THE IMPACTS OF RENEWAL PROJECTS ON URBAN QUALITY OF LIFE: THE CASE OF SAVASSI, BELO HORIZONTE, BRAZIL

CAROLINA SOARES ROSSI CORDEIRO June, 2020

SUPERVISORS: Dr. J. A. Martinez Dr. S. Amer

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CAROLINA SOARES ROSSI CORDEIRO Enschede, The Netherlands, June 2020

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SUPERVISORS: Dr. J. A. Martinez Dr. S. Amer

THESIS ASSESSMENT BOARD: Prof.dr.ir. J.A. Zevenbergen Prof. Dr.-Ing. Peter Andreas Gotsch

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ABSTRACT

Urban renewal projects are said to enhance quality of life in cities. Urban renewals can be characterized as area-based design measures, that target improvements in particular life domains, such as economic, social, and environmental. Small-scale renewals have recently been applied in many cities, as a way to increase the quality of life of residents at the neighbourhood level. Quality of life can be measured by assessing specific life domains through a selection of indicators. The objective of this study is to develop an approach that tests the relationship between small-scale urban renewals and objective quality of life, and empirically test it in the Brazilian context. An index approach using the Min-Max rescaling technique was chosen to assess changes in the urban quality of life. The index was constructed by selecting suitable quality of life indicators, based on a literature review. The developed index was applied to the case study of the Savassi renewal, in the city of Belo Horizonte, Brazil. By assessing the relationship between renewals and quality of life, this study provides knowledge on the characteristics of urban renewals in the Brazilian context, in terms of interventions in the urban environment, legislation, and impact assessments. This research also gives insight into the outcomes of urban renewals, regarding their effects on specific quality of life domains. The results of this study show that the Savassi renewal has enhanced the local quality of life and that some quality of life domains had larger improvements than others. Spillovers were also observed in some neighbourhoods adjacent to the renewal location. This study concluded that an index approach is a suitable method for assessing changes in urban quality of life conditions and that the found results can be used to inform future renewal developments in the Brazilian context.

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1. INTRODUCTION

1.1. Background and Justification

Urban quality of life is a concept that describes the complex relationship between citizens and the management of cities. This relationship is based on interrelated elements of the urban environment and their effects on the lives of residents (Sertutxa, Navarro, Ortega, Hernández, & Irulegi, 2014). Urban quality of life is described by some authors as the relationship between physical features of the urban environment and the dynamics between those features (Serag, Din, Shalaby, Elsayed, & Elariane, 2013). The dimensions assessed vary in different studies. For instance, Serag, Din, Shalaby, Elsayed, and Elariane, (2013) consider the physical, environmental, political, economic, psychological, social and mobility dimensions, while Lotfi and Solaimani, (2009) argue that the dimensions should be limited to environmental, economic, social and physical dimensions.

Urban quality of life can be assessed subjectively, and objectively. Pacione, (1982) defines the subjective notion as perceived quality of life, that is related to how people experience and evaluate the environment. Objective quality of life relates to quantitative measures that describe the environment in which people live (Pacione, 1982). Urban quality of life assessments measure specific sub-dimensions of urban life, such as housing, employment, green spaces, public transport, (Lotfi & Solaimani, 2009), family income, safety (Teklay, 2012), neighbourhood sanitation, and built environment (Tesfazghi, Martinez, & Verplanke, 2010). Even though the assessment of quality of life sub-dimensions has been done using different methods, the most common approach is through indicators (Costanza, et al., 2007). Examples of indicators are presence of open spaces (Luttik, 2000), easiness of access to health facilities (Leby & Hashim, 2010), presence of services such as schools and hospitals (Furtado, 2011), and transport accessibility (Srour, Kockelman, & Dunn, 2002). Indicators can give relevant insight into the changes in quality of life (QoL), by comparing results over a period of time.

Urban renewals fundamentally promote changes in the urban space, affecting the quality of life of residents (Serag, Din, Shalaby, Elsayed, & Elariane, 2013). Urban renewals are defined by Lai, et al., (2007) as an activity of regeneration of the urban space for the common good. Carmon, (1999) identified three important periods of urban renewal in history. The first occurred in the early 1930s and was characterized by physical determinism, focusing on the urban environment. The second is characterized by the rehabilitation of the neighbourhood, addressing social issues, and started in the 1960s. The third, at the beginning of 1970, focused on economic development by taking a business-like approach in the revitalization of city centres. Even though renewals might have different aims, they usually consist of physical changes in the urban environment that somehow upgrade it. Those changes can be for instance implementation of infrastructure, creation of green spaces, economic hubs, replacement of old abandoned buildings with new ones. The content of urban renewals and interventions applied in the urban space are usually regulated by local legislation, which determines specific guidelines for urban planning and management. Those regulations are usually specific to the renewal location and scale.

The extent of an urban renewal usually defines it as a large-scale or a small-scale renewal. Large scalerenewals are high-budget regeneration works, that usually aim at the rehabilitation of specific areas (Gotz, Cooper, & Paskaleva, 2015). Small-scale renewals are defined by upgrading works applied at the local citydistrict or neighbourhood level, that aim at the improvement of certain life conditions of residents (Gotz, Cooper, & Paskaleva, 2015). Small-scale renewals can be developed by different actors, such as local institutions, the municipality, social workers, engaging citizens, and private companies. Because of its restricted scale, the budget for small-scale renewals is usually based on, but not restricted to, smaller investments (Gotz, Cooper, & Paskaleva, 2015). Regardless of size, both large-scale and small-scale renewals can impact the urban environment in which they are inserted. The management of the impacts can be done before or after the renewal implementation, to avoid harmful outcomes.

Impact assessment tools are commonly used in urban planning to regulate and minimize negative impacts in the urban environment. These can be regulatory impact assessment (RIA), social impact assessment (SIA), health impact assessment (HIA), equality impact assessment (EqIA) among others (Glasson & Wood, 2009). The application of impact assessments is usually regulated by legislation, and ground rules are provided to determine what type of assessment will be applied, and what will it tackle. Impact assessments are usually carried out before the implementations of renewals, to prevent possible negative impacts and increase quality of life (Calguner, 1999). The application of post-impact assessments, that is after a renewal implementation, is sometimes defended in literature and can give insight into the overall shifts in urban quality of life (Trop, 2017).

Urban quality of life measurements can be useful to assess whether renewal projects result in positive, negative, no outcomes, or a combination of those. Positive outcomes can come from improvements in transport accessibility, water supply system, and general cleanliness of the urban space, as shown in the research of Eni and Abua, (2014). Renewal initiatives that invest in city attractiveness, through the improvement of open spaces and stimulation of entrepreneurial activities diversification, for instance, can also provide positive outcomes in resident's quality of life (Caltabiano, 2018). On the other hand, negative impacts on urban quality of life can relate to problems of social integration, unequal access to affordable housing, services, facilities, and economic activities for instance (Garau & Pavan, 2018). Such problems derived from renewals followed by a gentrification process might cause the displacement of residents not able to afford the new neighbourhood standards (Uzun, 2003). The outcomes of an urban renewal are not restricted to the boundaries of the intervention and can reflect on the surrounding areas.

Indirect effects on surrounding neighbourhoods, or spillovers, are identified as positive and negative and can result from urban renewals. Positive spillovers are extended benefits to the surrounding neighbourhoods, for instance, an increase in property value, and a decrease in crime and vandalism (Castells, 2010). Negative spillovers, however, relate to harmful outcomes of a renewal spreading to surrounding neighbourhoods. An example of such outcomes is the forced relocation of low-income groups due to demolished public housing, a phenomenon also known as the waterbed effect (Kleinhans & Varady, 2011). The investigations around spillover effects are important to keep monitoring neighbourhood change and evaluate the need for inclusion policies, minimizing negative impacts.

This research analyses the changes in urban quality of life caused by a renewal and investigates spillovers. The selection of suitable dimensions and sub-dimensions of urban quality of life was done based on a systematic literature review. The measurements are presented in the form of an index, using objective indicators.

1.2. Research Problem

The research problem concerns the effects on urban quality of life and possible spillover effects caused by the implementation of small-scale urban renewals. This study is applied in a Brazilian city and provides knowledge on the character of small-scale Brazilian renewals, as well as develops an approach to assess the impacts of this type of development in specific QoL dimensions. This knowledge acquisition is valid since there is a lack of information about the impacts of small-scale renewal projects in urban quality of life in Brazil, and how to assess those effects. This research also investigates how a renewal process is carried out in Brazil in terms of planning and legislations, and their possible spillovers. The findings of this study could

support future urban renewal developments, by giving insight on their possible outcomes and spillovers in terms of urban quality of life.

1.3. Research Objective

1.3.1. General Research Objective

The overall objective of this research is to develop an approach to assess the impacts of urban renewal projects on the urban quality of life of residents, in the Brazilian context.

1.3.2. Specific Research Objectives

The general objective can be decomposed into specific objectives, that assist the development of the research. The specific objectives are:

- 1. Investigate how the process of urban renewal planning is developed in the Brazilian context and identify its main characteristics.
- 2. Identify suitable dimensions of urban quality of life to assess the effects of urban renewal.
- 3. Assess the impacts of a renewal implementation on urban quality of life, and empirically test it in Brazil.

1.4. Research Questions

The proposed research objectives are reached throughout the thesis, by answering research questions that are derived from them. Those questions are:

1.a) What are the main characteristics of an urban renewal planning process in a Brazilian context and how is it developed?

1.b) What types of impact assessments are usually applied in a Brazilian context to evaluate urban renewals, and how are they carried out?

2.a) What dimensions are considered in urban quality of life assessments, and how are they measured?2.b) What are suitable indicators to measure objective urban quality of life?

3.a) How to assess changes in urban quality of life?

3.b) Which dimensions of urban quality of life are affected by urban renewals, and how are they affected? 3.c) Are there spillover effects deriving from the urban renewal, and what are their outcomes?

Even though it is expected that the local urban quality of life has changed after the implementation of a renewal, this research is not based on a specific hypothesis.

1.5. Conceptual Framework



Figure 1: Conceptual Framework

Figure 1 presents the conceptual framework of this study. It consists of three main themes, each corresponding to a specific research objective. The first theme, urban renewal, relates to the first research objective. Under this theme, the characteristics of urban renewals in the Brazilian context are searched for in literature, presenting its planning process, legislations involved, and application of specific impact assessments. The second theme, objective quality of life, relates to the second research objective and presents a literature review of QoL assessments. This literature review indicates the main dimensions, sub-dimensions, and indicators used to assess urban quality of life. The third theme relates to the third research objective and aggregates the concepts of urban renewal and quality of life, by assessing the impacts of a specific urban renewal in the urban quality of life of residents, in a Brazilian context. This is done by developing an approach that assesses changes in urban quality of life in a specific case study, analysing the possible positive, negative, or lack of outcomes, and checking for spillovers in the surrounding areas.

1.6. Research Structure

This section presents the structure of this study, divided into five following chapters, consisting of Literature Review, Research Methods, Results, Discussion, and Conclusion. The first section of the literature review presents the main findings around urban renewals, and urban renewals in the Brazilian context, their main characteristics, legislations, and impact assessments applied. The second section presents literature about the concept of spillovers and the methods to address it. The third and fourth sections present, respectively, literature reviews on urban quality of life dimensions and urban quality of life indicators, which will be later used to support the development of an approach to assess changes in urban quality of life in a case study. The Research Methods chapter is divided into seven sections. It starts by introducing the study area in the first section, and the research design in the second section. The third section presents the methodology of a conducted interview, and how the data collected was analysed. Section four describes the data used in this study and presents information about its type, format, and source. Section five presents the methods adopted to construct an index that assesses changes in urban quality of life, applied in a case study. Section six presents the selection of quality of life dimensions and indicators, used to develop the QoL index. This chapter ends by presenting the ethical considerations of this research.

