the 1990s, several user-initiated housing transformations in Egypt, Bangladesh, and Brazil were recorded (REIS, 1995; KOWALTOWSKI; PINA, 1995; TIPPLE; AMEEN, 1999; TIPPLE, 2000). In Brazil, many POE studies of SH identify user-introduced changes, mostly in projects based on single-family houses. Numerous studies of projects of the large housing program called *Minha Casa Minha Vida* exist (BORTOLI; VILLA, 2020; SIMÕES, 2018; COSTA, 2015). Concepts associated with the transformation phenomenon are flexibility, adaptability, metamorphosis, evolution, and resilience (GARREFA et al., 2021). Transformations in multi-story projects may occur individually within the confines of private apartments, but collective interventions need planning and cooperation, not always possible or easily attained. Transformations undertaken in response to inadequate conditions do not always have positive results, as shown by many POE studies on SH projects with user-initiated, well-intentioned transformations (KOWALTOWSKI; PINA, 1995; BORTOLI; VILLA, 2020). Additions may block light and ventilation of existing spaces for instances, affecting environmental comfort conditions of houses. Construction waste is also associated. A cycle of building, breaking, and rebuilding is evident in many of the cases studied. For multi-story SH projects, such additions are predominantly on the ground floor, giving these apartments opportunities for increases in private indoor space to the detriment of the whole project's open public areas (REIS, 1995).

Many POE studies show environmental comfort conditions to be poor. In Brazil, we see a constant desire for more security and aesthetic improvements exist, such as distinguishing one's house from others or simply promoting change in appearance, exchanging floor material, upgrading and updating installations of kitchens and bathrooms (NASCIMENTO et al., 2015). These desires induce, in some cases, quite extensive changes to houses

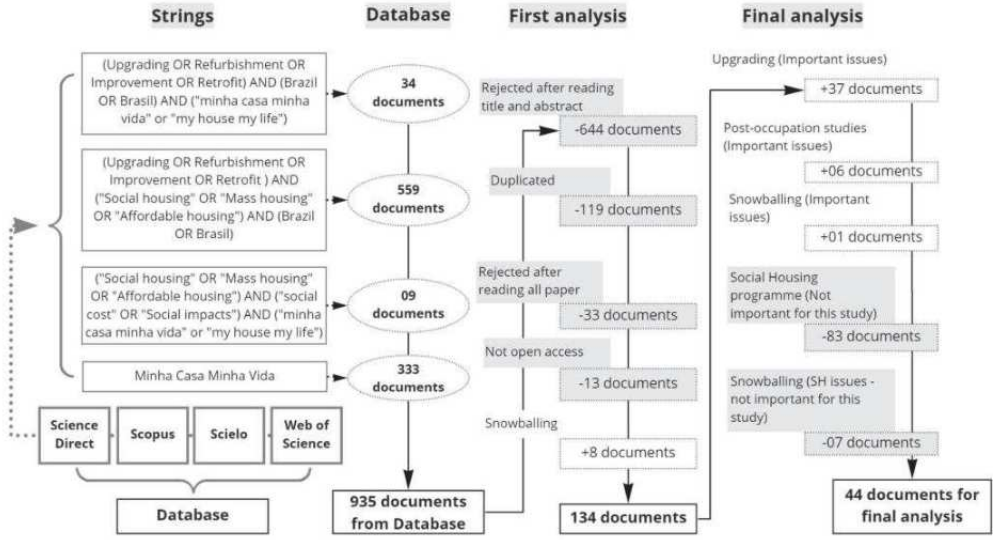
(BORTOLI; VILLA, 2020). For multi-story, multifamily SH, these requirements are similar, with added desires such as quiet living conditions, access to nature through green areas and landscaping, and parking places (KOWALTOWSKI; GRANJA, 2011). Dwellers demand individual metering of electricity and water to have better control over utility and service costs (SERAPIÃO, 2016). As security is the most crucial issue, project perimeter walls are built and controlled entrance gates installed, demanding new installations such as interphones. Different types of upgrading, such as shallow or deep invasiveness, can be distinguished. While most programmes are top-down initiatives instigated by housing commissions, bottom-up upgrading, instigated by users, has more diverse causes and aims (KARVONEN, 2013). Hochstenbach (2015) warns that top-down programmes need careful planning to avoid social exclusions, gentrification, and increased polarization between rich and poor. Upgrading of housing should improve living conditions and increase the feelings of well-being of dwellers. Further reasons for refurbishment programs relate to sustainable standards given the challenges posed by climate change and the social consequence of fuel poverty in cold climates. Energy efficiency is thus a significant issue of refurbishment programs, although not user initiated (IPCC, 2018).

