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Re-thinking the Urban Form of Social Housing in Brazil: A Search for Urban Sustainability

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RE-THINKING THE URBAN FORM OF SOCIAL HOUSING IN BRAZIL:
A SEARCH FOR URBAN SUSTAINABILITY

by

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ABSTRACT

During the last decade, Brazil has witnessed the construction of an unprecedented number of social housing developments, due to an ambitious federal program named "My House My Life" (*Minha Casa Minha Vida* – MCMV). In seven years, it has contracted 4.2 million of housing units, and 2.6 million of them were already delivered to beneficiaries. The program is currently in its third phase, and it covers three different ranges of income with two main goals: to boost the construction sector and reduce the housing deficit of the country by encouraging homeownership.

However, the resultant large scale developments are providing residents with housing units of reduced square footage, located in peripheral locations, with few or no access to basic services and commercial activity. In such conditions, these developments become "dormitory neighborhoods", since they lack enough infrastructure to meet the population's daily needs, such as education, health care, commercial activity, job opportunities, social interactions, etc. Standardization of architectural and urban solutions are a way of reducing costs and usually results in the decrease of the development's overall quality.

This thesis first discusses the Brazilian current housing provision situation and the interconnected relation between social and spatial structures of cities. Searching for a more sustainable urban form, it builds a conceptual framework that expands the eight components for sustainable communities presented by the Egan Wheel by incorporating design strategies to reach them.

It was performed an assessment, based on the conceptual framework, of one of the largest MCMV's development, located in the city of Londrina, second biggest city of the State of Paraná, South of Brazil. This study focuses on the urban form of the development, pointing out that any people's habitat should be consisted of more than a shelter, it should be complemented by a healthy neighborhood that promotes human interaction, and encourages prosperity. Then, it was proposed an alternative master plan to the case study, which has maintained ninety percent of the total current residents and offered quality public and green spaces with a more rational urban form, which also takes into consideration the social processes that define a community.

CONTENTS

1. INTRODUCTION

Urban form therefore is not simply about buildings and the spaces between them, street layouts and open spaces, skylines and city boundaries – although it is about all of those things. Urban form is also about densities and distributions of people, spatial relations between social groups, the spatial marking of legal boundaries and entitlements, urban environments and the submerged or social infrastructures that shape and segment them. Those who seek to understand the city […] need to think about the human clay as well as about the concrete.[1]

This thesis investigates social housing developments in Brazil built under the national program of housing provision "My House My Life", focusing on their urban form and infrastructure. It recognizes the equal importance of social and spatial structures to achieve urban sustainability by building a conceptual framework that combines both aspects and guides the assessment of a case study. Once acknowledged the main challenges and opportunities, a design exercise was proposed to illustrate possible improvements, providing an alternative master plan to the case study.

Social housing developments in Brazil, designed for low-income families, have always faced structural issues that go back to the period of urbanization of the country. The high price of the land, the little interest from the private market to target low-income segments and the dominance of the informal construction sector are still current challenges to a more just housing provision in Brazil. My House My Life Program, launched in 2009, aimed to provide incentives to the private sector to build social housing and subsidies to beneficiaries acquire housing units; this way, reducing the country's housing shortage.

However, the resultant mass production of housing units have been happening disconnected from existing housing policies and have been perpetuating bad practices, to which low-income population have been subject for decades: poor architectural and urban standardized solutions, peripheral location, poor access to basic infrastructure and services, lack of collective spaces, marginalization and socio-spatial segregation.

This study acknowledges that the current mass production of social housing is not the answer to Brazilian issues of housing provision, being the solution more complex, requiring multidisciplinary efforts – from political will to social services. Yet, MCMV is a real program that is changing Brazilian's lives. Because of that, the thesis' hypothesis is that with a proper urban form, supported by the search for urban sustainability, those developments can be more environmental sensitive, socially just and economically prosperous.

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[1] Tonkiss 2013, 25.

2. BACKGROUND RESEARCH

2.1 Overview of urbanization in Brazil

This section will first introduce briefly the major facts in Brazil's history, so readers can be historically situated when big achievements and failures in the housing sector are presented, and relate to the relevance of the object of this study: large-scale social housing developments, illustrated by a case study in the city of Londrina. Then, it is presented an overview of urbanization processes in the country, which led to the current unsustainable urban model, indiscriminately repeated throughout the country. This model is seen in the case study and it is characterized by environmental impacts, difficult access to urban land, consequent speculation, informality and urban segregation.

2.1.1 Brief history of Brazil

In order to understand the recent urbanization and the issues of housing provision of Brazil, it is helpful, first, to go back in history to recognize some important facts that have contributed to the development of the country.

The Portuguese explorer Pedro Álvares Cabral landed in Brazil in 1500, and claimed it for Portugal. It was only after more than 300 years of periods of exploitation and abandonment, in 1822, that Pedro I, the son of the Portuguese king, declares independence and establishes the Brazilian Empire. In 1888, slavery was abolished and the country received a large influx of European immigrants. In 1889, the Military demands Emperor Pedro II to give up his throne and Brazil becomes a federal republic with central government controlled by coffee oligarchies.

The "Old Republic" ended in 1930, when a revolution happened with the populist Getúlio Vargas at head of provisional revolutionary government. Seven years later, Vargas leads a coup and rules as dictator with military support. The "Era Vargas" ends in 1945, when he is overthrown in a military coup; however, Vargas is elected president in 1951, followed by Presidents Juscelino Kubitschek in 1956 and Jânio Quadros in 1961.

Nevertheless, this quick democratic period ends with a coup d'état (1964) designed by the Brazilian Military Forces and supported by the United States. The regime imposed a new, restrictive Constitution, repressed freedom of speech and political opposition; adopted nationalism, economic development and Anti-Communism as its guidelines. Censure, torture and expatriation were also common practices.

After 20 years of authoritarian military dictatorship, aggravated by an economic crisis, a civil unrest movement, *"Diretas Já!"* [Direct Elections Now!] demanded direct presidential elections. It was a catalyst for various opposition forces and a voice for popular discontent. The re-

democratization process ended with the return of civil power in 1985 and the approval of a new constitution in 1988, which called for the first direct presidential elections in 1989, initiating the period called the "New Republic".

The first president elected, Fernando Collor de Mello, was impeached due to charges of corruption, and was replaced by the vice president. In 1994 Fernando Henrique Cardoso was elected and then re-elected four years later. He managed the terrible inflation and ran the country with neoliberal ideals. In 2002, the left-winger Luiz Inácio Lula da Silva won the election and was also re-elected four years later. President Lula's administration focused on social programs and economic policies that helped to significantly raise living standards, especially for the poorest and middle class. Even with serious accusations of corruption related to members of his party, he is often regarded as the most popular politician in the history of Brazil, leaving power with approval rating of close to 90% (Philips 2010). His successor, the first woman elected president, Dilma Rousseff, was also re-elected and stripped of her presidential powers as she faces a controversial impeachment process that is dividing the country.

In conclusion, it is important to understand that the current economic, social and political condition of Brazil was influenced by the colonial and then imperialist period, when the international capital was mainly associated with a local elite that was seeking its own interests. Because of this, for centuries, the country's main resources were exploited and exported, using cheap or slave work force, keeping the internal market stagnant (Maricato 2010, 11). According to Dujon (2008),

> Resource scarcity in developing countries is a consequence of both historic patterns of economic exploitation and more recent neoliberal market policies of structural adjustment that prioritize the generation of economic profits and debt repayment over the health and well-being of ordinary working people. (124)

History proves that the late industrialization, the lack of an autonomous politics and the fragility of the internal market have affected the social and economic development of the country, deepening social exclusion.

2.1.2 Urbanization in Brazil

In Brazil, the Brazilian Institute of Geography and Statistics (IBGE) is the institution that collects data about Brazilian. The definitions of "urban" vs. "rural" by IBGE are still quite limited, since, basically, "rural" is whatever is not "urban", the latter being "a perimeter defined by municipal legislation" (Garcia 2010, 8). It was only recently that new criteria were incorporated to Brazilian census: now, in addition to the legal classification "urban" and "rural", there are eight

new classifications[2] defined by physical characteristics visually noticed by officers from IBGE (Garcia 2010, 2). So, for the purpose of this thesis, the definition of "urban areas" will follow the current IBGE definition: *urban areas are the ones related to legally defined cities, villages or isolated urban areas* (IBGE 2011).

Brazil maintained rural characteristics until the end of the 19th century, when a combination of factors contributed to the urbanization of the country. The main factors were the abolition of slavery, in 1888; immigrants coming from Europe and Japan, in the 1900s; the end of the coffee and gold economic cycles and the beginning of industrialization in Southeast region, leading to a wave of migration within the country in the 1930s; and the overall population growth of Brazil.

According to IBGE, from 1920 to 1940, the urban population tripled, reaching 41.2 million of people living in cities. The search for job opportunities and better living conditions have influenced so much this wave of migration to urban centers that, in the middle of the 1960s, the majority of the population was already living in cities. In fact, in the end of the 20th century, Brazil was already in an advanced stage of its urbanization. In 1991, 30% of Brazilians were living in big cities, with more than 1.5 million of people (IBGE 2007, 50). In the last decade, the urban population reached 84.36% of the total population, while the rural portion comprises 15.64% (MARCHI 2015, 89).

However, even though the urbanization was a national phenomenon, it is important to note that there were differences among regions. In the 2000s, for example, the highest rate of urbanization was found in the Southeast region (91%), while the Northeast region presented the lowest rate – around 70% (IBGE 2007, 50). Another important observation is that urbanization cannot be analyzed only in quantitative terms, since this phenomenon has transformed the country politically and administratively: more people started claiming their rights to the city, to housing, and for more participation in the decision-making process regarding public policies (MARCHI 2015, 89).

With the high rates of urbanization in the beginning of the 21st century, typical migrations country/city decreased and it was intensified the migration city/city, leading to major transformations in the urban network. As a result, nowadays not only the metropolises – with more than 500,000 residents – are the major destinations of these migrations, but medium sized cities – range of 100,000 to 500,000 residents – are also being important in this process. Data from the Institute for Applied Economic Research (IPEA) show that medium sized cities have been

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[2] The eight classifications are: 1) Urbanized area of a town or a city; 2) Non-urbanized area; 3) Isolated urbanized area; 4) Rural area of an urban extension; 5) Rural Settlement (village); 6) Rural Settlement (nucleus); 7) Rural Settlement (others); 8) Area exclusively Rural.

growing more than the national averages, with GDP growth above 5% per year and population growth around 2% per year (IPEA 2008).

The last census released by IBGE, in 2010, pointed out that Brazil had a total population of 190,732,694 people. Other interesting facts the census revealed were:

- The cities where 85% of the population lives correspond to 0.6% of the national territory;

- In 2010, the average demographic density was 22 persons per km²;

- Brazil presented the lowest rate of population growth ever: 1.17%, due to low fertility rates;

- The average number of persons per family fell from 3.4 to 3.1;

- Low-income families still present higher rates: 4.2 persons per family.

The institution estimates that in the present year, 2016, Brazil has already reached a population of more than 206 million people. The distribution of the population within the regions of Brazil can be seen in Figure 1, which also demonstrates that people are concentrated along the coast, what is attributed to the colonization process of occupation of the country, and especially in the Southeast states (São Paulo and Rio de Janeiro), mainly due to the industrialization and job opportunities.
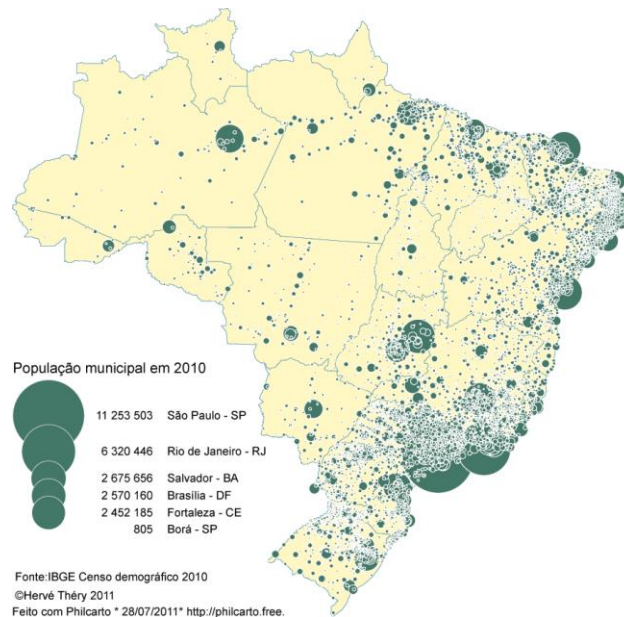
Figure 1: Population by municipality.
Source: Data from IBGE, 2010. © Hervé Théry, 2011. https://confins.revues.org/7215?lang=pt

Similarly to other developing countries, the model of accelerated industrialization in some regions of Brazil was based on an economic pattern of extreme concentration of wealth and serious consequences to the environment, such as extreme pollution levels, acid rain, systematic destruction of vegetation, overexploitation of the workforce left in poor conditions, and so on (Ferreira and Ferrara 2015, 62). Some of these problems are also observed in developed countries;

however, countries like Brazil, with poor regulation and enforcement leading to an uncontrolled growth of informal settlements and slums, still have to deal with the consequences of accentuated social inequality. Cities with strong regional imbalances have experienced a rapid urbanization process, with intense attraction of labor (Ferreira and Ferrara 2015, 63).

Rates of urban growth did not follow the development of infrastructure, basic services and housing alternatives in Brazilian cities, dominated by unequal pattern of land access and poor distribution of public investments in urban areas. In addition, cities have to overcome deficiencies in sanitation, urban mobility and adequate affordable housing. In spite of the economic growth of the last decades, there is still a big challenge of reversing the exclusionary pattern of land distribution and correcting the legacy of social and spatial exclusion of low-income groups (UN-Habitat 2013).

2.1.3   Unsustainability of the current urban model

Historically, every country that has promoted its economic growth with urbanization has also witnessed impacts on the environment. The overexploitation and consumption of raw materials, the large consumption of energy, deforestation, air pollution, soil contamination, among many other issues, combined with the poorly distribution of resources result in an imbalance that characterizes unsustainability (Ferreira and Ferrara 2015, 61).

The main differences between developed and developing countries regarding their environmental agenda, pointed out by Dujon (2008) and John and Barros (2015) are consequences of their historical development. Developing countries have experienced centuries of exploitation under colonialism, they have struggled for their national economic development and have been impacted by several global crises; these facts have altered their economic, social, and cultural structures, leading ultimately to an accentuated social inequality. Because of this, the social and economic agendas hold the direct and immediate interest of a great part of the population, while environmental conflicts remained in the background. On the other hand, John and Barros (2015) affirm that since the social question has already been largely addressed in the past by developed countries, they no longer are concerned with basic economic survival and now the population demands for environmental protections. Developed countries present "enough political will to support the passage of legislation that required some sacrifice of economic gain in the interest of clean air, clear water, and species protection" (Dujon 2008, 126). They managed to increase awareness to the environmental issue, largely supported by public concerns over the environment, "creating international agreements (…) and promoting specific national policies, associated with technological modernization" (Ferreira and Ferrara 2015, 61).

However, in order to fight ecological degradation, globally, it is also necessary to address its roots, namely, poverty, uneven development and population growth (Magis and Shinn 2008, 18). This way, developing countries in particular face a big challenge in search for their sustainable development, with quality economic growth and improvement of human well-being, eradicating cultural and racial oppression and promoting democratic participation in political life (Dujon 2008, 127).

In addition to social issues, another difference between developing and developed countries that helps increasing inequality is the state regulation on the urban lands and the characteristics of the private market. Maricato (2010) explains that in cities like London, Paris, New York City, Boston, Toronto and Tokyo, the State provides regimentation over the totality of urban land, following existing laws, with few exceptions. On the other hand, in cities like São Paulo, Rio de Janeiro, Mumbai and Johannesburg the majority of the population can live in informal settlements, segregated from the "legal" city; in those cases, what should be the exception becomes the rule. The author also mentions that in developed countries, the private market meets the needs of housing provision of the majority of the population, and only a small percentage of the people need subsidy to afford a house – in Canada, for example, this number reaches 30%. In developing countries, the opposite is true. In Brazil, 70% of the population cannot afford the prices of the private market and need some kind of subsidy.

The current urban model adopted by Brazil and other developing countries present serious challenges regarding socio-environmental justice in an urban context, especially regarding housing provision to low-income families. For Ferreira and Ferrara (2015),

> The characteristics of Brazil's urbanization process are based on economic and social inequalities and restricted access to land ownership, which makes facing precarious housing, urban informality and environmental and social damages, the priority urban environmental challenge. (57)

The lack of access to the formal market induces informality – economic activities that are not declared to government agencies – which can represent up to 70% of the economy in developing countries (John and Barros 2015, 160). One of the main consequences of illegal housing settlements is the environmental impact due to occupation of areas such as edge of streams, sliding slopes, flood plains, areas of protection of watershed, wetlands, etc. The occupation of environmentally fragile areas is forbidden by law but in practice is what "is left" to the urban poor, excluded from public programs and the often luxurious market.

Among the most difficult barriers to improve the housing provision in Brazil are the availability of urban land, and the possibility of greater State control over land use. Both obstacles can only be faced effectively with solid political will, but despite the difficulties, Brazil has been well recognized for important achievements in sanctioning and implementing a rights-based agenda for urban and housing matters (UN-Habitat 2013, 25).

The first big step was the approval of a popular amendment in the Constitution of 1988, which introduced two articles (182 and 183) on the social function of private property and the social function of the city. Then, in 2001, the federal government enacted the City Statute, representing a social achievement and exemplifying how different actors, from different social groups, can persevere several years towards an idea even under adverse conditions (Maricato 2010, 5). The central topics of the City Statute are the social function of land and property, and the condition that housing is constitutionally guaranteed as human right. Maricato (2010) points out that the law intends to regulate urban property in a way that the business interests behind it does not become an obstacle to the right of housing for the majority of the people. It is a legal tool to combat segregation, territorial exclusion, and the development of a city that is unhuman, unequal and environmental predatory. In theory, the legislation would transform the Brazilian urban reality, however, the author claims that its implementation has been challenging to municipalities, since the unsustainable and unjust pattern of the occupation of urban land has not changed yet.

2.1.4   Spatial pattern of segregation

Brazilian metropolises are characterized by spatial segregation of social classes in distinct areas of the city (Villaça 2001). Spatial segregation deepens inequality, increases violence and weakens social relations, the acknowledgment of the other and the sense of tolerance. Saboya (2009) calls attention to the fact that low-income populations are the most affected by spatial segregation because they are the ones who depend on public transportation, who struggle with lack of infrastructure and basis services like education and health. Living in segregated areas also affects how people from different social classes relate to and acknowledge each other.