The Results chapter presents the main findings of this study. Its first section presents the main characteristics of the case study renewal, which were found through literature review and an interview with a key-informant. Section two presents the results on changes in urban quality of life for the selected indicators. The third section shows the results of the urban quality of life index, developed to assess the changes that occurred since the implementation of an urban renewal.

The Discussion chapter analyses the main findings of this study relating it to the literature review presented in Chapter 2. It is divided into five sections, presenting discussions about the Savassi renewal according to the literature of urban renewals, the effects of the Savassi renewal on urban quality of life, gentrification effects, spillovers, and the limitations of the research.

Finally, the Conclusion chapter summarizes the research, presenting its main findings and limitations, reaching the research objectives, giving further recommendations for future studies, and stressing the applications of this study.

2. LITERATURE REVIEW

This chapter presents the reviewed literature in four sections. The first section presents literature on urban renewal policies, so that this research's study area renewal can be better understood and classified in terms of model, spatial patterns, and scale. The second section shows literature on spillovers, one of the key concepts of this research, which will guide the discussions around the possible influence of the study area's renewal on adjacent neighbourhoods. The third section presents reviewed dimensions of urban quality of life in literature, which will support the choice of dimensions analysed in this research. The last section shows the reviewed urban quality of life indicators, which will also support the choice of indicators selected for this research.

2.1. Urban Renewal Policies

Urban renewal is a concept with different definitions and models. One definition of urban renewal is the natural regeneration of the urban space that ideally involves the community and does not allow the displacement of original residents (Lai, et al., 2007; Clarke, 1960). The community involvement model of urban renewal that follows this definition usually avoids demolition strategies. Another definition is urban renewal as a measure to adapt the physical structure of the urban environment to the needs of the residents, in the attempt to improve specific conditions of the area, regardless of gentrification effects. A model of renewal that follows this definition focuses on the development of interventions that remove or prevent unwanted aspects of the urban environment, indicated in literature as "blight" (Mitchell, 2007). The blight removal model focuses on demolition and slum clearance strategies to achieve the rehabilitation and conservation of an area (Zheng, Shen, & Wang, 2014; Assari & Assari, 2012). An even further definition of urban renewal is the adaptation of the physical structures and services of the urban environment to the needs of occupants, regarding their relationships and activities performed in the area (Mitchell, 2007). The land-use adaptation model will most likely be based on changes in the city's masterplan, to adapt the land-use types to the activities developed in the area (Mitchell, 2007).

Even though urban renewal has different definitions and models, it always makes changes in the public space. The public space is defined as any space accessible to the general public (Kukoleca, Madureira, & Martinez, 2019). The public space is formed by and shapes the interaction of the people, depending on the use of that space (Dymnicka, 2010). Public spaces act as points of convergence for specific functions and have a symbolic value that adds to the identity of the place (Kukoleca, Madureira, & Martinez, 2019). Public spaces have been studied at the city level, focusing on their functions, uses, and roles of stakeholders that change the form of those spaces (Madanipour, 2010).

The spatial patterns of urban renewals have different forms at the city scale. One form shows a centrifugal occupation, a consequence of neoliberal economic policies, characterized by the emergence of economic activities in the entire metropolitan region, causing a decentralization of retail (Borsdorf & Hidalgo, 2013). This type of occupation can cause a loss in the market significance of the city centre, due to higher competitiveness with other areas (Borsdorf & Hidalgo, 2013). Another form of urban renewal consists of the densification of the city centre, characterized by the emergence of city-integrated shopping centres, as an effort to strengthen the market of central locations (Borsdorf & Hidalgo, 2013; Dattwyler & Zunino, 1992).

Urban renewal can be implemented in large scales as well as in smaller areas. Small-scale initiatives have been experimented in many cities in the last decade, as a way of enhancing the quality of life of citizens (Coletti & Rabbiosi, 2020). Small-scale renewals are smaller than the neighbourhood scale and consist of the regeneration of areas such as a street, block, or square. Urban regeneration has been experiencing shifts in the way it is performed, and the main shift consists of the transition from large scale renewal projects to small-scale ones, as a way to enhance the urban space's symbolic value and sense of identity (Coletti &

Rabbiosi, 2020). The regeneration of small areas is shown to increase the quality of life of citizens when strategically planned for it, which was the case for the Urban Landscape Program (ULP), in Malaysia. The ULP consisted of landscape small-scale beautification projects emphasizing the regeneration of urban green spaces through pocket parks, urban squares, protocol roads, promenades, and urban woodlands (Ahmad & Simis, 2017). In this study, the authors investigated the success of different ULP works in terms of user satisfaction, function of urban green spaces, and environmental quality. The results were promising, showing high scores for all categories in most of the works. The study concludes that such renewal works should be addressed in a holistic and integrated way so that they have a positive impact on the quality of life of citizens. Another example of small-scale renewal is the case of the Braga corridor, in the city centre of Bandung, in Indonesia. The street was constructed in the early 20th century as a shopping hub for the Dutch elite. However, the area was downgraded throughout the years as a result of the creation of more modern shopping areas in the city (Soewarno, Hidjaz, & Virdianti, 2017). In 2013, the corridor went through a local government-led renovation, which consisted of a pedestrian-friendly project, changing the building functions, road materials, and landscape renovations such as urban furniture and street lighting. The research of Soewarno, Hidjaz, and Virdianti, (2017) showed that the renewal had a positive result, proven by an increase in the number of investors and by a decrease in the number of abandoned buildings.

The Asbury Park in New Jersey was also tackled by several pedestrian-friendly urban renewals, as an attempt to recover from the physical and socioeconomic decline that happened between the 1960s and 1970s. The area, which consists of a small-scale park, received, over the past 30 years, a waterfront development, tourism-based historic preservation, and a renovation following gentrification principles (Ammon, 2015). The research of Ammon, (2015) suggested that the area benefited from the various renewals, led by different actors, including the local government, private investors, and citizens. Even though the displacement of residents came as a consequence of gentrification, this process was gradual. It was observed that the waterfront development benefited not only the area of the park but adjacent neighbourhoods as well since the renewal attracted private investment to surrounding neglected areas (Ammon, 2015). The Asbury Park benefited from an inflow of tourists, and private investments, and is now a prestigious area of the city, that had a positive impact on the quality of life of citizens.

In the context of South America, the patterns of urban renewal shifted after 2000. Before the 21st century, a centrifugal occupation of the urban space was in vogue in South American cities, and with that, the devaluation of central areas (Borsdorf & Hidalgo, 2013). After the year 2000, there was a return of the city centre densification by housing and economic activities, as an attempt to recover the importance of central areas and reinforce their symbolic value (Borsdorf & Hidalgo, 2013).

The reappropriation of the city centre through urban renewals can have both positive and negative outcomes. It is argued that the densification of central areas can impact the social sphere, causing the displacement of low-income groups through land value increase (López-Morales, Meza, & Arriagada-Luco, 2015). This was the case for Santiago in Chile, which experienced a noticeable increase in housing prices of new residential developments in the city centre after an urban renewal (López-Morales, Gasic, & Meza, 2012). Positive impacts can also come from the densification of the city centre if strategically planned by policymakers. By taking into consideration the users and the functions performed in those spaces, renewals have the power to improve the living and working conditions of those who occupy the urban space.

2.1.1. Urban Renewal Policies in Belo Horizonte

Urban renewals are defined by the Belo Horizonte municipality as public initiatives applied in a specific urban area, using an urban planning development plan. This development plan establishes guidelines for interventions, which will transform the urban fabric by altering the physical conditions of the environment (Prefeitura de Belo Horizonte, 2018). Those initiatives are often part of public policy instruments, that aim at maximizing the potential of a specific urban area and implementing new urban management models. The

process of transforming the urban space is guided by legislation, which establishes limits for human intervention on the environment (Prefeitura de Belo Horizonte, 2018).

The urban legislation is an instrument of the Brazilian government that sets guidelines to the promoted activities and constructions of the urban space, considering, for instance, allotments and buildings (Prefeitura de Belo Horizonte, 2020). Urban legislations are applied before and after an urban intervention. Before an intervention, the urban legislation is used to give permits for construction. After an intervention, the urban legislation is used to give permits for construction. After an intervention, the urban legislation are part of the federal constitution and the City's Statute, which means the entire country falls under a few federal urban principles (Prefeitura de Belo Horizonte, 2020). However, the municipality makes the urban legislation viable, defining some of the principles of this instrument. Specific aspects of the occupation of the urban space per se are defined by a city's masterplan, which is elaborated by the municipal power.

The city masterplan is a municipal instrument that defines guidelines for urban planning and management at the local level. In the case of Belo Horizonte, one plan is elaborated for each one of the regional areas. A regional area is an administrative boundary, that aggregates several neighbourhoods. In the case of Belo Horizonte, there are 9 administrative boundaries. It is expected that the city's masterplan considers an equal distribution of goods throughout the city, not privileging some areas in detriment of others (Prefeitura de Belo Horizonte, 2020). The development of the plan is done with specialized urban planning professionals and participatory budgeting. The city's masterplan aims to define an urban structure, indicating public policy instruments that should be used to assure the effectiveness of the plan's guidelines. A public policy, after elaboration of urban policies in the Belo Horizonte municipality is done by a specific council, COMPUR (Urban Policy Municipal Council). This council is responsible for the monitoring of public interventions, promoting debates with citizens, monitor the implementation of the city's masterplan guidelines, develop guidelines for urban policy instruments, and promote impact assessments in large scale constructions (Prefeitura de Belo Horizonte, 2020). Aside from this council, some decisions regarding urban policies and urban renewals are dedicated to a municipal department.

The city masterplan is not the only document guiding the urban planning process in Brazilian cities. Another important document is the municipal Code of Practice, which aims to the occupation of the urban space in a balanced and harmonic way, by setting ground rules to the use of specific areas. The Code of Practice sets guidelines for the construction, conservation, maintenance, and use of public spaces such as sidewalks, streets, cycle lanes, squares, and street blocks closed for traffic.

The Urban Policy Municipal Department (SMPU) is a Belo Horizonte municipal office responsible for the articulation and implementation of urban policies, regarding the mentioned urban legislation and the Code of Practice. One of the aims of this department is to increase the quality of life of citizens. It is divided into three sub-departments, the Supervision (SUFIS), Urban Regulation (SUREG), and Urban Planning (SUPLAN). The urban planning sub-department is responsible for the balanced progress of the city, and the increase in the quality of life of citizens, through the redesign and interventions on the urban environment (Prefeitura de Belo Horizonte, 2020). With this objective, the SUPLAN is the municipal office of Belo Horizonte accountable for the planning of urban renewals.

SUPLAN is also responsible in Belo Horizonte for planning and developing urban operations. Urban Operation projects are interventions organized by the municipal executive power, in collaboration with the public or private sphere. It consists of the development of urban renewal projects following the city masterplan, promoting the redesign of the urban fabric to maximize an area's construction potential (Prefeitura de Belo Horizonte, 2018). Objectives of Urban Operations can be to attract local businesses and services, densify housing areas, restore cultural and environmental heritage, implement and requalify public spaces, construct and renew urban facilities and improve mobility and infrastructure. Those objectives have a common aim of increasing the quality of life of citizens, by improving conditions on the housing and work environment (Prefeitura de Belo Horizonte, 2018).

Urban operation projects can be Urban Consortium Operations or Simplified Operations. Urban Consortium Operations promote structural alterations in the urban environment, thought a public-private partnership, which includes the municipal executive power and landlords, citizens, and private investors. One of the pillars of this type of operation is the partnership with the private sector, which happens by selling construction benefits to investors. This means changes in the local building regulations, as to maximize construction potential and change the current land use (Siqueira, 2019). This type of operation is controversial. Some authors argue that consortium operations do not account for social policies and have gentrification as a central feature, which ultimately causes the displacement of low-income groups (Siqueira, 2019; Hackworth & Smith, 2001; Smith, 2002). Simplified operations follow the same principles as the urban consortium operations, as it also promotes changes in certain legislation parameters to allow the construction of a given development. However, it requires a benefit in exchange for the operation, which is an intervention in the urban space that will benefit the citizens. Benefits of simplified operations include the renovation of public spaces, implementation of urban equipment, implementation of social housing, road improvement, restoration of cultural heritage, environmental protection, climate change mitigation actions, regularization of buildings and its use, and requalification of urban spaces (Prefeitura de Belo Horizonte, 2018). Urban interventions that are not related to the implementation of a renewal development that needs building regulation adjustments are not qualified as urban operations. However, most urban interventions promoted by the municipal planning department need to follow protocols, such as an impact assessment, as to not compromise the environmental state of the area.

