

A panorama of Brazilian social housing research: scope, gaps and intersections

Um panorama da pesquisa sobre Habitação de Interesse Social no Brasil: abrangência, lacunas e interseções

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Abstract

Social Housing (SH) is investigated worldwide, especially in emerging economies. However, SH literature demonstrates that there are still barriers to achieving the real benefits of those programmes. Brazilian SH programmes have positively reduced housing deficits and the vulnerability of low-income populations. However, studies developed in Brazil also reveal the negative impacts of SH. Investigating the reason for the recurrence of negative impacts is fundamental to gaining a stronger understanding of the causes and scope of SH problems. Moreover, state-of-the-art studies may support the development of actions to mitigate those problems. Thus, this study aims to categorise the major topics studied on SHs, identify and evaluate SH main failures and impacts, analyse intersections of topics, and understand their scope. A systematic review and literature mapping were applied to analyse SH studies. Although evidence emphasises significant advances in SH production, results demonstrate the intersecting panorama of occurrences that cause negative impacts and stress the need for investments and the implementation of housing public policies aligned with societal interests to improve SH.

Keywords: Social Housing. MCMV. Housing programmes. Urbanisation.

Resumo

A Habitação de Interesse Social (HIS) é amplamente investigada mundialmente, especialmente nas economias emergentes. No entanto, a literatura sobre HIS demonstra que ainda existem barreiras para alcançar benefícios reais desses programas. Os programas de HISs brasileiros reduziram positivamente o déficit habitacional e a vulnerabilidade social da população de baixa renda. No entanto, estudos desenvolvidos no Brasil também revelam os impactos negativos da HISs. Investigar a razão da recorrência de impactos negativos é fundamental para maior entendimento da causa e abrangência dos problemas. Além disso, estudos do estado da arte podem auxiliar com o desenvolvimento de ações para mitigar impactos de HISs. Assim, a pesquisa visa categorizar os principais tópicos estudados sobre HIS, identificar e avaliar as deficiências dos HISs, analisar interseções de tópicos, e compreender a sua abrangência. Uma revisão sistemática e mapeamento sistemático da literatura foram aplicados para analisar e mapear os estudos de HIS. Embora as evidências enfatizem avanços significativos na produção de HISs, resultados demonstram o panorama interseccional de ocorrências que causam impactos negativos, ressaltam a necessidade de investimentos e a implementação de políticas públicas de habitação alinhadas aos interesses da sociedade para melhorar HISs.

Palavras-chave: Habitação de Interesse Social. MCMV. Programa habitacional. Urbanização.

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Introduction

Social Housing (SH) programmes are widely studied in different fields worldwide, revealing that barriers exist to achieving real benefits from SH programmes, mostly in emerging economies. There is scientific research evidence that SH often fails to deliver the intended socio-economic benefits and may trigger negative impacts on society (Buckley; Kallergis; Wainer, 2016; Gustavsson; Elander, 2016; Liu; O’Sullivan, 2016).

Brazilian SH policies began with significant efforts in 1964 through the National Housing Bank policy, which lasted until 1985, as a response to the housing crisis in relation to accelerated urbanisation (Cardoso; Mello; Jaenisch, 2015; Oliveira; Souza, 2019). In 2003, although extinct in 2019, the Ministry of Cities coordinated and managed the National Urban Development Policy. Under this ministry, in 2009, the Brazilian government launched an SH programme called ‘My House My Life’ (MCMV, ‘*Minha Casa Minha Vida*’ in Portuguese) (Loureiro; Macário; Guerra, 2015; Triana; Lamberts; Sassi, 2015). The MCMV programme aimed to reduce the housing deficit, improve the living conditions of vulnerable people, and increase economic growth (Tubelo *et al.*, 2018; Acolin; Hoek-Smit; Eloy, 2019; Chaves, 2019; Kowaltowski *et al.*, 2019; Falchetti, 2020; Albert, 2021). In 2019, the federal government announced a new programme called *Casa Verde e Amarela* (CVeA) (Depieri; Ramos, 2020), and in 2023, the new government re-launched the MCMV.

The beneficiaries of MCMV are classified according to the income levels¹ or *Faixas*² that include: *Faixa 1* (income up to USD 345,91); *Faixa 1.5* (income up to USD 499,64), considered lower-income families; and *Faixa 2* (income up to USD 768,68) as well as *Faixa 3* (income of up to USD 1.345,19), considered middle-income families. Three architectural typologies of MCMV use repetitive models across the national territory, with the following types:

- (a) single-family homes;
- (b) vertical multifamily buildings of four to five floors; and
- (c) vertical multifamily buildings with elevators (Ferreira, 2012).

Despite the effectiveness in reducing the housing deficit, in Brazil, studies on SH also present negative impacts, mostly on urban and neighbourhood scales, rather than buildings and units (Tubelo *et al.*, 2018). Most of SH is characterised by socio-spatial segregation conditions (Andrade, 2015; Nascimento *et al.*, 2015; Paz *et al.*, 2015; Rizek, 2015; Rufino *et al.*, 2015; Sobrinha *et al.*, 2015; Vannuchi *et al.*, 2015; Vicentim; Kanashiro, 2016; Acolin; Hoek-Smit; Eloy, 2019). However, the localisation of SHs may trigger negative impacts for residents associated with social, environmental, and economic issues (Rufino *et al.*, 2015; Vicentim; Kanashiro, 2016). Investments are needed in such existing SH to reduce these negative impacts (Kowaltowski *et al.*, 2021; Muianga *et al.*, 2021).

A substantial volume of studies on Brazilian SH exists (Muianga; Kowaltowski, 2022). These studies cover different fields of knowledge, such as architecture, construction, geography, history, economics, and social science. However, there is a lack of a consolidated understanding of research developed so far. Understanding SH problems from different fields and knowledge may contribute to mapping how these studies relate to each other, and how they address SH problems. Furthermore, the consolidation of research may contribute to the diffusion of a broader knowledge on the subject. Therefore, the SH literature must be analysed to evaluate the main failures and impacts of SH problems and consequences. Identifying cause and effect is essential to develop actions to mitigate existing problems in SH through evidence. Thus, two questions guided this research's development: what are the main failures and impacts of SH in Brazil? What are the main actions presented by the conducted studies?

Thus, the research aims to consolidate and categorise issues related to SH studies. The research also aims to identify and assess SH impacts (positive and negative) and analyse the intersections of SH issues with state-of-the-art knowledge. The research contributes a visual panorama of SH issues that may be applied to develop actions for SH upgrading. An organised knowledge base on SH research in Brazil is presented as an additional contribution.

¹Federal Savings Bank Brazilian currency *Faixa 1* (income of up to R\$ 1,800.00); *Faixa 1.5* (income up to R \$ 2,600.00), considered lower-income families, and *Faixa 2* (income up to R \$ 4,000.00); *Faixa 3* (income of up to R \$ 7,000.00).

²Values converted on 03-03-2023. 1 Real/BRL=0,192171USD. Brazilian central bank: <https://www.bcb.gov.br/conversao>.

Method

The study combined two Systematic Review (SR) methodologies:

- (d) a Systematic Literature Review (SLR); and
- (e) a Systematic Mapping Study (SMS) or Systematic Literature Mapping (SLM).

The purpose of SLRs is to gather empirical studies related to a specific research question to analyse, synthesise, and interpret evidence (Kitchenham *et al.*, 2009; Okoli, 2015; Koç, 2015; Cahyo, 2021). SMS seeks to identify, collect, and analyse relevant studies on a topic, as well as categorise, synthesise and structure a research area (Yañez-Figueroa; Ramírez-Montoya; García-Peñalvo, 2016; Kaur; Kaur Chahal; Saini, 2022).

The SLR and SMS were developed to identify and analyse new research on SH in Brazil, covering diverse study fields. Snowballing techniques were applied to complement the study sample (Wohlin, 2014; Fabbri *et al.*, 2016). Quantitative and qualitative analyses were applied in the final sample and presented through visual and descriptive results.