The three types of segregation, according to Lojikine (1997, as cited in Saboya 2009), are: a) an opposition between city center and periphery; b) a separation between high-income and low-income classes; and c) a separation between urban functions, contained in specific zones (residential, industrial, commercial, etc.). The first one, city center vs. periphery, is the best known type of segregation, in which wealthier people are located at central areas with infrastructure, and poorer people are relegated to distant peripheries that lack most kinds of services. However, in Brazil, the most common type of segregation follows a radial logic: high-income classes occupy specific sections of the city with good accessibility to the center city, promoting its development, while other parts of the city remain progressively worse in terms of infrastructure and mobility. Wealthy areas of the city become, then, new sub-centers with specialized services to that social class with plenty of public investments. (Saboya 2009).

However, different from what one may think, wealthier neighborhoods – "voluntarily" segregated – are not more sustainable than poorer neighborhoods – victims of the "involuntary"

segregation. Ferreira and Ferrara (2015) point out that the pattern of urban occupation "is dominated by large-scale projects, with the proliferation of shopping malls and isolated vertical condominiums and walled communities" and that this model produces several urban-environmental impacts, such as:

> (…) condos built using high impact features (for example, high consumption of water due to the typology of multiple bedrooms with bathrooms per unit), fragmentation of the urban landscape by walls cutouts, spatial segregation by social level, restriction of multiple uses, elimination of local shops, replacement of public spaces and squares and promenades with private space for the condominium complexes, soil sealing, and the absolute priority given to the automobile as a model of transportation, etc. (66)

Curiously, but not surprisingly, this failed model has been adopted by cities of developing countries, repeating what high-income cities in the world have been doing. One of the reasons pointed out by Ferreira and Ferrara (2015) is the recognition by the majority of the population that this is a desirable model. However, the replicability associated with its large scale dimension, and its monofunctionality worsen the quality of those neighborhoods, created without proper urbanization standards.

Low-income neighborhoods tend to follow the same standard, but are aggravated by other basic issues that usually high-income ones do not deal with. These variances have also to do with the difference between involuntary and voluntary segregation, as table 1 summarizes[3]:

Table 1: Involuntary and Voluntary Segregation Attributes. Source: Elaborated by the author

Involuntary Segregation	Voluntary Segregation
No urban planning	Poor urban and architectural solutions
Lack of means of transportation	Automobile dependence
High vulnerability to natural disasters	Disturbance of natural lands for profit
Lack of available jobs close to home	Lack of engagement with the community
Environmental issues	Insufficient and small exclusive green spaces
Violence	Isolation from the urban fabric seeking safety
Lack of education and health facilities	Non-diverse services class-wise

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[3] The table offers a general overview of some of the prevailing issues encountered in voluntarily and involuntarily segregated settlements. However, some of the items listed can be easily combined and/or interchanged depending on the development.

Figure 3: Voluntary segregation: Gated Community in Campinas-SP.
Source: Acervo LabHab, 2008.

Figure 2: Involuntary segregation: Irregular occupation in the edge of a stream in Manaus-PA.
Source: José Sette Whittaker Ferreira

Situating new social housing projects in remote areas encourages sprawl, increases infrastructure costs (like sanitation and transportation), facilitates speculation and exiles the poorest segments of the population. Ferreira and Ferrara (2015) claim that "there is definitely a political culture reflected in municipal housing policies, accepted by the wealthiest segments of society, and promoted by municipalities and by the construction sector, to continue to produce, even in new developments, the urban spatial segregation".

Segregated cities are marked by homogeneous spaces, social disparity, retention of vacant lands, restricted and luxury market, speculative profit, lack of social policies, housing shortages, and informality (Hildebrant 2010).

2.2   Housing shortage in Brazil

In the 1930s, the fast growth of the urban population and the lack of housing infrastructure of urban centers to accommodate the spare population, encouraged the creation of "*cortiços*", rental houses with very low-quality building and sanitary conditions. Among several other issues, the government at the time decided to regulate the rental market, consequently discouraging it. During the Military government (1964-85), the foundations for a new era for housing policy were laid: the "dream of homeownership". At that time, it was created the National Housing System (*Sistema Financeiro de Habitação*), the construction sector was boosted to stimulate the economy and to create jobs and housing was represented the ideal of well-being and "social compensation" for Brazilian citizens. The National Housing Bank (BNH) was the country's main agent of urban and housing policies and it financed about 5 million housing units. However, only 33.5% were destined for families with an income of up to 3 minimum wages (UN-Habitat 2013, 10).

With the end of the Military government, the last two decades of the 20th century were characterized by a decentralized governance (with local municipalities having greater autonomy) and the growth of informal settlements. Housing and urban infrastructure problems were aggravated and affected mainly the urban poor, indicated by the massive proportion of irregular land occupation and the growth in number and size of favelas.

Housing shortage in Brazil relates to the immediate need to build new housing for the solution of social issues and specific problems of housing provision detected in a certain moment. The deficit is also related to the conditions of houses; this way, public policies can address the improvement of low-quality buildings as well (Fundação Joao Pinheiro 2015). The object of this study is a social program – My House My Life Program –one of the main goals of which is to fight housing shortage in Brazil.

2.2.1   Measurement of Housing Shortage in Brazil

In Brazil, the João Pinheiro Foundation performs regular studies about the housing sector at the request of the federal government. Housing shortage studies measure housing deficit by the real absence of housing and further assessments in terms of habitability and affordability. The housing deficit indicator covers all households and not only those in favelas, and consists of four criteria:

a)   excessive spending on rent (more than 30% of household income)

b)   involuntary cohabitation (when more than one household live in the same house)

c)   precarious housing conditions

d)   number of persons per unit or over-crowding (3 or more people live in the same room)

The last study released, from 2013, pointed out 5.8 million dwellings as the total housing shortage of the country – 85% of it in the urban environment –, resulting from the combination of these four criteria. The total number is distributed throughout the five regions of the country, as Graph 1 presents, and if compared to Figure 1 (in chapter 2.1.2), it is possible to notice that the housing deficit is concentrated on the most populated states, along the coast. The city of São Paulo presents the worst results – 1.25 million of dwellings (Fundação João Pinheiro 2015).

Graph 1: Housing shortage in the five regions of Brazil.
Source: Elaborated by the author, based on Fundação Joao Pinheiro, 2015
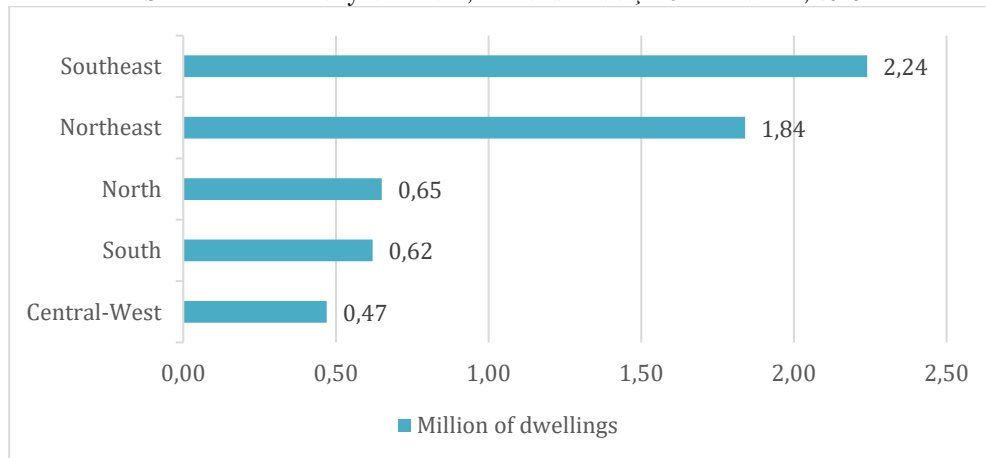
Although the absolute concentration of the housing deficit is located in the Southeast and Northeast, the largest percentage of relative deficit is concentrated in the North: 13.7%. Regarding the composition of the housing shortage, Graph 2 shows that the category that most contributes to the deficit is excessive spending on rent:

Graph 2: Composition of Housing Shortage.
Source: Elaborated by the author, based on Fundacao Joao Pinheiro, 2015.
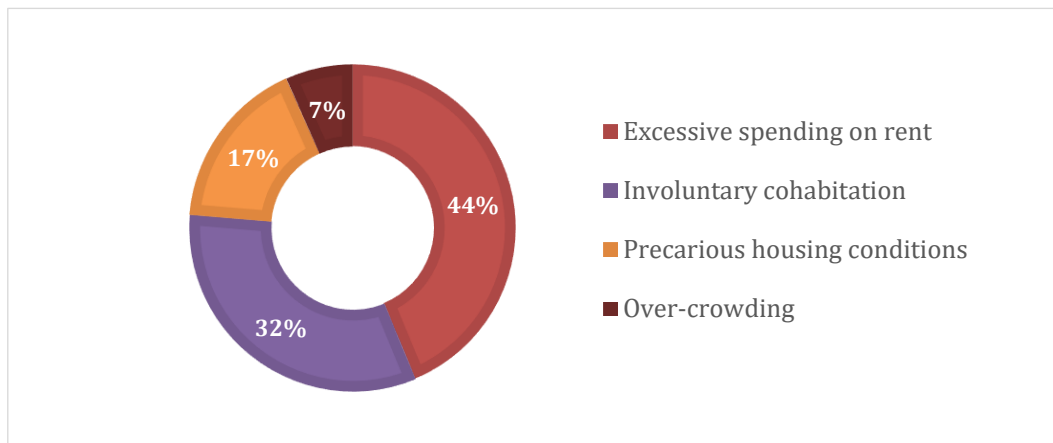
According to Hildelbrant (2010), the portion of the population that earns up to three minimum wages is the one who suffers the most with the lack of housing provision; they represent more than 70% of the national deficit. Conceptually, this segment is considered the priority by the State.

2.2.2 Challenges and Opportunities to Face Housing Shortage

The history of housing provision in Brazil have been associated with models of socio-spatial segregation, particularly for the urban poor (Hidelbrant 2010). The solution is complex, multidisciplinary, and must be also faced politically so real changes can happen.

The *high price of the land* limits not only its purchase by the people and the State – who could be building parks, schools, health centers, etc. – but it also drives housing provision to distant areas. However, what is usually not taken into account is the extra costs of bringing infrastructure to these areas (Ferreira and Ferrara 2015, 76).

The *private market* has little interest in the low-income segment and keeps serving only a narrow share of income ranges that can afford formal market products. The *informal sector*, the alternative for low-income households, represents half of the 1.5 million housing units built annually. John and Barros (2015) claim that since "informal economy is invisible to the State, it makes planning processes difficult and it is relatively resistant to public policies".

The *mass production of housing* is based on large development models guided by the goals of quantity, speed of execution and productivity. The results of such practice are the well-known issues of peripheral location, lack of connectivity to the urban fabric, consequent marginalization and exclusion, lack of flexibility, adaptation, and diverse uses (Stébé 1999 as cited by Ferreira and Ferrara 2015). In peripheries, the model of urbanization is similar to gated communities and walled neighborhoods – which mainly follow the American model – and lead to a sprawled and unequal urbanization (Maricato 2010, 15).

Lack of adequate *urban infrastructure and basic services* are also issues that developing countries have to face in addition to the housing deficit, and it also affects mostly low-income households. Examples of that are the low-quality and high-cost transport systems and insufficient basic sanitation – only 55.4% of the total 57.3 million households were connected to urban sewer systems in 2010.

The *empty housing stock* represents both a challenge and an opportunity: it is estimated more than 7 million empty units in Brazil, 90% in conditions to be occupied, which could serve about 19 million people. However, this issue has not been adequately taken into consideration in the scope of recent housing policies and there in not enough evidence of the legal status of those units (UN-Habitat 2013, 22).

Advances on housing provision began with the Constitution of 1988 and the City Statute in 2001 through the recognition of the right to adequate housing and to the social function of urban land in Brazil. The creation of the Ministry of Cities, in 2003, and several council and funds are also improving the situation by subsidizing programs like the Acceleration of Growth

Program (PAC) and the My House My Life Program (MCMV). The former deals with the "inadequacy of urban and land regularization and improvement of the residential stock in informal settlements through procurement of building material; urban and land tenure regularization; slum upgrading; expansion and improvement housing units; rehabilitation of buildings; and construction of health facilities" (UN-Habitat 2013, 26). Programs like MCMV support the production and acquisition of new housing units, used stock and plots, as well as the purchase of building materials.

Self-construction in peripheral lots is a common form of access to housing for low-income people, due to the absence of urban land, infrastructure, collective and community spaces and public facilities. MCMV present a construction modality – Entities – in which projects can be developed through "*Mutirões*" (mutual-aid construction, which beneficiaries work in the construction site); "*Administração Global*" (self-management, with outsourcing of specialized work); and "*Empreitada Global*" (global contract, which private companies implement the project but an organized entity and the beneficiaries manage it). The benefit of having some kind of self-construction process is to involve citizens and increase awareness regarding the social and political dimensions of housing (UN-Habitat 2013, 49, 88).

2.3   My House, My Life Program (MCMV)

Because of Brazil's history of development, the current unsustainable urban model and several political and economic issues, the housing shortage is a complex matter that needs to be faced seriously and by multidisciplinary fronts. The "My House My Life" Program is one effort promoted by a combination of stakeholders that aim to address the issue. The case study is about one of the developments built under this program.

This section will present an overview and the main conclusions already drawn about MCMV. However, it is important to acknowledge that MCMV is applied throughout the national territory, so each region has its own particularities that must be taken into account individually. Here, essential information will be presented so the case study can be better understood.

2.3.1   MCMV Overview

The "My House My Life" Program (*"Minha Casa Minha Vida"* – MCMV) is originally an economic program, conceived by the Ministry of Finance and Ministry of the Cabine, along with the construction sector. In the context of the global economic crisis, the proposal was accepted by the Federal Government and launched in 2009, with a strong belief in the economic potential of building large-scale housing developments. The idea was to mobilize several other sectors associated to the construction industry: from the extractive to the furniture industry and household appliances (Amore 2015, 15-16).

Goals

The program's goals were basically to stimulate the economy by the production of new housing units, and to fight Brazil's housing shortage – at that time equivalent to 7.2 million dwellings, 90% of it concentrated on the lower range of income – by promoting the acquisition of these units by the low-income population. To do so, special mechanisms were created to mobilize the private construction sector to build houses for this income group, and arrangements of subsidy and finance were designed to enable homeownership (UN-Habitat 2013, 31).

In order to meet the first target – building 1 million houses between 2009 and 2010 – the Government allocated R$ 34 billion (the equivalent of US$ 18.4 billion) from non-refundable resources (the federal budget surplus – 75%) and refundable funds (Workers Severance Fund (FGTS) – 22%). The last 3% (R$1 billion) came from The Social Development Bank (BNDES) for infrastructure financing (UN-Habitat 2013, 37). "The amount of subsidies mobilized for the Program was unprecedented in the history of social housing interventions in Brazil, and signals a strong redistributive component amidst the crisis response policy." (UN-Habitat 2013, 31)

Significance

According to the report published by UN-Habitat in 2013 ("Scaling-up Affordable Housing in Brazil"), the significance of the program can be summarized in five topics:

1) Its large-scale approach to allocating subsidy finance, mobilizing housing provision and reducing the housing deficit at a national level;

2) Its integrated approach to housing and economic development: the combination of the strategy of promoting access to housing with the creation of jobs and the strengthening of the supply chain of the construction sector;

3) The wide eligibility ranges of the program: it assigns greater focus to the lower-income groups but also mobilizes private-oriented housing provision to middle-income households;

4) The stimulation of the private sector to produce low-income housing through mechanisms that reduce the risk, fiscal incentives and institutional changes to improve and accelerate project approval and execution at the local level.

5) The inclusion of traditional experience related to self-construction in Brazil and the capitalization of the long-established experiences of social housing movements and cooperatives, though the "Entity" modality of the program.

Institutional Framework

The main agents involved in the program and their main roles are summarized in the following table:

Table 2: Summary of the Institutional Framework of MCMV. Source: Adapted from UN-Habitat 2013

Federal Government	Ministry of the Cabinet & Ministry of Finance	- The financial architects of the Program
	Ministry of Finance + Ministry of Cities	- Definition of general guidelines and conditions for regional distribution of resources; - Monitoring the Program implementation.
	Ministry of Cities + National Housing Secretariat	- Management of the Program; - Definition its overall operationalization
	CAIXA (Public bank)	- Management of the resources allocated for subsidies and finance; - Provision of loans for developers and finance to the beneficiaries; - Definition of technical criteria for project design;

	CAIXA (Public bank)	- Implementation and monitoring of projects execution; - For developments targeting the lower income ranges, CAIXA manages the stock, and once construction is completed distributes units to selected beneficiaries.
State and Municipalities	State and Municipal Government Housing Secretaries; COHABs; Planning Depts.; Local Departments for Project Approval	- Selection and enrollment of potential beneficiaries; - Funding parts of the projects (in cash, through the provision of services or land) - Issuing project licensing (important role in urban insertion and location of projects)
Executor Agents	Private Developers	• Undertake the bulk of housing construction within the Program; • Commercialization of the units when targeting higher income ranges.
	Social movements and community-based organizations	• Within the "Entities" Modality (MCMV-E) they can organize and enroll the demand, acquire land, elaborate, execute and manage projects.
	Built Environment Professionals	• Technical expertise

Income groups

The eligibility range of the MCMV Program was first defined by the number of minimum wages per household (zero to ten), but because of issues of minimum wage readjustment, now it is based on a fixed amount of "reais (R$)", to avoid distortions and the exclusion of the poorest. (Amore 2015, 19). Until the present year, 2016, the program is divided in four income groups, but in practical terms, it is divided in two main scenarios: the income group 1 – the lower income range – who gets public subsidies and finances the housing unit with no interest rates; and the rest of the income groups, who gets discounts, low interest rates and more access to financial credit (Ferreira 2012). The distribution of developments within Brazil is based on the housing deficit by location. Table 3 summarizes the main characteristics about the income groups eligible by the program.

Table 3: Range of income groups targeted by the Program. Source: Adapted from Brasil, 2016.

Monthly Income	Income Group	Characteristics
Up to R$1,800.00	1	Subsidy: 90% of total value. Finance the balance in 120 months Maximum R$270.00/month
Up to R$2,350.00	1.5	Subsidy: up to R$45,000.00 5% interest rate/yr
Up to R$3,600.00	2	Subsidy: up to R$27,500.00 5.5%-7% interest rate/yr
Up to R$6,500.00	3	8.16% interest rate/yr

All income groups are important and need to be addressed by public policies, however, the first one is the most urgent, once it concentrates the larger portion of the Brazilian housing shortage. In addition to that, since there is a shorter amount of money available to the developments destined to group 1, usually they present lower urban and architectural quality solutions. This is why this thesis will focus on the study of developments of income group 1.