An impact assessment is an instrument that analyzes the negative impacts that a certain development has on its surroundings, as a result of its size and or activities. It evaluates the extent of the impacts and mitigates it, to minimize negative consequences in the urban space (Prefeitura de Belo Horizonte, 2020). This assessment is part of the City's Statute, and in Belo Horizonte it is also part of the city's masterplan and analyses the guidelines of both documents. That are generally two types of impact assessments in Brazil, the Environmental Impact Assessment (EIA), and the Neighbourhood Impact Assessment (NIA).

An environmental impact assessment is a technical report, part of the federal law, that assesses the impacts on the environment that a new development might cause. The environmental department of the federal government (CONAMA) defined the basic guidelines of what constitutes the EIA (Conama, 1986), and it is also responsible for defining what kind of developments should provide an EIA. A neighbourhood impact assessment is also part of the City's Statute and assesses the positive and negative outcomes of new developments regarding citizens' quality of life. The NIA can provide a license to build and license to expand a business, private, or public (Marques & Silva, 2015). Each NIA will have its scope, depending on the characteristics of the development. It is carried out by an officer of the urban planning department, along with the executive power, and addresses technical aspects of the building, implementation, and operation of activities. Developments that might be subjected to a NIA are non-residential buildings with car parking of more than 10000m², residential units with more than 300 units, mixed-use developments with construction area higher than 20000m², public spaces with a constructed area higher than 6000m², concert halls, night clubs, supermarkets, helipads, and changes in the road structure of consolidated areas (Lei Municipal 7.166/96, 2020).

The main difference between an EIA and a NIA is the context of the impact assessment. While the NIA addresses the impacts on the quality of life of citizens using qualitative and quantitative indicators (Freire, 2015), the EIA addresses the physical environment in terms of soil, fauna, flora, and socio-economic aspects (Master Ambiental, 2016).

2.2. Spillovers

Spillovers are indirect effects, caused by specific changes in the urban environment that projects to the surrounding areas. The concept of spillover is present in many urban renewal assessment studies. The implementation of renewal projects improves the city's living environment and might create spillovers

outside the boundaries of the project (Newell, 2009). It is important to consider the surrounding environment before an urban renewal implementation, as it is likely that those areas will be affected (Chau & Wong, 2013).

The geographical extent of what might be considered a spillover area varies in different studies. Geographical proximity with the renewal area can be one approach, and it is based on the fact that closer locations are more likely to be affected by a renewal than remote locations (Weber, Bhatta, & Merriman, 2003). In the study of Newell, (2009), several experiments of distance to a target point were done to check for spillovers. In this case, rings of 100, 300, and 500 meters were traced from a new development area to analyse which ring locations were most affected by spillovers of the renovation. The definition of area categories to run a spillover analysis is another approach. This is the case for the study of Smith, (2006), which determined three area descriptions to check for spillovers due to the implementation of Tax Increment Finance districts (TIF) in Chicago. The areas were described as within the boundary of a TIF and sold after the renewal, within the TIF boundary and sold before the renewal, and outside the TIF boundary. Urban planning plays an important role in leading to possible spillovers, by integrating the new urban renewals in the surrounding neighbourhood (Tang & Wong, 2018). However, the effects of urban renewals in the surrounding neighbourhoods are inconclusive, since different studies show different results, such as positive, negative, and no spillovers (Chau & Wong, 2013).

The spillover effects of urban renewals can be positive, negative, or not relevant. Positive spillovers could be, for instance, the increase in land value and the valuation of specific neighbourhoods, targeted for new housing developments. Positive spillovers are dependent on the renewal's provision of facilities, spatial design, and integration with the surrounding neighbourhoods (Tang & Wong, 2018). Positive spillovers can also be associated with the implementation of a better environment that provides new amenities to the residents (Chau & Wong, 2013). Chau and Wong, (2013) found that the implementation of well-planned renewals in areas of high population density with high rise buildings can produce positive spillovers, observed through the increase of the property values of surrounding neighbourhoods. That same effect was observed in the researches of Rosenthal and Helsley, (1994) and Immergluck, (2009), which presented the increase of property values in the vicinities of slum areas that were renewed. Several studies assessed the spillovers of housing prices as a consequence of renewals. The studies of Weber, Bhatta, and Merriman, (2003); Smith B. C., (2006); Weber, Bhatta, and Merriman, (2007); and Schwartz, Ellen, Voicu, and Schill, (2006) show positive spillovers associated with public housing projects, that resulted in a valuation of the surrounding neighbourhoods.

On the other hand, negative spillovers can also be detected as a consequence of urban renewals. Negative spillovers might be related, for instance, to changes in land value or property value, resulting in the displacement of residents. The research of Tonin and Turvani, (2014) showed that the effects of renewals are considerably higher for low-income groups, which are subjected to displacement due to an increase in housing prices in the development's vicinities. Negative spillovers might also be related to the economic sector. This was the case for the study of Tonin and Turvani, (2014), which observed a market failure in a renewal's surrounding neighbourhoods, a phenomena know for the lack of wealth generation, and the prevention of land development (Tonin & Turvani, 2014).

Literature also presents studies in which no relevant spillovers were detected. Tse, (2001) observed a better environment and increase of economic values for the renewed area, but no spillover in the vicinities and Lai, et al., (2007) did not find any changes in the surrounding areas of an urban renewal.

Urban renewals that cause spillovers have an impact on the quality of life of residents. The research of López-Morales, Meza, and Arriagada-Luco, (2015) assessed the impacts that the densification of Santiago's centre had on the life of residents. Their results show that there were mostly negative changes in the subjective quality of life in the centre's vicinities, even though those changes were perceived with different intensities by the residents. It is possible to infer from the literature review that the consequences of an urban renewal in the surrounding areas cannot be predicted as a rule of thumb. The spillovers caused by the

implementation of an urban renewal are subject to how well-planned the new development is, how it accounted for possible externalities, and the kind of implementations that are being offered, such as infrastructure or public spaces.

2.3. Dimensions of Urban Quality of Life

There is no consensus on the definition of quality of life among literature. Depending on the objective of the research, quality of life can be assessed by tackling different dimensions. Such dimensions are usually economic (Aja, 2009; Eras, et al., 2014; Torres, 2010; Lotfi & Solaimani, 2009; Nahas, Pereira, Esteves, & Gonçalves, 2006), environmental (Aja, 2009; Lotfi & Solaimani, 2009; Nahas, Pereira, Esteves, & Gonçalves, 2006), environmental (Aja, 2009; Lotfi & Solaimani, 2009; Kran & Ferreira, 2006), and related to the urban environment (Aja, 2009; Eras, et al., 2014; Torres, 2010; Kran & Ferreira, 2006; Lotfi & Solaimani, 2009; Casas & Brea, 1990). Casas et al. (2006) argue that the choice of quality of life dimensions should comprise the diversity of the multiple aspects of the urban life. However, some authors focus on fewer dimensions depending on the assessment's objective. For instance, Nahas et al. (2006) only consider the social dimension in their research, and Casas and Brea, (1990) only tackle the urban environment dimension, even though both authors consider various sub-dimensions within the chosen dimensions. Not only the choice of dimensions to be analysed is empirical, but the sub-dimensions also depend on the objective of the study.

Often in urban quality of life studies, each urban QoL dimension includes a set of sub-dimensions, which are related to specific aspects of the urban life. For instance, Eras, et al., (2014) consider health, education, culture, and sports to be sub-dimensions of the social dimension, and Lotfi and Solaimani, (2009) consider employment rate and housing costs as part of the economic dimension.

The literature review presented in Table 1 contains similarities and differences regarding the relationship between sub-dimensions and dimensions of quality of life. As for the similarities, Eras, et al., (2014) and Torres, (2010) include the commercial or economic activities sub-dimension under the economic dimension, and the health, culture, and education sub-dimensions are solely part of the social dimensions (Aja, 2009; Eras, et al., 2014; Torres, 2010; Lotfi & Solaimani, 2009; Nahas, Pereira, Esteves, & Gonçalves, 2006). However, some differences can also be found in Table 1, and specific sub-dimensions can fall under different dimensions in different studies. This is the case for the sub-dimensions water, waste, and energy, which are part of the environmental dimension in the studies of Aja, (2009) and Kran and Ferreira, (2006), but are present under the urban environment dimension in the research of Torres, (2010). The same can be seen for the housing sub-dimension, which is included under the economic dimension (Lotfi & Solaimani, 2009), social dimension (Nahas, Pereira, Esteves, & Gonçalves, 2006), and urban environment dimension (Kran & Ferreira, 2006; Torres, 2010). This is true since there is no universally accepted definition of quality of life, and the dimensions which compose it are subjected to change depending on the author's point of view and objective with the study. The type of urban QoL assessment also depends on the author's preferences and can be objective, subjective, or a combination of both.

The notions of quality of life and the methods chosen to assess it also vary in literature review. Quality of life can be objective and subjective. Dissart and Deller, (2000) define objective quality of life as the exogenous facts of one's life, that is, the external factors that influence a person's living conditions. Objective quality of life is assessed using quantitative methods, as done in the research of Aja, (2009). Subjective quality of life is defined by one's perceptions of their life conditions and reflects a person's satisfaction with specific aspects of life (Dissart & Deller, 2000). Objective and subjective quality of life can be assessed together, as an attempt to capture different spheres of the urban life. A mixed-method approach is suitable for assessing objective and subjective quality of life, and was used in the studies of Casas and Brea, (1990), Eras, et al., (2014), Kran and Ferreira, (2006), Lotfi and Solaimani, (2009), Nahas, Pereira, Esteves, and Gonçalves, (2006), and Torres, (2010).

The study of Nahas, Pereira, Esteves, and Gonçalves, (2006) is applied to the same city as this research. It presents an analysis of the methodology adopted by the municipality of Belo Horizonte to construct indices

and social indicators that measure urban quality of life. Even though the study of Nahas, Pereira, Esteves, and Gonçalves, (2006) was relevant in giving insights into which dimensions of QoL and indicators to adopt in this research, a comparison between results would not be relevant. That is because in that research they chose to analyze the methodology of an index development, rather than applying it. Another reason why an in-depth comparison would no be relevant is that the scale used in their research is not comparable with the scale adopted in this study. The scale used in the research of Nahas, Pereira, Esteves, and Gonçalves, (2006) is the planning unit level, which is slightly smaller than the neighbourhood level, aggregating what could be important data.

The literature review presented in Table 1 gives insight into relevant dimensions to tackle while assessing urban quality of life, especially in the context of Latin American cities. Specific sub-dimensions appear in several studies, for instance, housing, infrastructure services such as waste, energy, and water supply, and commercial activities. That consistency of sub-dimensions which are present in different studies makes their relevance clear and states a common ground between different urban quality of life assessments.