Social costs (SCs) represent non-economic arguments in favour of upgrading initiatives in existing SH. SCs were defined by KAPP (1970) as externalities of industrialized productions or as equivalent monetary values associated with adverse effects on society by businesses. SCs are economic losses due to annoyances of living in an inappropriate location and a poorly designed home (GILCHRIST; ALLOUCHE, 2005). Poor housing conditions can affect health, both physical and cognitive, and also create family conflict. These factors diminish the quality of life of dwellers. In all cases, whether individually instigated or officially planned and supported, housing transformations should be in favour of well-being. Location, design, and construction elements determine living conditions and impact dwellers' well-being (MOURATIDIS, 2020). The concept of quality of life is based on individuals' well-being and extends concerning societal issues and progress (SWOPE; HERNÁNDEZ, 2019; FIELD, 1994; McKIM, 1997). Housing should provide comfort, convenience, and safety for quality of life. Health is a vital impact factor on feelings of well-being (THEOFILOU, 2013). However, other factors such as employment, accessibility, local facilities, social activities, access to education, family, wealth, safety, freedom, and religious beliefs play a part in a person's quality of life (ORRELL et al. 2013; MOURATIDIS, 2018). This complexity of factors should be investigated with a focus on specific contexts to gain understanding on the interrelation of housing design on the well-being of users and on potential upgrading interventions.

3. METHODOLOGY

Our study is based on a Systematic Literature Review (SLR). Titles and abstracts of all retrieved studies were analysed to create a panorama of the research conducted (Figure 1).

Figure 1: SLR structure of documents analysis



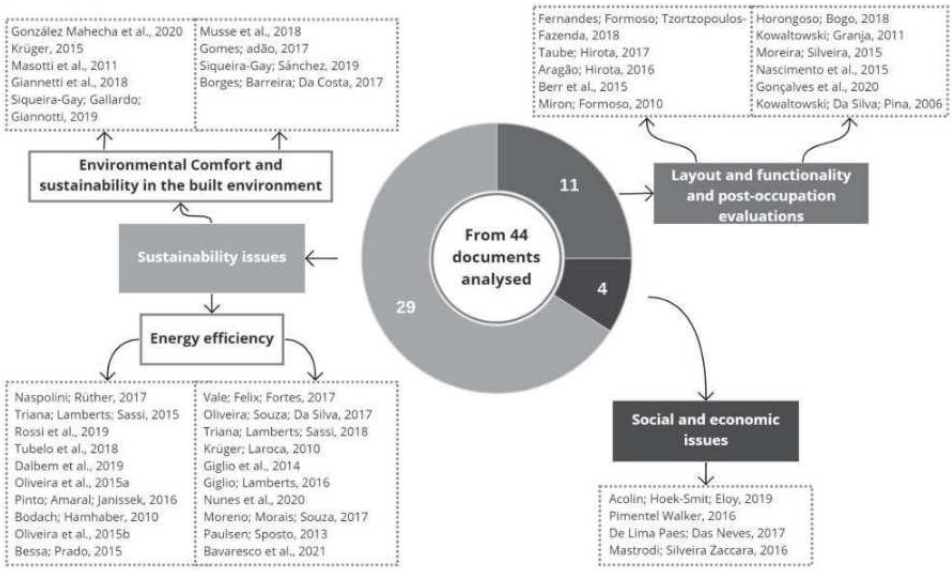
Source: The Authors

A critical study on social housing in Brazil analysed 44 studies, to understand the impact of upgrading projects on desires and well-being of residents. A SLR selected the studies to identify the types of transformations and improvements that occur in Brazilian SH. The first sample evidence from four databases (Scopus, ScienceDirect, Scielo, and Web of Science) used a set of terms and their combinations to form the search strings. These were: upgrading, social housing and its variations, as well as "*minha casa minha vida*" or "my house my life" in English, the most common SH programme in Brazil.