Typical Steps – Income Group 1

The Municipal Government signs off an agreement with CAIXA to participate of the Program

⬇

CAIXA begins to receive proposals of land acquisition and projects from developers

⬇

Municipalities provide CAIXA the list of beneficiaries,
according to the criteria defined by the program

⬇

Developers/Construction companies present their projects to CAIXA

⬇

After a simplified analysis, CAIXA hires the construction company to develop the project

⬇

The construction company executes the project and delivers it finished and legalized

⬇

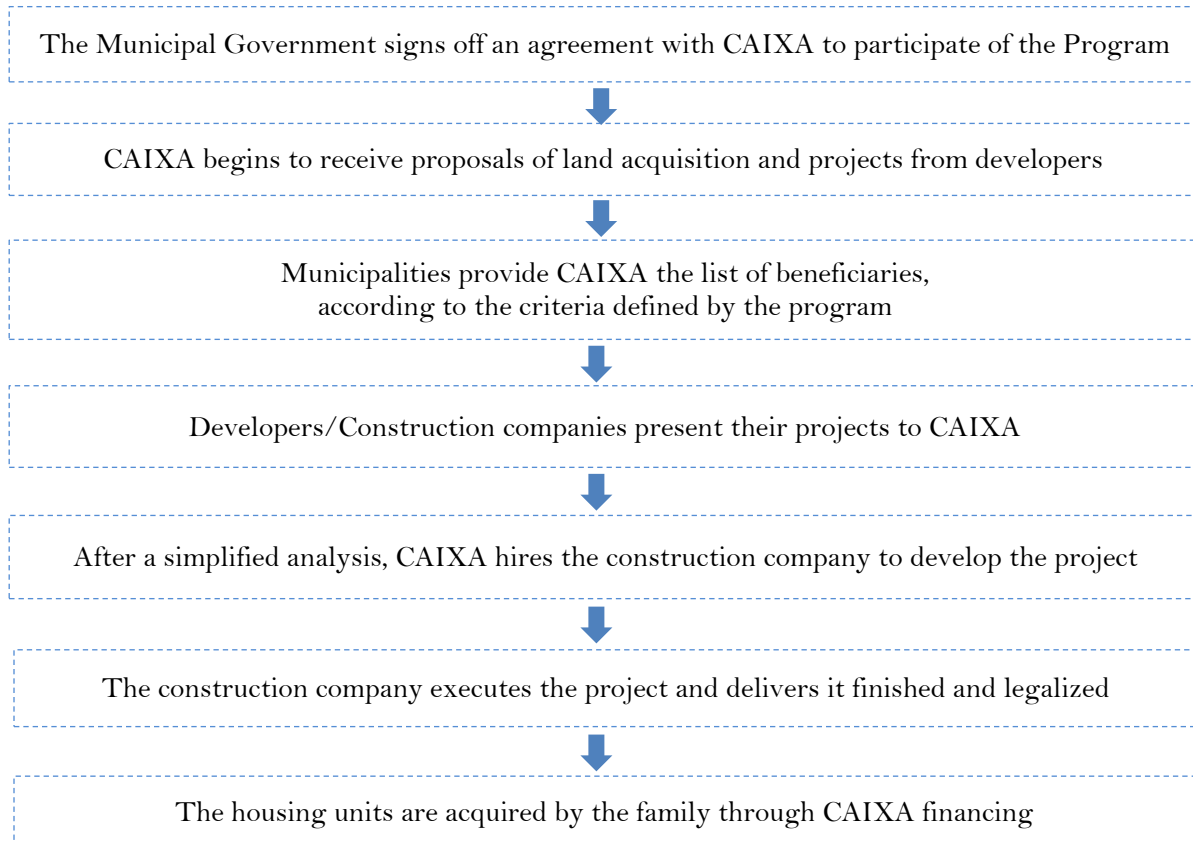The housing units are acquired by the family through CAIXA financing

Figure 4: Typical Steps of a Development for Income Group #1.
Source: Elaborated by the author, based on Rolnik 2010.

In order to the families occupy the housing units in this segment, they must meet the criteria of maximum income, they cannot own another housing unit, neither be a beneficiary of another social program nor have registration restrictions. They can also earn "extra points" if they meet additional criteria related to vulnerability and territoriality, i.e. having a woman as head of household, presence of disabled people in the family or living in risky areas (Amore 2015, 21). Beneficiaries of this group of income cannot sell or rent the unit before the financing period of 10 years ends. Sale is allowed for the other income groups.

Services and Maintenance

The need for buildings for public and social services are defined by the National Secretary of Housing, and implemented by the construction company, financed by Caixa – the same process the housing units follow. However, once built, the municipal government is responsible to equip and put it into operation. The investment in such buildings is up to 6% of the value of the development to which it is linked (Caixa 2016).

Regarding commercial areas in developments destined to the income group 1, they were only allowed from the second phase of the program on. The income generated from these spaces must be allocated fully to fund the condo and these commercial units cannot be sold. However, a proper integration with the housing units is not seen in many developments. Residents can create little commercial spaces in their houses, as long as they keep the building as their home – such strategy help residents to generate income that ultimately will help them pay condominium fees.

The condominium fees are related to general maintenance and employees' wages. The total amount is usually divided equally between residents, the payment is mandatory and it is not subsidized by the program. One resident is elected democratically as the "condominium manager" and earns a salary to maintain the order and the good operation of the condominium. Depending on the size of the development, more than one building manager is elected. They usually deal with a variety of daily and structural issues – from a loud neighbor to default.

In developments from the income group 1, there are residents that struggle to pay condominium fees, since some of them do not have a fixed income or any income at all. In such cases, the overall default can jeopardize the good operation of the development; however, creative condominium manager can overcome this situation by, for example, proposing that a person that knows how to take care of a garden offer his/her services in exchange of a percentage of the condominium fee.

Figure 5: Single Family Houses. Income Group 1.
Source:
http://www.jcnet.com.br/Nacional/2015/09/caixa-fecha-cerco-a-inadimplentes-do-minha-casa-e-imoveis-serao-retomados.html

Figure 8: Housing developments.
Source: http://www.t1noticias.com.br/cidades/cidade-de-araguaina-convoca-sorteados-para-assinarem-contratos-na-proxima-5%C2%AA/73563/ o

Figure 6: Multi-story Buildings. Income Group 1.
Source:
http://www.casadicas.com.br/financiamento/minha-casa-minha-vida-o-que-e-e-como-funciona-o-programa/

Figure 9: Single Family Houses and Buildings.
Source:
http://www.idifusora.com.br/2015/04/13/sorteados-para-assinatura-de-contrato-do-minha-casa-sao-convocados/

Figure 7: Buildings from other Income groups, advertised by construction companies.
Source: http://minhacasaminhavida.pro.br/wp-content/uploads/2015/11/minha-casa-2016-minha-vida.jpg

2.3.2 Quantitative Analysis

The MCMV Program is now in its third phase and so far, it has reached numbers that indicate nothing but success. In the first phase, from April 2009 to June 2011, it reached 100,5% of the goal of contracting 1 million of housing units, totalizing 1,005,128 units (Brasil 2013, 5). For phase 2, from June 2011 to December 2014, the goal was increased to 2.4 million housing units, and until the end of 2015, the total number reached 4.2 million units.

According to Portal Brasil (2016b) the program has generated and maintained 1.2 million direct and indirect jobs – in six years, 6% of the jobs related to the construction industry were related to MCMV – providing direct income of R$120 billion (average of 7.8% of GDP). So far, 10 million people were beneficiated by the program and until 2018 the goal is to beneficiate 15 million more, totalizing 25 million of people. The program was also decisive to the annual average reduction of 2.8% in the Brazilian housing deficit between 2010 and 2014 (Portal Brasil 2016a).

It is estimated that for every 1 million *reais* invested in the program, the Brazilian economic activity creates approximately 32 jobs. The segments of construction materials and services are also fostered, since MCMV generates, annually, R$15.4 billion in new businesses (Brasil 2013, 5).

The program is constantly changing, and in the different phases several adjustments were done to improve the product delivered to the beneficiaries. In the second phase, the income groups were widened, low income groups were prioritized, new partnerships were consolidated, and improvements in the housing units were established as a requirement, such as a bigger square footage, solar heating systems, ceramic tile floors, larger doors and windows and improved accessibility (Palácio do Planalto 2011).

Because of cuts in the national budget and political and economic issues in Brazil, the third phase was only launched in March 2016, but it aims to contract another 2 million units. It was also included a new income group, "1.5" – that gets less subsidy than the second income group, but more than the first one – to increase the access to the program and encourage its expansion to metropolitan areas, where land price is more expensive. The size of the units was increased again and new "sustainable" features are now requirements, such as the improvement of thermal and acoustic performance, water-saving faucet aerators, dual flush toilets, presence lighting sensors for common areas and certified water pumps. Native plants must be planted in a proportion of one tree to every five apartments and/or one tree every two single family houses. New projects must have all streets public and connected with the existing urban tissue, with minimum block, streets and sidewalk sizes promoting safety and walkability. (Agência Caixa 2016).

The following table summarizes some of the main facts of the three phases:

Table 4: Summary of the three phases of MCMV. Source: Elaborated by the author based on Brasil (2016).

	1st Phase	2nd Phase	3rd Phase
Time period	April 2009 – June 2011	June 2011 – Dec. 2014	March 2016 - 2018
Income Groups	1: Up to R$1,395.00 2: R$1,395.01 to R$2,790.00 3: R$2,790.01 to R$4,650.00	1: Up to R$1,600.00 2: R$1,600.01 to R$3,100.00 3: R$3,100.01 to R$5,000.00	1: Up to R$1,800.00 1.5: R$1,800.01 to R$2,350.00 2: R$2,350.01 to R$3,600.00 3: R$3,600.01 to R$6,500.00
Units delivered	2.6 million (more than 10 million beneficiaries)		Expected 2 million
Units contracted	Total of 4.2 million		Expected 2 million
Investment	R$ 294.5 billion		Expected R$ 210 billion
Employment	1.2 million jobs created		

In addition to the impressive numbers above that illustrate the number of people that now have a more descent house to live in, it is also important to acknowledge that this program represents one of the biggest mobilization of housing provision in the history of Brazil. In the last years, the housing policy has been structured robustly due to the large-scale approach of allocation of subsidies. Data from IPEA attest that the national housing deficit has fallen from 10% in 2007 to 8.53% in 2012 (Nicacio 2014).

However, an extensive number of qualitative studies points out that this huge effort still does not cover all social groups and urban realities seen in the country. The rationalized logic of the housing production system tends to generate large-scale developments, reproducing unsustainable urban models, ignoring other forms of housing, and usually pushing low income population to peripheries, far away from job opportunities and basic services such as health and educational facilities. These issues will be detailed in the following subchapter.

2.3.3 Qualitative Analysis

Once acknowledging the importance and relevance of MCMV to Brazil, it is necessary to understand the main challenges pointed out by specialists in the field, such as Amore (2015), Rufino (2015), Rolnik (2010), Ferreira (2012), UN-Habitat (2013), IPEA (2015), and many others.

Ferreira and Ferrara (2015) indicate the similarity between some low-income housing projects in Brazil and large social housing developments built during the European Post-War period. The latter is usually described as socially and aesthetically homogenous projects, deprived of the multiple functions and services of a city (John and Barros 2015, 169); these older housing developments are being demolished in the United States, Europe and Australia. Stébé, cited by Ferreira and Ferrara (2015), states that these large projects "were the result of a social housing

development policy guided by the objectives of quantity, speed of execution, productivity and industrialization of the production chain, which overshadowed the search for architectural, urban and technical quality" (76). They were developed in peripheral locations, in residual areas, disconnected from the existing urban fabric, with lack of collective spaces, marginalized and excluded. Housing units were architecturally mediocre, not adaptable enough for the residents and poorly insulated.

The evaluation above is quite similar to what researchers have been stating about MCMV projects, however, by being in a developing country, there are deep-rooted issues of social inequality that aggravates the consequences of implementing such unsustainable urban model. The main challenges of MCMV will be categorized in two aspects: the program logic and the aspects related to project design.

The Program Rationale

Detachment of broader housing policies

The MCMV Program is still not very well integrated with the main long-term housing strategies proposed by the National Housing Plan and lack of congruence with the Local Plans for Social Housing. At the same time that this enables quicker flow work procurement and project execution, the approach weakens the social control and accountability of public investment (UN-Habitat 2013, 107-108). Raquel Rolnik, professor of the Architecture and Urbanism Department at the University of Sao Paulo and former UN Special Rapporteur on adequate housing, states that one of the biggest contradictions Brazil faces with this program is the huge amount of investment in housing production disconnected from a spatial planning policy that modernizes the urban space, and places affordable housing in well-located lands (Nicacio 2014). The access to land – the main obstacle in the Brazilian urban policy – and the socio-spatial segregation are issues still not addressed by MCMV Program that can lead to unpredictable consequences in the Brazilian urban space (Amore 2015, 18).

Inadequacy to the Housing Demands

Despite the significant number of housing units built for the income group 1, studies show some issues in the articulation between the housing supply produced by the program and the existing housing demands. Overall, the production of houses for this group were more concentrated in the North and Northeast regions, and even though the housing deficit is significantly concentrated in central areas, a fair amount of developments was built in peripheral areas of the cities (Rufino 2015, 59). In addition, even though one of the program's goal is to fight

housing deficit in Brazil, the different components that define it[4] are not contemplated by the program, especially the one that represents almost half of the shortage (44%): excessive spending on rent (Balbim, Krause and Neto 2015, 12).

Financial Logic

The institutional framework of the program was designed in a way that the financial institution (Caixa), together with private construction companies have a more central role than the public institutions that actually make urban and housing public policies. The companies act as the proponents of the project, following minimum standards and rules established by Caixa, so in order to guarantee feasibility and profit, the basic financial strategies are choosing the less expensive land as possible and standardizing urban and architectural solutions (Rufino 2015, 55). This way, it is common to observe developments located in peripheral areas, disconnected from the main services of the city, and buildings with poor design solutions.

Integration with development and livelihood strategies

Socioeconomic inclusion is not guaranteed only by housing provision. In fact, when beneficiaries are moved from one settlement to another, their social capital networks are usually negatively affected, since they no longer benefit from close relationships created in their place of origin. By stimulating the occupation of peripheries, the program can reinforce segregation and limit income opportunities. Un-Habitat (2013) suggests that social support programs and post-occupation plans be included in the scope of the program, "so that housing access comes along with social development and inclusion opportunities" (109). Rufino (2015) affirms that there are several factors in this model that contributes to the residents' indebtedness, especially to the ones who moved from an irregular settlement to a legal one, and were not prepared to pay "extra" bills, such as condominium fees, utility bills, and furniture and home appliances financing.

Approach to Environmental Sustainability

The approach to sustainability is still inconsistent, since it is encouraged at the level of the household, but not in a broader sense, at the level of neighborhood and urban scale. While housing units are getting solar heating panels, renewable energy consumption and better thermal and acoustic insulation, the reproduction of an urban model based on low-density urban sprawl do not contribute for a more sustainable environment. This model uses a great amount of land and do not take advantage of existing infrastructure networks and bioclimatic design strategies that could

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[4] Refer to subchapter 2.2.1 of this thesis.

passively decrease energy consumption and provide more pleasant ambiences. Choice of building materials could also follow basic sustainable standards and be adapted to local contexts. Additionally, there is no consideration on the "complete life cycle of housing production, including site location and land use, origin of building materials, water and resource inputs, costs of production and waste disposal and maintenance" (UN-Habitat 2013, 109).

Monitor and Evaluation Systems

Because of the size of Brazil and the diversity of local realities, it is a difficult task to monitor and evaluate all housing interventions of the program, which require qualitative indicators, impact analysis, elaborated analysis of urban settings, and many other tools. Steps are already being made by the Ministry of Cities, like partnerships with academic institutions to encourage a more autonomous approach to monitor the effectiveness of the program (UN-Habitat 2013, 109).

Aspects related to Project Design

Access to Land and Location of Projects

The main challenges of the program are linked to the location of the developments due to the difficulty to access land in Brazil. Processes of land retention and speculation push prices up derailing economically the location of projects in central areas – where the land is more expensive. Existing policy tools, like the City Statute and the Special Zones for Social Interest Housing, were designed to help facing this complex problem, and could be incorporated in the program and reinforced by local governments (UN-Habitat 2013, 109). Placing housing developments far from central areas also bring serious social costs, since residents become excluded from the main services of the city and are forced to commute long distances to get anywhere.

Range of housing typologies

For developments of income group 1, there are two basic typologies recommended by Caixa:

1) Single-family houses (one story): minimum 32m² (344.4 sf)
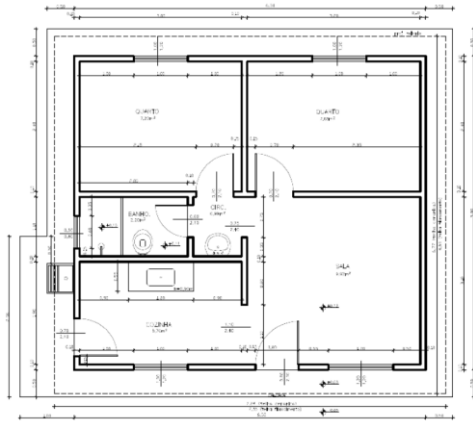2) Apartments on multi-family buildings: minimum 39m² (419.8 sf)

Figure 11: Typical Single-family house.
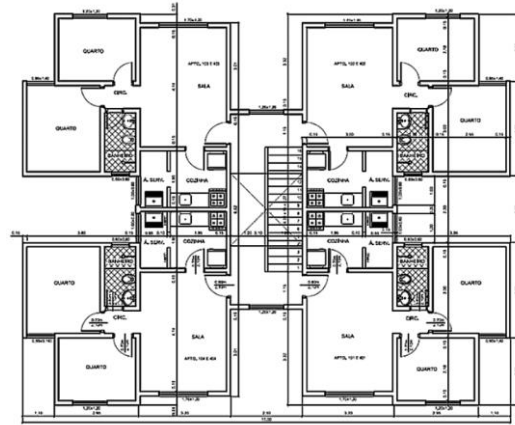Source: Cartilha da Caixa.

Figure 10: Typical Multi-family Floor Plan with 4 apartments.
Source: Cartilha da Caixa.

There are also ADA adaptations of these two units that are basically the same, but a few square feet bigger. Those typologies are not mandatory, but construction companies choose to apply them to reduce costs – using a project that is "ready", several hours of work are saved. What is usually done is the arrangement of such typologies within the site according to Brazilian codes, leaving residual areas as plazas and gathering spaces. This kind of approach does not respond to the needs of different households and neither contribute to the sense of place of the community, since it creates austere and scattered neighborhoods.