AUTHOR	ECONOMIC DIMENSION	SOCIAL DIMENSION	ENVIRONMENTAL DIMENSION	URBAN ENVIRONMENT DIMENSION	MEASURE / METHOD	CONTEXT
(Aja, 2009)	Economic accessibility, production, private sector, public services, employment	Wellbeing, environmental education, population, cultural identity, social inclusion, public participation, safety, and health	Agriculture, water, environment, energy, environmental management, environmental resources, waste, noise	Endowments, planning and management, soil, transport	Objective/ Quantitative	Spain
(Casas & Brea, 1990)				Urban space, sustainability, basic services and infrastructure, sanitation services, communication services, social services	Objective and Subjective / Mixed method	Argentina
(Eras, et al., 2014)	Income, industrial production, economic activities	Health, education, culture, sports		Transport, green spaces, environmental quality, waste	Objective / Mixed method	Cuba

Table 1: Urban Quality of Life Dimensions and Sub-Dimensions Literature Review

(Torres, 2010)	Commercial activities, telecommuni cation, services, specialized medicine, industrial and service chains	Education, health		Housing, facilities, space, green spaces, safety, illumination, energy, water, transport, service administration	Objective and Subjective / Mixed method	Latin America
(Kran & Ferreira, 2006)			Water, energy, waste, sanitation,	Population density, housing, street paving	Objective / Mixed method	City of Palmas, Brazil
(Lotfi & Solaimani, 2009)	Employment , housing	Crime, culture, sports, health, education	Sanitation, green spaces	Transport, politics, building	Objective and Subjective / Mixed method	Iran
(Nahas, Pereira, Esteves, & Gonçalves, 2006)		Commercial activities and Services, culture, economy, education, health, housing, urban management, public participation, urban environment, safety, transport, sports			Objective / Mixed method	Belo Horizonte, Brazil

2.4. Urban Quality of Life Indicators

Assessments of public policies and plans are often done using variables. An indicator is a variable that represents complex situations through values, allowing a temporal and spatial analysis of a specific subject (Aja, 2009). Palenzuela, (1999) defines indicators as a variable that aggregates information on a specific phenomenon, by applying a value to it that goes beyond the capacity of representation of the phenomenon itself. Indicators can be subjective or objective, depending on the objective of the research. In quality of life assessments, subjective indicators are used to measure subjective QoL and objective indicators to measure objective indicators are based on physical quantity (Malkina-Pykh & Pykh, 2008). The use of both types of indicators is also valid to measure distinct aspects of urban life, and a combination of objective and subjective QoL is present in different researches. Table 2 presents a literature review of indicators used to assess urban QoL. Table 2 was used to support the choice of objective indicators for the proposed index in this research, which will be presented in more detail in section 3.6.

The indicators presented in Table 2 are very distinct from each other, as the reviewed authors used different sub-dimensions of urban QoL to analyse, according to their research objectives. The same indicators can

appear under different sub-dimensions. For instance, the indicator "Waste disposal" which appears as part of the "Social services" sub-dimension in the study of Casas and Brea, (1990) appears under the "Waste" sub-dimension in the research of Kran and Ferreira, (2006). The selection of indicators to use and their placement under specific sub-dimensions seems to be empirical, depending on the objective of the research.

AUTHOR	SUB-DIMENSION	SION INDICATOR	
(Casas & Brea,	Urban services	Presence of landfills	
1990)		Presence of precarious settlements	
		Flood area	
		Building situation	
		Visual comfort	
	Sustainability	Sound pollution	
		Air pollution	
		Water pollution	
	Basic services and	Gas	
	infrastructure	Energy	
	Sanitation services	Sewer network	
		Drinking water network	
	Communication services	Railway and/or automotive public transport	
		Telephone/mail	
		Television	
	Social services	Health	
		Education	
		Safety	
		Waste disposal	
		Public space	
(Eras, et al.,	Income	Income	
2014)	Industrial production	Rate of industrial production	
		Local trade performance	
	Economic activities	Public feeding	
		Budget evolution	
	Health	Citizens per medical	
		Citizens per dentist	
		Mortality rate	
	Education	Students per school	
		Students per teacher	
	Culture	Professional artists	
		Offer of artistic and cultural	
		Participation in cultural	
	Sports	Rate of sport participation	
		Citizens per sport teachers	
		Citizens per sport facilities	
	Transport	Bus trips per capita	
		Accessibility of buses	
	Green spaces	Accessibility of buses Access to green space	

Table 2: Urban quality of life indicators literature review

		Urban cleaning			
	Waste	Municipal solid waste			
(Kran & Ferreira,	Water	Water supply			
2006)	Energy	Energy supply			
	Waste	Waste disposal			
		Waste collection			
	Sanitation	Sanitation services supply			
	Sewage	Sewer network			
	Density	Population density			
		Residential density			
	Housing	Precarious settlements			
		Social housing			
	Street paving	Access to street paving			
(Lotfi &	Employment	Employment rate			
Solaimani, 2009)	Housing	Land value			
	Crime	Crime rate			
	Culture	Cultural facilities			
	Sports	Sports facilities			
	Health	Health facilities			
	Education	Educational facilities			
	Sanitation	Sanitation system progress			
	Green spaces	Access to green spaces and park			
	Transport	Public transport rate			
	Politics	Urban political facilities			
	Building	Building quality			
(Nahas, Pereira,	Commercial activities and	Presence of supermarkets			
Esteves, & Gonçalves, 2006)	services	Presence of bakeries			
		Presence of bank agencies			
,		Commerce of pharmacy products			
	Culture	Number of cultural facilities			
	Economy	PIB			
		Average family income			
		Investment possibility			
		Occupancy rate			
	Education	Number of enrolments in high school			
		% of non-graduated people between 15 and 17 years old			
		Highschool enrolment rate			
	Housing	Non-precarious settlements			
	Tiousing	F			
	litousing	Settlements with bathroom facilities			
	Tiousing	Settlements with bathroom facilities Average housing size			
	Tiousing	Settlements with bathroom facilities Average housing size % of housing with water supply			
	Tiousing	Settlements with bathroom facilities Average housing size % of housing with water supply % of housing with sewage system supply			
	Tiousing	Settlements with bathroom facilities Average housing size % of housing with water supply % of housing with sewage system supply % of housing attended by waste collection system			
	Health	Settlements with bathroom facilities Average housing size % of housing with water supply % of housing with sewage system supply % of housing attended by waste collection system Number of doctors			
	Health	Settlements with bathroom facilitiesAverage housing size% of housing with water supply% of housing with sewage system supply% of housing attended by waste collection systemNumber of doctorsNumber of health facilities			
	Health	Settlements with bathroom facilities Average housing size % of housing with water supply % of housing with sewage system supply % of housing attended by waste collection system Number of doctors Number of health facilities Mortality rate			
	Health Urban management	Settlements with bathroom facilities Average housing size % of housing with water supply % of housing with sewage system supply % of housing attended by waste collection system Number of doctors Number of health facilities Mortality rate Information database			

	Legislation presence
Public participation	Presence of union facilities
	Presence of councils
Urban environment	Urban environment problems
	Urban environment actions
Safety	Number of security agents
	Mortality rate by murder
	Client protection agencies
Transport	Number of public transport drivers
	Number of public transport vehicles
	% of housing in paved streets

The literature review presented in this section supported the selection of quality of life dimensions, subdimensions, and indicators, to be applied in this study. The dimensions of quality of life to be assessed in this study were limited to Economic, Social, and Environmental. The Urban Environment dimension was not included in this study because it contains sub-dimensions, such as housing and infrastructure, that could be placed under the Economic, Social or Environmental QoL dimensions according to the literature review (see Table 1). Another reason for the exclusion of the Urban Environmental dimension from this study is the lack of available data to assess the other sub-dimensions it contains according to the literature review. The authors studied in the literature review present different views about what constitutes each quality of life dimension. For that reason, the choice of sub-dimensions was done based on frequency on literature review and availability of data. Sub-dimensions such as Economic Activities or Accessibility, Employment, Housing, Water, Waste, Sanitation, Green Spaces, were present in more than one study reviewed and were included in this research for being considered relevant in QoL assessments. The indicators selected for this study were also chosen based on literature review. Indicators such as Land Value, Employment Rate, Waste Collection, Water Supply, Sanitation System, and Access to Green Spaces appeared in the studies reviewed, and for that reason were considered relevant and included in this research. Some indicators were adapted according to data availability, and more details on their selection will be given in Chapter 3.

The notion of quality of life selected for this study is objective. Objective quality of life was considered the most appropriate notion for the specific case study, and more details will be given about this choice in Chapter 3. This research included an index approach to measure objective quality of life, and an interview to have a better understanding of the character of urban renewals. The index approach was chosen for this research as it is a relevant method to measure objective QoL, as performed in the studies of Eras, et al., (2014); Lotfi and Solaimani, (2009); and Nahas, Pereira, Esteves, and Gonçalves, (2006). Interviews are also carried out in the studies of Lotfi and Solaimani, (2009), and Casas and Brea, (1990), and is another approach adopted for this research.

3. RESEARCH METHODS

This chapter presents the methodology of this research. It is divided into seven sub-sections, presenting the study area, research design, interview methods, calculations of the urban QoL index, data specifications, selection of dimensions and indicators of urban QoL, and the ethical considerations of this research.

3.1. Study Area Description

The study area chosen for this research is the Savassi neighbourhood, in the city of Belo Horizonte, Brazil. The city, with an area of 330km², is located in the south-east of Brazil, and it is the capital of the Minas Gerais state, (see). Belo Horizonte was the first planned city of Brazil and has a prestigious south-eastern location that connects the northern part of the country with relevant states such as São Paulo, Rio de Janeiro, and the national capital, Brasilia. Belo Horizonte is considered to be representative of the average Brazilian city (Furtado, 2011). Belo Horizonte's masterplan was finished in 1897, to be the state capital. The city has now an estimated population of 2.5 million people, and about 4 million people in the metropolitan area, according to the National Statistics Institute for 2009. The administrative boundaries within the city are divided into nine regionals, so-called North (Norte), Northeast (Nordeste), Northwest (Noroeste), West (Oeste), East (Leste), South-Central (Centro-Sul), Barreiro, Venda Nova, and Pampulha (see Figure 2). As the regional boundaries aggregate different neighbourhoods, the scale unit adopted for this research is the census tract. Census data is collected at the census tract scale, and the last Brazilian census presented 3936 tracts within Belo Horizonte, with an average of 603 people per census tract. The urban renewal chosen for this study is known as the Savassi renewal.

The Savassi renewal is part of a Simplified Urban Operation, implemented in the Savassi neighbourhood, in the south-centre region of Belo Horizonte (Figure 2). Even though the official city centre was implemented in the 1897's masterplan, the Savassi neighbourhood, with an area of 1,18km², has been emerging as a centrality, since the end of the 20th century. The growing of this south-centre region was fundamentally caused by the establishment of the retail market in the area, as a consequence of the saturation of the traditional centre (Lemos, 2015). From 2004 until 2012, the Praça Diogo de Vasconcelos, popularly known as the Savassi square (see Figure 3), was targeted by a local government Simplified Urban Operation characterized by the creation of public spaces and an urban design that favoured economic development. The Savassi renewal is a small-scale development, and its boundaries consist of a roundabout and the four adjacent blocks (Figure 3). The project was conceived as an attempt to transform the previous car-oriented urban design intro a pedestrian-friendly one (Prefeitura de Belo Horizonte, 2012). The establishment of Savassi as an unofficial centrality drew the attention of urban planners to the area, and the renewal project was designed to exploit the area's potential as a public meeting space for further growth (Prefeitura de Belo Horizonte, 2012).

The location of the square is at the intersection of four important roads, two of which are the main connectors of the city, and connectors of Savassi to its eight adjacent neighbourhoods (see Figure 4). Those neighbourhoods were chosen to be checked for spillovers due to their geographical proximity to the renewal location, and because Urban Operations aim for the improvements of neighbourhoods surrounding the intervention area (Prefeitura de Belo Horizonte, 2013). Even though those neighbourhoods are close geographically, each has its character (Table 4), which can be checked by their land uses (see Table 3).

The neighbourhoods surrounding Savassi have distinct profiles. Lourdes, São Pedro, and Santo Antônio are high-income neighbourhoods, whereas Serra is composed of middle-class residents and shares boundary with one of the largest slums of the city, Aglomerado da Serra. Some neighbourhoods, such as Boa Viagem and Funcionários, are highly commercial, and São Pedro is locally recognized as the "Silicon Valley" of Belo

Horizonte, even though it is majorly residential. Other neighbourhoods are mainly characterized by the presence of green spaces, such as Cruzeiro, and neighbourhoods such as Carmo are recognized by their historical building and presence of churches (Table 4).