4. DISCUSSION & RECOMMENDATIONS:

A bibliometric analysis of our survey is shown in Figure 2. Three main topics are identified: Layout and functionality, and post-occupation analysis; Social and economic issues, and Sustainability issues with the highest number of studies. Energy efficiency is of special importance in research on upgrading. This is in line with investigations on refurbishment in international literature.

Figure 2: Bibliometric of documents topics



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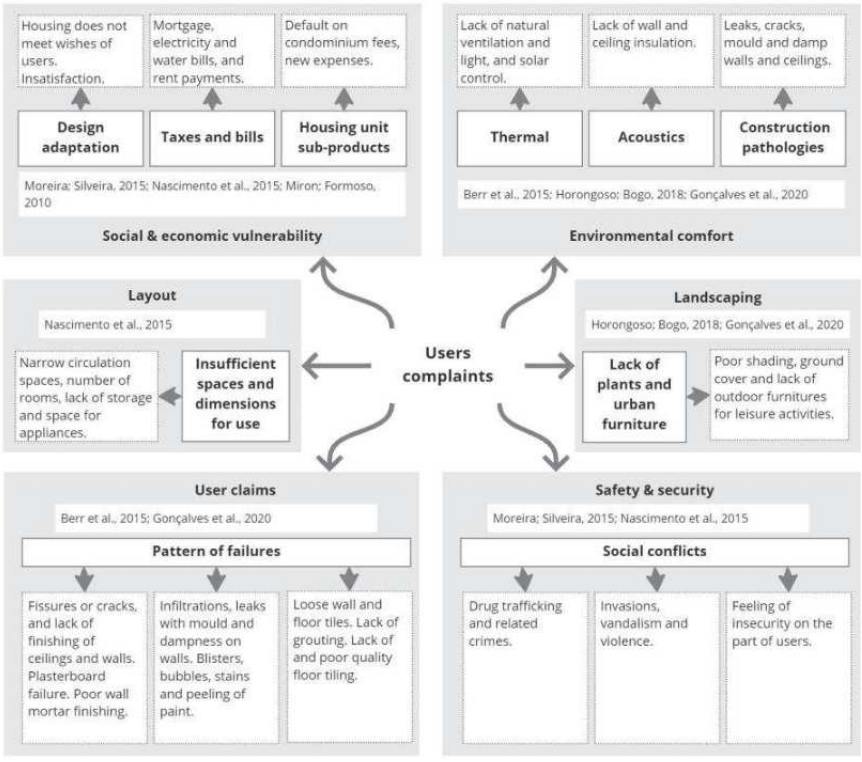
4.1 Layout and functionality and post-occupation analysis

Concerning user satisfaction with functional issues of homes and their internal layouts, POE studies identify discontent elements demanding upgrading actions. Figure 3 shows the patterns of user complaints, indicating strategies to meet requirements.

