universitas humanística
Vol. 90
Publicación continua
2020
ISSN: 2011-2734 (En línea) | ISSN: 0120-4807 (Impreso)
Artículos

A Sociotechnical Analysis of the Infrastructure of the Minha Casa, Minha Vida Program*

Un análisis sociotécnico de la infraestructura del Programa Minha Casa, Minha Vida

Uma análise sociotécnica da infraestrutura do programa Minha Casa, Minha Vida

DOI: https://doi.org/10.11144/Javeriana.uh90.saim

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Received: 06 august 2021
Accepted: 28 october 2021
Published: 30 december 2021

Abstract:

This article examines the infrastructure of the Minha Casa, Minha Vida Program (PMCMV), a long-running public program intended to provide housing to low-income Brazilian families. The article uses concepts and ideas drawn from the corpus of STS (Science, Technology and Society) literature. Methodologically, conducted as an exploratory study, this paper was developed based on a literature review about the proposed case study. As part of the results, this policy represented, for many Brazilians, the first opportunity to become a homeowner. However, in spite of mitigating, to some extent, the existing housing deficit, the infrastructure built under the Program is permeated by varying sociotechnical concepts, controversies from the program formulation and risks inherent to the involved companies and Units. The policy was implemented based on a Top-Down model, where the only actors taken as a reference in the formulation and implementation were the great entrepreneurs in the construction sector.

Keywords: Minha Casa, Minha Vida Program, sociotechnical analysis, infrastructure studies, Brazil.

Resumen:

Este artículo examina la infraestructura del Programa Minha Casa, Minha Vida (PMCMV), un programa público de larga duración dedicado a proporcionar vivienda a las familias brasileñas de bajos ingresos. El artículo utiliza conceptos e ideas extraídas del conjunto de la literatura CTS (Ciencia, Tecnología y Sociedad). Metodológicamente, constituyéndose como un estudio exploratorio, este trabajo se desarrolló a partir de una revisión bibliográfica sobre el caso de estudio propuesto. Como parte de los resultados, esta política representó, para muchos brasileños, la primera oportunidad de tener un hogar propio. Sin embargo, a pesar de mitigar, en cierta medida, el déficit habitacional existente, la infraestructura construida en el marco del Programa está impregnada de imaginarios sociotécnicos, controversias en su formulación y riesgos inherentes a los emprendimientos y Unidades. Se implementó la base política bajo el modelo modelo Top-Down, donde los únicos actores considerados en su formulación e implementación se referían a los grandes empresarios del sector de la construcción.

Palabras clave: Minha Casa, Programa Minha Vida, análisis sociotécnico, estudios de infraestructura, Brasil.

Resumo:

Este artigo examina a infraestrutura do Programa Minha Casa, Minha Vida (PMCMV), que integra as estratégias das políticas públicas de longo prazo encaminhadas a fornecer habitação às famílias brasileiras de baixa renda. O artigo utiliza conceitos e ideias extraídos do corpo de literatura STS (Ciência, Tecnologia e Sociedade). O estudo é exploratório, foi desenvolvido a partir da revisão de literatura sobre o caso proposto. Como parte dos resultados, esta política representou, para muitos brasileiros, a primeira oportunidade de ter teto próprio. Porém, a pesar de mitigar, em certa medida, o déficit habitacional existente, a infraestrutura construída sob o Programa é impregnada de imaginaria sociotécnica, controvérsias na sua formulação e riscos inerentes aos empreendedorismos e unidades. A política foi formulada e implementada segundo o modelo Top-Down, que contempla apenas grandes empresários do setor da construção.

Palavras-chave: Programa Minha Casa, Minha Vida, análise sociotécnica, estudos de infraestrutura, Brasil.

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Introduction

In this paper we discuss the infrastructure of the Minha Casa, Minha Vida Program (PMCMV), a long-running public program intended to provide housing to low-income Brazilian families. Methodologically, conducted as an exploratory study with a qualitative approach, this paper was developed based on a literature review about the implementation of the PMCMV in the Metropolitan Regions of Campinas and São Paulo. Our analysis is based on concepts and ideas drawn from the corpus of STS (Science, Technology and Society) literature.

The paper is divided into three main parts, in addition to this brief introduction and the closing remarks. The first part presents the topic of "infrastructures" as an object of sociological inquiry. The second part aims to present the Brazilian experience with PMCMV, providing a general characterization of the Program. In the third part, we propose an analysis of the Program and its related infrastructure, providing an interpretation of its dynamics, potentialities and hindrances.

The theme of Infrastructures

According to Howe et al. (2016), there has been a considerable increase in research on infrastructures in Humanities and Social Sciences over recent years, accompanied by studies carried out in the scope of engineering, architecture, physical sciences, planning and information sciences, among others. The authors argue that infrastructures may be defined in multiple ways, being rooted in social meanings and local culture. In their words, "infrastructure is material (roads, pipes, sewers, and grids); it is social (institutions, economic systems, and media forms); and it is philosophical (intellectual trajectories: dreamt up by human ingenuity and nailed down in concrete forms)" (Howe et al., 2016, p. 549). That is, they end up synthesizing an "Infrastructure, which epitomizes the conjunction of material forms, expertise, social priorities, cultural expectations, aesthetics, and economic investments" (Howe et al., 2016, p. 549). As examples of infrastructure studies, we can mention the works carried out by Ureta (2014) and Velho (2018).