Standardized solutions

Standardized solutions go in the opposite direction of urban, organizational and familiar diversity, but are common strategies of reducing costs of MCMV developments. Rufino (2016) points out how evident is the inadequacy of providing an extremely standardized product to different types of demands and needs for different social and economic groups of people. In addition to repetitive typologies, it is common to observe the lack of urban and landscaping projects that result in low quality public areas and gathering spaces. In order to better confront the issue, it is necessary to know the different realities of the country, to acknowledge its continental dimensions, with different characteristics and deep regional, social, economic and cultural disparities.

The typical arrangement of the typologies mentioned above in "gated communities" establish a dynamic that do not always work for low-income residents, and consequently, disrupt the management of the development. Fees are charged to residents to distribute equally expenses that cover facilities maintenance, general improvements, workers' wages, and so on. However, some families get overloaded with those payments and are forced to leave – or irregularly sell their unit. The program's only pathway to access housing is through homeownership. Other

forms, like rental housing, incremental housing and provision of serviced plots, are not in the scope of the program.

Modernization of the construction sector

In Brazil, the construction sector is still marked by low technologic methods, waste of materials, the predominance of unskilled labor, high levels of turnover, the informality and precarious work conditions. MCMV has contributed to introduce industrialized building systems in large-scale low-cost housing projects and improvements in productivity have been seen in the sector (UN-Habitat 2013, 110). However, due to the extent of the program, much more could be done, like strengthening opportunities to small scale companies, enhancing labor skills through training, developing new methods of construction, etc.

Despite of all these remaining challenges the program still has to face, a recent study from IPEA showed that families are overall satisfied with their new homes. The research gathered information from 7,620 residents from 324 developments from income group 1, in 187 cities, between August and September 2013. The goal was to capture the residents' perception of the attributes of their houses and improvements in well-being. Results showed that families rated their homes with an average grade of 8.8 in a zero to ten scale.

7.9 — Monthly Financing Cost   8.6 — Improvement in Well-being   8.8 — Satisfaction with the house   8.1 — Satisfaction with surrounding areas

Figure 12: How families evaluated satisfaction and well-being in MCMV developments (income group 1).
Source: Elaborated by the author, based on Nicacio 2014.

Improvements in the program have been done in each new phase, like financing adjustments, incorporation of minimum standards for the projects and sustainable features, new parameters of assessment, new organization and refinement of existing criteria, etc. (Amore 2015, 17-18). And even though it is known that MCMV is not the only and best answer to solve the country's housing deficit, it is a real effort that is changing Brazilians' lives. However, the social structure and spatial arrangement are still a weakness of the program. In order to build truly sustainable new communities, several issues must be addressed to get closer to a more sustainable urban form. This thesis aims to enumerate and illustrate a series of strategies to improve the way MCMV developments are constructed, focusing on the urban space and the social interactions produced by it.

3. BUILDING A CONCEPTUAL FRAMEWORK

Urban and sustainability studies are linked to multidisciplinary bodies of knowledge, such as Urban Planning, Geography, Sociology, Architecture, Biology, Politics and Economics. This thesis aims to discuss the relationship between urban form and urban sustainability in a context of large-scale housing developments for low-income families in Brazil, so a qualitative method is needed to link the main concepts and build a conceptual framework that will guide the analysis and discussions. According to Jabareen (2009), a conceptual framework is a construct of concepts, each one playing an integral role and having a relationship with each other; it is an interpretative approach to social reality that provides understanding instead of a theoretical explanation.

Therefore, the first section of this chapter, 3.1, explores the relationship between social and spatial structures of urban settlements, pointing out the need of an interdisciplinary approach to achieve sustainable urban models. Section 3.2 lists a broad set of principles that can guide communities through a more sustainable path. Finally, in the last section, 3.3, it is proposed the conceptual framework that guides the analysis of the existing condition of the case study and underpins diagrammatic solutions for the challenges assessed.

3.1   Social and Spatial Structures of Cities

According to Lynch (1981), to understand any place completely, it is necessary to see it as a social, biological and physical whole. The author claims that a place's social and spatial structures are only *partially* related to each other, since the human actor is *the* intervening variable that influences both structures in a community. Human actions and thoughts became significant due to their repetitiveness in the persistent structure of ideas (culture), in enduring relationships between people (social institutions) and in standing relations of people and place.

The interplay between people and place is also pointed out by Tonkiss (2013), who states that by focusing on this relation it is possible to observe how "the material organization of urban space is crucial to the production and reproduction of social and economic arrangements, divisions and inequalities" (2). The author believes the approach to city design must engage with a broader domain, since

> The design of cities emerges from the complex interaction of socio-economic with spatio-technical processes and practice. The forms in which cities take shape are deeply determined by economic arrangements, social relations and divisions, legal constructions and political systems; in turn, the material forms of cities provide the conditions in which key social and economic processes are produced. (2)

Tonkiss (2013) offers a multi-disciplinary view of city design, understanding "design" not as exclusive products of architects and engineers, but as "social practices and processes that shape

spatial forms, relationships and outcomes in intentional as well as less intended ways" (5). Lynch (1981) also admits that "like any other phenomenon, the city extends out into every other phenomenon" (48), since the form of human settlements consists of not only physical things, but also living organisms, actions people engage in, social structures, the economic and ecological systems, the control of the space and its meaning, etc.

From this point of view, it is possible to say that social and spatial structures are inextricably linked in urban design, with objectives and conditions that complement each other. City design must take into consideration both the human dimension and the physicality of urban forms, with the ultimate goal of achieving a more urban sustainable model. Ferreira and Ferrara (2015) conceptualize the notion of urban sustainability as:

> [...] first of all, the idea that we are capable of reversing the current urbanization pattern towards the establishment of a new urban matrix. This is both with regards to dealing with environmental problems [...], and with regards to the ability to regulate and organize ongoing urbanization into more socially just and less impactful parameters. (70)

This statement suggests that the current urban matrix is unsustainable and needs to be reconsidered so communities can improve both their spatial and social structures, reducing their impact on the environment, and pursuing social justice, while still economically prosperous. The following subsections will develop those structures in more depth, introducing the human dimension of sustainability and the effort to achieve a more sustainable urban form.

3.1.1 The Human Dimension in Urban Sustainability

Sustainable development is commonly defined as conceived by the Brundtland Comission report "Our Common Future", in 1987: "development that meets the needs of present without compromising the ability of future generations to meet their own needs". It is also known that sustainability occurs in three fundamental dimensions: environmental, economic and social. However, the broad definition of sustainability allows for different applications to the different interest groups that use it (Jenks 2002, 3).

From the three constructs, Magis and Shinn (2008) state that the social dimension is the least explored and it is often posited in relation to ecological sustainability – society's threat to natural resources and it stewardship function – or economic sustainability – meeting basic human needs to enhance productivity and reduce costs. For the authors, "society must be sustained in its own right" (15).

Larsen (2008) shares a similar vision, stating that people, the economy and the environment should be placed in a common terrain in search for sustainability and sustainable development. Economic and environmental focuses have obscured the proposition that "sustainability is first about the people, how they make choices, and the consequences" (76). For

Magis and Shinn (2008) too, social sustainability "plays a paramount role in the continuous journey toward sustainability because, ultimately, it is human beings, individually or in collectives, that will determine economic and environmental well-being" (38).

The human dimension is embedded in the four main conditions that support social well-being and, consequently, social sustainability, pointed out by Magis and Shinn (2008) and Dujon (2008): *human well-being* (meeting basic needs and security), *equity* (assurance of equitable sharing of society's benefits and costs), *democratic government* (governance oriented to people) and *democratic civil society* (empowerment of people to participate in democratic practices). These conditions enable the creation of a self-enforcing movement that balances multiple and divergent interests, guides policies and encourages resiliency to any unexpected changes in the system.

Dillard, Dujon and King (2008) acknowledge that people have a central role as "social, economic, and political actors to demand and create environments and institutions that support human well-being" (289) and encourage civic engagement. Therefore, local and democratic governance must implement urban policies that bring people and the various parts of a community together into a cohesive whole (Laren 2008, 78), improving accessibility in terms of space, basic services, and jobs. This way, social interactions and public participation in civic decision-making processes are more likely to happen. In addition, the existence of social organizations of communities can encourage collaboration between residents to initiate collective problem solving (Semenza, 2008, 265).

According to Semenza (2008), American suburbs lack the human dimension with "poorly designed urban layouts [that] can stifle physical activity, degrade the environment, and curb spontaneous social interactions" (264). As it was already mentioned in this study, Brazilian developers tend to apply urban models from developed countries in their developments, and large-scale developments oriented to low-income population are no different – however, aggravated by financial constraints that compromises quality. Therefore, such criticism can also be applied to the Brazilian case.

An interdisciplinary effort is required to address the human dimension of sustainability, since human and community well-being depend on cultural, economic, social, environmental and political conditions. Not addressing this dimension on urban projects means losing a great opportunity for fostering a more urban sustainable environment that can enhance social integration, participation and overall quality of life. Some planning strategies are, for example, the location of public squares as vital nodes for the community, geometric grids to increase connectivity, promotion of higher densities and mixed-use, among others. (Semenza 2008, 264-265).

3.1.2   The Quest for Sustainable Urban Forms

As it was previously mentioned, the urbanization processes of cities are also responsible for serious environmental impacts. Jabareen (2006) lists not only direct impacts on habitat, ecosystems, endangered species, water quality and habitat fragmentation, but also indirect impacts, caused by change in human behavior. For example, by using almost exclusively the automobile as means of transportation, more fossil fuels are burned, therefore increasing greenhouse gases rates, air and soil pollution, premature loss of farmland and wetlands, global climate, noise, among many other impacts. Depending on a city's urban form, these impacts can be enhanced or reduced with time.

The Urban Form

But what is urban form? For Lynch (1981), settlement form is "the spatial arrangement of persons doing things, the resulting spatial flows of persons, goods, and information, and the physical features which modify space in some way significant to those actions, including enclosures, surfaces, channels, ambiences, and objects" (48). Tonkiss (2013) also defines urban form in a multi-dimensional way, "composed of material structures and physical spaces, but also and perhaps more fundamentally by social, economic, legal and political modes of organization and interaction" (2).

Jabareen (2006) offers a more straight forward definition, describing urban form as the "result of aggregations of more or less repetitive elements" (39), then specifically states that the elements that define urban form are *urban patterns* grouped into concepts: street patters, block size and form, street design typical lot configuration, layout of parks and public spaces, etc.

Alexander, Silverstein and Ishikawa (1977) also talk about "patterns", but as the elements of a practical language that orients the work in several spatial levels, from the city to neighborhood, from public spaces to buildings. Each of the 253 patterns defined by them – web of public transportation, activity node, cooking layout, interior windows, etc. – describes a problem encountered repeatedly in our environment and a solution for that problem. The authors call the attention to the fact that "no pattern is an isolated entity. Each pattern can exist in the world, only to the extent that is supported by other patterns" (xiii). This view of the world is fundamental, since the combination of parts make the whole coherent.

This way, urban form is understood here as the physical structure of a city, composed of urban patterns "related to land use, transportation systems and urban design" (Jabareen 2006, 39) that interchangeably influence social interactions and human behavior.

Sustainable Urban Form

Different individuals and organizations have been approaching urban sustainability; by proposing new frameworks of redesign and restructure of urban places. The challenge of achieving sustainable development in cities has been addressed in several scales: the region, the city, the community and the building (Jabareen 2006, 38-39). However, Jenks (2002) and Jabareen (2006) agree that there is no single sustainable urban form and there is no conceptual framework that makes possible the comparison of the different propositions. There are a variety of urban forms, indicated as more sustainable than others, but still dependent on local characteristics and strategic objectives chosen to achieve sustainability (Jenks 2002, 1).

However, there are several components that can influence the sustainability of urban forms, states Jenks (2002), such as "the size, shape, density, and compactness of cities; processes of intensification and decentralization; land use, mixed uses, layout and building type (particularly housing); and green and open spaces" (3). The author also points out that a more responsive design to local climates could improve sustainability – an issue commonly neglected.

Models of Sustainable Urban Forms

Literature shows the rise of several models developed to encourage the application of more sustainable urban forms, such as Neotraditional Development/New Urbanism, Urban Containment (Smart Growth), Compact City, Eco-City, Sustainable Urbanism, among others. Many of these models were already largely discussed in the literature, and applied in real projects, so it is possible to notice that each has distinct priorities and theoretical foundations, but usually share the same core design concepts.

This section will acknowledge the important role of each model on advancing the discussion toward a more sustainable urban form framework, briefly describing their visions and strengths; and it will also point out their main criticisms and weaknesses, mainly regarding the lack of a more comprehensive understanding of the human dimension of sustainability.

- **New Urbanism**

New Urbanism is the best known among the neotraditional approaches to planning (Jabareen 2006, 43). This planning and development approach seeks to conceive alternatives to the typical post-WWII development, especially in the United States, that follow patterns of urban sprawl, single-use and low density. New Urbanism is inspired by traditional urban forms, focusing on human-scaled urban design: walkable blocks and streets, housing and shopping in close proximity, and accessible public spaces (CNU 2016). Higher density, diversity, and mixed land-use are also priorities of the movement.

However, authors cited by Jabareen (2006) claim the disparity between theory and the reality in practice of new urbanists developments, stating that most of them "have helped produce more subdivisions than towns, densities too low to support much mixed use, much less to support public transportation, homogeneous demographic enclaves, (…) a new wave of determinism, implying that community can be ensured through design" (44), etc. So, even though, in theory, new urbanism plans for a diversity of people, income, building sizes and types, what is commonly seen in those developments are homogeneity, an artificial aesthetic and a sense of exclusivity in premium condos. Those aspects undermine the idea of urbanity and diverse social integration.

Ellis (2002) agrees that New Urbanism has emerged, in the last decades, as a "controversial alternative to conventional patterns of urban development", but at the same time, the author believes it presents a range of spatial patterns that represents good urban design, that can fit well with many other planning goals.

Figure 13: New Urbanist Development in Seaside, Florida.
Source: https://socialcapital.files.wordpress.com/

Figure 14: "Pedra Branca" New Urbanist Development in Santa Catarina, Brazil.
Source: http://guiapedrabranca.com.br/author/equipe/

- **Urban Containment**

Because urban sprawl has considerable effects on the land and its resources, policymakers created urban containment policies that aim to reduce sprawl and restrain urban growth. The goal is to look inward, promoting "cost-efficient construction and use of urban infrastructure, reinvestment in existing urbanized areas (…), creation of higher-density land use patterns that encourage mix of uses and patronage of public transit" (Jabareen 2006, 45). The three tools that help shape metropolitan growth are: greenbelts (areas of preserved open space), urban growth boundaries (a line between urbanization and rural lands), and urban service areas.

One of the best-known practices of urban containment is management programs often termed Smart Growth programs. Table 5 presents the ten principles of Smart Growth, that aims to "protect our health and natural environment and make our communities more attractive, economically stronger, and more socially diverse" (US EPA 2016).

Table 5: Principles of Smart Growth. Source: Elaborated by the author, based on US EPA 2016.

10 Smart Growth Principles
Mix Land Use
Take advantage of compact building design
Create a range of Housing Opportunities and choices
Create walkable neighborhoods
Foster distinctive, attractive communities with a strong sense of place
Preserve Open Space, farmland, natural beauty and critical environmental areas
Strengthen and direct development towards existing communities
Provide a variety of transportation choices
Make development decisions predictable, fair and cost effective
Encourage community and stakeholder collaboration in development decisions

Critics of Smart Growth claim that the strategies to contain urban growth increase regulation and diminish freedoms; reduce housing affordability by reducing land supply; and congestion due to higher rates of density. Those criticisms are based on the idea of inflexibility of consumers, that would prefer living in large single-family homes in automobile dependent communities instead of more sustainable communities (Litman 2015, 2). However, "experience indicates that people are actually quite adaptable and creative, enjoy walking and cycling, and can flourish in a wide range of land use conditions and transportation patterns" (3).

Figure 15: Rendering a Smart Growth neighborhood.
Source: http://livehealthykankakeecounty.org/

- **Compact City**

The vision of the Compact City was developed by George Dantzig and Thomas Saaty in the 1970s, and it is still compatible with principles of sustainable development applied today. The main idea is to create compactness and density that use resources more efficiently, enhancing quality of life, but not at the expense of future generations (Jabareen 2006, 46). In compact cities

fuel emissions are reduced due to the reduction of travel distances, rural lands are protected from development, local business are supported and the local dynamic is more autonomous. Studies show that density rates are intimately linked to carbon footprint of transportation, since residents of spread-out communities are more likely use their cars to commute, producing vehicle emissions. The following figure shows the difference between Atlanta (USA) and Barcelona (Spain) – they present approximately same population, but the latter produce much less transport carbon emissions (Badger, 2014).
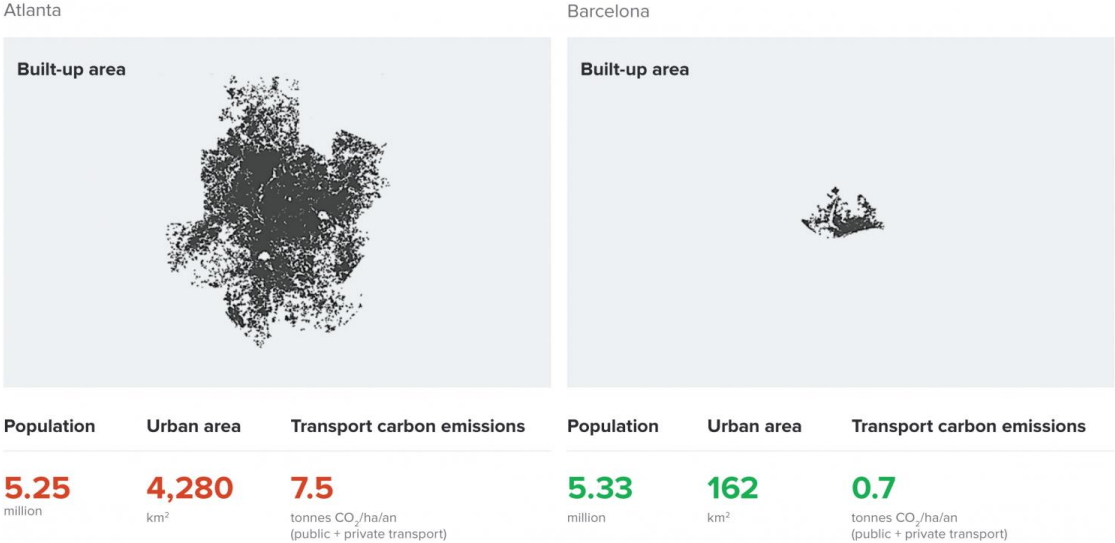
Figure 16: Transit and density.
Source: Studies by Bertaud and Richardson 2004, presented by Badger 2014.