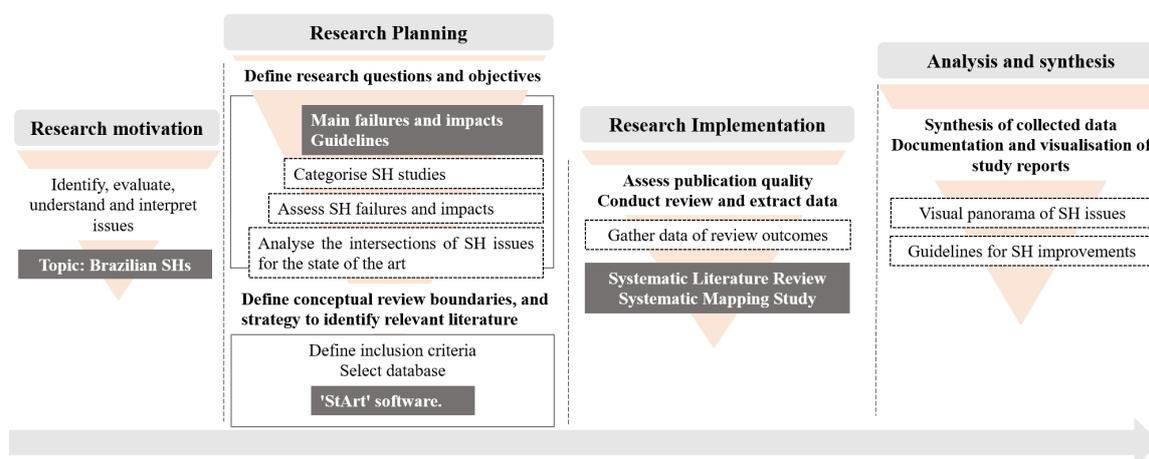
Research data were retrieved through the 'StArt' software. 'StArt' stands for "State of the Art", developed by LaPES (Laboratory of Research on Software Engineering) from the Federal University of São Carlos (UFSCar) in Brazil. The 'StArt' software allows users to search for evidence in the scientific literature and automate coding processes through qualitative and quantitative methods (Bhattacharjee, 2012; Fabbri *et al.*, 2012, 2016). The method considers a group of keywords applied in the protocol in the research title, abstract, and the paper's keywords for scoring analysis (Fabbri *et al.*, 2012). Studies with high scores should be accepted, and studies with low scores and at least one citation may have a manual analysis, while studies with low scores and no citation should be excluded (Fabbri *et al.*, 2016).

Research procedure

The SR process was developed following four steps (Barat *et al.*, 2017; Cahyo, 2021) presented in Figure 1:

- (a) research motivation: the state of the art of Brazilian SHs was our research motivation. Literature analyses identified studies to understand and contextualise the topic from different perspectives and research fields. The diversity of field analysis enables an association of knowledge presented in Results and discussion item;
- (b) research planning: the terms and search strings are presented in Figure 2. Boolean operators were included to define the relations between search terms and construct appropriate strings. Strings were applied to selected databases: Scopus, ScienceDirect, Web of Science, and Scielo, which combine a significant number of journals indexed with quality criteria. To improve the analysis of studies using the automatic criteria, a practical evaluation procedure was adopted to select or exclude papers through the StArt software, which classifies studies by score and number of citations. Moreover, our analysis strategy used inclusion and exclusion criteria by title and abstract reading. After the first inclusion and exclusion criteria by StArt software, all Brazilian SH studies were selected in Portuguese and English. Snowballing processes were applied to add studies to the sample. However, studies published in non-open access journals were excluded;
- (c) research implementation: after selection, accepted studies were read, and the data extracted. The SMS method was applied. Studies were classified by main topic issues (Figure 3) and organised by categories. SLR method was applied for quality and data synthesis. The results of this analysis are presented in Results and discussion item; and
- (d) analysis and synthesis: existing studies developed in Brazil were identified and contextualised. Description of SH issues – qualitative analysis item presents the SH topic and sub-topic problems and guidelines to improve the problem raised, as well as an overview of the association of issues. Review outcomes were synthesised and presented as a result of the research. The relation of topics is presented (Figure 3).

Figure 1 - SR process



Results and discussion

Quantitative analysis

The sample selection was developed in March 2022. Strings and sample analysis are presented in Figure 2. For the string, terms such as “social housing” and its variations, upgrading and its variations, MCMV, “social impacts”, and “social cost”, and Brazil to limit the search for the region were applied to compose strings. The search period was from the beginning of 2000 to March 2022. Moreover, 935 documents were identified in the first search. The first search identified 935 studies documents. After applying the SLR protocol, the study sample included 122 studies covering articles published between 2006 and 2021.

The research evaluated clusters of studies on SH. The analysis identified five topics outlined in SH studies:

- urban accessibility;
- use of resources;
- public policy and SH programmes;
- post-occupancy evaluation (POE); and
- Brazilian SH financing.

Figure 3 presents the topic and references of the studies considered in each topic.

Urban accessibility is widely investigated in geography and architectural studies. In sociology, topics such as public policies that support the production of SH, as well as the organisational structure of agents involved, are frequently addressed in investigations. In economics, the process and performance of the financial market in SH productions and the relationship between product quality, location of developments and the real estate market are investigated. In the construction area, including architecture and civil engineering, POEs and sustainability issues are found. User satisfaction, transformations and possibilities of SH improvements are the main investigated topics in POE studies.

The distribution of study topics over time shows that specific issues are more prevalent in certain years (Figure 4). Studies on urban accessibility and sustainability issues peaked in 2017. The topic of public policy decreased since 2015. Sustainability issues have appeared since 2010, with peaks in 2015 and 2017. Brazilian SH finances and POEs are less studied overall in relation to SH. Some POE studies were developed between 2015 to 2018.

Figure 2 - Identification and selection of studies on SH in Brazil according to specific strings