Star (1999, p. 379) proposes that infrastructures "are never a thing", since they are constituted as an organic relationship between elements of different nature. He argues that infrastructures share a total of nine fundamental characteristics: i. "Infrastructures are immersed / sunk in and within other infrastructures, social arrangements and technologies"; ii. "Infrastructures are transparent in use"; iii. "They can be spatial or temporal"; iv. They "are members of a community of practice"; v. They "have form and are formed by the conventions of communities of practice"; vi. "They are modified by scopes and often by conflicts, assuming transparency when connecting with other infrastructure standards"; vii. "They struggle with the inertia installed at the base and inherit its strengths and limitations"; viii. "Become visible when they break or break"; and ix. "They are large, layered, and present complex negotiation processes" (Star, 1999, pp. 381-82).

Howe et al. (2016) argue about the apparent existence of characteristic paradoxes in infrastructure, involving elements such as ruins, maintenance and modernization, and the related risks. With regard to the first paradox, the authors show that infrastructures can bring direct negative impacts to populations, which can serve as a basis for possible wars, structural violence and environmental catastrophes. In this sense, the infrastructures share "complex forms of ruins" that are unevenly scattered throughout the cities, since they are permeable and incorporate different structures of power and direction (Howe et al., 2016, p. 550). Thus, it is recognized that despite promoting ideas related to economic progress and growth, these infrastructures have deficiencies, which can deepen situations of existing inequalities. Ruination, therefore, makes infrastructures visible. While designed for the future, they are rarely made to be conserved. In the authors' words, the ruins "call attention to the constructive and destructive nature of the infrastructure" (Howe et al., 2016, p. 552).

As for the second paradox, maintenance and modernization, the authors argue that past infrastructure projects have the need to modernize, reform and refit, in order to meet new contingencies and standards. However, as in the paradox related to ruins, the maintenance and modernization processes can also be considered as "complex and unequal" (Howe et al., 2016, p. 554). Thus, depending on needs, technology and desires change over the time, with the updating and alteration of infrastructures becoming inherent to their development. Thus, the authors add that "the inability of an infrastructure to 'grow'- or to change and adapt to new environments - is one of the reasons why infrastructures may fall out of use" (Howe et al., 2016, p. 554). It is observed, therefore, that the need for such processes ends up making their disabilities visible, making room for the possibilities for the emergence of new technologies to meet new needs and demands (Howe et al., 2016).

Regarding the third and last paradox, the risks, Howe et al. (2016) say that the infrastructures are designed by and developed for humans and can represent opportunities for equal access. In his words, "infrastructures such as roads and dams allow the creation of things, but they are also destructive of other things" (Howe et al., 2016, pp. 555-556). In this sense, they see that the primary objective of an infrastructure is to mitigate risks, however, with its introduction, these also create new risks and, due to their intertwining in relation to social institutions, when there is a failure in an infrastructure, it causes a cascade effect, causing failures in several systems. The authors also add that the infrastructures are the result of a process of choices and, therefore, produce selective consequences, being both inclusive and excluding (Howe et al., 2016). Thus, they state that "the infrastructure paradox is its double quality as solid and durable and evaporative and itinerant; it is built and growing, rigid and fluid, destined to last, but condemned to be exceeded, ruined and exceeded" (Howe et al., 2016, p. 559).

Drawing from Jasanoff (2004, p. 16), it can be argued that the design of the infrastructures ends up reflecting "the imaginative faculties, cultural preferences and economic or political resources of their creators and users", that is, to the shared sociotechnical imaginary. Therefore, such technological objects are constructed and constituted as belonging to the social order, being "collectively imagined forms of social life and social order reflected in the design and fulfillment of nation-specific scientific and/or technological projects" (Jasanoff & Kim, 2009, p. 120). Likewise, such infrastructure projects mobilize different actors who may benefit (or not) from their construction, as well as may derive from or establish a new one (s) controversy (s) and risks from its introduction and permanence.

They are also subject to controversies. Nelkin (1975, p. 37) points out that "recent technological controversies [...] suggest that access to knowledge and expertise have become a source of conflicts". Thus, when scientific knowledge is used to solve public problem situations, it is often shaped, distorted and manipulated by political practice. In other words, it is what the author calls the politicization of expertise (Nelkin, 1975).

According to Jasanoff (2009), the processes of using expertise in political decisions have become increasingly frequent at the state level in North America and Europe, especially due to the creation of scientific advisory committees. These committees, therefore, offer the possibility to build science-based policies in a flexible way, with relative low costs and the possibility to increase the legitimacy of decisions. However, the author argues that science was called to reduce conflicts, but frequently ended up accentuating them. Moreover, the power of scientists cannot be overestimated, as decisions are often previously made by other (more powerful) actors and they only provide a symbolic force for action. In summary, Jasanoff (2009) points out that science mixes with other types of knowledge, interests, values, administrative routines, political strategies, among others. Therefore, it is clear that the specialist has a different position, as it is legitimized — or sometimes even delegitimized— by the social status of science and the support it has from other actors — with emphasis on companies and governments (Skogstad & Hartley, 2007; Jasanoff, 2009).

Now we will move on to address the case study related to the intrinsic infrastructure of the Minha Casa, Minha Vida Program.

The infrastructure of the Minha Casa, Minha Vida program

According to Soares et al. (2013), the context that shaped Brazil's national housing policy was marked by the increase in investments and public and private housing financing and by the continuity of relevant regulatory and institutional frameworks, such as the creation of the Ministry of Cities in 2003, the approval of the National Housing Policy and the National Housing Plan, the establishment of the National System of low-income family housing and the development of the Minha Casa, Minha Vida Program (PMCMV).