However, a problematic aspect of the compact city pointed out by Neuman (2005) is that there is a "tendency to reduce a complex entity – the city – to one criterion – density" (21). The author claims that compact city is not a necessary condition for a city to be sustainable and, instead, it is helpful to conceive "urban form as a processual outcome of urbanization" (23), focusing on a new dynamic conception of urban planning that is not governed by static tools of zoning.

- **Sustainable Urbanism**

Sustainable urbanism is defined as "walkable and transit-served urbanism integrated with high-performance buildings and high-performance infrastructure" (Farr 2010, 42), and is composed of five main attributes: definition, compactness, completeness, connectedness, and biophilia. The theory behind Sustainable Urbanism is similar to the one presented by new urbanists; however, the former also focus on the *performance* of buildings and infrastructure. The five attributes are described in table 6:

Table 6: Attributes of Sustainable Urbanism. Elaborated by the author based on Farr 2010.

Attributes of Sustainable Urbanism	
Definition	Limiting size of neighborhoods and defining its center and edges increases convenience and value relationships and transactions inside of it.
Compactness	Higher densities support public transit and walkability, existing infrastructure is better used, paved areas are reduced and sensitive lands protected.
Completeness	Diversity of land uses and the provision of a wide range of building and dwelling types encourage people to meet their needs on feet and stay in the community.
Connectedness	Transit corridors are essential to sustainable urbanism, linking neighborhoods together with districts and other destinations. Internally, providing abundant opportunities to walk, ride, bike and using a wheelchair around the neighborhood increase connectivity.
Biophilia	Increasing the connection between people and nature promote passive and active benefits to human beings, such as daylighting and fresh air, willingness to walk and be outdoors, and environmental awareness.

The Farr's idea of sustainable urbanism is relatively new and not widely applied yet, neither critically examined in the literature. The emphasis in the limited literature is confined to "good practices" that illustrate each of the main attributes and concepts.

- **Eco-city**

The core of the many approaches of the "eco-city" focus on the *management* of the city, and not specifically in the urban form. Some emphasize passive solar designs – Ecovillage, Solar Village, Cohousing, and Sustainable Housing – and some focus on green spaces and passive energy design – Environmental City, Green City, Sustainable City, Living Machines, etc. (Jabareen 2006, 47).

Figure 17: The City of Curitiba (Brazil) is considered an example of "eco-city", due to its integration between urban development, transportations and public health. Source: https://en.wikipedia.org/wiki/Eco-cities#/media/File:Curitiba_Brazil_Structure.jpg

Figure 18: Eco-village and cohousing projects in Ithaca, NY. Source: http://ecovillageithaca.org/live/neighborhoods/

The models presented briefly here aim to incorporate sustainability in the urban scale. Larsen (2008) claims that "despite its complexity and proliferation of ideas, sustainability is a concept that elicits passion and commitment" (45), but because of the broad definition of the term, it is common to observe "sustainability" focusing on strategies that serve specific interests, like marketing or policies definition. In addition, having reviewed the social sustainability literature, it is possible to infer that many times those models do not address properly this dimension - or do not give it the necessary importance, related to human well-being, equity and democratic governance. They usually prioritize design strategies that respond mostly to environmental and economic values.

One example is the development "*Pedra Branca*", situated in the State of Santa Catarina, one of the two new urbanism developments in Brazil directly connected to CNU and DPZ. Just like other cases seen in the United States, the Brazilian development also lack overall diversity and is characterized by a segregation pattern that, instead of connecting different social strata, it isolates voluntarily a social group that can afford the housing units and access services. Ribeiro (2010) believes this model in Brazil reinforce some good practices that contribute to the reduction of pollution, commuting time, stress, energy consumption, etc.; however, the main criticism is still the idea of favoring spatial forms over social processes. *Pedra Branca* is marketed as a sustainable community due to the presence of green buildings and a scheme that prioritizes walkability; yet, as this research argues, isolated design components do not turn a community into truly sustainable unless the social dimension is also carefully addressed.

In Brazil, studies on sustainable urban form are still insipient, and often are based on international cases. Initiatives that promote sustainability – most of them at the building scale – are driving the conversation towards best practices in the construction sector, like *Selo Casa Azul*, *Procel Edifica*, *Processo AQUA*, and *Qualiverde*. *Selo Casa Azul* was developed by Caixa – the public bank that is in charge of My House My life, and some of the new developments are now applying this "green certificate". that evaluates 1) Urban Quality; 2) Building Design and Comfort; 3) Energy Efficiency; 4) Material Resources Conservation; 5) Water Management; and 6) Social Practices.

3.2   Conceptual Framework Toward a More Comprehensive Sustainable Urban Form

This study acknowledges that human settlements are formed by equally important social and spatial systems and structures, and that there is no single formula to achieve sustainability in cities; however, a series of strategies can make communities more environmentally sensitive, socially just and economically prosperous. Lynch (1981) claims that "the good city is one in which the continuity of this complex ecology[5] is maintained while progressive change is permitted" (117), so resilience is also a necessary condition.

Models and methodologies are constantly being developed and reviewed by experts seeking innovation and improvement of strategies and practices toward more sustainable communities, and some of them were briefly described in subchapter 3.1.2. However, there are not many comprehensive approaches that balance social and spatial systems, and it is common to observe disparities on how to approach the issue – what can enrich the discussion, but can also jeopardizes more significant advances. Ferreira and Ferrara (2015), commenting on the participation of experts in Panels of Rio+20, state that they were

> clearly divided into two groups: those who tend to propose solutions with a more technical character, who would be able to 'fix' the course of urbanization giving its 'sustainable' attribute, and those with a more critical stance, who tend to point out the structural elements of the economic system as the central cause or urban environmental problems. (85)

Understanding the importance of both approaches, this research will combine two sets of components, due to their comprehensiveness: 1) the eight components for sustainable communities proposed by The Egan Review; and 2) the seven design concepts that Jabareen (2006) observed as a constant when investigating sustainable urban models. These two sets of components will be introduced in the next two subchapters and a conclusion presented on the last subchapter.

3.2.1   The Egan Wheel

The Egan Wheel is one of the products of The Egan Review, named after Sir John Egan, who chaired a study of the necessary components for building sustainable communities in the United Kingdom in 2004. It defines sustainable communities as those which

> meet the diverse needs of existing and future residents, their children and other users, contribute to a high quality of life and provide opportunity and choice. They achieve this in ways that make effective use of natural resources, enhance the environment, promote social cohesion and inclusion and strengthen economic prosperity (HM Government 2004, 18).

The Egan Wheel (see Appendix A) consists of the eight components listed in the following table, which cover both social and spatial structures and offer a comprehensive

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[5] The "complex ecology" Lynch discusses the immense and intricate network of elements that form a settlement, "which can be understood only as a series of overlapping local systems, never rigidly or instantaneously linked, and yet part of a fabric without edges" (Lynch 1981, 117).

framework for sustainable communities. While in terms of social structures designers have a limited role to contribute to sustainability, in spatial structures they have a fundamental role; what illustrates, then, the importance of interdisciplinary approaches to urban sustainability.

Table 7: Components of the Egan Wheel. Elaborated by the author, based on the Egan Wheel.

Social Structure	Governance	Equity	Social & Cultural	Economy
Spatial Structure	Transport & Connectivity	Housing & the Built Environment	Environmental	Services

Those components together constitute the "common goal" of communities that seek the path for sustainability. The Egan Review claims that if all stakeholders adopt this vision,

> the definition and indicators for measuring progress, can be a means of securing more effective joining up of policy agendas in national, regional and local government; provide a framework for delegating much more performance related responsibility from national to local government; create a mechanism for identifying essential components in very significant new developments; and provide a framework within which skill sets can be developed. (HM Government 2004, 8)

Because of the comprehensiveness of the proposed components by the Egan Wheel, they have been adapted, and further elaborated on this research, to values that make sense to the object of this study. The values were also broken down into goals and design strategies, to support the proposal, as subchapter 3.2.3 presents.

3.2.2 Design Concepts Constantly Addressed by Sustainable Urban Form Models

Jabareen's (2006) investigation led to a set of seven interconnected concepts that are repeatedly present on models of sustainable urban form. Those concepts are embedded in the design strategies proposed in table 8.

Density: Defined as the ratio of people or dwelling units to land area, it has a direct impact on transit use, land and energy consumption and social integration.

Diversity: A multidimensional and vital phenomenon that promotes variety of housing types and sizes, densities, social and cultural contexts, ages, incomes and interests.

Mixed Land Use: Defined as diversity of functional land uses, it ensures that services are within a reasonable walking or cycling distance, decreasing the automobile dependence and playing an essential to achieve a more vibrant and sustainable urban form.

Compactness: It refers to the most efficient use of urban land, increasing density and promoting contiguity and connectivity in the urban tissue, minimize transport of energy, water, materials, products, and people.

Sustainable Transportation: Defined as "transportation services that reflect the full social and environmental costs of their provision; that respect carrying capacity; and that balance the

needs for mobility and safety with the needs for access, environmental quality, and neighborhood livability" (Jabareen 2006, 40).

Passive Solar Design: a design that focus on making the best use of solar gain and microclimate conditions to minimize the need for space heating or cooling. Designing buildings in the best orientation and adjusting urban densities.

Greening: integrating nature and city, bringing the benefits of this contact to city dwellers through a diversity of open landscapes – that also enhances the urban image – and systems that improve the quality of the air, water, soil and the management of waste.

3.2.3 **Conceptual Framework**

The conceptual framework, then, guides both the case study analysis and the diagrammatic propositions. The assessment investigates the existing development in two ways: a) quantitatively (numerical data, i.e. population, number of housing units, area of available green spaces, etc.) and; b) qualitatively (which values are missing in the existing development and why). The diagrammatic proposal suggests design improvements in the urban form in order to foster a more just, environmental sensitive and thriving community.

For this research, the following table was developed to organize a new framework for sustainable urban forms, taking into consideration both social and spatial structures of a community. The eight values are wide-ranging components, based on the Egan Wheel, that are not necessarily completely achieved through design only, so the definition and goals present a broad view of the value, while the design strategies, based on Jabareen (2006), focus on the designers' role to contribute to that specific value. The process of the construction of this table can be seen in Appendix B.

Table 8: Values, Goals and Design Strategies for Sustainable Communities.
Elaborated by the author based on HM Government, 2004.

1) **Promoting inclusive and effective participation, representation and leadership**
Communities that are well represented by an accountable governance, with strong and effective leadership, will encourage citizens and residents to participate more actively in the decisions that influence their lives, empowering them to action and change. Promoting the sense of civic values by the understanding of one's rights and duties contributes to the sense of responsibility towards the community as a whole.

Goals	To encourage effective leadership, promote inclusive participation and empowerment of community members.

Design	➜ Provision of common facilities to promote formal and informal gatherings, meetings, workshops, etc.;
Strategies	➜ Provision of common open spaces to promote outdoor events, sports and cultural events to get the community together.

2) Creating a sense of community identity and belonging

A community that can combine diversity with tolerance and respect, becomes vibrant, harmonious and inclusive, encouraging involvement in common matters and engagement with people from different backgrounds and beliefs. When there is a sense of identity and belonging, people feel connected to community's values, feel responsible for the place and take care of it; they become more friendly and helpful to their neighborhoods, creating new opportunities for social interaction and sharing.

Goal	To encourage participation and the acknowledgement of the other through activities and spaces that gather a diversity of people.

Design *Strategies*	➜ Provision of social and cultural infrastructure for the community: public and green spaces, farmer's markets, social clubs, art and music centers, libraries, places for worship, community spaces to the development of projects that encourage diversity and integration;
	➜ Provision of shared spaces in the community to encourage social integration, like community gardens, squares, playgrounds, community center, small parks, etc.

3) Encouraging a thriving community

A thriving community is economically sustainable. However, Magis and Shinn (2008) point out that economic development should be "a means to make qualitative improvements in human well-being[6]" (31), and not the ultimate goal. The development of local businesses in a community encourages individuals to spend money locally, helping other people's businesses to thrive. Successful business means more jobs and better standards of living for members of the community.

Goal	To promote the creation and maintenance of a local business community, sustainable and connected to the wider economy of the region.

Design *Strategies*	➜ Incorporation of mixed-use buildings to encourage investment in the community and the creation of local business, jobs and training opportunities;
	➜ Provision of quality public and open spaces to encourage the existence farmer's markets, fairs and events in which the community can be commercially active;
	➜ Provision of efficient public transportation system allows people to be active not only in their local businesses but also to engage in other ventures in the city.

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[6] *Human well-being* is defined by Prescott-Allen, cited by Magis and Shinn (2008), includes "the ability to meet one's needs, the opportunity to be creative and productive, secure against crime and violence, and guaranteed human rights" (32).

4) Promoting equity within the community

Equity issues include equitable economic opportunity to enhance living standards, accessibility, political equity, civil rights, social and environmental justice. Communities should plan to embrace diversity, avoiding to be exclusive or excluding. A wide range of social and economic groups – people of all ages, cultures, genders, and abilities – must be given access to the community's spaces, services, jobs and education.

Goal	To enhance the sense of equity and inclusion within the community.
Design Strategies	➜ All public areas must be accessible and attractive to all at all times; ➜ Private developments (like retail and leisure activities) must be integrated with the public realm in spatial, accessible, and safety terms.

5) Establishing an environmentally sensitive relationship between places and people

Environmental sensitive communities will protect natural resources and improve biodiversity by minimizing the negative environmental impact (energy and land use, water consumption, air pollution, etc.) and enhancing the positive impact (recycling, using alternative transportation and renewable energy sources, etc.). In addition, the well-known benefits of contact with nature to human beings' mental health should be taken into consideration by urban planners and policymakers. Studies show evidence of people exposed to natural settings, showed decreased activity in a region of the brain associated with depression (Standford 2015).

Goal	To reduce negative environmental impacts and enhance positive ones; To promote the efficient use of resources; To make natural settings more accessible to people.
Design Strategies	➜ Climate-responsive arrangement of buildings and open spaces; ➜ Increase density and compactness and encourage infill in urban settlements to reduce urban expansion to suburbs and rural lands; ➜ Provision of quality green spaces with native species that enhance biodiversity; ➜ Provision of rainwater management, integrated with landscaping projects; ➜ Provision of waste separation units and food waste disposers – encouraging recycling and composting – and a community space where residents can deposit unwanted items and take someone else discarded item – encouraging reuse; ➜ Incorporation of renewable energy systems and passive strategies to buildings and the urban infrastructure; ➜ Provision of community gardens to grow food and enhance the interaction of people with nature.

6) Increasing connectivity within the community and with the city

Well connected communities offer efficient, safe and diverse transportation services to its residents, reducing commuting time and automobile dependence while linking people to jobs, schools, health facilities, etc. They offer a proper infrastructure that encourages safe local walking and cycling, promoting a healthy lifestyle. Well connected communities are also about effective communication networks, such as telecommunications and the internet, so people can overcome geographical barriers and expand their personal and professional networks.

Goals	To have an efficient and diverse transportation system; To encourage healthy practices such as walking and cycling; To provide access to communication networks.
Design Strategies	➜ Provision of infrastructure that prioritize pedestrians, cyclists and public transportation; ➜ Location of parking areas without compromising the urbanity of the community; ➜ Promote shared and individual spaces that offer access to digital communication networks.

7) Bringing quality to the built and natural environment

Well designed, built and maintained communities, with adequate size, scale, density, physical shape, ambiences, and integration with natural settings, contribute to the creation of a distinctive local character that connects people to place. Public and green spaces with facilities that embrace different ages, genders, and interests during different times of the day help to make a place vibrant and active. Neighborhoods that include a variety of land uses, building and dwelling types can more effectively meet both one's daily needs and one's needs over a lifetime (Farr, 2008). High quality, mixed-use, adaptable and flexible buildings can accommodate the varied needs for housing through time, bringing resiliency to the housing stock.

Goals	To create a built and natural environment that brings a sense of identity and pride to the community.
Design Strategies	➜ Provision of a wide range of sizes and types of housing units, to accommodate the different family configurations; ➜ Distinctive paths, nodes, edges, landmarks and districts that help constructing a sense of identity to the community; ➜ Well designed, built, managed and maintained buildings, public spaces, urban parks and meeting places.

8) Meeting basic demands

A well served community offers to its residents accessible and high quality public, private, community and voluntary services, such as schools, health care, social services, retail, food, utilities and commercial activity in general.

Goal	To offer a wide range of services within the community do people do not have to commute long distances to meet their daily needs
Design Strategies	➜ Provide the amount of services that respond to the communities' demand.

The design strategies pointed out on table 8 are related to the seven design concepts mentioned in section 3.2.2. To visualize the influence of the concepts and the designer's role to achieve each value, the following matrix was created. The interaction between the variables were measured by the attribution of a weight and a correspondent color to the type of interaction: strong (1.0 – dark purple), medium (0.5 – medium purple) or low (0.0 – light purple). The vertical sum represents how important is one design concept to the overall values; and the horizontal sum illustrates the possible contribution of a designer on achieving a specific value.

DESIGN CONCEPTS \ VALUES	Dense	Diverse	Mixed-Use	Compact	Sust. Transp.	Passive Solar Design	Green Spaces	DESIGNER'S ROLE
1) Participation & Leadership								0.5
2) Sense of identity & belonging								2.0
3) Economically prosperous								3.0
4) Equity & Inclusion								3.0
5) Environmental Sensitive								5.0
6) Well Connected								4.0
7) Quality Built Environment								7.0
8) Well Served								4.5
INFLUENCE OF DESIGN CONCEPTS IN VALUES	4.0	6.0	4.0	4.0	5.0	2.5	3.5	

Figure 19: Matrix Design Concepts vs. Values.
Elaborated by the author. Based on Jabareen (2006) and Table 8.

Assuming equal weight to each value, the vertical sum of this matrix shows, for example, that diversity is the design concept that has the strongest interaction values, reinforcing its importance on building sustainable communities. On the other hand, passive solar design is only strongly helpful to two values. From the results of the horizontal sum, it can be inferred that it is impossible to achieve a participative community relying only on design contributions. In this case, it is necessary to consider other influences – such as political, economic and social efforts – to guarantee democratic participation, equity, equal access, and diversity. On the other hand, all design strategies help to bring quality to the built environment.

The matrix demonstrates that the first four values, more related to social structures, are less related to design concepts and require the integration of other disciplines to be fully accomplished. The last four values are almost dependent on design aspects, and are usually the focus of designers and urban planners. What this matrix also points out is not the lack of responsibility of the designer toward social issues, but the need to integrate actions to build a truly sustainable community. Design decisions must take into consideration the social processes to create the environment that will embrace social interactions and environmental justice, while still being economically prosperous.

4 CASE STUDY: RESIDENCIAL VISTA BELA

4.1 Overview of the development

The development called *Residencial Vista Bela* (RVB) was one of the largest developments ever built under the My House My Life Program, with 2,712 housing units, accommodating more than 10,000 residents in approximately 100 acres (0.15 square mile) in the North portion of the city of Londrina, the second biggest city of the state of Paraná, South of Brazil. The population of RVB is larger than 60% of the municipalities of the state (E.A.M. Construtora 2016). It was built during the first phase of the program, from 2009 to 2011 and it was restricted to the first level of income – at that time, a maximum monthly income of R$1,600.00.