As compared to the surrounding neighbourhoods, Savassi has a distinct character (Table 4). Savassi is a cultural and economic hub of Belo Horizonte, containing two of the biggest shopping centres of the city, Pátio Savassi and Quinta Avenida. It contains a variety of services, such as hotels, movie theatres, art galleries, night clubs, and several bars, as opposed to the economic activities performed in the surrounding neighbourhoods, which are mostly composed of office buildings and services such as restaurants and banking agencies. Savassi is also the location of the architecture faculty of Belo Horizonte (UFMG), one of the most renowned of the country, and Praça da Liberdade, the first planned square of the city, surrounded by museums and art galleries. Those landmarks also contribute to the cultural character of Savassi and make it unique in relation to the surrounding neighbourhoods.

Savassi has a land-use majorly composed of commerce and service activities. The renewal targeted the further development of the commercial sector in the area, by closing for cars the four blocks adjacent to the roundabout and transforming those spaces in public meeting spots, with bars, restaurants, and commerce activities (see Figure 6 and Figure 7). The Savassi square changed considerably throughout the years, and its evolution can be seen in Figure 8, Figure 9, and Figure 10.

The choice of the study area was made due to three important aspects. The Savassi square has been an important landmark of Belo Horizonte, and the neighbourhood's dynamic character aggregates richness to the study. A second reason is the data availability. There are census data available, published by the IBGE, and to some extent, housing, and economic activities data, published by the municipality website, which can be used for an assessment of objective quality of life. The third reason for the study area choice is the availability of local knowledge. This is a powerful tool as it enriches the research by providing possibilities of exploratory analysis that a researcher who does not know the area of study might be unable to perform.



Figure 2: Location of Belo Horizonte in Brazil / Source: using Bing XYZ tiles and IBGE WFS



Figure 3: Location of the Savassi Renewal/ Source: using IBGE WFS and Belo Horizonte municipal WFS



Figure 4: Location of the Savassi renewal and adjacent neighbourhoods/ Source: using IBGE WFS and Belo Horizonte municipal WFS



Figure 5: Land use map of Savassi and adjacent neighbourhoods/ Source: using IBGE WFS and Belo Horizonte municipal WFS

	SAVASSI	LOURDES	BOA VIAGEM	FUNCION ÁRIOS	SERRA	CRUZEIRO	CARMO	SÃO PEDRO	SANTO ANTÔNIO
Commercial/	54%	47%	50%	45%	16%	18%	36%	27%	14%
services									
Residential	27%	36%	30%	37%	70%	73%	46%	56%	76%
Mixed-use	13%	12%	16%	12%	6%	6%	16%	8%	5%
Other	6%	5%	4%	6%	7%	3%	2%	9%	
•••••									5%

	CHARACTERISTICS	LANDMARKS
Savassi	Commercial character with a high presence of clothing and footwear stores. After the 1970s, Savassi becomes an alternative centre for medium and high-income shoppers, due to the traditional city centre's saturation. It is one of the first neighbourhoods to be occupied, having received early infrastructure provision.	Praça Diogo de Vasconcelos (Savassi square)
Lourdes	Neighbourhood characterized by the occupation of high-income residents. Mostly residential, this area has been one of the most prestigious in the city since the 1920s, with the buildings of elite houses. Nowadays it is mostly characterized by high-rise buildings and some remaining old constructions considered to be cultural patrimony.	Minas Tênis Clube (private elite club)
Boa Viagem	Originally part of the Funcionários neighbourhood, separated in 1910. Characterized by middle-class occupation and high provision of commercial activities. It is one of the first neighbourhoods to be occupied, having received early infrastructure provision.	Dom Cabral square
Funcionários	Characterized by middle-class occupation and high provision of commercial activities. Its name (which translates to "workers") is derived from the number of workers that lived in the area in the 1910s. It is one of the first neighbourhoods to be occupied, having received early infrastructure provision.	Colégio Arnaldo (private prestigious middle and high school)
Serra	This neighbourhood is characterized by its duality, being partly occupied by the middle class, and having one of the biggest slums of the city next to its boundaries (Aglomerado da Serra). It is mostly residential but has several old commercial buildings that are part of the city's cultural patrimony.	Colégio Sagrado Coração de Maria (private prestigious middle and high school)
Cruzeiro	Includes one of the main avenues of the city (Afonso Pena). The construction of the avenue influenced the occupation of the neighbourhood, mostly by residential buildings. It has a strong presence of green areas and preserves one of the natural watercourses of the city. It is mainly occupied by middle-class residents.	Mercado Distrital do Cruzeiro (market building with several restaurants, bars, and food market)
Carmo	Mostly middle-class residential, this neighbourhood did not have a clear boundary until 1920, being part of its surrounding neighbourhoods. It contains important streets that connect the south-centre region to other regions of the city.	Nossa Senhora do Carmo Church, which gives the name of the neighbourhood
São Pedro	Mostly occupied by middle- and high-income classes. This neighbourhood is commonly referred to as the "Savassi's annex". Characterized by the presence of high-rise buildings.	Major Lopes street (street with the presence of several bars, restaurants, and commercial establishments)
Santo Antônio	Characterized as a prestigious neighbourhood, with high-rise buildings, occupied by middle- and high-income residents. Still preserves some old houses, part of the current cultural patrimony of the city.	COPASA (headquarters of the only city's private water distributer)

Table 4: Neighbourhood Characteristics/ Source: (Prefeitura de Belo Horizonte, 1999)



Figure 6: Savassi square after renewal | Source: (Trip Advisor, 2017)



Figure 7: Pedestrian quarter after urban renewal in Savassi | Source: (Morais, 2017)



Figure 8: Savassi square 1970 | Source: (Prefeitura de Belo Horizonte, 2012)



Figure 9: Savassi Square before renewal | Source: (Prefeitura de Belo Horizonte, 2012)



Figure 10: Savassi square after renewal | Source: (Prefeitura de Belo Horizonte, 2012)

3.2. Research Design

This research presents the development of an approach that assesses changes in urban quality of life in the Brazilian context. The developed approach was applied in a selected case study, which consists of an experiment that aims to find results on a specific matter in a specific dimension (Yin, 2014). The literature review on urban renewal presented in Chapter 2 was used to understand the main aspects of urban renewals, such as implemented policies, legislations involved, and applied impact assessments. The literature review on urban quality of life presented in Chapter 2 supported the selection of urban quality of life dimensions, sub-dimensions, and indicators to assess the impacts of the Savassi renewal on the objective QoL of residents. This assessment was done by developing an index, constructed using secondary data.

PHASE	SUB- OBJECTIVE	RESEARCH QUESTION	DATA REQUIRED	METHOD
1	1	What are the main characteristics of an urban renewal planning process in a Brazilian context and how is it developed?	Urban renewals in Brazil	Literature review, interview (transcription and translation), coding on Atlas.ti
	1	What types of impact assessments are usually applied in a Brazilian context to evaluate urban renewals, and how are they carried out?	Urban renewals in Brazil	Literature review, interview (transcription and translation), coding on Atlas.ti
2	2	What dimensions are considered in urban quality of life assessments, and how are they measured?	Urban QoL dimensions	Literature review
	2	What are suitable indicators to measure objective urban quality of life?	Urban QoL indicators	Literature review
3	3	How to assess changes in urban quality of life?	Index data (see Table 6)	Index approach with feature scaling on QGIS and mapping of indicators on QGIS
	3	Which dimensions of urban quality of life are affected by urban renewals, and how are they affected?	Index data (see Table 6)	Index approach with feature scaling on QGIS and mapping of indicators on QGIS
	3	Are there spillover effects deriving from the urban renewal, and what are their outcomes?	Index data (see Table 6)	Index approach with feature scaling on QGIS and mapping of indicators on QGIS

Table 5: Research Design

3.3. Interview

To gather information about a renewal planning process in Brazil, an interview with a key informant was carried out. The interviewee was Mr. Mauro César da Silva Ribeiro, architect and urban planner, on the board of the SUPLAN and SMPU, who was responsible for the bidding process of the Savassi renewal. The interview approach was selected for this study, as it was considered to be a relevant method according to the studies of Lotfi and Solaimani, (2009); and Casas and Brea, (1990). The original plan of this study was to have a mixed-method approach and conduct multiple interviews to gather as much information as possible around the Savassi renewal. However, the possibility of interviews was impaired due to the Covid-19 pandemic, and only one interview was made.

The objective of the interview was to gather information about the renewal itself, for instance, its physical components, the bidding process, and legislations applied, to better understand the results found in the QoL assessment developed in this research. For that, the interview was structured around four main themes, according to the conceptual framework (Figure 1), to answer some of the research questions presented in section 1.4. The themes were urban renewal, legislation, urban quality of life, and spillovers. The interviews were recorded on skype and transcribed manually, and the scope of the interview can be seen in the Appendix (Table 10). The interview, which was done in the Portuguese language, was then translated to the English language, and coded using Atlas.ti. This was done so that main topics were identified and related to a specific theme, to facilitate the interpretation of the interviews, following the method of Bryman, (2012). The coding strategy was adopted for this research, as it helps to generate ideas (Bryman, 2016).

Coding consists of sorting the data into distinct categories by labeling specific aspects of it (Walsh, 2003). The coding strategy was based on the interview themes. The four main themes of the interview, urban renewal, legislation, urban quality of life, and spillovers were added to Atlas.ti as coding groups, and the keywords that emerged from the interview under each theme were used as codes under a specific group. This strategy was performed using the open coding tool of Atlas.ti. Figure 11 shows the resulted coding scheme. Interesting results can be observed, as specific keywords appear under more than one group, which is the case for "user" and "benefit". The same keyword can be present under different groups, as it came up more than once during the interview, under different themes. Counter-intuitive results can also be observed, for instance with the keyword "mitigation" under the coding theme "legislation". The relationship between the codes was also performed on Atlas.ti, so that the interpretation of the interview could have more substance (Figure 12).


Figure 11: Interview coding scheme on Atlas.ti



Figure 12: Relationship between interview codes performed on Atlas.ti

3.4. Data

The specifications of the data used in this study can be seen in Table 6. The table is divided into three sections, referring to different steps of the study (refer to Figure 1 and Table 5), firstly urban renewal, secondly urban quality of life, and thirdly the developed index. The data used for the index refers to different years, as the index was applied for two different periods, before and after the Savassi urban renewal.

Because the Brazilian Census data is collected every 10 years, the last available census is from 2010. It was then defined that the 2010 census would be used in the after-renewal index, as it is the most recent census, and the 2000 census used in the before-renewal index. Since the Savassi renewal started in 2004, the 2010 Census is relevant for addressing the post renewal period.

The data used for the indicators were also collected to address the before-renewal period and the afterrenewal period. The years of the collected data were defined based on data availability, and concerning the Savassi renewal finishing year, 2012. All data used in the before-renewal index is from before 2012, and all data used for the after-renewal index is from after 2012, except for the Census data. Information about the census statistics is given in Table 7. The number of census tracts is slightly different between the two censuses. For that, an aggregation of the 2000 census tracts was done on QGIS, so that the two shapefiles from the different census can be compared.