Figure 3: User complaint elements as indicators for upgrading actions



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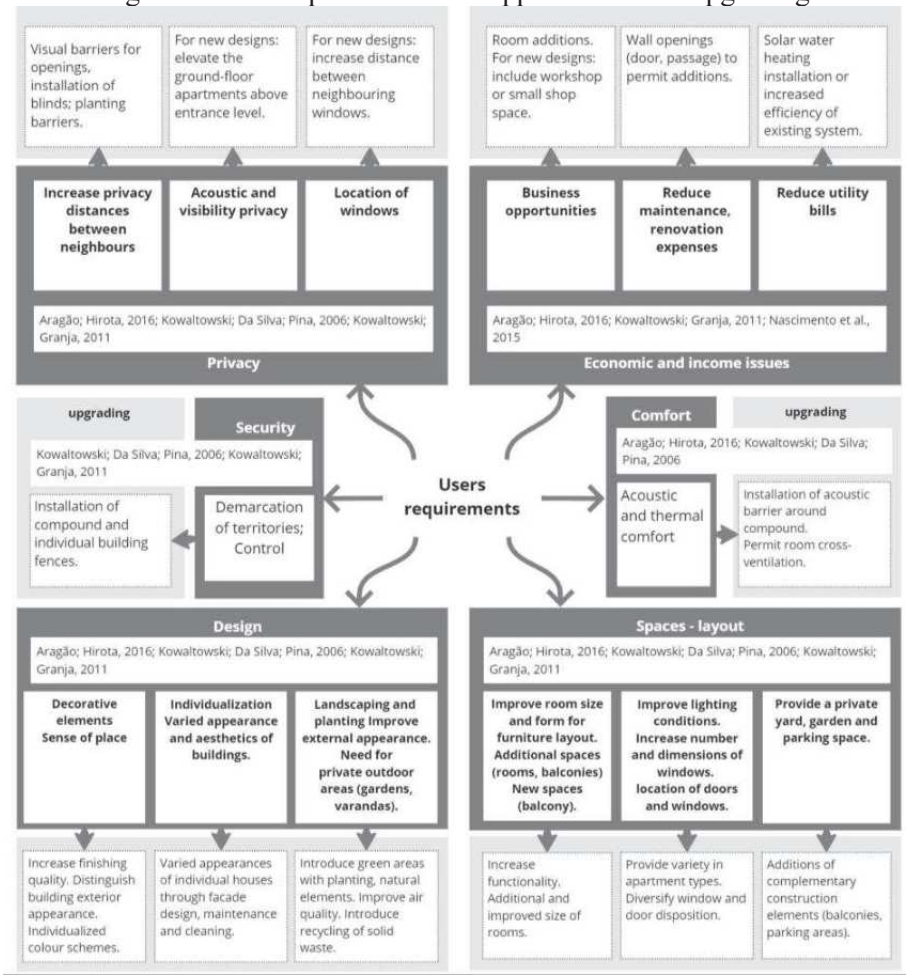
Costs, such as mortgages and utility bills, are considered a problem that impact potential upgrading interventions (MOREIRA; SILVEIRA, 2015; NASCIMENTO et al., 2015; MIRON; FORMOSO, 2010). In many

cases, reforms increase the value of buildings, which could be an incentive to introduce improvements, especially for homeowners, as is the case for most SH in Brazil, once mortgages are fully paid. However, with the lowest income groups, any extra expenses are prohibitive. Figure 4 outlines desires for upgrading measures. The results are in line with previous user value assessments (KOWALTOWSKI; GRANJA, 2011).

Figure 4: User requirements and opportunities for upgrading



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The urban isolation of SH estates is criticised as it reduces the potential of extra income opportunities (KOWALTOWSKI et al., 2018). Transformations of homes show however that users are enterprising with their adaptations. Small shops and workshops are created, and trailers appear on streets with various commercial activities. This phenomenon encroaches on public space and may cause a neighbourhoods' general deterioration, although permitting better access to services (ARAGÃO; HIROTA, 2016; KOWALTOWSKI; GRANJA, 2011).

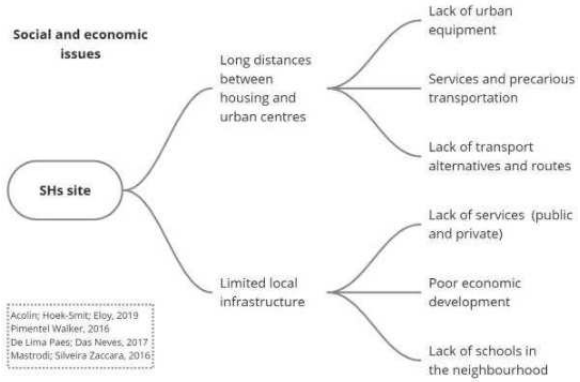
More technical issues are strongly associated with environmental comfort. People complain about small window openings for light and ventilation. Noise interference from neighbours is a frequent problem. Such issues may affect people's health (physical and mental) and therefore their well-being (MOURATIDIS, 2020). Poorly ventilated spaces can cause respiratory diseases. However, environmental comfort and associated health issues are less prevalent reasons for upgrading by owners (THOMSON et al., 2013). Functional convenience is a stronger driver to improve SH, demonstrated by desired to gain space and a private parking area. Construction defects are perceived. Discontent with the landscaping of SH estates is found in multi-story projects. Although users value vegetation, actions to plant in public areas are rare however due mainly to weak community cohesion (ARAGÃO; HIROTA, 2016; KOWALTOWSKI; DA SILVA; PINA, 2006). Public SH owners primarily transform their homes to gain space. Design changes are often hampered due to the lack of planning for expansions and minimum dimensional standards. The lack of foresight and the inclusion of flexibility and adaptability into design concepts of homes for low-income families has been criticised for some time. The main complaint continues to be the lack of security and the desire to have protective elements such as estate perimeter walls, guarded entrance gates, surveillance cameras, and bars on windows. As well as a demand for security, many transformations respond to desires to individualize the home through decorative elements. Users change finishing and front doors in apartment buildings and windows and exterior wall colours in individual houses. Prevalence in Brazil reaffirms the psychological need for identity.