This size of development is actually forbidden by the Program's regulation. To avoid the already known issues caused by large-scale standardized housing developments, MCMV limits the size of a project in 500 housing units. However, in the case of RVB, developers have subdivided it so the projects could be approved separately, but built in contiguous sites, with same architectural and construction solutions to reduce costs (Zanon, Cordeiro and Junior 2015, 209).
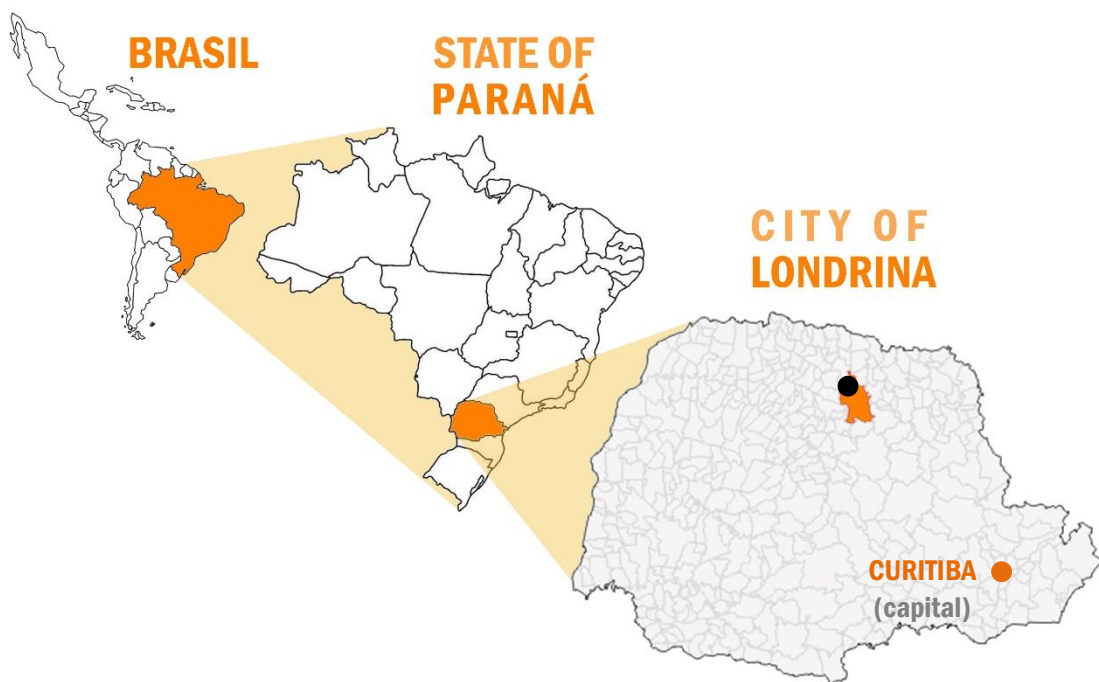
Figure 20: Location of the development.
Source: Elaborated by the author, 2016.

Londrina is a medium-size city, located in the North of the state of Paraná, established in 1934. The growth of this region was stimulated in the second decade of the 1900s when the state

government granted lands to foreign private companies so they could develop the region. The British "colonized" the area that is present-day Londrina[7]. Their first developments failed, but later on they managed to turn them into real estate projects, giving title deeds to both big developers and small farmers. This sort of agrarian reform, with no intervention of the State, stimulated the production of coffee (main product of that period), demographic growth and expansion of urban settlements (Prefeitura de Londrina, 2015b). At that time, immigrants from Germany and Japan start coming to the city, attracted by the fertile soil.

From 1934 on, Londrina has witnessed constant growth, with the establishment of several industries that target national and international markets, universities, and a shift from a prevailing agrarian economy to the consolidation of the tertiary sector. In the 1950s, more than half of the 75,000 residents were living in rural lands; in 2010, this percentage fell to only 2.67% of the total population (IBGE, 2015). Londrina keeps growing; according to IBGE (2015), the total population has gone from 506,701 residents in 2010 to 548,249 in 2015. Regarding the growth of these medium-size cities in Brazil, Ferreira and Ferrara (2015) claim that

> recent studies show that there is in fact a shift occurring in the equation of internal migration and the shaping of urban networks, with a new regional leading role of these medium cities, whose population and GDP grow more than those of other Brazilian cities, including the metropolises. It seems that this phenomenon is related with the substantial growth of the so-called 'C class[8]'. (65)

The following table illustrates population and territory data about Londrina, compared to the capital and biggest city of the state, Curitiba. There is also a comparison with Rochester, NY, in the United States, so readers can have a clearer idea of the two foreign cities. It is possible to notice that Londrina still presents rural population in its territory, and lower average density, if compared to the other two cities.

Table 9: *Illustrative* comparison: Londrina vs. Curitiba (capital of the state) vs. Rochester NY. Elaborated by the author based on 2010 data from IBGE 2016 and US Census Bureau 2016.

	Londrina	Curitiba	Rochester (NY)
Total Population	506,701	1,751,907	210,565
Urban Population	493,52	1,751,907	210,565
Rural Population	13,181	0	0
Area (sqmiles)	637.3	167.95	35.78
Density (people/sqmiles)	795.07	10,431.12	5,884.8

The North part of Londrina, once predominantly rural, became the largest residential area after the 1960s, when social housing developments were largely built during the military

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[7] The name "*Londrina*" comes from "*Londres*", which means London in Portuguese.

[8] The classification of social classes most adopted by the market in Brazil ranges from A to E and it is based, overall on the household's gross monthly income. The "C class" earns above BRL 3,152 monthly (approximately USD 995). This class is usually composed by those who provide services directly to the wealthier groups, such as teachers, managers, mechanics, electricians, nurses, etc. Most people in this class have finished high school and there is also a significant quantity of people who have completed higher education or have at least a technical level degree (Novais 2011).

government. These developments were situated in cheaper lands, distant from downtown (Prefeitura de Londrina, 2016). In Brazil, social housing projects are managed by COHAB (State Housing Company) and in Londrina, since 1969, COHAB was responsible for the construction of 30,693 social housing units. The Company also takes care of the selection and enrollment of potential beneficiaries for Federal Programs like MCMV. Data from 2011 shows the registration of 37,809 families, 93.8% belonging to the equivalent to the income group 1 of MCMV, as the following table shows:

Table 10: Number of registrations in programs of homeownership. Source: COHAB-LD, March 2011.

Monthly income range	Number of registrations
From 0 to 3 minimum wages	35,471
From 3 to 10 minimum wages	2,329
More than 10 minimum wages	9
Total	**37,809**

It is fair to say, then, that 7.45% of the population of Londrina, in 2011, was in need of more adequate housing conditions, seeking more affordable alternatives and/or hoping to be randomly selected for a social housing program. Therefore, the rise of MCMV Program and particularly the construction of RVB represented a way out from poor housing and sanitary conditions for these families. The images below show some of the conditions current RVB residents were living under, before moving to the development.

Figure 21: Housing conditions of beneficiaries of RVB.
Source: E.A.M Construtora, 2016.

However, just like other MCMV developments, RVB did not face structural issues of the cities' housing shortage, as exposed in subchapter 2.2.2, and perpetuated the same issues that previous large-scale housing developments have faced: lack of mixed use and basic services, peripheral location, socio-spatial segregation, insufficient public transportation, homogeneity, among others.

4.1.1 Location

Residencial Vista Bela is situated at the current urban edge of the city, surrounded by empty lots, rural lands, and a preservation area due to the presence of a stream that is connected with a major river of the state – the Tibagi River. It is approximately 5 miles from Downtown, that means around 20 minutes by car or 36 minutes by public transportation (bus). Even though this travel distances does not seem much, in the context of the urban core of the city, RVB is located as far as possible from it, and from the services the city provides.
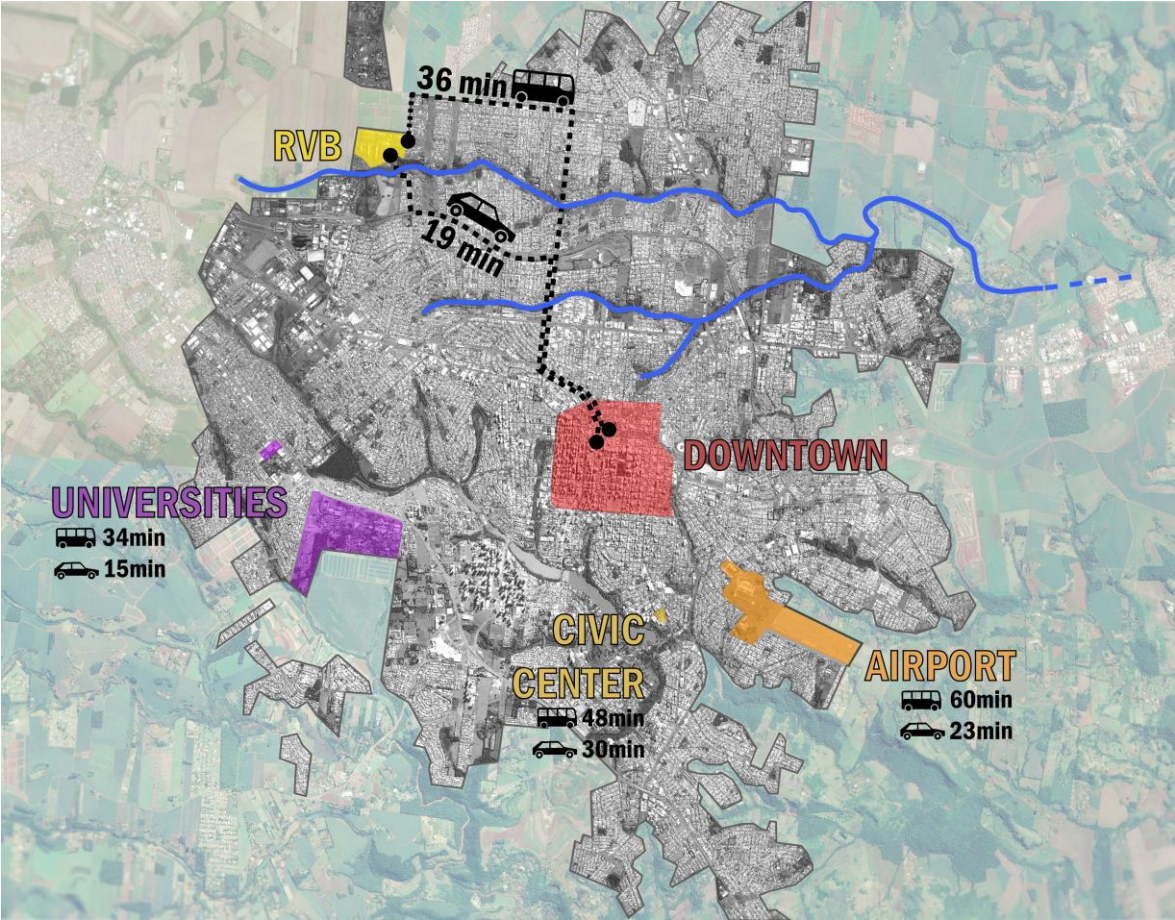
Figure 22: Location of RVB in the city of Londrina and main travel distances.
Elaborated by the author, 2016.

4.1.2 Urban Grid

The urban grid of RVB follows a similar pattern to the neighbor developments, with long and narrow blocks that usually accommodate small single family houses. Through the following ground figure diagram, it is possible to notice the difference between the north part of the city, where most of the social housing developments were located, and Downtown, where the grid is more square and rational. The topography and the presence of preservation areas (due to streams and rivers) also helped to shape the resultant grid of the city.

Figure 23: Urban Grid of part of the city, and preservation lands.
Elaborated by the author, 2016.
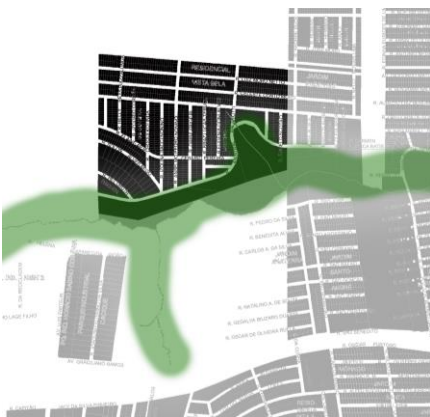
Figure 24: Closer view of Figure 23.

The average dimensions of the development's blocks are approximately 820 feet x 215 feet (250m x 65m). Long blocks like this reduce the cost of public infrastructure like roads, sidewalks and public lighting; but they also establish a less integrated network of walkable streets. According to Farr (2008), a maximum uninterrupted block face should ideally be 450 feet, and streets at intervals no greater than 600 feet apart, so pedestrians, cyclists and motorists can move safely and comfortably through a neighborhood.

4.1.3 Land Use

The development is almost exclusively residential, with 9 small areas designated for community activities and insignificant formal commercial activity, which represents only 0.2% of the total area of RVB. There are 1,206 single-family housing units, every two units grouped as one house. There are also 66 bigger single-family houses, "special" units designated for families with disabled or elderly people, that require a little more space. None of the single-family houses get parking spaces; these are available only to the apartment units (one parking space per apartment). There are 90 four-story apartment buildings, with 4 apartments per floor, totalizing 1440 apartments and 1440 parking spaces. Each block of multi-story buildings has also a bike storage. The only educational facility existent in the development today is a preschool that takes care of 180 children, but recently the construction of an elementary school was approved that will benefit another 600 children (Bonde, 2015). The green/public spaces are located on the edges of the development, without any equipment that encourage their appropriation by the community.
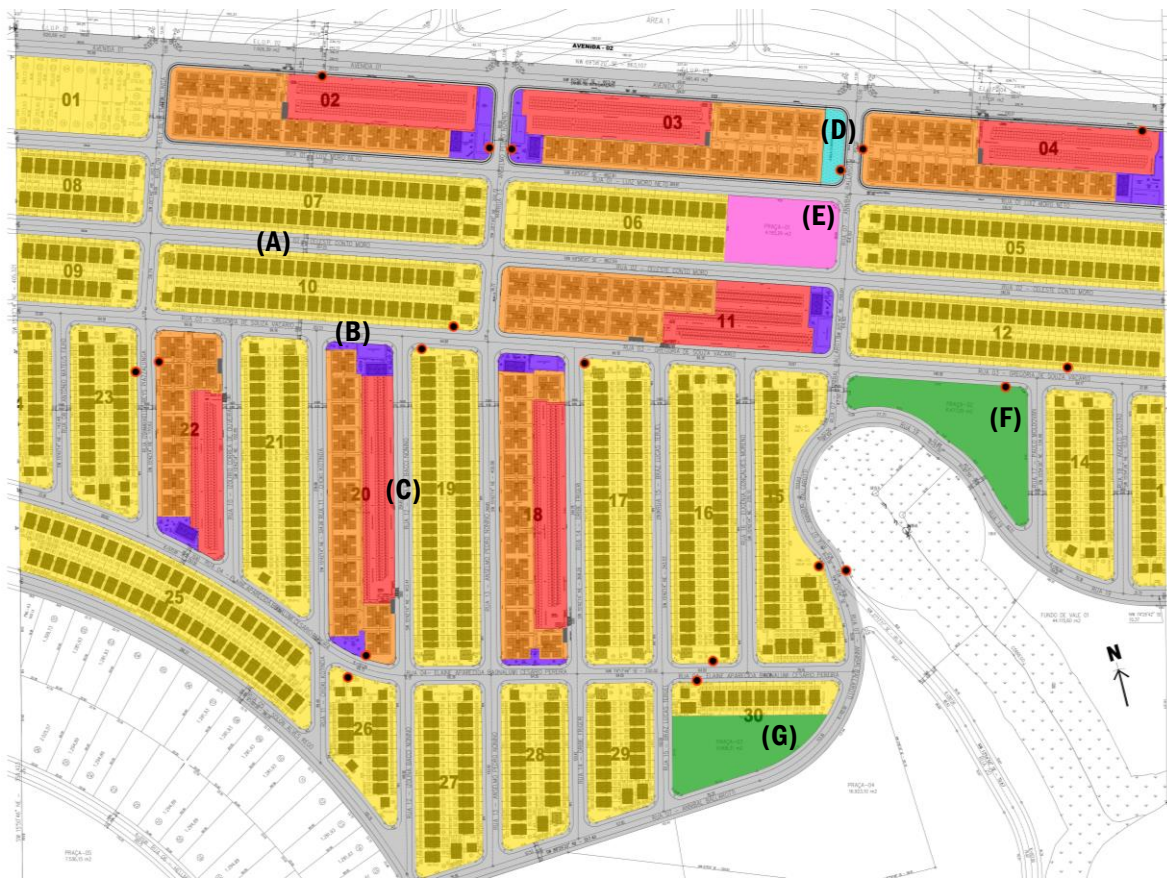
Figure 25: Land Uses of RVB.
Elaborated by the author, 2016.

LEGEND

| Single-family Houses | Four-story Apartment Buildings | Parking | Community Spaces | School | Green/Public Space | Commercial area | Bus Stops |

(A) to (G) refer to the following images, which aim to provide a clearer image of the development:
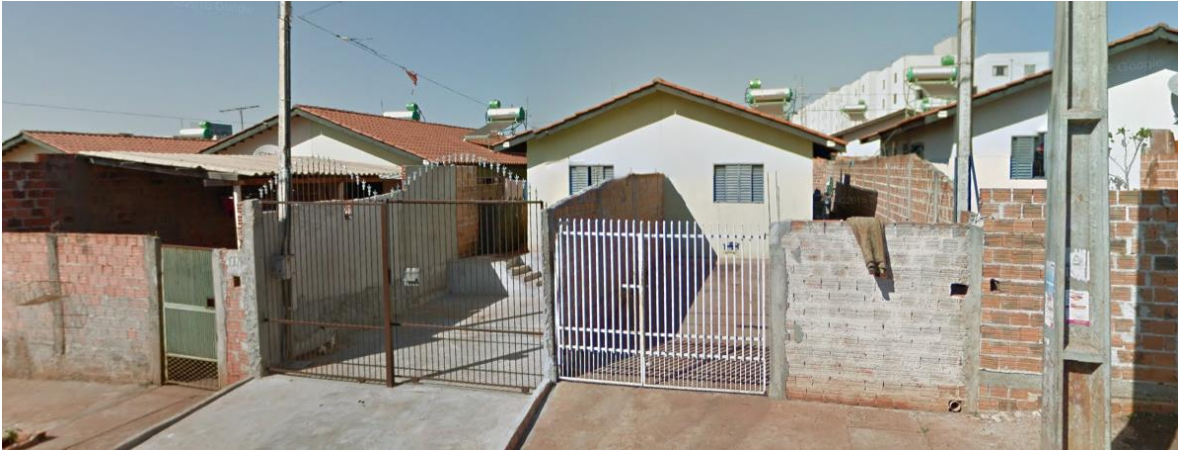
Figure 26: (A) Single-family house.
Source: Google Street View, 2016.