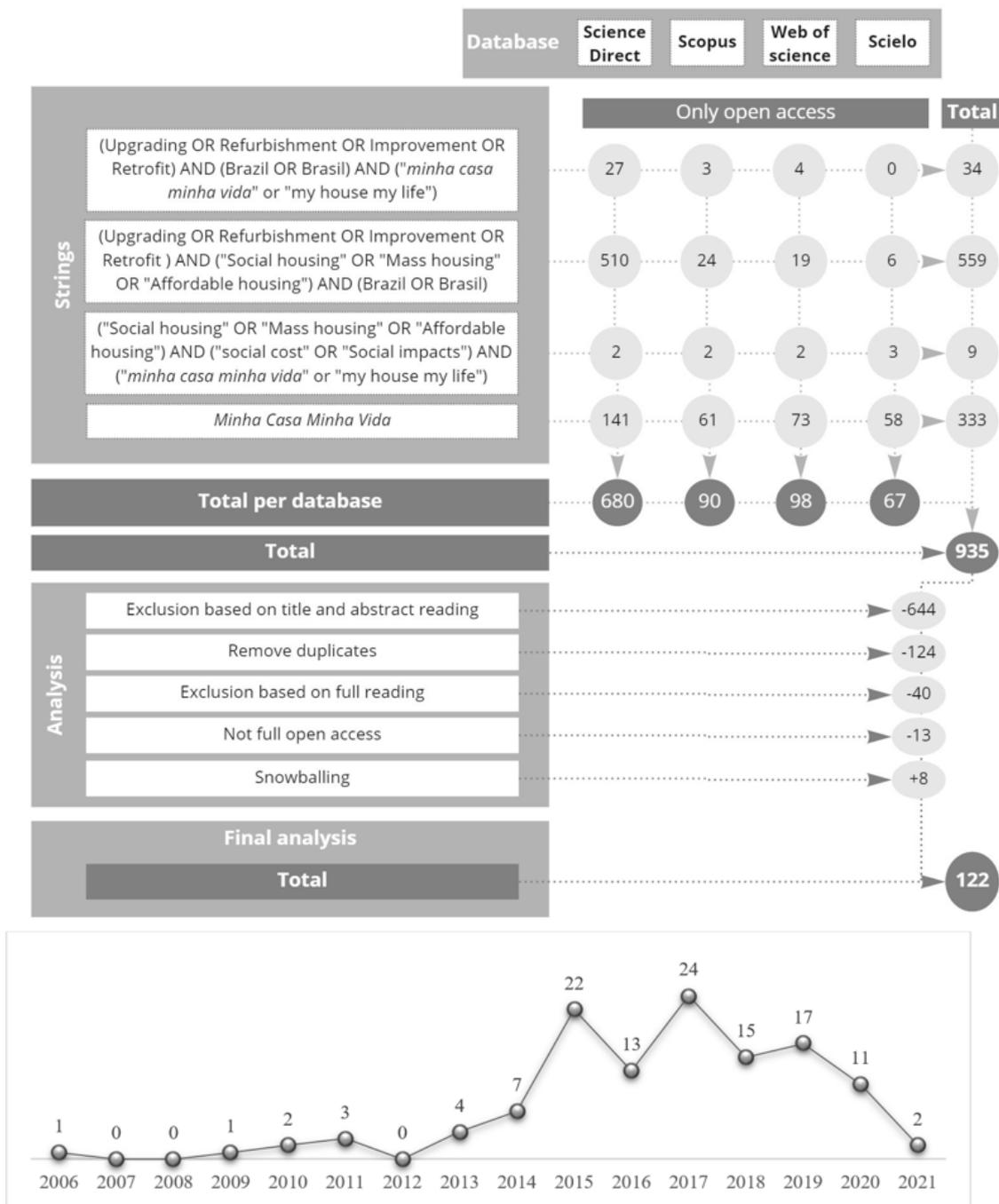
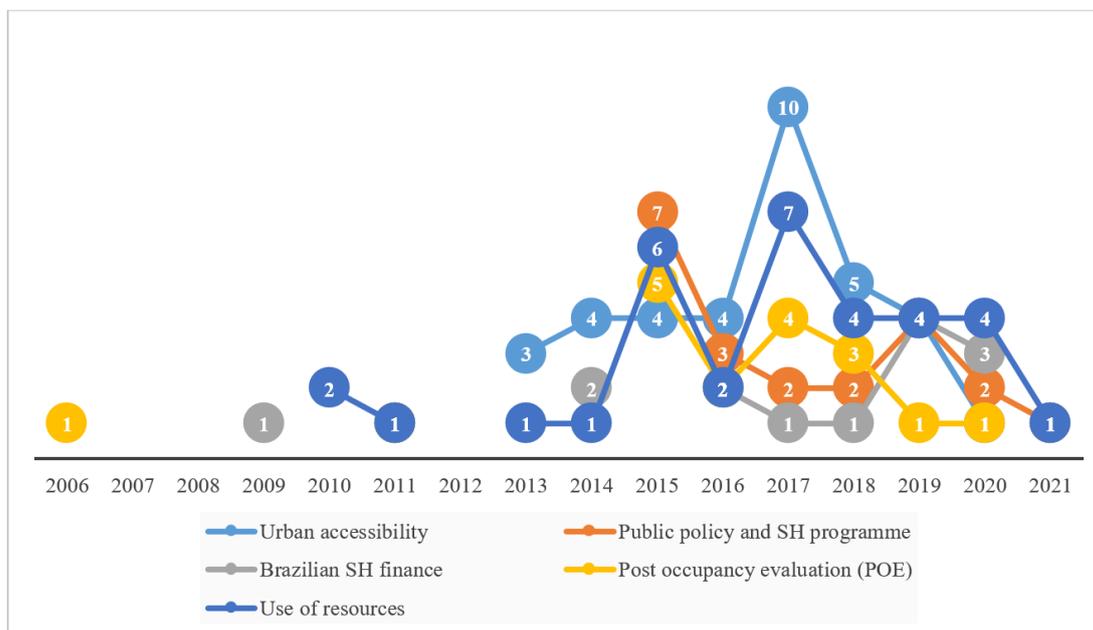


Figure 3 - Cluster of topics of SH studies

Topics	Studies Reference
Urban accessibility	Pequeno and Elias (2011), Leitão and Araujo (2013), Miotto (2013), Silva and Fleury e Silva (2013), Baltrusis and Mourad (2014), Medrano and Spinelli (2014), Moura (2014), Rizek, Amore and Camargo (2014), França (2015), Garcia and Fernandes (2015), Lima <i>et al.</i> (2015); Sobrinha <i>et al.</i> (2015), Moreira and Silveira (2015), Hehl (2016), Mastrodi and Zaccara (2016), Menezes (2016), Vicentim and Kanashiro (2016), Acolin and Green (2017), Alvarenga and Reschilian (2017), Borges, Barreira and Costa (2017), Carvalho and Medeiros (2017), Kopper (2017), Matos (2017), Meireles and Castro (2017), Santos and Matos (2017), Paes and Neves (2017), Campos (2018), Cunha and Silva (2018) Jesus and Denaldi (2018), Moreira, Silveira and Euclides (2018), Souza and Sugai (2018), Campos and Santos (2019), Kowaltowski <i>et al.</i> (2019), Oliveira and Souza (2019), Pereira (2019) and Sousa and Braga (2020).
Use of resources	Bodach and Hamhaber (2010), Krüger and Laroca (2010), Masotti <i>et al.</i> (2011), Paulsen and Sposto (2013), Giglio <i>et al.</i> (2014), Bessa and Prado (2015), Krüger (2015), Oliveira <i>et al.</i> (2015a), Oliveira <i>et al.</i> (2015b), Ruppenthal <i>et al.</i> (2015), Triana, Lamberts and Sassi (2015), Giglio and Lamberts (2016), Pinto, Amaral and Janissek (2016), Gomes and Adão (2017), Mesquita and Ripper Kós (2017), Morais and Labaki (2017), Moreno, Morais and Souza (2017), Napolini and Rüter (2017), Oliveira, Souza and Silva (2017), Vale <i>et al.</i> (2017), Giannetti <i>et al.</i> (2018), Musse <i>et al.</i> (2018), Triana, Lamberts and Sassi (2018), Tubelo <i>et al.</i> (2018), Dalbem <i>et al.</i> (2019), Rossi <i>et al.</i> (2019), Siqueira-Gay, Gallardo and Giannotti (2019), Siqueira-Gay and Sánchez (2019), Azevedo, Geraldi and Ghisi (2020); Gonçalves <i>et al.</i> (2020), Mahecha <i>et al.</i> (2020), Nunes <i>et al.</i> (2020) and Bavaresco <i>et al.</i> (2021).
Public Policies and SH Programmes	Cardoso, Mello and Jaenisch (2015), Finger, González and Kern (2015), Loureiro, Macário and Guerra (2015), Monteiro (2015), Quirino <i>et al.</i> (2015), Rufino <i>et al.</i> , (2015), Vannuchi <i>et al.</i> (2015), Eskes and Vieira (2016), Serapião (2016), Zaccara and Mastrodi (2016), Menezes and Mourão (2017), Thery (2017), Buonfiglio (2018), Costa, Silva and Santos (2018), Costa <i>et al.</i> (2019), Ferreira <i>et al.</i> (2019), Lavalle, Rodrigues and Guicheney (2019), Stiphany and Ward (2019), Camargo (2020), Rangel <i>et al.</i> (2020) and Albert (2021).
Post-occupancy evaluation (POE)	Kowaltowski <i>et al.</i> (2006), Kowaltowski and Granja (2011), Berr <i>et al.</i> (2015), Cavalheiro and Abiko (2015), Nascimento <i>et al.</i> (2015), Paz <i>et al.</i> (2015), Aragão and Hirota (2016), Walker (2016), Prudente and Leiro (2017), Müller and Lima (2017), Taube and Hirota (2017), Vasconcellos <i>et al.</i> (2017), Villa <i>et al.</i> (2017), Fernandes, Formoso and Tzortzopoulos-Fazenda (2018), Horongoso and Bogo (2018), Silveira <i>et al.</i> (2018), Silveira, Carmo and Luz (2019) and Bortoli and Villa (2020).
Brazilian SH financing	Lima <i>et al.</i> (2009), Silva and Alves (2014), Klink and Denaldi (2014), Conceição and Mastrodi (2016), Kopper (2016), Campos and Guilhoto (2017), Alvarenga and Reschilian (2018), Acolin, Hoek-Smit and Eloy (2019), Chaves (2019), Fraga and Vieira (2019), Falchetti (2020), Vieira <i>et al.</i> (2019), Outeiro and Nascimento (2020) and Santoro and Chiavone (2020).