Table 6: Data specifications

DATA	ТҮРЕ	FORMAT	SOURCE	REMARK
Urban renewal data				
Urban renewal projects in Brazil	Literature review	Word	grey literature, urban renewal literature	
Interviews	Primary Data	Word, Atlas.ti	Participants on interview	The interviewee works on the Planning Department of the Belo Horizonte Municipality and is directly linked with the Savassi renewal
Urban Quality of Life data				
Urban QoL dimensions	Literature review	Word	urban QoL literature	The literature used can be seen in Table 1
Urban QoL indicators	Literature review	Word	urban QoL literature	The literature used can be seen in Table 2
Index Data				
Census tract	Secondary data - Belo Horizonte census tracts as polygons	shapefile	IBGE	Census tracts for the years 2000 and 2010 (last two available censuses in Brazil)
Regional boundaries	Secondary data - regional boundary polygons	shapefile	WFS – Belo Horizonte Municipality Geoportal	
Municipality boundary	Secondary data - municipality boundary polygon	shapefile	WFS – Belo Horizonte Municipality Geoportal	
Roads	Secondary data - roads as lines	shapefile	WFS – Belo Horizonte Municipality Geoportal	
Neighbourhood boundaries	Secondary data - neighbourhood boundaries polygons	shapefile	WFS – Belo Horizonte Municipality Geoportal	
Density of economic activities indicator	Secondary data - Economic activities dataset	excel	CNAE - state department of economic activities	Data for the years 2011 and 2015
Richness density indicator	Secondary data -Economic activities dataset	excel	CNAE - state department of economic activities	Data for the years 2011 and 2015
Construction Permits indicator	Secondary data – Construction permits municipality dataset	excel	PBH - Belo Horizonte municipality	Data for years between 2008 - 2011 and 2012 - 2015
% of owned properties indicator	Secondary data - Census data	excel	Brazilian Census	Data for census years 2000 and 2010
Land value indicator	Secondary data -Property transactions records	excel	PBH - Belo Horizonte municipality	Data for the years 2010 and 2015
Literacy Rate	Secondary data - Census data	excel	Brazilian Census	Data for census years 2000 and 2010
Employment Rate	Secondary data - Census data	excel	Brazilian Census	Data for census years 2000 and 2010
Waste indicator	Secondary data - Census data	excel	Brazilian Census	Data for census years 2000 and 2010
Water indicator	Secondary data - Census data	excel	Brazilian Census	Data for census years 2000 and 2010
Sanitation indicator	Secondary data - Census data	excel	Brazilian Census	Data for census years 2000 and 2010
Distance to green spaces indicator	Secondary data - bhmap	Point layer	BHmap – Belo Horizonte municipality	Data for years before 2012 and after 2012

CENSUS INFORMATION	2000	2010
number of census tracts in the study area*	190	191
population of Savassi	16130	11741
population density of Savassi	136 hab/km ²	99,5 hab/km²
average number of people per census tract Savassi	597	434
maximum population per census tract in Savassi	1059	859
minimum population per census tract in Savassi	296	47

Table 7: Census data information

3.5. Index Calculations

The assessment of the objective urban QoL in the selected case study area was done by developing an index, as this approach was considered relevant in the literature review presented in Chapter 2. An objective approach was chosen because, since the Savassi renewal took several years, it would be challenging to identify citizens of the neighbourhood that experienced both the periods before and after the renewal, for a subjective analysis. A properly designed index represents the state of the quality of life in a simplified way but gives broader visions for stakeholders and decision-makers (Malkina-Pykh & Pykh, 2008). The aggregation of indicators makes it possible to analyse the general quality of life conditions of a given area. For more detailed insight on each QoL dimension, the indicators were also be mapped separately.

A set of relevant indicators was chosen to measure changes in urban QoL according to the literature review in Chapter 2. Detailed information about the selected indicators and the methods used to assess them are presented in section 3.6. The index consisted of the usage of secondary data, obtained by the Brazilian Census of 2000 and 2010, and by the Belo Horizonte. All indicators were structured using the feature scaling method, the same approach used in the study of Eras, et al., (2014), which consists of the equalization of feature ranges (Aksoy & Haralick, 2001). This is done so the indicators are standardized and aggregated to produce a final score on a specific scale (Yoon, 2012). The scale used for this research is the census tract, which is the unit that census data is collected in Brazil. The technique used to normalize the indicators is the Min-Max Rescaling technique, which decomposed each indicator into a value on a scale between 0 and 1, where 0 is the worst score, and 1 the best score (Cutter, Burton, & Emrich, 2010). The formula used to calculate those values is: Vi = (Xi - Xmin) / (Xmax - Xmin), where Xmin is the lowest value of a certain indicator, and Xmax the highest. This technique was chosen for this analysis following the methods described by Malkina-Pykh and Pykh, (2008). The authors affirm that normalizing indicators to a scale between 0 and 1 is the most widely accepted method for a quality of life index assessment. The indicators were standardized to be benefit indicators, which means that the higher the score within the 0 to 1 scale, the better. Cost indicators, for which the higher the score, the worse for the index, were normalized using to formula Vi = 1 - x.

The indicators were grouped into three categories, related to the literature review on urban QoL dimensions in Table 1. The three dimensions analysed were Social, Economic, and Environmental. The QoL dimensions were assigned equal weight, to synthesize the index, following the same method used in the research of Baud, Sridharan, and Pfeffer, (2008). This means that a dimension which has more indicators will present a smaller weight per indicator so that all dimensions have the same influence on the final index score (see Table 8). The advantage of this method consists of the fact that no individual indicator has a higher influence of the final index score, and preference is given to the QoL dimensions, which are considered to be equally relevant, regardless of differences in the numbers of indicators within each dimension. This approach would be questionable in the case that the QoL dimensions had very different numbers of indicators. This is not

the case for this research since the differences in numbers of indicators within each dimension are not highly different. Calculations for the final index scores for before and after the Savassi renewal were done by multiplying each normalized indicator value by its dimension weight, summing all the results, and dividing it by the number of dimensions used, which is a technique described in the research of Yoon, (2012). The final index scores are presented within a scale between 0 and 1.

The indicators were each mapped separately, for before and after the renewal, using their real values. This was done to give a better understanding of the resulted index scores. Even though the Min-Max Rescaling technique is accepted as a suitable method, it adjusts all values from the original data to a scale between 0 - 1, which can lead to small variations presenting broad values. To avoid this misunderstanding, the indicators were mapped separately with their real values, as to give the correct information about the value variations. The representations of the index and the separate indicators were done through change maps, which show areas with positive, negative, and no changes, highlighting the areas with higher change values. The change maps represent the difference between the after-renewal scenarios and the before-renewal scenarios. The index maps were represented using the natural breaks classification of the areas that had most and least QoL change according to the mean values. All mapping analyses were done using QGIS version 3.8.3. The index methodology flowchart can be seen in Figure 13.



Figure 13: Index Methodology Flowchart

3.6. Selection of Dimensions and Indicators

This section presents the selected dimensions and indicators of urban quality of life to be assessed in an index approach. The dimensions used in this research were narrowed down to Economic, Social, and Environmental. Even though QoL assessments present various dimensions, those three were the most frequently addressed in literature review and are general dimensions that can aggregate various sub-dimensions. Urban renewals produce wider effects than just the physical assets being renovated but have social, economic, and environmental implications on the lives of citizens (Melo & Cruz, 2017). As presented in Chapter 2, the selection of indicators was done based on literature review, with adaptations being made due to data availability.

The indicators which are related to possible spillovers identified in Section 2.2 are labelled (*) in Table 8. Those are Density of economic activities, Richness density, Construction Permits, Land value, and Employment rate. This was done so that special attention could be paid in the Discussion chapter, to check for possible spillovers.

DIMENSION	SUB-	INDICATOR	WEIGHT	DESCRIPTION	RATIONALE
Economic	DIMENSION Economic activities	Density of economic activities*	0.33	Total number of economic activities per census tract/ census tract area in hectares (Batty, 2008)	Indicates the prosperity (or lack thereof) of the economic sector, and how many different activities are being provided to residents. It provides a measure of the economic development level (UN Habitat, 2009).
	Economic category	Richness density*	0.33	Total number of economic activity categories per census tract/ census tract area in hectares (Jost, 2010)	Indicates the economic richness of the area. The more economic categories, the richer it is. Low economic category might indicate a lack of activity provision or specialization of economic activity. It also provides a measure of the economic development level (UN Habitat, 2009).
	Built-up area	Construction Permits*	0.33	Constructed area in m ² for newly approved settlements for construction (Istituto Nazionale di Statistica, 2018)	Construction Permits indicate an effective urbanization approach and might lead to the well- functioning of urban markets (UN Habitat, 2009).
Social	Housing tenure	% of owned properties	0.25	Number of owned property/ total number of properties * 100 (UN Habitat, 2009)	Owned property is recognized to protect the tenant against power asymmetries with the landlord and secures the tenant from the risk of eviction (UN Habitat, 2009).
	Land value	Land value*	0.25	Mean land value per m ² , given in number of minimum wage salaries (adapted from UN Habitat, (2009))	Increase of land values can ensure public investment and neighbourhood valuation (UN Habitat, 2009).
	Education	Literacy rate	0.25	Number of literate people/ total number of people over 15 years old (UN Habitat, 2009)	Literacy relates to the capacity of communication and understanding. It is a vital condition that influences one's decision-making process (UN Habitat, 2009).
	Employment	Employment rate*	0.25	Number of employed people/ total number of people of working age (OECD, 2019)	Employment is the main source of income that should be enough to provide an adequate standard of living. It also is vital for a city's economic health (UN Habitat, 2009).

Table 8: Index dimensions and indicators

Environmental	Waste	Waste collection	0.25	Number of properties with waste collected from official collection system/total number of properties (UN Habitat, 2009)	As uncollected waste degrades the urban environment, this indicates that the waste disposal is being carried out by safe disposal methods, ensuring sanitation health for residents, who don't need to make use of unofficial dumping strategies (UN Habitat, 2009).
	Water	Water supply	0.25	Number of properties with official water supply system/ total number of properties (UN Habitat, 2009)	Access to official water supply reduces chances of diseases and keeps residents from manually collecting water (UN Habitat, 2009)
	Sanitation	Sanitation system	0.25	Number of properties with official sanitation system/total number of properties (UN Habitat, 2009)	Access to official sanitation system reduces health issues, such as sickness and death (UN Habitat, 2009)
	Green spaces	Distance to green spaces	0.25	Access to green spaces as in minimum distance to the nearest green area (Van den Bosch, et al., 2015)	The distance to green spaces contributes to the quality of life of residents, who have more opportunities for leisure spaces. It also contributes to the sustainable use of the land (UN Habitat, 2009).

The methods adopted to construct each indicator, and how they were manipulated to be part of the Urban QoL index are presented as follows:

- Density of economic activities: The input for this indicator was the economic activities dataset from the Belo Horizonte municipality (see Table 6), which contains a record for each economic activity in the city of Belo Horizonte for the years 2011 and 2015. The dataset was filtered for the area of study, and a centroid for each activity was generated. The number of points in each census tract polygon was counted and divided by the area of the corresponding census tract. The output of this analysis was the density of economic activities per census tract for the years 2011 and 2015. This indicator was inspired on the reviewed economic indicators Presence of Supermarkets, Presence of Bakeries, and Presence of Bank Agencies (Nahas, Pereira, Esteves, & Gonçalves, 2006), presented in Table 2 and relates to the sub-dimensions of Economic Accessibility by Aja, (2009), and Economic Activities by Eras, et al., (2014) (Table 1). By aggregating all economic activity provision, this indicator gives insight on the economic activity feeding of each census tract. The total number of activities was divided by the census tract area, as to give the density result, rather than an absolute number which could lead to wrong conclusions on smaller areas being less provided with economic activities.
- **Richness Density:** Richness indicates the number of economic categories, rather than the absolute number of economic activities, and gives insight into the economic diversity of a given area. This indicator used the economic activities dataset from the Belo Horizonte municipality (see Table 6), containing a record for each economic activity in the city of Belo Horizonte for the years 2011 and 2015. The number of points of economic activities was counted, by using the ID of the economic activity as a class. This resulted in the number of economic categories per census tract, which was divided by the area of the corresponding census tract. The output of this analysis was the number of economic categories per census tract area for the years 2011and 2015.

The Richness Density indicator was based on the Local Trade Performance indicator (Eras, et al., 2014), in combination with the research of Jost, (2010). This indicator also relates to the subdimensions Economic Accessibility by Aja, (2009), and Economic Activities by Eras, et al., (2014) (Table 1).