PMCMV was launched under Act No. 11977 on March 2009 and became one of the most important public policy for the Federal Government in the housing field. The main purpose presented by the Government when the Program was launched was "to contribute to the reduction of the housing deficit in the country by granting incentives to the production and purchase of new housing units" (Rolnik et al., 2015, p. 129). In the same line, the Program was also presented as a response to the international economic crisis that ended up affecting the country in 2008, considering its potential for generating large investments, as well as jobs and income in the civil construction area (Soares et al., 2013; Rolnik et al., 2015).

However, in Bonduki's perspective (2009 apud Rolnik et al., 2015, p. 131), "the program moved away from urban planning guidelines contained in the housing policy as set out in the National System of low-income family housing(SNHIS), ruled by Act 11124 / 2005, and the National Housing Plan (PlanHab), launched in 2009". In fact, it should be noted that prior to the creation of this Program, the National Housing Secretariat of the Ministry of Cities was already mobilizing various actors and State's representatives to resume the planning actions in the housing field with a view to establishing long-term goals. At that time, numerous studies and diagnoses were carried out, considering projections of demand for housing, calculations of subsidies, etc. (Loureiro et al., 2013). However, in view of the severe financial crisis of the late 2000s, the Civil House represented at that time by the incumbent minister Dilma Rousseff, ended up playing a controversial role: she met with entrepreneurs from the civil construction sector, as representatives of MRV, WTorre, Rossi and Cyrela and these ended up making official what was already said in the construction of thousands of houses (Loureiro et al., 2013).

Therefore, through a Top-Down model, a new program was prioritized by the Federal Government, being viewed in a positive way by the big businessmen in the civil construction sector to boost the economy. On the other hand, the group of actors who struggled for the right of access to housing for a long time, ended up being ignored in such a Program, which resulted in revolts and concerns about the quality and adequacy of the infrastructure that was to come.

In the words of Loureiro et al. (2013, p. 17),

> PMCMV represented, politically, a change in the priorities previously agreed on the housing policy by the Ministry of Cities, under the direction of Olívio Dutra and his advisors previously engaged in the PlanHab, and the imposition of new priorities for the housing field, determined both by the need for a quick response to the economic crisis and the prominent role assumed by the Casa Civil in the management of priority government policies, as well as pressure from the business community. Priorities now better contemplated with the change of command in the ministry. In other words, the PMCMV implied that the housing policy started to be defined as a predominantly economic and non-social policy, that is, the need to activate the market started to overlap the objective of reducing the housing deficit for low-income workers. income [...].

In this perspective, it was an infrastructure implemented from a political controversy, considering in the foreground the main role of the construction companies and, secondly, the construction of housing adequate to the needs of the benefited families. According to Rolnik et al. (2015, pp. 130-31), "the convergence of interests of construction companies, local governments and the Federal Government in making the program" run "supplanted concerns with aspects such as the urban quality of the surroundings of the projects". In this sense, it can be seen that the emergence of the construction of such enterprises, coupled with the established controversy, constituted fundamental elements for the existence of possible risks inherent to the construction of such infrastructures. On the one hand, there was a significant increase in resources for the housing field,

but from the point of view of those who lose —social movements and civil society— it ended up representing a "trampling" of what had been constituted through participation of these actors in policy councils and other instances of democratic participation. In addition to social movements and civil society, the exclusion of small contractors and family businesses from this Program must also be considered, as well as the situations of outsourcing and subcontracting workers for the construction of such projects, with a view to achieve the set goals.

In this sense, from the design, the Program's initial intention was to build one million homes, with "400 thousand intended to families with a family income of 0 to 3 minimum monthly wages, 400 thousand intended to families with a family income up to 6 minimum monthly wages and 200 thousand for the range of 6 to 10 minimum monthly wages" (Soares et al., 2013, p. 121). Thus, in the context of its emergence, the Program was divided into three income groups, which are: i. Lane 1, for families whose monthly income does not exceed R$ 1,600.00; ii. Lane 2, for families whose monthly income was between R$ 1,600.00 and R$ 3,100.00; iii. Lane 3, intended for families whose income was between R$ 3,100.00 and R$ 5,000.00. Therefore, corresponding to each income bracket, there is a type of financing modality. It should be noted, however, that the financing bands ended up being updated over time, as can be seen in figure 1 of this work.

Regarding the implementation flow[1] and construction of Housing Units (UH) for the lowest income bracket, the Federal Government allocates budgetary resources to the entire national territory, requesting the submission of projects by Builders, which can propose them individually or in partnership with Social Movements, Cooperatives, States or City Halls. The latter is in charge of registering and selecting the beneficiary families, as well as making land available for the construction of projects, when feasible. Afterwards, Caixa Econômica Federal analyzes the project submitted by Construtora and contracts the work, as well as monitors its construction, releasing the necessary resources and, when it is completed, carries out its commercialization (Soares et al., 2013). In this case, therefore, Construtora ends up being remunerated for the construction of the project through the Residential Lease Fund (FAR), which obtains the funds through the Federal Budget. That is, the Construtora is not subject to the risks that may come to occur due to default by the beneficiary families, who must make monthly payments within a maximum period of up to 10 years. In this same income bracket, there is also the modality called "Entities", where the construction of the UH is carried out in conjunction with social movements related to the right to housing. In such a case, financing is provided by the Social Development Fund (FDS), with greater control being made available to the beneficiary families (Rolnik et al., 2015).