Figure 4 - Studies per main topics



We analysed studies by localisation to understand where Brazilian SH housing investigations are more prevalent. Figure 5 locates studies published by states and regions of Brazil. Furthermore, information on contracted units is presented (Figure 6).

The MCMV programme covers most of the Brazilian territory (Moreira; Silveira; Euclides, 2017). However, according to data from the electronic system of the Citizen Information Service (*Serviço de Informação ao Cidadão - SIC*³), the Northeast region has the largest number of residential contracted units (RUs), with the Southeast second largest (RUs).

The Southeast, which includes the state of São Paulo, has many studies. Studies are located in the cities of *São Paulo, Campinas, São José dos Campos, Araraquara, Região do Grande, ABC (Santo André, São Bernardo do Campo, São Caetano do Sul, Diadema, Mauá, Ribeirão Pires e Rio Grande da Serra), São José do Rio Preto, São Francisco, Osasco, São Carlos*. The State of *Minas Gerais* has specific studies for the cities of *Viçosa, Ponte Nova, Visconde do Rio Branco, Ubá, Montes Claros, Belo Horizonte, Uberlândia* and *Ouro Preto*). In contrast, the State of *Rio de Janeiro* has research on the cities of *Rio de Janeiro, Várzea, Teresópolis, Serra da Tiririca, Niterói, and Petrópolis*.

In the South, for the state of *Rio Grande do Sul*, research was developed in *Porto Alegre, Santa Maria, São Leopoldo, Uruguaiana* and in the state of *Paraná*, there is research from *Curitiba, Maringá* and *Londrina*. In contrast, the state of *Santa Catarina* concentrates research on the cities of *Florianópolis, Blumenau* and *Canoinhas*.

The Northeast is the region with the largest number of contracted RUs. The state of *Sergipe* presents studies from *Aracaju, Itabaiana, Lagarto, Estância* and *Nossa Senhora da Glória*. In contrast, in the state of *Bahia*, the studies are mainly concentrated on the city of *Salvador*. In the state of *Rio Grande do Norte*, the cities found are *Natal* and *Parnamirim*, and in the state of *Ceará*, we find research on *Nova Olinda* and the city of *Fortaleza*. In the state of *Pernambuco*, the studies are concentrated in *Recife*. In *Piauí*, there are studies in *Teresina*.

In contrast, the north had more studies published than the northeast of Brazil, although fewer RUs were built. In the state of *Pará*, *Parauapebas, Abaetetuba* and *Belém* present studies, while in the state of *Amazonas*, the city of *Manaus* appears, as well as some small towns along the Amazon River. Finally, the Centre-west region represented by the states of *Mato Grosso do Sul, Mato Grosso* and *Goiás* presents data from the cities of *Campo Grande, Dourados* and *Goiânia*.

³The Citizen Information Service (SIC) is the unit responsible for answering requests for access to information made to the Ministry of Economy. https://www.gov.br/economia/pt-br/canais_atendimento/ouvidoria/sic.

Figure 5 - Studies per states and region

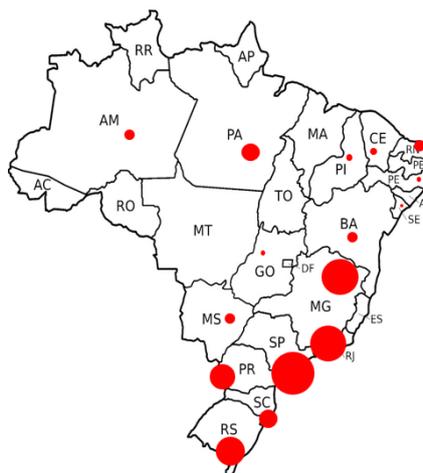
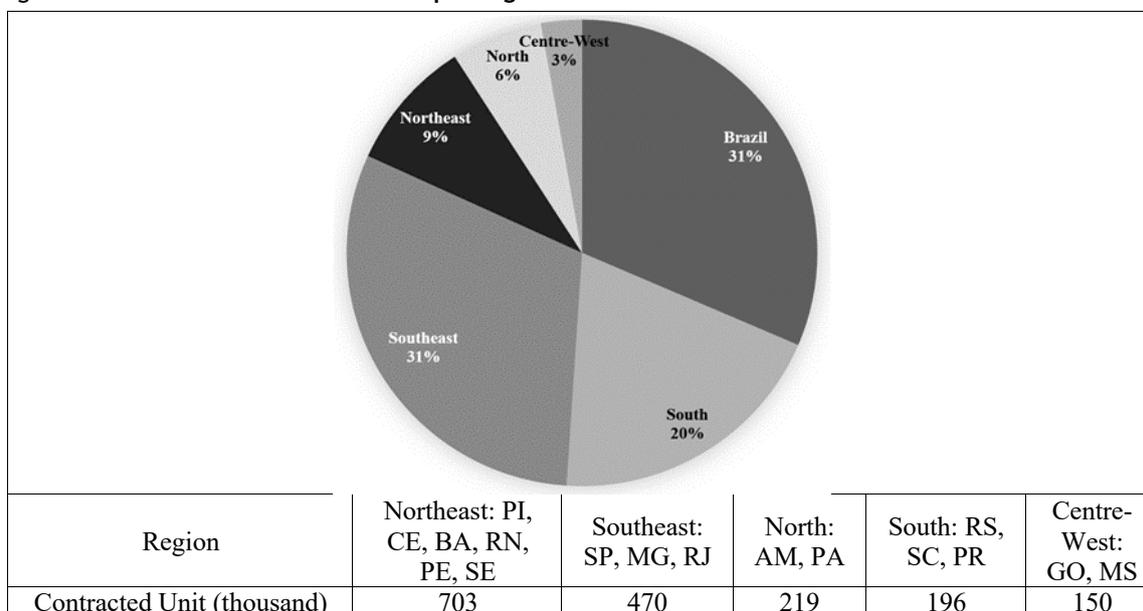


Figure 6 - Residential units contracted per region



Source: Moreira, Silveira and Euclides (2017).

Guidelines to overcome the negative impacts

SH programmes are widely studied in various research and knowledge fields. These studies demonstrate how a public policy focused on housing impacts society in social, economic and environmental contexts and how it affects the built environment. Thus, our theoretical background covers five topics. A review of urban accessibility, public policy and SH programmes, Brazilian SH financing, post-occupancy evaluation and use of resources issues are presented. Subtopics are also presented.

Urban accessibility

Three issues are discussed in urban accessibility: urban design, effective use of Special Social Interest Zones (*Zonas Especiais de Interesse Social – ZEIS*, in Portuguese), and urban infrastructure and equipment.

Urban design

Although urban design has social implications, many Brazilian SH projects are fragmented, characterised by socio-spatial segregation and by high concentrations of low-income people (Medrano; Spinelli, 2014;

Carvalho; Medeiros, 2017; Sousa; Braga, 2020). Even SH systems that provide well-inserted housings fail in this respect (Silva; Fleury e Silva, 2013; Moura, 2014; Matos, 2017). Most SH projects of *Faixa 1* and *Faixa 1,5* are located in monofunctional neighbourhoods (Leitão; Araújo, 2013; Miotto, 2013; Mastrodi; Zaccara, 2016).

Real estate speculation also exerts pressures on urban morphologies favouring the finance of new homes for middle-class families well inserted in urban areas and expelling SH to the periphery of urban areas (Garcia; Fernandes, 2015; Sousa; Braga, 2020). The repetitive SH production model has led to a recurrent negative social impact for both residents of these dwellings and society as a whole (Muianga *et al.*, 2021).

Special Social Interest Zones - ZEIS

ZEIS are demarcated areas in a municipal master plan (*Plano Diretor Municipal*) within a city's territory for housing settlements for low-income populations. However, ZEIS are ineffective in relation to the social function they were intended for (França, 2015; Mastrodi; Zaccara, 2016; Acolin; Green, 2017). Land values and, therefore, the final value of a housing unit is decisive in the marginalisation of SH beneficiaries, mainly the lowest-income group (Campos, 2018; Cunha; Silva, 2018). Consequently, residents must spend a long time commuting daily to access jobs, education institutions, and services for daily activities (França, 2015).