- **Construction Permits:** This indicator has as input the construction permits dataset from the municipality of Belo Horizonte (see Table 6). This dataset consists of records of newly approved constructions from 1996 to 2018. The dataset was filtered for two-time slots, from 2008 to 2011, and from 2012 to 2015. The filtered datasets were joined by location, summing the values of the construction area attribute. The output was the total new constructed area in m² for each census tract for the time slot corresponding to before the Savassi renewal, and for the time slot corresponding to after the Savassi renewal. This value was then divided by the area of the corresponding census tract so that it was a ratio indicator, rather than an absolute value indicator. This indicator was adapted from the Residential Density indicator (Kran & Ferreira, 2006), which aims at measuring the investment in the housing sector. The adaptation was done because of data availability. This indicator relates to the Building sub-dimension, present in the study of Lotfi and Solaimani, (2009).
- % of owned property: This indicator derived from census data from 2000 and 2010 and was constructed by dividing the number of owned properties per census tract by the total number of properties.

This indicator is an adaptation of the indicator Residential Density used in the study of Kran and Ferreira, (2006). The adaptation was done due to data availability. This indicator focuses on measuring investments in the housing sector, but also giving social indications about the resident's purchasing powers. This indicator relates to the Housing sub-dimension, present in the studies of

Torres, (2010), Kran and Ferreira, (2006), Lotfi and Solaimani, (2009), and Nahas, Pereira, Esteves, and Gonçalves, (2006).

• Land value: The input for this indicator was a database of the property transaction records (see Table 6), between 1994 and 2018 (Prefeitura de Belo Horizonte, 2020). The tables were filtered for the years 2010 and 2015 and were spatialized as points. The point layer was the input for a land value per m² map, which was done using a multilevel b-slipe interpolation. Zonal statistic using the mean value was then performed on the land value map, to extract the mean land value per m² for each census tract of the study area. The values resulted were then divided by the corresponding minimum wage value for the years 2010 and 2015. The output of the analysis was the mean value of the land in m², in minimum wage salaries, for each census tract.

This indicator was based on the Land Value indicator used in the research of Lotfi and Solaimani, (2009). However, an adaptation of the calculation methods using minimum wage salaries was done to better fit the census data available, incorporating changes in inflation and minimum wage values throughout the years.

• Literacy rate, Employment rate, Waste collection, Water supply, Sanitation system: Those indicators were derived from the Brazilian Census, for the years 2000 and 2010. The datasets were filtered by municipality and then filtered to accomplish only the study area extent. The indicators were normalized using the feature scaling method, described in section 3.5.

The literacy rate indicator was adapted due to data availability. It was based on education indicators such as Students per School, Students per Teacher (Eras, et al., 2014), and Educational Facilities (Lotfi & Solaimani, 2009). The literacy rate indicator relates to the Education sub-dimension, present in the studies of Aja, (2009), Eras, et al., (2014), Lotfi and Solaimani, (2009), Torres, (2010), and Nahas, Pereira, Esteves, and Gonçalves, (2006).

The Employment Rate indicator was based on the Employment Rate indicator used in the research of Lotfi and Solaimani, (2009), as part of the Employment sub-dimension.

The environmental indicators of Waste Collection, Water Supply, and Sanitation System were based on the indicators with the same name used in the research of Kran and Ferreira, (2006), and are respectively related to the Wate, Water, and Sanitation sub-dimensions, present in the studies of Aja, (2009), Eras, et al., (2014), Torres, (2010), Kran and Ferreira, (2006), and Lotfi and Solaimani, (2009).

• Distance to green spaces: The data used for this indicator was downloaded from the municipality of Belo Horizonte open data WMS portal (see Table 6). The data contained all registered parks of the city and their construction date. An intersection between the park polygons and the study area layer was done to filter the parks that were part of the analysis. Then, the parks were divided between year of construction, to filter the ones which were constructed before 2012, and the ones after. Layers containing the centroids of the parks and of the census tracts were created. A distance matrix was then performed, using the minimum value, to know the minimum distance of each census tract centroid to the nearest park centroid. This indicator is a "cost" indicator, since the higher the distance value, the worst for the index. The values were normalized and transformed into "benefit" values.

This indicator was based on the Access to Green Space indicator (Eras, et al., 2014), and the Access to Green Spaces and Park indicator (Lotfi & Solaimani, 2009). It relates to the Green Spaces subdimension, present in the studies of Eras, et al., (2014), Torres, (2010), and Lotfi and Solaimani, (2009).

3.7. Ethical Considerations

This section provides the ethical considerations of this research, mainly regarding data collection and the developed interview. The data used in this study for the index development was not collected on field and was restricted to secondary data. All data used in this study is public, and it does not consist of personal data, therefore it is not possible to identify a person. As for the interview carried out in this research, permission to record was asked to the interviewee, as well as consent to mention the interview content in this study.

The reporting of the process of this study was done accurately, with transparency and honesty regarding data usage. The methods used for the development of this research were based on scientific methods, which were searched for in literature. The overall study was developed responsibly, acknowledging its limitations, and providing a relevant scientific research.

4. RESULTS

This chapter presents the results of this research divided into 3 sections. The first section presents the interpretations of the interview with the architect and urban planner responsible for the bidding process of the Savassi renewal and relates it to the literature review presented in Chapter 2. The second section shows the changes in each indicator between the years before and after the Savassi renewal. The third section shows the results of the Urban Quality of Life Index, which illustrates the changes in the urban QoL in Savassi from before and after the renewal.

4.1. Characteristics of the Savassi Renewal

The Savassi renewal was a small-scale project consisting of the renovation of a square and its four adjacent blocks. The characterization of the Savassi renewal can be done according to the literature review presented in Chapter 2, as can be seen in Table 9.

Regarding Urban Operation, developments that are specific to the Brazilian context, the Savassi renewal is considered a Simplified Urban Operation (Table 9). The renewal of the Savassi square, from 2004 to 2012, emerged as a counterpart policy of the Pátio Savassi construction. This development consisted of the construction of a shopping centre in the Savassi neighbourhood, two blocks away from the Savassi square, opened in 2004. Because the Pátio Savassi development had a large scale and was in the core of the neighbourhood, the Savassi square renewal was suggested as a benefit, to balance the negative impacts of the shopping centre construction, such as traffic flow change and demolition of buildings. The renewal was led by the Urban Policy Municipal Department (SMPU), in cooperation with a private cement company, the union of commerce workers (CDL), and the Savassi association, composed by residents.

This small-scale renewal is characterized by a land-use adaptation model (Mitchell, 2007) (Table 9), which means interventions in the land-use were carried out to adapt specific conditions of the urban environment to the economic activities performed in the area. The Savassi renewal is an example of the central densification pattern (Table 9) that has been developed in South American cities after the year 2000 (Borsdorf & Hidalgo, 2013). Demolition strategies were discouraged, to avoid the displacement of residents, following the urban renewal models described by Lai, et al., (2007) and Clarke, (1960).

TYPE OF OPERATION	IMPACT ASSESSMENT	SCALE	MODEL	SPATIAL PATTERNS
Simplified Urban Operation (Prefeitura de Belo Horizonte, 2018)	Regulatory – RIA (Glasson & Wood, 2009)	Small-scale (Gotz, Cooper, & Paskaleva, 2015)	Community involvement (Lai, et al., 2007; Clarke, 1960)	Centrifugal occupation (Borsdorf & Hidalgo, 2013)
Urban Consortium Operation (Prefeitura de Belo Horizonte, 2018)	Social – SIA (Glasson & Wood, 2009)	Large-Scale (Gotz, Cooper, & Paskaleva, 2015)	Land-use adaptation (Mitchell, 2007)	City-centre densification (Borsdorf & Hidalgo, 2013; Dattwyler & Zunino, 1992)
	Health – HIA (Glasson & Wood, 2009)		Blight removal (Mitchell, 2007)	
	Equality – EqIA (Glasson & Wood, 2009)			
	Neighbourhood – NIA (Marques & Silva, 2015)			
	Environmental – EIA (Master Ambiental, 2016)			

Table 9: Savassi Renewal characteristics related to literature

The Savassi square was designed in 1970 in a car-oriented framework, and the renewal aimed at rearranging the urban design to favour the pedestrian, indicating a change in public policy priorities. The area diagnosis conducted by SMPU identified that the area had a high rate of occupancy, with large flows of pedestrians. It was also observed that the square's surrounding blocks did not have an intense traffic volume and that those streets were mainly occupied by parked cars. The idea that emerged then was to close the access for cars in the square's surrounding blocks, to turn those spaces in places of permanence, rather than places of transition (see Figure 16). The rearrangement of the streets was needed so that the square could be accessed by pedestrians, and that cars could still reach the streets adjacent to the square.

One of the premises of the renewal was to favour the diverse uses and activities performed in the square without creating spectacular spaces, but rather giving it an urban design treatment that reinforced its symbolic value as a prestigious market centrality. To minimize the impacts on residents, the renewal was divided into two stages, the first stage tackling the adjacent blocks of the square, from 2009 to 2011, and the second stage tackling the central part of the square, from 2011 to 2012 (see Figure 15). The renewal consisted of:

- Closing the access for cars in the blocks adjacent to the square with sidewalks
- Implementation of four water fountains, one in each block
- Expansion of the sidewalks using concrete and limestones
- Elevation of the street crossings in the central square to slow car speed
- Incorporation of vegetation
- Construction of sidewalk ramps
- Reduction of traffic volume
- Implementation of urban furniture such as trash cans, benches, public phone booths, bike sheds, base for magazine stands and public lighting
- Implementation of new traffic lights
- Relocation of old urban furniture, including street lighting
- Implementation of irrigation system for new vegetation
- Management of drainage, telephone, and television cable systems



Figure 14: Rearrangement of the Savassi car traffic/ Source: (Prefeitura de Belo Horizonte, 2012)



Figure 15: Scheme of the Savassi renewal intervention/ Source: (Prefeitura de Belo Horizonte, 2012)



Figure 16: Digital image of the implementation of street lighting, vegetation, and urban furniture in the pedestrian blocks/ Source: (Prefeitura de Belo Horizonte, 2012)

The process of the renewal started with a diagnosis of the area, and an investigation of what could be done following the Code of Practice and the city's masterplan. A preliminary proposal following the Code of Practice was elaborated by the SMPU and presented to the estate government, which was responsible for the bidding of the project. After the project was approved and bided by the estate, a private architecture company was hired by the Belo Horizonte municipality to develop the executive project of the renewal. The total cost of the renewal was budgeted at R\$11,8 million (approximately 2 million Euros), and part of the budget, approximately 1,5 million Euros, came from the Savassi Urban Operation, established by law in 2010 (Prefeitura de Belo Horizonte, 2012).

Because the renewal consisted of the renovation of a small-scale public space, no impact assessment was developed before or after the interventions (see Table 9). That is because impact assessments are only obligatory by law if the development in question is thought to potentially harm the area, therefore, neither the Neighbourhood Impact Assessment (NIA) or the Environmental Impact Assessment (EIA), presented in Section 2.1 were applicable. However, mitigation measures were taken by SMPU to minimize the impacts of the renewal works on the residents. The Belo Horizonte municipality kept in touch with local merchants about the renovation works and constantly published updates about changes in road circulation and the maintenance of specific bus lines on the municipality website (see Figure 14). A chronogram of the renewal works was done by SMPU and also uploaded on the municipality website, to keep residents informed about what was being done and when so that negative impacts on their daily lives could be avoided.

Even though there was no monitoring of the region regarding the changes the renewal brought upon the urban space, the urban planner's perspective, according to the interview, is that the area benefited from the interventions.

"When I pass by Savassi, I see that the space, unlike other renewed spaces, was not degraded and is being used by the population. I believe the space is being constantly occupied, which can also be seen from the street events that are carried out there." (César, 2020)

Savassi has been a stage for many public street events, such as the "Savassi É Nossa", a cultural event with musical, fashion, and food attractions (Figure 17), the "Festival Savassi Cultural", an event with musical, circus, and dance performances that took place during the soccer world cup in 2014, the "Savassi Festival" a music festival that happens every two years and has several musical attractions (Figure 18), and the "Festa Italiana", an Italian event that has musical attractions and typical Italian food stalls (Figure 19).