Figure 27: (B) Sports court, playground and community space in the back.
Source: Google Street View, 2016.
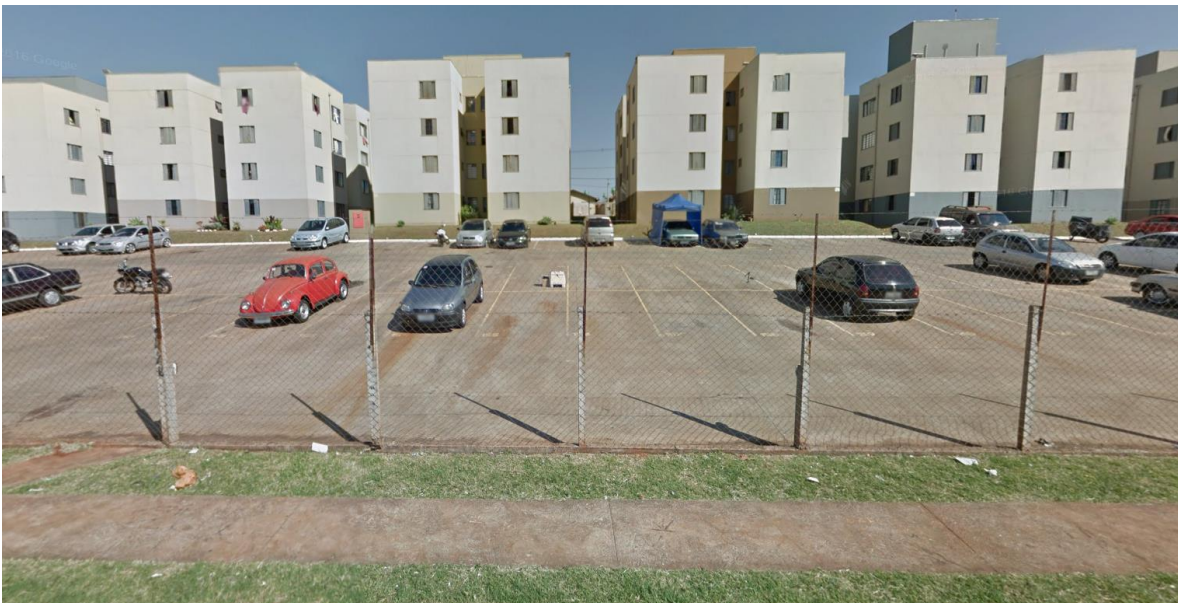
Figure 28: (C) Parking Lot facing the street.
Source: Google Street View, 2016.

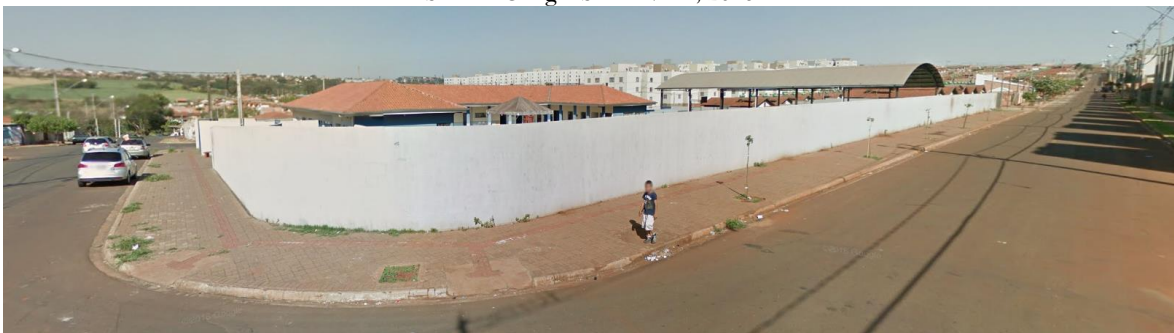Figure 29: (D) Commercial area.
Source: Google Street View, 2016.

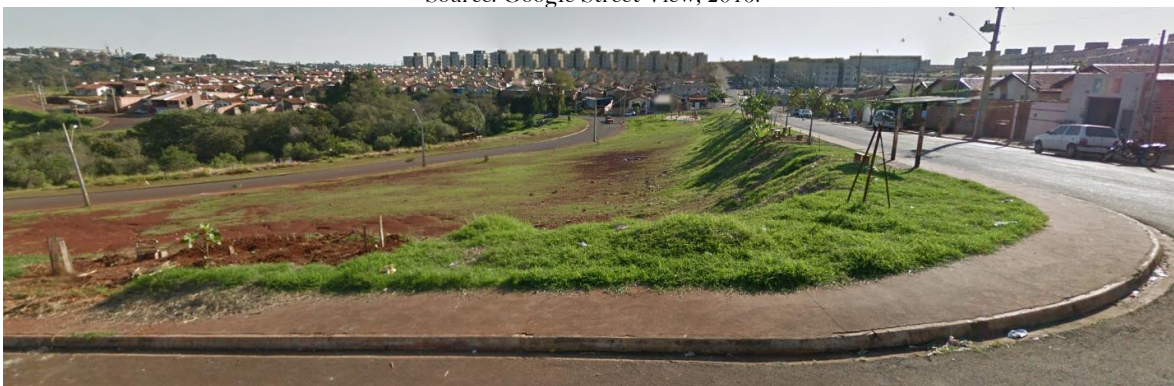Figure 30: (E) Preschool.
Source: Google Street View, 2016.

Figure 31: (F) East Green/Public Space.
Source: Google Street View, 2016.

Figure 32: (G) South Green/Public Space.
Source: Google Street View, 2016.

4.1.4 Climate

Some of the pictures showed what it seems to be a dry environment; however, Londrina's climate is classified as humid subtropical, with rain occurring in all four seasons, but mainly in the summer. There are rarely droughts or floods. The annual average temperature is around 20°C, and relative humidity ranges from 76% in the summer to 69% in the winter (Prefeitura de Londrina, 2015a). The arid aspect of the development is due to the scarcity of green spaces, the lack of trees on the urban space and features that could provide shading, as well as the prevalence of impervious surfaces. In addition to the generation of an unfriendly environment to pedestrians and cyclers, these characteristics also contribute ultimately to the heat island effect, increasing energy demand, greenhouse gas emissions, and affecting water and air quality.

4.1.5 Building Types

There are only three building types in the whole development. From left to right: 1) Single-family houses (half for each family is the typical; the entire house is designed "special house"); 2) Four-story apartment building; and 3) Community Building.
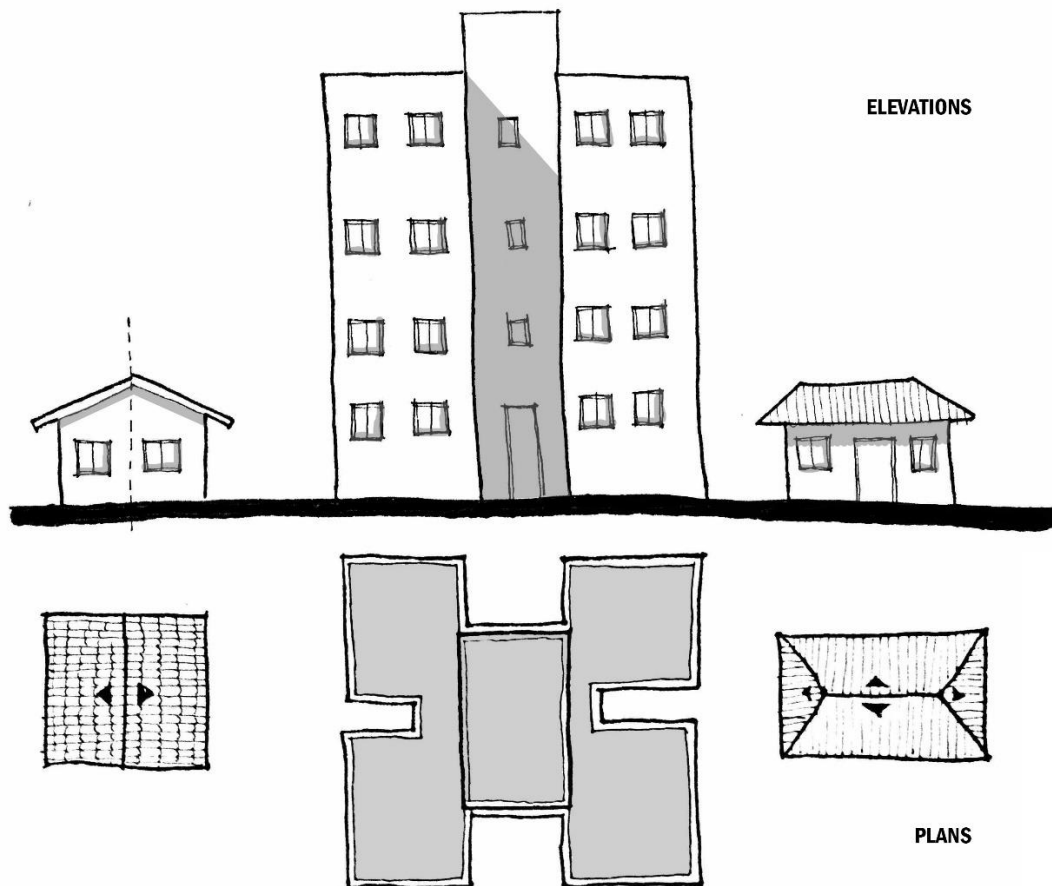
Figure 33: Types of Buildings of RVB.
Source: Elaborated by the author, 2016.

4.2   Assessment of RVB Through the Lens of the Conceptual Framework

The conceptual framework elaborated for this study, based on the Egan Wheel for sustainable communities, aim to balance social and spatial structures, acknowledging their interdependence and significance for the construction of better community environments. Social structures are less influenced by design than spatial ones; however, by taking into consideration social processes that encourage fruitful social interactions, it is possible to make more informed design decisions, leading to a more successful urban design. Therefore, the following topics will discuss the current situation of RVB in relation to the eight values of the conceptual framework.

Participation & Leadership
Even though this topic is not directly related to design and also requires post-occupation initiatives to encourage participation and leadership within the community, it is possible to notice in RVB the lack of public spaces to promote social interaction among the residents. The community spaces shown in purple in figure 25 are a combination of playgrounds, sports court, turf area, and a one-story building for any community purpose – from private parties to general

Figure 34: Typical Community Spaces in RVB.
Source: Google Street View, 2016.

meetings. This is the only area where the community can formally get together, and it is associated with the four-story apartment blocks, so it is not very accessible by all people. There is a clear need of more public spaces where people can exercise civic engagement.

Sense of Identity & Belonging
The sense of identity and belonging have much to do with social relations built in a community, the social network that is developed with time. The spatial aspect of this sense of place is discussed in Bond et al (2012), that found in their studies that the "importance of places of residence lies partly (or largely) in the way they affirm an individual's sense of identity and social position". There are "strong associations between mental wellbeing of the physical and service qualities of housing and neighborhoods" (Bond et al 2012, 12) in terms of appearance, relations with local institutions and neighbors. The homogeneity of RVB due to the standardization of housing units, their consequent lack of flexibility to adapt to the different familial structures, no social or cultural infrastructure and little contact with nature do not contribute to the construction of a sense of place.

Economically Prosperous

There is insignificant commercial activity in RVB. The area designed for that is small and does not meet the needs of the thousands of residents. This way, there is no job opportunities within the community. Families who managed to develop businesses while still living in the same building, as the program regulation requires, do it almost informally, since there is no planned commercial network (web of stores) within the neighborhood. The only education facility is a preschool; so every child older than five years old needs to commute to distant areas of the city to get public education. There is not any sort of training center to support residents or adequate open and public spaces that could hold events such as farmer's markets, fairs, and events to stimulate commercial activity in the development.

Figure 35: Ice-cream shop in a single-family house.
Source: Google Street View, 2016.

Equity & Inclusion

RVB is homogeneous in terms of income, since residents cannot earn more than R$1,800.00; but even though the income range is short, there is a considerable lifestyle difference between who earns the maximum amount and who do not earn any income at all. The lack of infrastructure of the neighborhood (such as schools, health facilities, adequate public transportation and social services) undermines possible changes to the economic condition of some families. In terms of accessibility, the lack of public spaces and the prevalence of residential use makes streets unattractive and dead, surrounded by private fences and walls. To change that, RVB should incorporate more shared and common spaces, to encourage the integration of a diversity of people, from different ages, races, abilities, and cultures, to promote safety, tolerance and respect.

Environmentally Sensitive

RVB does not present many environmentally friendly features; in fact, many of the design decisions for this development suggest environmental issues, such as the automobile-oriented fabric, the use of conventional and wasteful construction systems, soil imperviousness, lack of vegetated areas and trees, no
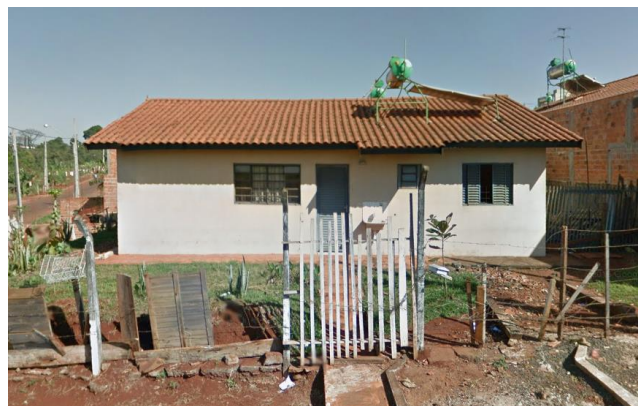

Figure 36: Solar Heat System installed in single-family houses.
Source: Google Street View, 2016.

rainwater or waste management system, among others. One of the only sustainable features is the installation of solar heating systems in every single-family house. This is a MCMV requirement that aims to reduce the family's electricity demand for heating water. However, much more can be done to minimize the negative environmental impacts of this kind of large-scale housing development and enhance positive ones, such as encouragement of alternative transportation, recycling and reuse, introduction of rainwater and waste management systems, etc.

Well Connected

The master plan for RVB followed an automobile-oriented scheme, just like the majority of developments in Brazil. Parking lots are designated only to apartment units, and whoever owns a car and lives in a single-family house, must park the car on street. Every block has 3.0 meter sidewalks (9.8 feet) and every road is large enough to dedicate some width to exclusive bike lanes; however, those practices could be more encouraged if the paths were connecting nodes like squares, parks and retail stores, or if the streets had a better ambience, with trees casting shadows to protect from the heat, and urban furniture. The average length of blocks is approximately 820 feet, making residents walk long distances to reach their points of interest. There are 19 bus stops with no seating or connection to other activities, to make it more comfortable or safer. Regarding communication networks, while some communities in Brazil[9] are already getting free wi-fi to access the internet, in RVB these services are restricted to private services.

Figure 37: Typical street with single-family houses on each side.
Source: Google Street View, 2016.

Figure 38: Typical Bus Stop.
Source: Google Street View, 2016.

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[9] For example, the *Complexo do Alemão* [German Complex], a large favela in Rio de Janeiro, has been granted access to free wi-fi since 2012. The State government believes this project was important promote digital inclusion and new opportunities for residents in the community. (Braga 2012)

Well Designed

RVB could be better designed, since it offers its residents only the minimum features required by MCMV and local regulations. Standardized solutions to housing, with almost no flexibility to adaptation by the different families in different stages of life, result in a homogeneous settlement, with few references or landmarks for the neighborhood. According to Alexander, Ishikawa and Silverstein (1977), "when the balance of life cycles is well related to the kinds of housing that are available in a neighborhood, the possibilities of contact become concrete" (189), so having only 3 rigid typologies in the whole development can also challenge the rise of new relationships.

There are few public/common/green spaces in RVB and they are situated in residual spaces, and do not contribute to the livelihood of the community. Another aspect pointed by Farr (2008) is the importance of making sure that compatible building types face one another across unified streets, making transitions between different building types happen at the rear lot lines. In RVB, there is no evidence of any concern for this, as the figure shows.

Figure 39: Transition between building types.
Source: Google Street View, 2016.

Well Served

The absolute predominance of residential use in the development makes the residents' life more difficult, since they need to commute long distances to get to workplaces, schools, health centers, as well as to meet daily needs activities, such as grocery stores, and retail in general. This way, the development turned itself into a "dormitory neighborhood", where many people only come back to sleep, since their major activities are done outside in other parts of the city. There are a few cases reported by Zanon, Cordeiro and Junior (2015) of former RVB residents that could not afford the cost of daily commutes to work and study, and/or could not stand the new situation of isolation and returned to their places of origin. Since RVB was built during the first phase of the program, commercial activities were not required; however, it is clear there is a need for mixed-use buildings and basic educational and health infrastructure in large-scale housing developments like this.

In conclusion, RVB is a development that has been gathering people in challenging financial situations, from different parts of the city of Londrina, with different life stories and backgrounds. Because of its size and population, RVB is almost a "mini city", but it does not present the advantages of an urban center, like easy access to basic services and amenities. The development is also located in a peripheral location, what demands long commutes to workplaces, schools, health centers, etc. It is clear that, for economic reasons, standardized solutions were applied, affecting the resultant quality of the architectural and urban space. In addition, since the housing units are as small as they can be, it is important to approach the outdoor space as a continuity of the residents' houses, so residents can interact with each other, engage in actions to improve their community and increase their sense of belonging and self-esteem.

4.3   An Alternative to the Existing Situation

Understanding the main characteristics and weaknesses of the existing development, this study will propose an alternative master plan, focusing on the urban form, which goal is to provide the residents with a more sustainable and thriving neighborhood, that is environmentally sensitive and with more opportunities for social interactions. This thesis acknowledges the fact that the following proposal *is not the only way* of achieving a more sustainable community, but rather, it represents one alternative to the existing situation. Successful urbanism needs to address specific cultural, economic, political and social conditions of a place, and people experience urban spaces differently, so diverse strategies are required and they are better implemented with prior understanding of the different actors' needs.

The idea was to start from scratch, only maintaining some programmatic requirements so the development can still meet the current demand. The constraints to using this approach were:

- Using the existing property area;
- Working with the same lot size and dwellings footprint;
- Trying to reach the same number of housing units, parking spaces and residents;
- Using simple building forms and solutions to avoid much higher resulting costs;
- Maintenance of the same management structure of the development: 10 areas managed by 10 different condominium managers.