Living in SH estates, low-income families also face costs not previously foreseen. Residents have new expenses, such as utility bills and the instalments of their new home (Muianga *et al.*, 2021). The financial condition of such families does not enable them to assume new property expenditures which impact their cost of living. The difficulty of affordability due to low income, in some cases, forces SH residents to return to their original places, often not legalised lands, which are generally more connected to urban areas, however, more vulnerable (Baltrusis; Mourad, 2014).

Urban infrastructure and equipment

The impact of territorial segregation on intra-urban dynamics generates neighbourhoods that demand public infrastructure, public and private services and equipment, access to sewage systems, public transport, public spaces, green areas, leisure and cultural activities (Leitão; Araújo, 2013; Lima *et al.*, 2015; Menezes, 2016; Meireles; Castro, 2017; Prudente; Leiro, 2017). Moreover, the necessity of private cars, daily dislocations demand private costs and may cause health impacts due to air pollution and stress, and cause productivity losses (Miotto, 2013; Borges; Barreira; Costa, 2017; Souza; Sugai, 2018). Therefore, poorly inserted housing may trigger social impacts and costs (Muianga *et al.*, 2021).

In some cases, to overcome such main failures and impacts, in critical situations of urban fragmentation, local communities attempt to develop their own services that operate independently from the overall logic of an urban system (Hehl, 2016). Although local services are seen as potential extra income for families, they may cause irregular occupation of public land and illegal and uncontrolled economic activities (Leitão; Araújo, 2013).

Guidelines to overcome the negative impacts regarding urban accessibility

SH programmes, therefore, should be restructured to include urban accessibility, promoting adequate locations for SH projects with appropriate infrastructure (Medrano; Spinelli, 2014; Garcia; Fernandes, 2015; Mastrodi; Zaccara, 2016; Cunha; Silva, 2018). Thus, it is important to reduce real estate “businesses” in SH production (Pequeno; Elias, 2011; Rizek; Amore; Camargo, 2014). Therefore, it is necessary to increase the institutional and regulatory capacity of SH programmes to reduce location impacts (Pequeno; Elias, 2011; Santos; Matos, 2017; Jesus; Denaldi, 2018). Moreover, it is important to improve the use of ZEIS for low-income housing, reducing the pressure for precarious occupations in environmentally fragile areas (Acolin; Green, 2017; Campos, 2018; Sousa; Braga, 2020). Municipal actions should provide infrastructure and equipment and public transport lines based on social demands for work, health, education, leisure and cultural services (Kopper, 2017; Moreira; Silveira; Euclides, 2018; Souza; Sugai, 2018; Campos; Santos, 2019).

Understanding SH beneficiary's needs and desires through participatory process is important to define the integration of SH neighbourhoods and urban spaces (Sobrinha *et al.*, 2015; Vicentim; Kanashiro, 2016; Paes; Neves, 2017). The involvement of communities through participatory planning is recommended to develop legitimate urban and SH planning with local interests (Silva; Fleury e Silva, 2013; Lima *et al.*, 2015; Alvarenga; Reschilian, 2017; Matos, 2017; Kowaltowski *et al.*, 2019; Oliveira; Souza, 2019; Pereira, 2019).

Public policy and SH programme

Three issues are discussed in relation to public policies and SH programmes: the housing deficit, the National Rural Housing Program and mass reproduction.

Housing deficit

SH programmes are launched to reduce housing deficits and increase the beneficiaries' quality of life. This goal has, however, yet to be met. A diversity of negative impacts still represents an obstacle to SH policies (Cardoso; Mello; Jaenisch, 2015; Monteiro, 2015; Ferreira *et al.*, 2019). The MCMV program was fundamental in helping to remove people living in risk areas. However, this contributed to an increase in socio-spatial segregation having a negative effect on families' quality of life (Cardoso; Mello; Jaenisch, 2015; Ferreira *et al.*, 2019). The housing deficit involves issues related to both quality and quantity, and the maximised production of new units in deprived places does not solve SH impacts (Zaccara; Mastrodi, 2016).

SH programmes facilitate decision-making and outsourcing to private developers, which leads, in many cases, to reduced SH quality located on low-cost land (Thery, 2017; Albert, 2021). These programmes are mostly aligned with profit generation for its agents, especially developers, builders and banks, which have a low alignment with public political goals (Zaccara; Mastrodi, 2016). Moreover, the program also tends to reinforce the intense real estate appreciation seen in Brazilian metropolitan areas, further increasing the difficulties of access to housing through rent and other forms of production, thus imposing new inequalities (Rufino *et al.*, 2015). It is also evident that Brazilian SH is guided by short-term business and economic logic and is not part of an effective structural policy of planning and urban reform of long-term processes, which is essential to improve the quality of life (Loureiro; Macário; Guerra, 2015; Eskes; Vieira, 2016).

National rural housing program

The National Rural Housing Program (*Programa Nacional de Habitação Rural* in Portuguese - PNHR), the rural extension of the MCMV, provides housing access for people in rural areas to maintain their activities in place (Costa; Silva; Santos, 2018; Costa *et al.*, 2019). It is designed to minimise the national housing deficit, allowing people to build a new house or even renovate the house they already own (Rangel *et al.*, 2020). At the same time, PNHR demonstrates an intention to avoid the creation of peripheries in spaces that are considered rural (Rangel *et al.*, 2020). The PNHR, although predominantly rural, often demands urbanised land and fails to provide sufficient infrastructure (water, energy, sewage, drainage), quality public transport networks, and in addition, adequate access to education, health and supply facilities (Buonfiglio, 2018; Rangel *et al.*, 2020).

Urban dispersion is also seen near PNHR neighbourhoods, with growing real estate launches, on cheaper land, reaching areas farther from urban centres. Although the urban mesh attracts the deployment of mixed-use buildings, the legislation is inadequate and cannot control occupations in rural areas (Costa; Silva; Santos, 2018).

Mass reproduction

Even though MCMV has improved living conditions for vulnerable families, this programme still intensifies stigmatisation (Vannuchi *et al.*, 2015). Despite dwellers demonstrating satisfaction by owning a property, which may be considered a positive social impact (Quirino *et al.*, 2015), they are still restricted concerning experiencing the city in its diversity (Vannuchi *et al.*, 2015; Serapião, 2016). Health, education, work, leisure, culture, sociability, and other amenities are essential for long-term satisfaction (Menezes; Mourão, 2017). However, as a major promoter of SH programmes, the lack of governmental decisions and leadership transfers critical decisions, such as design, land occupation, and production process, to outsourcing (SERAPIÃO, 2016).

In general, mass reproduction of the same housing model entailed a series of cultural, economic and management problems as regional and cultural diversity in large-scale development is reduced (Vannuchi *et al.*, 2015). The literature points to several actions and measures to reduce SH production errors. However, incorporating these actions into a practical process is still scarce (Muianga *et al.*, 2022).

Guidelines to overcome the negative impacts regarding public policies and SH programme

There is a societal value in owning a home or living in a well-located and built housing estate. SH programmes should therefore put less emphasis on the cost of production, focusing on the positive impacts on the lives of individuals that social housing programmes should have (Menezes; Mourão, 2017). Furthermore, SH

programmes should avoid the repetition of failures and establish a continuous improvement process (Finger; González; Kern, 2015). The local administrative capacities associated with the preference of dwellers and decentralised public policies are necessary. Historical evaluations of SH should also contribute to improvements in policies, programmes and projects (Lavalle; Rodrigues; Guicheney, 2019).

Refurbishment and upgrading actions with participatory processes are also important for improving SH programmes. Self-management (*autogestão* in Portuguese) has been advocated to increase citizen participation in housing production (Stiphany; Ward, 2019), acting as a procedure for the democratisation of design (Camargo, 2020). This may increase the opportunity for housing policies to integrate the formal and informal city by linking the most precarious areas with consolidated urbanisation (Serapião, 2016). There is a need to encourage stakeholders (construction companies, financial institutions, agencies and public policies, and beneficiaries) involved in SH programmes to look for alternatives that may reduce these projects' recurring negative social impacts. Thus, upgrading SH is not only about technical issues but may touch on subjective details to advance long-term, sustainability-oriented solutions and social change.