Overall, according to official government data (Ministério da Economía of Brasil, 2020), the PMCMV delivered more than 4.2 million units between 2009 and September 2020, impacting more than 20 million people, with an investment of more than R$ 463 billion and the generation of more than 1.7 million jobs. Regarding the number of contracts and deliveries between this period, it can be seen from table 1 that the largest investment occurred through Lane 2, followed by Lane 1, Lane 3 and, finally, Lane 1.5.

TABLE 1
Contracts and deliveries of the PMCMV: 2009 to 2020, by lanes

	Contracts (Units)	Deliveries (Units)	Contracted Amount (R$ Billion)
Lane 1	1,910,503	1,507,365	97.4
Lane 1,5	156,626	156,626	19.2
Lane 2	3,130,805	3,130,805	361.4
Lane 3	367,611	367,611	58.1
In production	510,159	0	15.1
Total	6,075,704	5,162,407	552.8

Source: adapted from Ministério da Economía of Brasil (2020)

For this paper, however, we will make the cut in relation to the enterprises whose subsidy occurs by the FAR, within the scope of Income Band/Lane 1. Regarding this specific Lane and the distribution of investments in the different regions of the country, it is possible to observe from figure 1 that there was a top of investments in 2013, with the Northeast (Nordeste) and Southeast (Sudeste) regions receiving most of the resources for this Lane[2]. This is explained by the high level of housing deficit in these regions. Moreover, it is also possible to observe the decrease in public investment in this Lane, as well as in the other Lanes, especially from 2015.

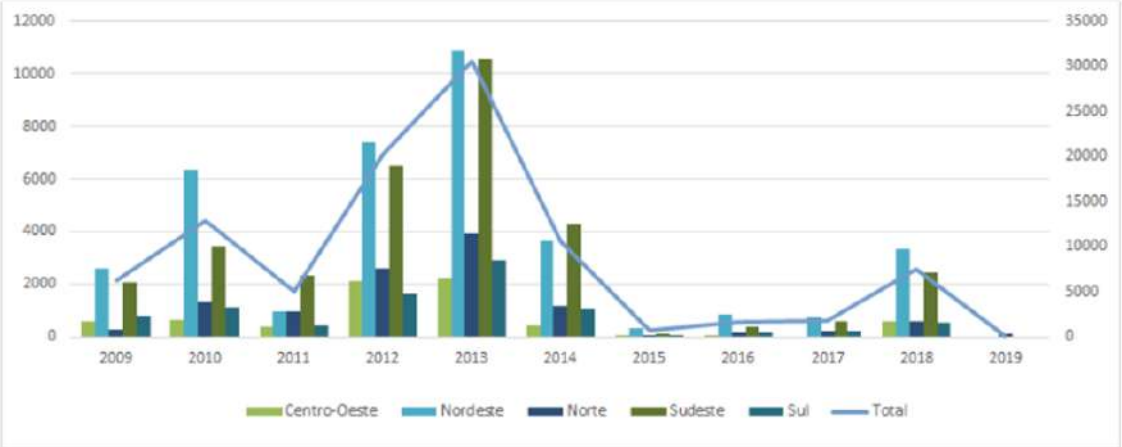

FIGURE 1
Distribution of resources (contracted value) Lane 1 by region and year (in millions of R$)
Source: Ministério da Economía of Brasil (2020)

Therefore, having been formulated with intense participation from representatives of the civil construction sector, the design of the Program's infrastructure ended up reiterating the "reproduction of the peripheral housing pattern of the low-income population in the country" (Rolnik et al., 2015, p. 131) In other words, in order to obtain a profit, these companies depend on the acquisition of cheap land for the construction of such UH. With this in mind, they carry out the purchase of soils in areas "located on the fringes of the city", being that such places end up receiving little benefit in relation to public services, such as access to public transport and the city (Soares et al., 2013). Therefore, a business oriented towards maximizing profits was formed, with highly possible gains significant scale problems by such companies (Rolnik et al., 2015).

> The choice of land by companies, a determining factor for the rate of return of the enterprise, follows a complicated equation, being conditioned by variables such as the cost of the square meter and the requirements established in the legislation regarding access to infrastructure networks, equipment and services. They must be peripheral enough to minimize the percentage of investment spent on the land, but not so far that they do not meet the minimum requirements for the approval of an operation, or demand additional costs with the expansion of basic infrastructure networks. This equation can be influenced by the action of city halls and state governments that, in addition to donating public lands for the production of Range 1 projects, can complement the subsidies made available by the FAR through financial counterparts, enabling the purchase of more expensive land and in thesis better located, or also to fund the expansion of infrastructure networks, equipment and services, enabling the promotion of enterprises in areas that at first would not meet the minimum requirements of the program. (Rolnik et al., 2015, p. 132).

Therefore, as for the architectural typology of such projects, they must follow the minimum requirements established by the Program, as can be seen in figure 2 and Annex 1 of this work. Thus, the UH must have a living room, a bedroom for a couple and a bedroom for two, a kitchen, a service area and a bathroom, presenting at least 36m². Specifically, about the infrastructure related to the projects, they must have an electric power network and public lighting, rain drainage, guides and gutters, paved access and circulation routes, sidewalks, water and sewage network and selective garbage collection. In addition, it is foreseen that these "are inserted in the urban network or in urban expansion zones" (Moreira & Silveira, 2015, p. 96).