Since MCMV's official regulations and construction guide do not provide any orientation, or good practices, regarding urban design, any design changes that could help enhance the quality of RVB were welcomed. The official regulation only mentions that the financial institution, Caixa, should prioritize projects situated in areas with existent infrastructure (water, sewage and

electricity) and basic services (Brasil 2013, 7). Other than that, in practice, developers can build developments the way they conclude is more efficient and profitable.

4.3.1 Bubble Diagram

The bubble diagram was a scheme that generated the final proposal. Red dashed lines represent existing axis within the development that provide connections with the city's urban fabric and could be vectors of expansion to adjacent lots. The point where these paths come across gives rise to the new centrality of the development. According to Farr (2008), there are five basic design conventions that make great neighborhoods[10], one of them being "identifiable center and edge to neighborhood": the heart of the community must be within a walking distance of the surrounding and present a mix of uses to encourage its appropriation. The longest distance a resident will ever walk to get to the new centrality is 0.27 mile; but the majority of residents are located within less than 0.25 mile from the centrality, a figure that is commonly accepted as a reasonable walking distance – equivalent to 5 minutes of walk.

Brown circles represent the ten areas managed by different condominium managers. The diagram suggests that each area has its own community center (in purple) - a small building to hold events, meetings and social gatherings. This way, those sub-centers are distributed more evenly throughout the development.

The north-south and east-west axis will have rows of trees that will help to build an identity and to reinforce the importance of these streets. The major green space will no longer be a product of residual areas, but it will refer to the green space nearby, which is part of a larger ecosystem connected to Tibagi river. Smaller green spaces will be distributed throughout the blocks, as community gardens, so the residents can perform activities that bring them together, like growing food collectively, planting flowers, etc. Finally, the diagonal axis represents secondary accesses to the new centrality, with a geometry that allows a more organic arrangement of the linear park.

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[10] The five basic design conventions are: 1) Identifiable Center and Edge to the Neighborhood; 2) Walkable Size; 3) Mix of Land Uses and Housing Types with Opportunities for Shopping and Workplaces Close to Home; 4) Integrated network of Walkable streets; and 5) Special Sites are reserved for civic/community purposes (Farr 2008). Those conventions are contemplated on the seven design concepts proposed by Jabareen (2009) and discussed in subchapter 3.2.2.
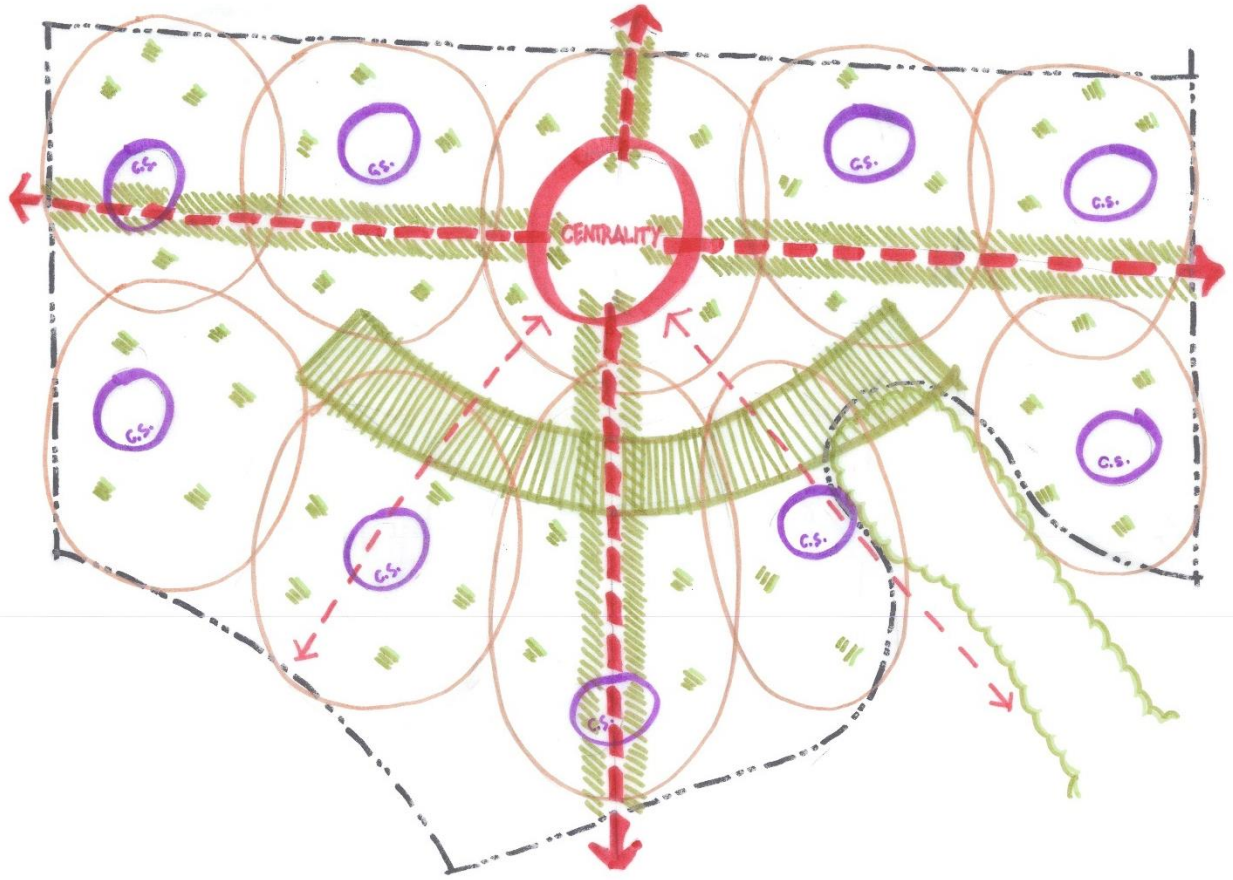
Figure 40: Bubble Diagram.
Source: Elaborated by the author, 2016.

Figure 41: Master Plan.
Source: Elaborated by the author, 2016.

Figure 42: Land Uses.
Source: Elaborated by the author, 2016.

Single-family Houses	Four-story Apartment Buildings	Parking	Community Spaces	School	Green/Public Space	Health Center	Five-story Mixed-use Buildings

4.3.3   Lot Reconfiguration and Building Types

This thesis' goal was to study more sustainable *urban forms* for low-income housing developments in Brazil, done under the My House My Life Program. However, the current single-family house typology – applied all over the country in developments limited to the income group 1 – do not contribute to the development of a more sustainable environment, due to its minimum size, standardization that undermines any climate-responsive design, lack of flexibility and impossibility of further adaptation.

Therefore, even though the focus of this thesis was not on the architectural redesign of the houses, it was proposed a new typology to make the case that we don't need to be stuck with the conventional project. The Chilean architectural office Elemental - whose director was the 2016 winner of the Pritzker Prize - is recognized by their thoughtful social housing design, showing that is possible to do better with similar constraints. They recently released four of their projects to the public for open source use, making the following statement:

> From now on they are public knowledge, an open source that we hope will be able to rule out one more excuse for why markets and governments don't move in this direction to tackle the challenge of massive rapid urbanization. These designs may require to be adjusted to comply with local regulations and structural codes, follow local realities and use pertinent building materials. But they are knowledge that we have tested, that has proved to be beneficial to communities and that have been implemented accepting very pressing budget and policy constraints (Elemental 2016).

The building applied in RVB master plan was from Villa Verde Housing, a residential neighborhood for 484 of the affected families by the 8.8-magnitude earthquake and subsequent tsunami of 2010 in Chile. The architects applied the principle of incremental construction, prioritizing the more complex components with high standards. Greene and Rojas (2008) believe that incremental housing construction can make significant contributions to solving the housing problem in Latin America. They define this method as

> an inverted version of the formal process of building and financing a house. In the formal process, the complete features of the house are available to the owners from the first day of occupancy, financed by the long amortization period of a mortgage loan while the house is in use. In contrast, in the incremental construction process, the house is acquired with only the most basic features and is upgraded later, at a pace based on the financing capacities of the families, through either savings, micro loans or self-help, which implies waiting until the final stage to obtain the completely finished house. (92)

Figure 43: Villa Verde Housing as they were delivered to residents.
Source: Elemental.

Figure 44: Villa Verde Housing, with increments made by the residents.
Source: Elemental

This project offers the residents a frame and half of the building constructed and complex elements such as plumbing and structure ready to the future expansion. The minimum size proposed for single-family houses by MCMV is 36m² (387.5 sf). In RVB's case, there is almost no possibility of expansion because of the arrangement of the site. Elemental's design for Villa Verde proposes 21.29m² (229.16 sf) for each floor, resulting in 42.78m² (458.32 sf) delivered to the resident. With incremental construction, they could double the size of the house, reaching up to 85.56m² (920.96 sf).
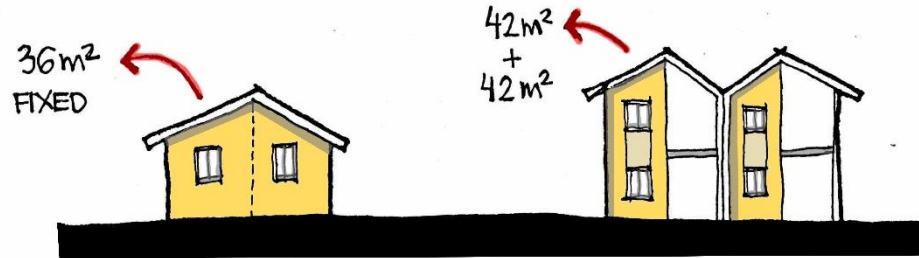
Figure 45: Group of two households: existing vs. proposed.
Source: Elaborated by the author, 2016.

The idea of incremental housing is interesting because it allows residents to adapt to their needs, and improve their living standards as they can. It encourages people to thrive at the same time that provides descent living conditions for those who cannot afford an expansion. Even though the housing unit follows a standard, the possibility of expansion creates architectural diversity within the neighborhood. In RVB's case, the project was adapted to the minimum lot size of 125m² (1345.5 sf) and the unit were grouped in pairs so more openings can be placed in the lateral walls, increasing the incidence of daylight and cross ventilation. Solar heating systems are part of the original project and are maintained in the master plan.
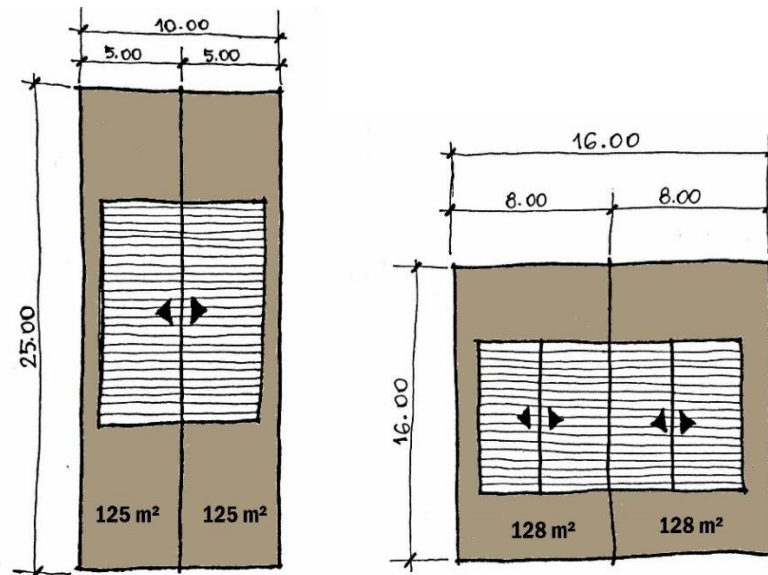
Figure 46: Lot configuration: existing vs. proposed.
Source: Elaborated by the author, 2016.

4.3.4 Strengths of the Alternative Master Plan

The strengths of this alternative master plan are embedded on the seven design concepts summarized by Jabareen (2009) – *density, diversity, mixed land use, compactness, sustainable transportation, passive solar design* and *greening* – and are listed below:

- **Configuration of a new centrality** for the neighborhood, with a school, a health center and mixed-use buildings that can hold social and cultural activities, as well as offices, stores, training centers, etc.;

- **Creation of identifiable streets**, by making transitions between different building types happen at the rear lot lines; this way, similar typologies face one another in the streets;

- **Addition of mixed-use buildings** in the main east-west axis of the development. The combination of commercial activity in the ground floor with residential units in the upper floors will bring life to this part of the neighborhood and will give the community opportunity to meet their daily needs on foot;

- **Reduction of block dimensions**, to increase the number of possible routes to pedestrians and cyclers, creating a more integrated network of walkable streets;

- **Creation of a linear park**, close to the new centrality, that can hold community activities, fairs, farmer's market, sports events, among others. This green space is located in the heart of the community, in its geometric center, to be equally accessible for every resident;

- **Placement of community gardens in every block**, so the residents can be brought together by doing activities like growing food collectively, planting flowers, trees, etc. This strategy also reduces the amount of overall impervious surfaces in the community, contributing to rainwater management.

Figure 47: Sketch of a typical block.
Source: Elaborated by the author, 2016.

- **Addition of two new schools** (elementary and high-school), connected to the linear park, to offer young students of different ages the possibility of studying closer to home, avoiding long commutes by public transportation;

- **Addition to a health center**, an old demand from the population;

- **Creation of alternative pedestrian-only paths** to encourage walkability and promote social interactions between neighbors;

- **Dismemberment of large parking lots** into smaller ones, hidden from the public realm, while still meeting the demand of one parking space per apartment. The parking lots' gateways are their only visible portion from the street;

- **Introduction of a new single-family housing typology**, that promotes flexibility, adaptability and possibility of expansion using the same lot size and building footprint.

- **Introduction of three new multi-family buildings**, with similar square footage, but that add more diversity to the neighborhood and helps to create more interesting urban form;

- **More evenly distribution of community buildings**, disconnected from walled blocks of multi-story buildings, but open to the surrounding areas.

Figure 48: Illustrative perspective from the proposed master plan.
Elaborated by the author, 2016.

The summary of the main changes can be found in the table below:

Table 11: Existing infrastructure vs. proposed infrastructure. Elaborated by the author, 2016.

	Existing	Alternative		Existing	Alternative
Building Types	3	6	Number of bus stops	19	26
Single-family houses	1206	907	Educational facilities	1	3
Special Houses	5.5% (66)	6% (56)	Health Center	0	1
Four-story residential buildings	90	36	Community buildings	7	10
Five-story mixed-use buildings	0	55	Number of streets	18	20
Apartments	1440	1456	Number of blocks	30	45
Total housing units	2,712	2,419	Average block dimension	250m x 65m (820 ft x 215 ft)	85m x 89m (278 ft x 292 ft)
Residents (*)	10,848	9,664	Sidewalks width	3.0m (9.84 ft)	3.0 m (9.86 ft) & 5.0m (16.4 ft)
Parking Spaces	1440	1309	Road width	8.0m (26.25 ft)	8.0m (26.25 ft) & 14.0m (45.9 ft)

(*) *Assuming the average of 4 residents per household.*

The new configuration resulted in 10% less housing units; however, it still houses almost 10,000 residents in the same site area, and it adds new facilities such as 2 schools and one health center, a linear park, communities garden in every block and 3 extra community buildings. The number of parking spaces also decreased, but this number does not take into account the on-street parking spaces.

Figure 49: The community Garden is one of the spaces for social interaction.
Elaborated by the author, 2016.

5 CONCLUSION

This thesis has identified in the history of urbanization in Brazil a pattern of spatial segregation, sometimes voluntary and sometimes involuntary. The country also presents a high rate of housing shortage: currently, six million of dwellings. Because of the high price of urban lands and restricted access to private construction market, housing is usually available to the poorest in peripheral areas of the city, with limited access to basic infrastructure and services.

The objects of this study, housing developments from MCMV, are not different. Even though the program represents an unprecedented initiative towards the reduction of housing deficit, it still presents weaknesses that jeopardize important achievements on housing policy, such as the City Statute. These large scale, standardized developments do not offer residents more than a shelter, which many times are not flexible enough to the different family structures and are arranged in a way that reinforce socio-spatial segregation in the city and within the neighborhood.

The search for urban sustainability in the literature showed that many of the current movements focus on the environmental side of sustainability (while still economically feasible), addressing important aspects like density, transportation, high-performance buildings and infrastructure, mixed land use, etc. However, the social dimension of sustainability is usually left aside, or conceptually linked to environmental aspects (society is a threat to the environment and need to protect it) or economic ones (people can be more productive in better built environments).

Therefore, this thesis approached the quest for urban sustainability by combining the eight components for sustainable communities from the Egan Wheel and the seven most common design concepts in sustainable urban studies as the base for the conceptual framework. By suggesting design strategies for each value of the framework, it was possible to observe the limitation of the designer's role to fully reach urban sustainability. Half of values are not directly related to design, but are still considered essential to sustainable communities. This idea reinforces the importance of collaboration and interdisciplinarity when dealing with urban planning.

The assessment of an existing development, based on the conceptual framework, showed that many of the sustainable components were not addressed. This way, an alternative master plan was proposed to illustrate possible improvements, without changing much of the constraints The new configuration resulted in 10% less housing units; however, still housing almost 10,000 residents in the same site area, and adding new facilities and shared spaces. The new alternative suggests that basic principles for better urbanism must be implemented during conceptual design phase, integrating professionals from different disciplines that can contribute for the development of a more sustainable neighborhood. So, even though designers cannot guarantee only by their work the creation of a sustainable community, they can definitely lay the ground for it.

6   FUTURE RESEARCH

This thesis has proposed an alternative master plan for one MCMV development to address the importance of thinking about sustainable urban design since the conceptual phase of the project. The proposal redesigned the development from scratch, taking into consideration some of the existing constraints. Future research is necessary to investigate the economic impact of such changes, to assess the feasibility of the new proposal and make adjustments to the proposal, if needed.

Another possible continuation of this work would be to perform a feasibility study for implementation of an alternative master plan that retrofits the existing infrastructure of RVB. What can be changed in the present configuration of the development to promote a better quality of life to the residents? How much these changes would cost? A research like this will require interviewing RVB's residents to investigate their wishes, concerns, ideas, etc., to get a sense of what the community really needs, and then, design accordingly.

A participatory research project with residents and condominium managers would be interesting not only for the purpose of proposing an alternative master plan, but also to analyze the effectiveness of such large-scale social housing developments. Many people that have moved to MCMV developments came from difficult and vulnerable living situations, but by moving from one place to another, their social network also changes. What is the impact of the social fabric change for this population? Are they able to establish a new social network? How this fact influences their lives?

Finally, this thesis has acknowledged that social participation and engagement in the urban space varies locally and people in the same neighborhood can respond differently to same stimuli. It would be interesting to investigate which design strategies would work better in specific MCMV developments, measuring their success with quantitative and qualitative analysis and, why not, experiments at 1:1 scale to assess residents' engagement – for example, building a community garden in a vacant lot and register people's perceptions and interactions with it.

The Egan Wheel

LIST OF FIGURES

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