POE studies, although available, have little impact on new developments, and thus errors are perpetuated, causing discontent and transformations (TAUBE; HIROTA, 2017; BERR et al., 2015). Requirement checking methods are seen as a way to ensure SH model reliability in terms of minimum dimensions of domestic functions (FERNANDES; FORMOSO; TZORTZOPOULOS-FAZENDA, 2018).

4.2 Social and economic issues

As shown in figure 5, social and economic issues relate to the location of most SH estates at the urban fringes of cities (MASTRODI; SILVEIRA ZACCARA, 2016). Families find themselves located far from their employment and social networks, which causes discontent (ACOLIN; HOEK-SMIT; ELOY, 2019; BORGES; BARREIRA; DA COSTA, 2017). As location cannot be changed, upgrading actions should be implemented to improve neighbourhoods through infrastructure, parks, schools, and services (ACOLIN; HOEK-SMIT; ELOY, 2019; GONÇALVES, 2020). However, there are indications that the erroneous identification of demands through socioeconomic surveys is the greatest obstacle to execute urban renewal programs (DE LIMA PAES; DAS NEVES, 2017).

Figure 5: Identification of social and economic issues



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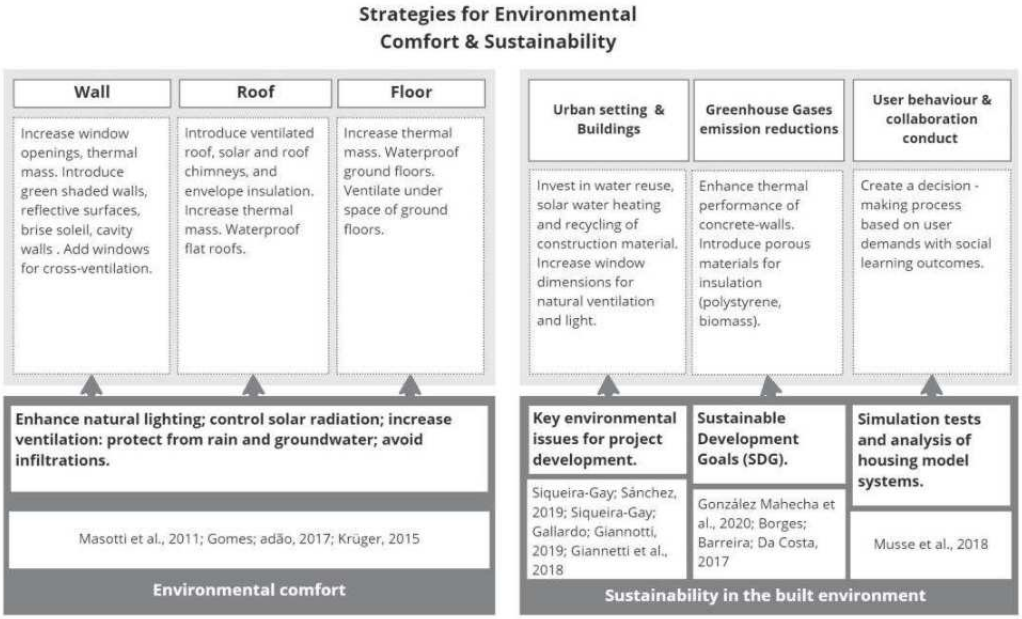
4.3 Sustainability

Environmental Comfort and sustainability in the built environment

As Figure 6 shows, low-income populations are affected by the lack of consistent policies and budget constraints. Policymakers often face a trade-off between quantity and quality to meet a housing shortage (GONZÁLEZ MAHECHA et al., 2020).