Brazilian SH financing

Two issues are discussed in relation to Brazilian SH finance: the real estate market and delinquent contracts.

Real estate market

Although MCMV has made significant progress in providing housing for low-income people (Falchetti, 2020), SH programmes tend to transfer the main decision-making to the real estate market (builders, developers, and agencies). SH is mobilised as an instrument to include low-income households as consumers in the real estate market (Conceição; Mastrodi, 2016; Kopper, 2016; Falchetti, 2020; Santoro; Chiavone, 2020).

Even knowing that SH programmes should be aligned with the interests of social policies (Outeiro; Nascimento, 2020), the real estate market is highly autonomous in project development and execution, and therefore demonstrates less consideration towards social outcomes (Campos; Guilhoto, 2017; Alvarenga; Reschilian, 2018; Outeiro; Nascimento, 2020). In the current context, the main decisions are taken by economic agents who are more interested in profit than in social benefits, to the detriment of the population that does not participate in the process as an agent (Outeiro; Nascimento, 2020).

Even with rules and restrictions, SH is developed in a contiguous model. For instance, an official limitation of housing units per project is stipulated to 500 (five hundred) for single-family units and 250 (two hundred and fifty) for multi-family units or apartments (Caixa, 2021). However, several projects, known as “contiguous developments”, are developed beyond the official housing unit’s limitation, known as “contiguous developments” which spatially configure significantly higher than 500 units (Nascimento *et al.*, 2015; Santoro; Chiavone, 2020). The social costs of living in such large developments are still neglected (Ferreira, 2012; Silva; Alves, 2014; Muianga *et al.*, 2021).

Thus, the main decisions of SH production are aligned with profit rather than social benefits, to the detriment of beneficiaries (Outeiro; Nascimento, 2020). The reproduction of projects limits the creative capacity and restricts developer teams and architecture firms to work in a flexible, autonomous process to streamline the project design (Kopper, 2016). Financial agents also have low actions for the social benefits of SH productions (Santoro; Chiavone, 2020).

Defaulting contracts

Low income or the absence of income is one of the main criteria for selecting MCMV beneficiaries, which means that loans have not been subjected to credit risk analyses, thus leading to the programme having a high number of defaulting contracts (Vieira *et al.*, 2019). Low effective income plays a significant role in the differential defaulting rates between cities and peripheral locations (Vieira *et al.*, 2019). The combination of low incomes with peripheral locations may produce an unsolvable equation as job access and poor urban infrastructure tend to impose high costs on poor households, triggering higher defaulting rates and worse social outcomes (Klink; Denaldi, 2014; Acolin; Hoek-Smit; Eloy, 2019).

Guideline to overcome the negative impacts regarding Brazilian SH financing

There is a need to develop effective and targeted actions to minimise the problem of defaulting in the MCMV programme and reduce real estate market pressures (Falchetti, 2020). A public guarantee fund may eliminate the risk of loan defaults during the construction period, while thereafter, units may be sold to the national

housing bank that assumes subsequent risks (Klink; Denaldi, 2014; Fraga; Vieira, 2019). The workplace situation is a factor that leads families with lower income to constantly change residence, as they need to move where jobs can be found (Chaves, 2019). Thus, job and income should also be addressed. Actions to map the professions of SH beneficiaries and provide services and employment systems are essential (Lima *et al.*, 2009; Fraga; Vieira, 2019). Providing actions to guarantee income through employment for SH beneficiary families is fundamental for investments and the continuity of the SH programmes.

Post Occupancy Evaluation (POE)

Two issues are discussed in relation to POE: transformation, cost of living and social participation.

Housing transformation

Because of all the adverse impacts of SH experienced by residents regarding poor quality neighborhoods and the design and construction of housing units, they act independently, adapting their homes, thus transforming and improving their physical environment (Villa *et al.*, 2017). Transformations occur mainly with the purpose of amplifying functional space, modifying the layout, providing new rooms for diverse activities, and meeting dwellers' needs (Kowaltowski *et al.*, 2006, 2021; Berr *et al.*, 2015; Cavalheiro; Abiko, 2015).

For instance, the construction of new rooms due to family composition, the need to separate the living room from the kitchen, bathroom alterations, and the adaptation of some rooms characterise interventions (Aragão; Hirota, 2016; Taube; Hirota, 2017; Bortoli; Villa, 2020). Moreover, there are demands for outdoor transformations (Kowaltowski *et al.*, 2006, 2021), such as adapting pathways, constructing walls and sidewalks, changing the floor and wall finishes, and green areas (Nascimento *et al.*, 2015; Bortoli; Villa, 2020).

On the other hand, transformations may cause various negative impacts on the unit's performance (Muianga *et al.*, 2022). The construction of roofs to accommodate balconies and new rooms, use of low thermal and performance materials, and obstruction of windows and doors may increase discomfort, reduce cross ventilation and natural light, and affect housing infrastructure (Kowaltowski; Pina, 1995; Villa *et al.*, 2017). In addition, transformations may trigger pathologies and affect the health of these families (Muianga; Kowaltowski; Castro, 2022). External transformation impacts housing design and functionality (Bortoli; Villa, 2020).

Cost of living

Costs of living in SH exist. Live-in condominium models represent a new problem for residents (Paz *et al.*, 2015). Fees for services such as water, electricity, cable television, the provision of the property and condominium demands represent an increase in the cost of living, which in many cases makes it infeasible, in the medium and long run, for low-income families to remain in their new SH (Paz *et al.*, 2015).

Although not considered in several studies, SH residents face the risk and costs of insecurity, which reduce external and leisure space uses. Leisure spaces are also often unused due to the lack of maintenance and equipment (Müller; Lima, 2017). Moreover, insecurity increases the need to install surveillance equipment and actions to reduce risks. Insecurity may cause isolation and trigger mental health conditions, such as depression, fear, and anxiety (Muianga *et al.*, 2021).

Social participation

End-users have the highest interest in housing quality, however, with little power to influence the system, as social participation in the SH Programme's decision-making process is scarce. Understanding and intervening in the territory of a given group requires working with it. Analysing different perceptions and interventions of a built environment from a group of people may guide broadly participatory improvement actions among users, agents and public policies (Silveira; Carmo; Luz, 2019).

The MVMV program should be based on a participatory planning process. Considering the importance of social participation in housing policies, especially in MCMV, public policies should emphasise citizen participation within the scope of SH programmes, including the need for training so that participation is effective (Moreira; Silveira, 2015; Silveira *et al.*, 2018). In this process, dwellers engage in all aspects of upgrading, from resource allocation to service delivery (Walker, 2016).

Guideline to overcome the negative impacts regarding Post Occupancy Evaluation (POE)

Actions, properly designed and developed by specialists under resident participation, may promote SH projects better suited to the resident's needs in the long term (Kowaltowski; Granja, 2011; Aragão; Hirota, 2016; Walker, 2016; Vasconcellos *et al.*, 2017; Taube; Hirota, 2017; Villa *et al.*, 2017; Silveira; Carmo; Luz, 2019). In this context, public policies should ensure the interaction between society and SH stakeholders, enabling participatory discussions and improvement actions (Moreira; Silveira, 2015; Silveira *et al.*, 2018).

The importance of space flexibility and individualisation should be incorporated into SH programmes (Nascimento *et al.*, 2015). Functionality, spaces for appliances, solar control in openings, visual and thermal comfort, natural lighting and ventilation, private leisure spaces, balconies, backyards, and spaces for pets and plants should be considered (Horongoso; Bogo, 2018; Muianga *et al.*, 2022).

Outdoor areas of housing developments should have urban infrastructure and landscaping projects with shade trees. In outdoor areas, improved infrastructure and landscaping, as well as providing shading around the buildings from the afforestation are essential. Residents' social networks, communal spaces, and leisure facilities need to be considered and may improve the habitability of SH as they represent a major value for dwellers (Berr *et al.*, 2015; Cavalheiro; Abiko, 2015). In general, detailed investigations of SH design and automatised methods of verifying requirements may provide projects that meet end-users' desires (Kowaltowski; Granja, 2011; Fernandes; Formoso; Tzortzopoulos-Fazenda, 2018).