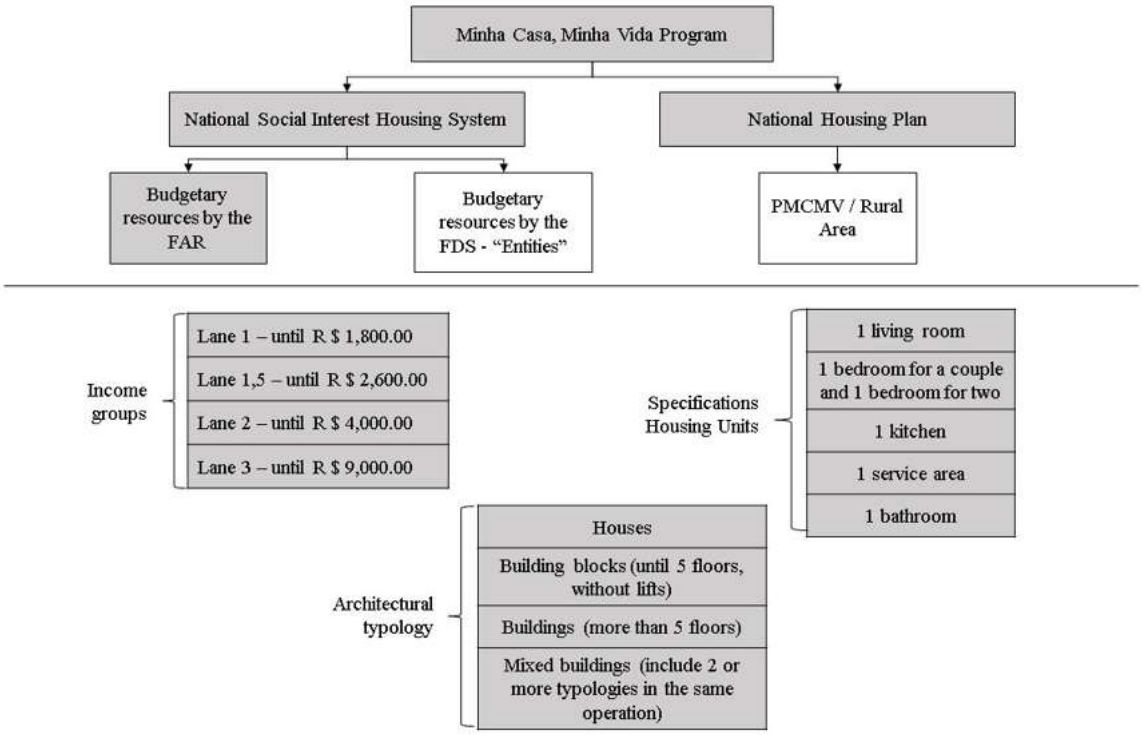

FIGURE 2
Structure of the PMCMV
Source: own elaboration based on information obtained through the institutional website of the Ministry of Regional Development / Presidency of the Republic

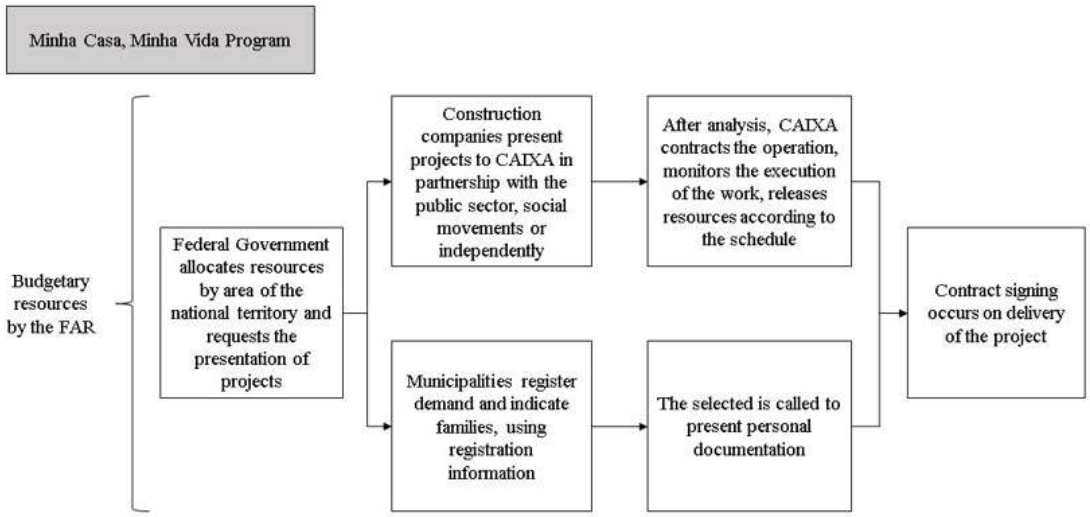

FIGURE 3
PMCMV / FAR implementation flow
Source: adapted from Rolnik (2006)

In Kopper's (2016) perspective, the house is, in itself, an imaginary of social ascent. Within the scope of the PMCMV infrastructure, especially with regard to the established minimum parameters, there is evidence of the materialization of shared political imaginary and induced cartographic sedimentation. That is, from the qualification process of techniques, architectural design, attributes and standards, the experts participating in the moments of formulation and implementation of such Program ended up performing and designing the needs of a target audience that integrates the low-income consumer. Among such experts are economists, engineers, architects and planners, who operate throughout the policy cycle through the realization of an artifact that reiterates the beneficiaries' periphery processes. Corroborating this point of view, Andrade & Demartini (2014) highlights three important aspects in the architectural typology of such projects, they are: i. in the scope of the design of the places where the benefited families stay and travel, there is an inadequate location or the absence of public facilities, such as daycare centers, squares, health centers, etc.; ii. there is an absence of a sense of city in the scope of the undertakings, in view of their similarity to closed condominiums that do not contribute to the relationship with their surroundings; and, iii. the enterprises and UH assume a standard number of members of the family composition, disregarding the diversity that this composition presupposes, also ignoring the assumption that a housing is a space for activities that go beyond domestic activities. Reiterating these aspects, one of the interviewees by Kopper (2016, p. 196) argues that "these are not works of architecture, but works of engineering". Table 2 describes the actors involved in the elaboration and implementation of the infrastructure, as well as their orientations / contributions.