Figure 6: Environmental comfort and sustainability upgrading proposals



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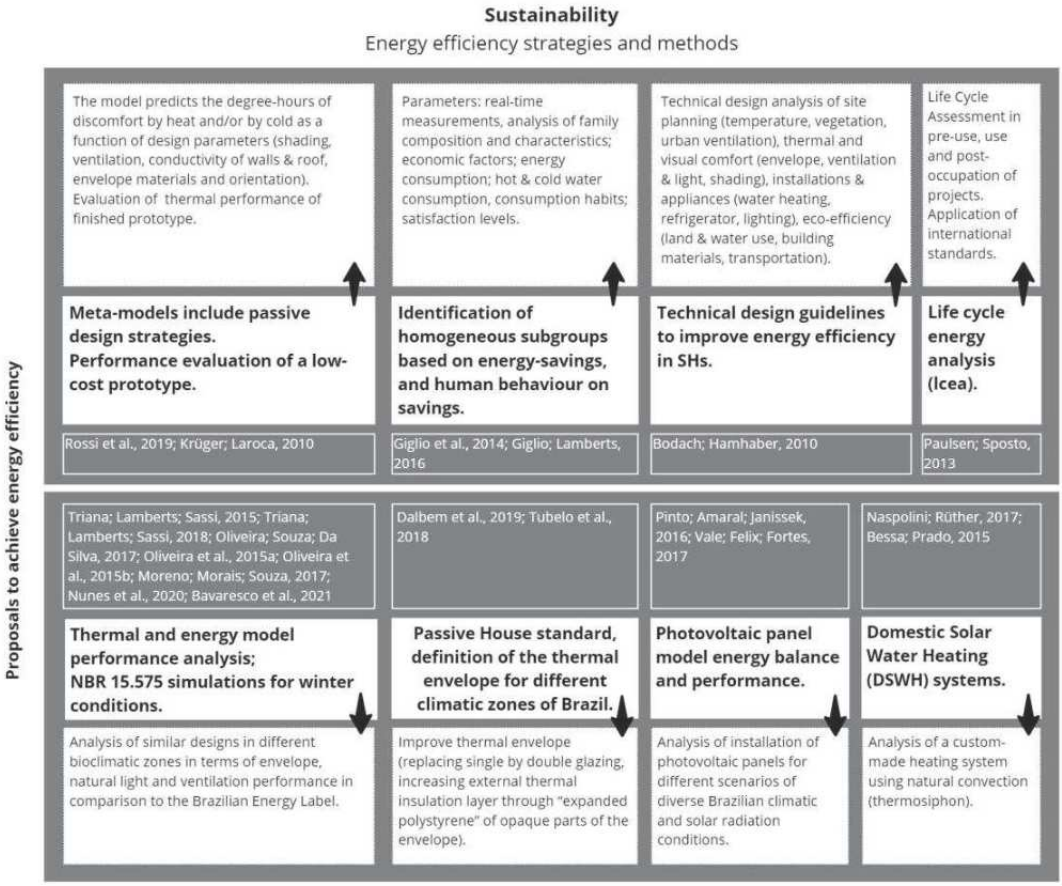
SH programmes should consider environmental comfort and sustainability in the design and implementation phases of a project, including economic issues (GIANNETTI et al., 2018; SIQUEIRA-GAY;

SÁNCHEZ, 2019). Correct constructive systems are essential to provide thermal comfort, and affect energy consumption and Greenhouse Gases (GHG) emissions of the buildings sector to meet Sustainable Development Goals (SDG), especially for large SH estates (GONZÁLEZ MAHECHA et al., 2020). However, SH in Brazil mostly employs a low-standard building system, with few concers for location and climate. Heat discomfort is felt in summer, and in some regions, cold discomfort can occur in winter (KRÜGER, 2015). Damp conditions and rain infiltrations are common. Most SH is poorly lit and ventilated (MASOTTI et al., 2011). Upgrading, in many cases, is urgent to improve thermal and comfort conditions and raise sustainability standards (MASOTTI et al., 2011; GOMES; ADÃO, 2017).

Energy efficiency

Energy efficiency is a significant focus of SH studies. Figure 7 indicates several strategies and models to achieve thermal and energy performance in Brazilian SH. A number of these are based on simulations with recommendations for future upgrading programs.