Use of resources

Considering local bioclimatic conditions and using energy efficiency strategies may reduce the use of resources to improve comfort (Giannetti *et al.*, 2018). Furthermore, upgrading to improve energy efficiency to overcome the effects of climate changes should be explored and applied in Brazil, mainly in SH, to ensure comfort and reduce future energy infrastructure needs (Triana; Lamberts; Sassi, 2015; Musse *et al.*, 2018).

Sustainability certification tools have been used to assess buildings and urban areas to promote more sustainable development goals and practices in civil construction and urban planning (Gomes; Adão, 2017; Gonçalves *et al.*, 2020). However, in Brazil, the initial cost of implementing energy efficiency is still a major barrier (Bodach; Hamhaber, 2010).

User comfort levels of a housing unit should attend compliances with the Brazilian Association of Technical Standards (*Associação Brasileira de Normas Técnicas* – NBR, in Portuguese): NBR 15575 (Residential buildings - Performance), and NBR 15220 (Thermal performance of buildings), considering minimum conditions for summer and winter in all Brazilian Bioclimatic Zones (Oliveira *et al.*, 2015a, 2015b). Moreover, the Blue House Label (*Selo Casa Azul* in Portuguese) is a sustainability certification focusing on the social sector (Gomes; Adão, 2017; Gonçalves *et al.*, 2020). However, NBR 15220 presents minimum values for parameters, which are considered inadequate, and improvement is needed to simplify and make instrument requirements compatible (Oliveira; Souza, 2019; Oliveira; Souza; Da Silva, 2017).

Most Brazilian housings use ceramic or concrete block walls covered by mortar, with a timber roof structure and ceramic tiles (Ruppenthal *et al.*, 2015; Tubelo *et al.*, 2018). This pattern of construction may not be suitable in some places with high temperatures all year round, which implies air conditioning installations, or in cold areas that imply heat systems in winter, consequently an increase in energy consumption (Dalbem *et al.*, 2019; Mahecha *et al.*, 2020). New housing construction technologies are needed to attend sustainable agendas.

Guidelines to overcome the negative impacts regarding Sustainability issues

The current challenge of promoting Sustainable Development Goals (SDG) and reducing resource uses, impacts of global warming, and carbon emissions require upgrading a built environment (Siqueira-Gay; Gallardo; Giannotti, 2019; Siqueira-Gay; Sánchez, 2019). Thus, it is becoming increasingly necessary to consider the context of Life Cycle Assessment (LCA) in SH, and the use of local materials to reduce the application of scarce and non-renewable resources and energy consumption, and carbon emission, to meet SDGs (Giannetti *et al.*, 2018; Azevedo; Geraldi; Ghisi, 2020).

The Life Cycle Carbon Assessment (LCCA) may be applied to assess building quality and sustainability (Mahecha *et al.*, 2020). The LCCA considers all the carbon-equivalent greenhouse gas (GHG) emissions resulting from the materials, construction, and use of a building over the stages of the Life Cycle, including its demolition and disposal. The use of material with less embodied energy and higher durability may decrease the need for maintenance and materials replacement, and achievement of an adequate Life Cycle Energy

Assessment (LCEA) (Paulsen; Sposto, 2013). Moreover, waste material use should be considered, such as recyclable ecological tiles and low-tech and low-cost, made by toothpaste tubes, which may be used to create sun-reflective elements, thus reducing solar heat effects (Masotti *et al.*, 2011).

Strategies to enhance the thermal performance of concrete block walls are crucial (Azevedo; Geraldi; Ghisi, 2020; Mahecha *et al.*, 2020). A well-ventilated building with adequate windows that fulfil daylight, colour absorption of walls and, in some cases of roofs, improves thermal comfort for its users, reducing energy consumption by eliminating the need for air conditioning (Mesquita; Ripper Kós, 2017; Morais; Labaki, 2017; Dalbem *et al.*, 2019). Implementing photovoltaic panels and replacing traditional materials with more efficient ones may represent energy savings and reduce the need for indoor cooling (Pinto; Amaral; Janissek, 2016; Vale *et al.*, 2017; Triana; Lamberts; Sassi, 2018; Dalbem *et al.*, 2019; Bavaresco *et al.*, 2021).

Improvements in urban morphology, such as the introduction of shaded or sunlit open areas, may promote better outdoor thermal conditions that indirectly influence indoor environments, reducing energy use (Krüger, 2015). Moreover, for most bioclimatic zones in Brazil, adequate natural ventilation performance is essential, giving importance to cross-ventilation (Dalbem *et al.*, 2019). Alternatives such as heating during winter, season adaptation for thermal comfort, water use efficiency, and rainwater harvesting are necessary (Oliveira *et al.*, 2015a, 2015b; Moreno; Morais; Souza, 2017).

Thus, metamodels to analyse the thermal performance of SH through sun orientation, shading and envelope materials, and natural ventilation models may provide thermal comfort options and should be applied during the early stages of the design process (Krüger; Laroca, 2010; Krüger, 2015; Rossi *et al.*, 2019; Nunes *et al.*, 2020). The public policies for SH in Brazil have included domestic Solar Water Heaters (DSWH) (Giglio *et al.*, 2014; Giglio; Lamberts, 2016). Adopting DSWH systems may provide annual energy savings and lower carbon emissions, representing a real benefit for end-users and distribution utility firms (Bessa; Prado, 2015; Napolini; Rüther, 2017).

Description of SH issues: qualitative analysis

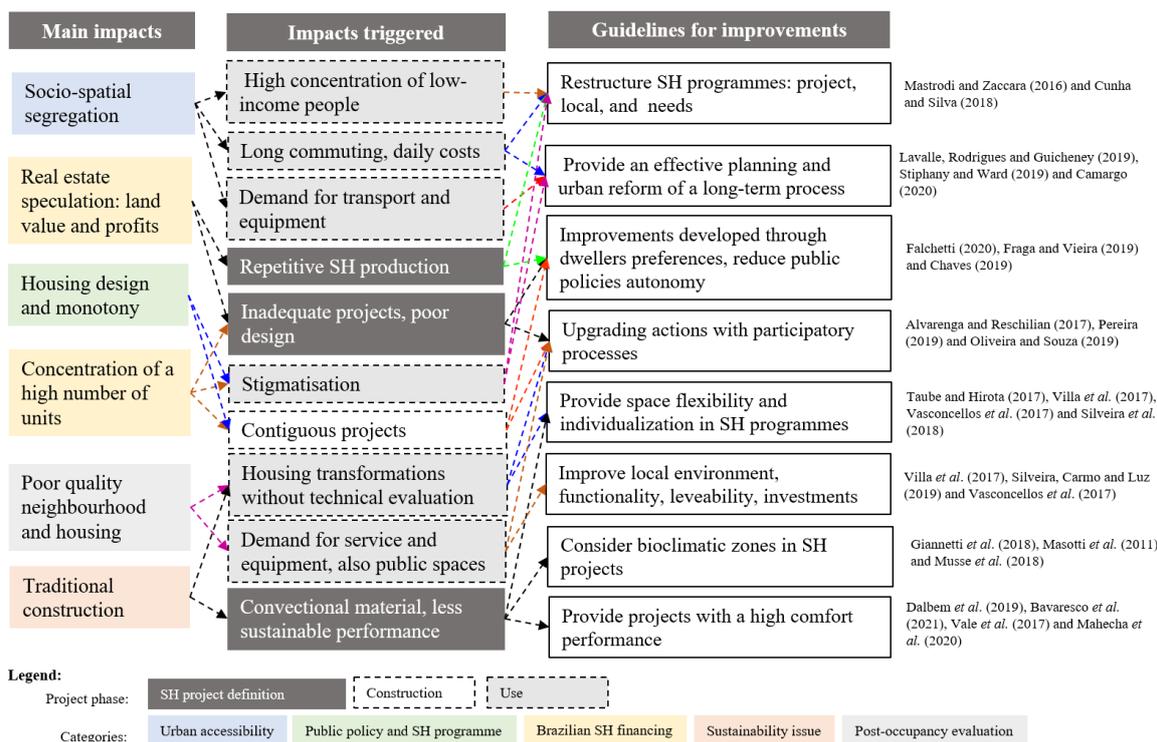
From each cluster of topics presented in Figure 3, eleven issues were identified and analysed. Urban accessibility analysed issues of urban design, ZEIS, and urban infrastructure and equipment. In relation to public policies and SH programmes' topics, issues of housing deficit, the National Rural Housing Program, and mass reproduction were identified. The topic of Brazilian SH financing analysed issues related to the real estate market and delinquent contracts. Post-occupancy evaluation (POE) topics analysed house transformations, cost of living and social participation issues. The topic of resources uses analysed issues of sustainable development goals, thermal comfort, and energy efficiency. For each topic, the main impacts of SH, the cause that those impacts trigger, the phase of the project cycle and guidelines for improvements are presented (Figure 7).