Table 2

State: politicians and bureaucrats	Organized civil society
1. Presidency of the Republic (Casa Civil) and Ministry of Finance, having as main concern to activate demand in the context of economic crisis (decision-making nucleus).	1. Civil construction and real estate business owners: recover previous investments and boost the real estate market (strong influence).
2. Ministry of Cities (technical team of the National Housing System, guided by the idea of urban reform): social concern to reduce the housing deficit, especially for the low-income population (participant in the decision-making nucleus, with important influence through incorporation low-income segments among program beneficiaries).	2. São Paulo Regional Council of Realtors (without influence, with the unsuccessful attempt to incorporate the recovery of existing homes into the program).
3. State representatives in the Council of Cities and in the Management Council of the National Fund for Low-Income Family Housing (one-off influence, reinforcing broader policies for urban development, such as sanitation, transport, etc.).	3. Representatives of social organizations in the National Council of Cities and in the FNHIS Management Council (one-off influence, reinforcing broader policies for urban development, such as sanitation, transport, etc.).
4. Ministry of Planning, Development and Management (monitoring the program together with Casa Civil and SNH).	4. Social movements for housing (without influence, with the unsuccessful attempt to incorporate the recovery of existing homes into the program).
5. National Congress, PMDB (punctual influence, with the incorporation of small municipalities in the program).	5. Municipal entities (occasional influence, with the incorporation of small municipalities in the program).
6. CAIXA, the executing agency for financial operations (important influence on the definition of technical criteria and project evaluation).	6. Financial groups linked to the Housing Subsidy Program (one-off influence, with the incorporation of small municipalities into the program).
7. City halls, co-participants, in complementary actions in the area of urban infrastructure.	7. Professional entities of architects and engineers and specialists in housing areas and urban issues - criticisms that led to the redefinition of the program's design (punctual influence).
8. Control bodies: Federal Audit Court and Federal Comptroller General (one-off influence).	

Actors involved in the design and implementation of the PMCMV infrastructure
Source: adapted from Loureiro et al. (2013)

As for the risks related to the type of such infrastructure, in addition to being located away from city centers and public facilities, the lack of knowledge about the needs and perceptions of the target audience ends up compromising the performance of these projects. According to the consulted authors (Rolnik et al., 2015; Kopper, 2016; Andrade & Demartini, 2014; Moreira & Silveira, 2015; Reis et al., 2015), the benefited families do not participate directly in the process of elaborating the project and construction of this and, having this in mind, the market interests end up being in the foreground, while the needs and demands of these families end up not being considered for the adequacy of the projects. Therefore, when questioned about the beneficiaries' perception of the UH (Moreira & Silveira, 2015; Reis et al., 2015), they argue, for the most part, that the size of the kitchen, the size of the service area, the materials of cladding, hydraulic installations, door and window conditions, summer temperature and safety are elements that represent greater problems and dissatisfaction, both in terms of size and in terms of quality. Such perceptions also reveal that about 82% of the benefited families - and consulted in the surveys - made changes in the structure, through reforms, extensions and improvements. In terms of enterprises, these beneficiaries argue that the quality of the network and telephone signal, quality of leisure areas, quality of living areas, security, accessibility and privacy also have significant negative aspects (Reis et al., 2015).

In order to exemplify these situations, Rolnik et al. (2015) presents two case studies related to the implementation of the PMCMV in the Metropolitan Regions of Campinas and São Paulo. According to the author, both regions present a "pattern of urban insertion [...] [which] reaffirms the predominance of an exclusionary and precarious urbanization model in most cities in the country, especially in the main metropolitan regions" (Rolnik et al., 2015, p. 127). In the specific case of the RMC, as can be seen in appendix 2 of this work, the projects are located within the limits of the urban area of the municipalities that compose it, being located in the southwest region, known as the poorest part of the RMC. In relation to the RMSP, the developments are located on land occupied, substantially, by the low-income population (Rolnik et al.,

2015). This situation can also be observed in other regions of the country, such as the Metropolitan Region of Natal and the Metropolitan Region of Fortaleza, among others (Moura, 2014; Pequeno & Rosa, 2016).

The PMCMV infrastructure from the perspective of ESCT

In view of the perspective of Social Studies in Science and Technology (ESCT), the infrastructure of the Minha Casa, Minha Vida Program is permeated by the participation of different actors who share opposite agendas; sociotechnical imaginary; controversies and risks. The following chart systematizes these elements.