Figure 7: Energy efficiency strategies and methods



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4.4 Actions to guide improvements

Different actions are necessary to guide the introduction of improvements in SH and increase the quality of life of dwellers. These actions can be categorised as follows:

- Functionality and environmental psychology issues relating to: privacy, ergonomics, number and dimensions of space, territoriality, crowding, leisure spaces, aesthetics.
- Environmental comfort, issues relating to: thermal comfort, ventilation, air quality, acoustic performance, visibility and natural light.
- Communication and infrastructure, issues relating to: access control and security system, IT monitoring systems.
- Installations, issues relating to: water and energy efficiency, consumption reduction - spending control, taxes, sustainability goals, waste treatment.
- Social urban issues: neighbourhood renewal, public and community areas, income and social issues (education and job opportunities), urban infrastructure, mobility, social services.

As outlined above, such actions are indicated by user-initiated transformations and are part of many upgrading programs in developed countries. With the ongoing pandemic, especially in Brazil, new actions are imminent to intervene in SH and its urban areas. The pandemic affects the way of life and habits of families. For social distancing, in most cases, space is inadequate, and there is a lack of functionality in general for a family to stay at home. To promote the well-being and health of residents, studies relating specifically to SH transformations are still scarce in Brazil (SEVERO; DE GUIMARÃES; DELLARMELIN, 2021). However, isolation measures have induced many families to transform the physical environment for daily necessities, both for work, schooling, and isolation in general. Leisure and other individual needs have also induced home alterations by users, although for SH with some difficulties (VILLELA, 2021). Future studies to analyse these transformations concerning the new ways of living under pandemic conditions are necessary.

5. CONCLUSIONS AND OUTLOOK

This study presents the results of a SLR on transformations and upgrading of SH in Brazil. Our analysis evaluated major findings related to environmental comfort and well-being issues of residents. Figure 2 presents prevalent types of transformations occurring in SH in Brazil. Many user-initiated transformations of houses are not always positive and can affect the health of dwellers. For houses, especially thermal and natural lighting comfort conditions are reduced with new additions blocking original openings. In apartment buildings, upgrading needs are associated with noise problems. Although this did not specifically appear in the Brazilian literature analysed here, a lack of user identity in large developments with a repetitive design model and locations far from city centres is in many international studies linked to cognitive health problems such as increases in anxiety symptoms and depression, thus affection user well-being, with SCs.

The reasons for changes to homes and desired improvements as opportunities for upgrading are outlined in Figures 3, 4, and 5. The prevalent comfort, privacy, security, design, layout and economic problems outlined directly affect the well-being of individuals. As shown also, society may suffer increases in criminal activities, and the SCs of treating such issues may be high.

Upgrading actions, to improve SH's sustainability and energy efficiency, are outlined in many studies through simulations, shown in Figures 6 and 7. These recommend strategies to mitigate problems such as better ventilation and lighting through larger window openings, enhanced thermal performance of walls through insulation and shading. For energy efficiencies many studies present strategies how to intervene and monitoring methods. Our SLR found few specific studies for upgrading SH given the ever-deepening pandemic situations, although ongoing research should be available in the near future. Available studies show that lack of ventilation propagates the virus and that infection rates are higher in poorly designed and high-density housing developments (ORTIZ; ITARD; BLUYSSEN, 2020; VILLELA, 2021). More research is necessary to accurately specify priority building construction details to reduce such rates, if not for this pandemic, then to provide healthier living conditions for low-income families in the future. An urgent question arises on how this can be achieved efficiently, avoiding the repetitions of past errors in SH.

SH upgrading needs to involve users and other stakeholders through participatory methods and co-designed solutions. The promotion of social innovations in the form of an increased perception of people's environment and their self-involvement in introducing positive changes. Partners also have to be engaged to design, finance, and execute the more complex changes needed. The often-complicated relation between stakeholders has to be mitigated to achieve outcomes that can effectively make a difference in people's well-being and lives. Finally, as this study has shown, upgrading of SH is not only about technical issues but touches on subjective details as well. Moreover, to quote the latest Pritzker Prize winners, the French Architect Anne Lacaton, and her husband Jean-Philippe Vassal "Buildings are beautiful when people feel well in them," and to achieve this, the built environment needs to be "repurposed, reinvented, reinvigorated."

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