In Figure 7, it can be inferred that categories may share negative impacts from different origins. Furthermore, it is perceived that impacts also may trigger other sub-problems. However, despite impacts being identified based on perceptions and findings from different areas of knowledge, there is an alignment of guidelines that should be applied to mitigate them. The assessment clearly evaluates how a particular intervention might address various interrelated problems.

SH programmes, especially for a lower-income group among the beneficiaries, require changes in their production as a matter of urgency. The SH fails, and impacts are presented over the stages of its Life Cycle, from conception to use. Thus, it becomes increasingly necessary for public policies and housing programme actions to attend to the dwellers' demands, not only in producing and delivering new housing but also in relation to what already exists.

The impacts of accessibility may be minimised by inclusive planning, where the resident becomes the protagonist in defining a neighbourhood according to their needs. Assessing the families' habits and displacements is essential to ensure SH definitions and improvements. Furthermore, it is important to emphasise sustainable neighbourhoods, providing access to amenities with less use of motorised transport. Therefore, the requalification of neighbourhoods where SHs are allocated should be part of public policies to reduce the impacts of housing quality and location. SH projects should be improved to ensure functionality and comfort and, consequently, the well-being of families.

Figure 7 - Association of SH issues



The cost of housing must not be a barrier to improvements, which are often demonstrated through research to be feasible, both in new projects and in existing ones. Funds to improve SH projects are important to elevate the quality of developments to provide adequate design and construction standards, improve people's wellbeing, environmental sustainability and reduce social costs. Funds to improve SHs are increasingly necessary, considering that the challenges faced by residents are recurring and have an impact throughout the life cycle, both in terms of well-being, sustainability, use of natural resources and social costs.

Figure 8 presents a panorama of SH programmes and their impacts through topic analysis. As presented, the actions and decisions of public policies and financing made during the project's initial phase may trigger negative impacts throughout housing production and use (post-occupancy) and affect urban accessibility issues.

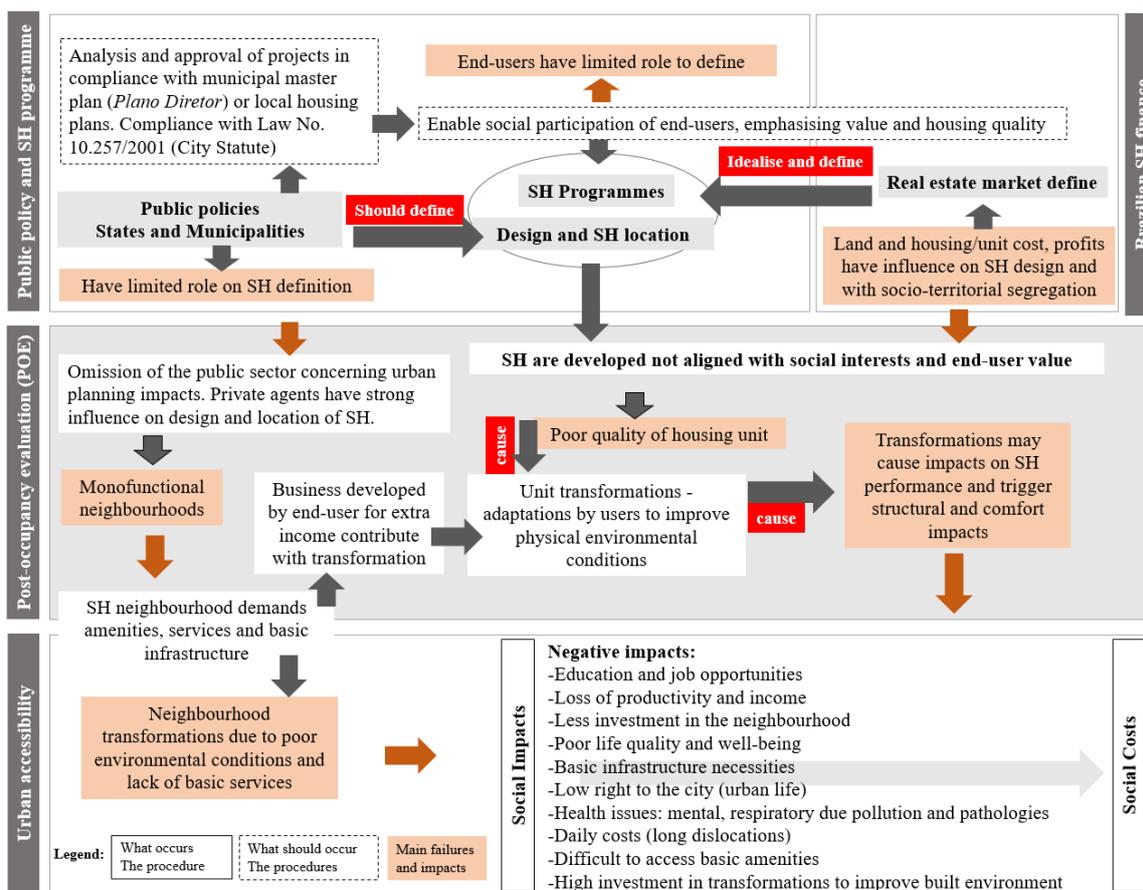
The lack of decisive participation of public policies when defining SH projects allows private agents to be the main decision-makers. Processes with the effective participation of beneficiaries of SH still do not occur, and houses are developed without the correct knowledge of resident needs in terms of units and neighbourhoods. The post-occupancy phase presents negative impacts which could be avoided if the production of SH were to consider social, economic and environmental issues necessary to ensure the quality of life and well-being of its beneficiaries.

The unit, building, neighbourhood and urban contexts affect SH residents in terms of health, productivity, income, educational opportunities, displacement, and right to the city, among other issues, and should be optimised. The introduction of improvements is essential to mitigate recurrent daily life problems that the SH populations face. Improvements to the existing SHs should be considered to reduce recurring problems that most residents of these complexes face in their daily lives. These improvements must be incorporated into new SH designs.

Final remarks

Urban accessibility, public policies, and the production of SH programmes stimulated many studies on Brazilian SH topics. Worldwide, the responsibility to improve environmental issues fosters studies covering various fields, focusing on energy efficiency and strategies for implementing sustainable projects.

Figure 8 - Main failures and impacts of SH programmes



Although issues involving indoor and outdoor SH conditions are raised in POE studies, most studies concentrate on external area issues and the location of SH units. Few studies detail the impacts of the physical environment of the units or present opportunities for improvements aimed at beneficiaries' quality of life. In addition, financing and high defaulting rates drive research in economics, although with less impact.

Public policies and SH programme definitions influence all SH development and trigger negative impacts. The lack of public policy actions, user participation in SH design definition and production, and reduced considerations concerning urban necessities result in the repetition of errors and reduced value for end-users.

In the absence of changes in the production of SH, in which public authorities and users could lead the main decisions on design and location, many of the recurrent problems will be repeated in future projects. An overarching involvement and large investments in infrastructure and the creation of public and private spaces, as well as essential services for segregated sites, are essential to reduce the daily costs of access to basic facilities. Thus, efforts to benefit beneficiaries of these SH estates, improve their quality of life, and the sustainability of these projects should ultimately increase satisfaction rates, constituting a goal for the built environment and societal advancement. Thus, the development of public housing policies linked to the social interests of society is urgent.

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