TABLE 3
PMCMV infrastructure analysis categories

CALL US	Discussion
i. Which sociotechnical imaginary (s) was present in the emergence and creation of the infrastructure?	Owing a home refers, in itself, to an imaginary of social ascent, as seen previously. Within the PMCMV infrastructure, the imaginary present in its construction and emergence encompasses two shared concepts: i. in terms of location, "the poor must remain on the periphery of urban regions"; ii. in terms of quality and adequacy of the infrastructure, "the poor can adapt to engineering projects, regardless of the number of family members"; "The houses do not need to have an architectural project, they can and must be equal to everyone"; "The quality of the materials used is not a very important element for the construction of these houses, since those who will occupy are low-income families". Such imagery is very clearly present in the work carried out by Kopper (2016).
ii. Point out the main actors involved in the creation of the infrastructure - *experts*, lay people, *expert* - lay people, identifying their positions and representations	The creation of the infrastructure counted on the active participation of large businessmen in the civil construction sector, as well as specialists / technicians from the National Housing System of the Ministry of Cities. Due to the strong influence on the part of the entrepreneurs and, having in mind the primary objective of the construction of the houses (that is, to dynamize the real estate market), the creation of the infrastructures of the enterprises ended up being "suffocated" by the interests of these actors, who aimed at cost reduction and profit making. Thus, in terms of the location of the developments, they are concentrated in spaces where the venal value of the land is less, being far from public equipment and services. In terms of quality, it is possible to see that this is not adequate, and the beneficiary families end up being forced to carry out constant renovations and maintenance. As for participation by the policy's target audience, they are not considered in the construction of the infrastructure.
iii. Which policy instruments (and possibly *politics*) were present in the process of emergence and creation of the infrastructure in question?	Prior to the formulation and implementation of the Program, the Ministry of Cities had studies and diagnoses related to the demands on the part of families that demanded residences. Their participation in its construction was foreseen, with a view to adapting to the needs. However, considering the adoption of the Top-Down model, as well as the pressure related to the civil construction sector to "run" the program, the studies and diagnosis carried out, as well as the consultation with the benefited families was not carried out. In other words, it was a public policy that, in a hierarchical manner, sought to meet the demands of the civil construction sector to the detriment of the needs of civil society. Specifically, regarding the allocation of the residence to the interested family, a registration system for these families was adopted, which should prove the income through the presentation of various documents. From there, after the construction of the infrastructure, families are drawn to occupy the residence.
iv. Was there any controversy established in the creation of the infrastructure and how did it close?	The creation of the Program's infrastructure arises from a controversy between two groups of actors: the first group, represented by the great entrepreneurs of the civil construction and by the Civil House, together with the Ministry of Cities; the second group, formed by the group of social movements and other actors of organized civil society, that is, the beneficiaries of the Program. At the time of its creation, there was an impasse between the demands already made by the second group - which had great achievements in the scope of housing policy - and between the demands made by the first group. Their demands did not coincide, due precisely to the purpose for which they attributed the construction of the residences. The dispute was closed through a hierarchical orientation for the implementation of the PMCMV, ignoring the demands made by the second group.
v. Is it possible to point out, in the controversy, if there was one, risk issues?	By not considering the demands and needs of each benefited family, the infrastructure ended up presenting some risks to these, they are: i. failure to adapt the space to the number of members of each family; ii. inadequate location of enterprises; iii. lack of access to public equipment and services; iv. quality of the infrastructure of the UH and of the undertakings lower than expected; v. inadequate infrastructure for the relationship with its surroundings; among others.

Source: own work

From this chart, it is possible to decompose the PMCMV infrastructure into three parts, which are: i. the "location" of the enterprise's land, which affects other infrastructures based on new demands related to basic sanitation, the electricity network, the telephone network, paving, access to public transport and public equipment, etc., in addition to speculation created after the construction of these ventures; ii. The "home technology" that shares a sociotechnical pattern of construction of a "residence for low-income families" or, in other words, "residence for the poor"; and, iii. the "political arrangement" of the Program, considering the policy formulation process, the groups of actors involved —their interests and inequalities in power— as well as the element of expertise involved. Table 4 below provides an overview of this breakdown.

TABLE 4
Breakdown of the PMCMV infrastructure

Infrastructure Components	Sociotechnical Imaginary	Comments
1. The Land / Location of the Developments	Sociotechnical consolidated urbanization pattern (but surrounded by conflicts and opportunities for change).	Crossing with other infrastructures (in the sociotechnical sense, for example, public equipment, basic sanitation, paving, public transport, etc.), as well as environmental risks (developments built in areas of environmental protection or areas of risk).
2. The "Home" Technology	Sociotechnical consolidated housing standard (but surrounded by conflicts and opportunities for change).	Crossing with other infrastructures (in the sociotechnical sense, for example, the standard of housing built, the way of construction, the use of construction materials with lower values and quality, in view of the sociotechnical construction of what is a "residence for the poor".
3. The Political Arrangement of the Program / The Design of the Program	Certain patterns of conception of public policy formulation (Top Down, inequality of power between actors, being surrounded by conflicts and opportunities for change).	The policy must be thought within an economic, political, cultural and expertise context. In the PMCMV, therefore, the moments of formulation and implementation clearly demonstrate the conflict and inequality of power existing in two different groups, with different agendas.
3.1 The Mobilized Expertise	Specialist's "authority" speech. Sociotechnical controversy about the Program at the academic level.	The scientific-technical-political knowledge applied in the formulation, implementation and evaluation of the Program, being composed of teams formed by economists, engineers, architects, planners, etc.).

Source: own work

Therefore, considering that the infrastructures are composed of paradoxes called "Ruins", "Modernization and Maintenance", and "Risks" (Howe et al., 2016), we have the following characteristics in the scope of the PMCMV infrastructure: i. in terms of "ruins", the infrastructure reinforces the uneven pattern of urbanization, partially solving the Brazilian housing deficit; in addition, it brings up issues related to other infrastructures such as accessibility and basic sanitation; ii. in terms of "modernization and maintenance", in order to preserve the Program —through the actors who benefit from the infrastructure— they seek to respond to criticisms through modernizations that, in the end, do not alter the shared sociotechnical imaginary; thus, there is the emergence of protest movements and other agendas that transcend the Program itself, such as the movement for the right to the city; iii. in terms of "risks", in addition to those presented, it is considered that there is no risk for the Builders involved in the construction of the projects, but there are economic risks for the State in terms of the possibility of default by the benefited families, as well as risks politicians, in view of the challenges related to the Policy; in addition, there are risks related to the inadequacy of the infrastructure to the particular needs of each benefited family, as well as the probability of the existence of environmental risks inherent to them, since certain projects are located in risk or environmental preservation areas (Ribeiro, 2012). Several studies reiterate the considerations of our study, given the particularities observed through other case studies (Ferreira et al., 2019; Souza & Sugai, 2018; Dourado & Araújo Sobrinho, 2020; Cunha et al., 2017; among others).

Closing Remarks

As an exploratory and qualitative approach, this paper aimed to explore the intrinsic characteristics of the infrastructure built under the Minha Casa, Minha Vida Program from the interpretation of Social Studies in Science and Technology. It is observed, therefore, that this policy represented, for many Brazilians, the first opportunity to become a homeowner. Furthermore, due to the fact that it is a public policy of national applicability, it has had a strong impact on the reduction of the housing deficit, since it has benefited more than 20 million people. Beyond the public investment, there was a direct impact in economic terms, in the creation of jobs in the construction sector, and in the quality of life of the benefited people.

However, in spite of mitigating, to some extent, the existing housing deficit, the infrastructure built under the Program is permeated by a sociotechnical imaginary, controversies from the program formulation and risks inherent to the projects and Units. Such particularities are due to the fact that the policy was implemented based on a Top-Down model, where the only actors included in the formulation and implementation wer the great entrepreneurs of the construction sector, ignoring the needs and demands of the real beneficiaries of the policy: the Brazilian low-income families.

Therefore, considering the analysis performed on the infrastructure components, that is, the "location" of the land, the "home technology" and the "political arrangement" of the Program, it was observed that the PMCMV was a policy with design patterns that keeps unsolved problems such as population segregation and peripheralization. Due to the standard of the housing and low financial cost, the housing units are low quality products, not meeting the real needs of the benefited population.

Therefore, even though the benefits of the PMCMV for the low-income population are undeniable in the homeownership rate, the setbacks of this policy are also undeniable. In this sense, even though it has become the materialization of the "dream of home ownership", the PMCMV perpetuates the idea of an unequal city.

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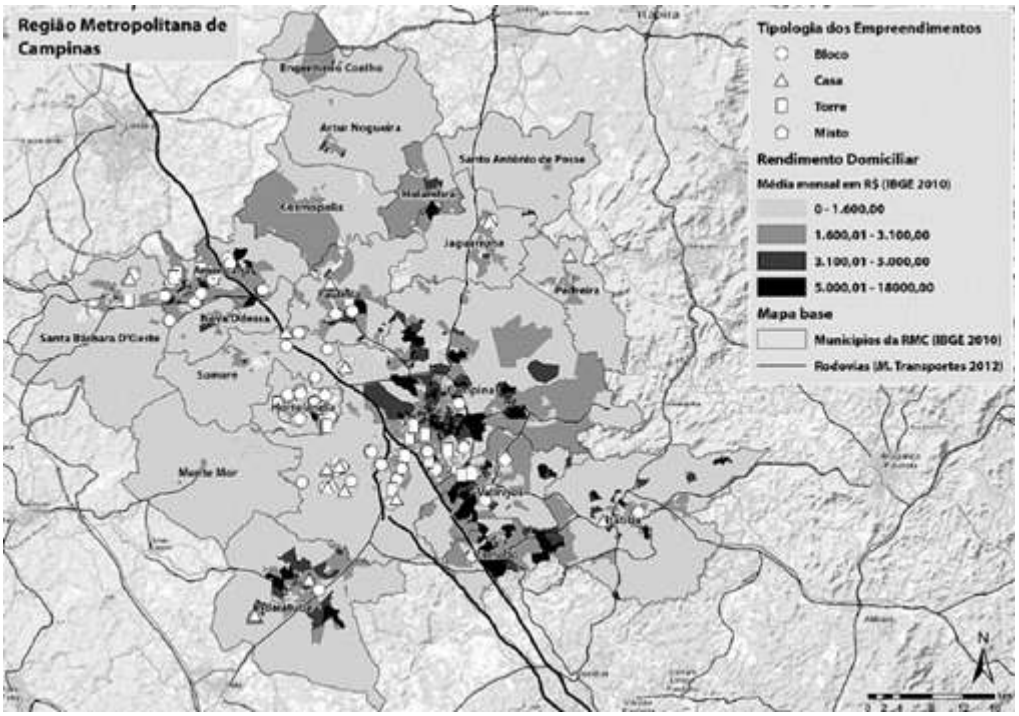
Annexes

Annex 1

Original plan of the housing units of the PMCMV, Santa Cruz - Rio de Janeiro / RJ

Annex 2

Type and location of MCMV projects in the Metropolitan Region of Campinas / São Paulo



Source: Rolnik et al. (2015, p. 139).

Notes

* Research article

1 This flow can be better visualized in figure 2 of this work.

2 In relation to the other income bands/lanes, the investment was mainly made in the Southeast (Sudeste) region of the country.

How to cite this article: Dibbern, T. A., de Brito Dias, R., y Pavan Serafim, M. (2021). A sociotechnical analysis of the infrastructure of the Minha Casa, Minha Vida Program. *Universitas Humanística*, 90. https://doi.org/10.11144/Javeriana.uh90.saim