Figure 17: Official poster for the "Savassi é Nossa" event/ Source: (Zas, 2015)



Figure 18: Musical performance during the Savassi Festival/ Source: (Savassi Records, 2020)



Figure 19: Dance performance at the "Festa Italiana"/ Source: (Magno, 2019)

4.2. Changes in Dimensions of Urban Quality of Life After the Savassi Renewal

This section shows the changes in the Economic, Social, and Environmental dimensions of urban QoL after the Savassi renewal. The results are shown for Savassi and adjacent neighbourhoods, as to investigate possible spillovers. The mean values of changes in Savassi and adjacent neighbourhood are also compared to the mean values at the city level. This is done to provide insight into whether changes in the study area are specific for those locations, and might be related to the Savassi renewal, or if those changes are following a city trend, which might indicate that the renewal did not play a big role in specific indicators.



4.2.1. Economic Dimension

Figure 20: Density of economic activity change (years 2011 and 2015)/ Source: using IBGE WFS, Belo Horizonte municipal WFS and CNAE data

The economic dimension had the most visible changes. Figure 20 shows that the positive changes in density of economic services were much higher for Savassi compared to the surrounding neighbourhoods and the city level change. The mean value of economic density for the surrounding neighbourhoods present a drop, and specific locations of those areas decreased considerably. A hypothesis for this behaviour is related to the fact that the regeneration of the economic activity in Savassi might have induced the relocation of some surrounding economic activities to the Savassi neighbourhood. The renewal location also presents a positive change, which means that the number of economic activities in the area increased considerably after the Savassi renewal.



Figure 21: Richness change (years 2011 and 2015)/ Source: using IBGE WFS, Belo Horizonte municipal WFS and CNAE data

Figure 21 shows that the richness of economic categories increased more for Savassi than for the adjacent neighbourhoods, and even more so compared to the Belo Horizonte rate, which decreased. Improvements in richness mean that economic activities are being more diverse, with an increase in economic categories. This result might indicate the effectiveness of the renewal's objective to adapt the urban environment to the economic activities performed in the area, by expanding the types of services provided in Savassi.



Figure 22: Construction permits change (years 2008 to 2011, and 2012 to 2015)/ Source: using IBGE WFS, Belo Horizonte municipal WFS, and Construction permits municipality dataset

Figure 22 shows that the number of constructions permits slightly decreased for Savassi and Belo Horizonte and did not have relevant changes for the adjacent neighbourhoods. Even though most areas of the adjacent neighbourhoods seem to have benefited from construction permits, the numbers are small, and no apparent change occurred at that scale. For Savassi and Belo Horizonte, the changes are considered negative, even if standard deviation values are small. Such results are counter-intuitive, as it was expected that the attractiveness of Savassi and the adjacent neighbourhoods would increase after the renewal, resulting in more investments in those areas in terms of new construction permits.

The overall changes in the economic dimension confirm the renewal's concern in improving commerce activities in the area and indicate that the involvement of local merchants in the planning process of the renewal promoted positive changes for this class.



4.2.2. Social Dimension

Figure 23: % of owned properties change (years 2000 and 2010)/Source: using IBGE WFS, Census 2000 and 2010 and Belo Horizonte municipal WFS

The social dimension was the second one with the most changes in urban quality of life. Figure 23 shows that the percentage of owned properties increased for Savassi, the adjacent neighbourhoods, and at the city level. However, Savassi itself did not have as much as an increase as the adjacent neighbourhoods. Neighbourhoods such as Santo Antônio and Serra are mostly residential (see Figure 5), and the number of privately owned properties is high. The area of the renewal, however, shows a slight increase in this indicator. Two hypotheses can explain the increase in property ownership in the renewal location and its surroundings. The first hypothesis is that the Savassi renewal contributed to the attractiveness of the area, influencing the purchase of local properties. Another hypothesis is that, because the area had an increase in commercial services (Figure 20 and Figure 21), consisting mostly of bars and restaurants, property values could have had a slight drop after the renewal due to sound pollution, which could have facilitated the purchasing of properties in that location.



Figure 24: Land value change (years 2010 and 2015)/ Source: using IBGE WFS, Belo Horizonte municipal WFS, and property transaction records

Figure 24 shows interesting results, as the land value increased for Savassi and the adjacent neighbourhoods. Even though the changes are positive, the results are counter-intuitive in the renewal area, which had a smaller land value increase as compared to other parts of the Savassi neighbourhood. A hypothesis that could explain this spatial pattern is that the renewal consolidated the area as mostly commercial, and the residential parts were not so benefited from the location of several bars and restaurants that might cause some sound pollution.



Figure 25: Literacy rate change (years 2000 and 2010)/ Source: using IBGE WFS, Census 2000 and 2010 and Belo Horizonte municipal WFS

Figure 25 shows no dramatic changes in the literacy rate for neither Savassi, adjacent neighbourhoods, or Belo Horizonte. The Savassi area, established as an unofficial centrality of Belo Horizonte since the 1970s, did not present low literacy rates even before the renewal. Therefore, measures to increase those rates were not taken, as they were not strictly necessary.



Figure 26: Employment rate change (years 2000 and 2010)/ Source: using IBGE WFS, Census 2000 and 2010 and Belo Horizonte municipal WFS

Figure 26 shows counter-intuitive results, as the employment rates for Savassi and the adjacent neighbourhoods slightly dropped. Even though the renewal was supposed to give an impulse to economic services and generate more employment, the economic crisis that Brazil was in during the mid and late 2010s cannot be unconsidered. Even though employment rates dropped in the area, it is visible from the map that the location of the renewal benefitted from an employment increase, which might be attributed to the renewal.

4.2.3. Environmental Dimension



Figure 27: Waste collection change (years 2000 and 2010)/ Source: using IBGE WFS, Census 2000 and 2010 and Belo Horizonte municipal WFS



Figure 28: Water supply change (years 2000 and 2010)/ Source: using IBGE WFS, Census 2000 and 2010 and Belo Horizonte municipal WFS



Figure 29: Sanitation system change (years 2000 and 2010)/ Source: using IBGE WFS, Census 2000 and 2010 and Belo Horizonte municipal WFS

The environmental dimension was the least affected, compared to the economic and social dimensions. Figure 27, Figure 28, and Figure 29 show that there was almost no change at all in waste collection, water supply, and sanitation system for Savassi, the adjacent neighbourhoods, and Belo Horizonte. The lack of changes in Savassi is explained by the fact that the renewal did not focus on infrastructure works such as those of the indicators presented.



Figure 30: Distance to green spaces change (years before and including 2012 and after 2012)/ Source: using IBGE WFS, Belo Horizonte municipal WFS, and BHmap

Figure 30 shows a change in distance to green spaces, and the negative values mean that the distance to those spaces decreased in meters. As this is a cost indicator, the lower the value the better accessibility. Because of this, it is possible to see that Savassi benefited from this indicator. The location of the renewal, as well as northern areas of Savassi and adjacent neighbourhoods, had a considerable increase in accessibility to green spaces. This can be explained by the fact that one of the Savassi renewal's intervention was the implementation of green areas. This premise of the Savassi renewal significantly contributed to the improvement in accessibility to green areas, which can be seen by comparing the Savassi and adjacent neighbourhoods mean values with the city trend values.

4.3. Urban Quality of Life Before and After the Savassi Renewal

This section provides the results of the urban quality of life assessment, aggregating the indicators presented above in an index approach. The results shown here are used to investigate the impacts that the Savassi renewal had on the urban QoL of residents of Savassi and adjacent neighbourhoods.



Figure 31: Urban QoL Index score for before the Savassi renewal / Source: using IBGE WFS and Belo Horizonte municipal WFS



Figure 32: Urban QoL Index score for after the Savassi renewal / Source: using IBGE WFS and Belo Horizonte municipal WFS



Figure 33: Change in index total score (after renewal – before renewal) / Source: using IBGE WFS and Belo Horizonte municipal WFS

The overall urban quality of life increased in Savassi and its adjacent neighbourhoods since the Savassi renewal. This observation is derived from Figure 31 and Figure 32, which show the Urban QoL indices for before and after the Savassi renewal, respectively. Before the renewal, most areas had a score of around 0.5. The renewal location had an even worse score (between 0.29 and 0.47) than most of the surrounding areas. However, comparing Figure 31 with Figure 32, it is possible to observe that the renewal location had an increase in urban quality of life after the renewal, presenting a score in the range of 0.62 and 0.75, the highest category.

Figure 33 gives more insight into the changes in urban quality of life. From this figure, most of the areas presented a score increase, except for some specific locations in the adjacent neighbourhoods. The adjacent neighbourhoods do not show a clear spatial pattern associated with the renewal location, even though most of the study area presented an increase in QoL scores after the renewal.

Most areas within the Savassi neighbourhood presented a score raise to some extent. From Figure 33 it is possible to infer that the renewal location and its surrounding areas benefited from the regeneration works. It is possible to see spatial patterns emerging from the renewal location to some extent, increasing the quality of life of the renewal surrounding areas, even beyond the boundaries of Savassi, reaching Santo Antônio, São Pedro, and Carmo.

5. DISCUSSION

5.1. The Savassi Urban Renewal

The renewal carried out in Savassi falls under the concept of urban regeneration. Urban regenerations are usually applied to small scale projects, aiming at the enhancement of the quality of life of residents (Coletti & Rabbiosi, 2020). The Savassi urban renewal can be characterized according to scale, model, and spatial patterns. Figure 34 represents those characteristics of the Savassi renewal compared to the characteristics of renewals researched in literature and relates it to QoL dimensions they affect.

The Savassi renewal consisted of a small-scale project (see Figure 34), tackling a square and its four adjacent blocks, and had the enhancement of urban quality of life as its central objective. The Savassi renewal followed an adaptation of the physical environment and the land uses to the economic activities performed in the area (see Figure 34). This adaptation was done regarding economic activities and falls under the model of land-use adaptation (Mitchell, 2007). The renewal had as one of its principles the improvement of economic conditions, by addressing local merchant's needs in the planning process and creating a space that promoted the emergence of economic activities. Since blight removal and demolition strategies were not part of the renewal's approach, the definitions of Lai, et al., (2007); Clarke, (1960); Zheng, Shen, and Wang, (2014); and Assari and Assari, (2012) do not apply to this case (see Figure 34).

The spatial pattern of the Savassi Renewal followed a densification of the city centre (Borsdorf & Hidalgo, 2013; Dattwyler & Zunino, 1992), rather than a centrifugal occupation (Borsdorf & Hidalgo, 2013) (see Figure 34). Characteristics of a centrifugal occupation are the decentralization of retail and the emergence of economic activities in the metropolitan region's extent, which is not the case for Savassi. For the Savassi renewal, there was a concern in strengthening the city centre's market, reinforcing the symbolic value of the square, and improving the conditions of the urban environment for pedestrians.



Figure 34: Urban Renewal and QoL Dimensions Matrix

From Figure 34 it is possible to see that the Savassi renewal has many points in common with the reviewed literature of urban quality of life and urban renewals. In the literature review it was observed that small-scale renewals impact the economic, social, and environmental dimensions of urban quality of life, which was the case for the studies of Ahmad and Simis, (2017); Soewarno, Hidjaz, and Virdianti, (2017); Ammon, (2015), and also for the Savassi renewal. The model of the Savassi renewal, which followed a land-use adaptation, had an impact on the economic dimension, which was also observed in the study of Soewarno, Hidjaz, and Virdianti, (2017). The spatial patterns of the city-center densification of Savassi were also in accordance with the literature review, impacting the economic dimension and the social dimension to some extent, as occurred in the studies of Soewarno, Hidjaz, and Virdianti, (2017); and López-Morales, Gasic, and Meza, (2012).

The Savassi renewal tackled aspects that helped increase the urban quality of life, focusing on specific dimensions of QoL. The symbolic value of the square was reinforced by the addition of green spaces, urban design (Figure 16), management of roads (Figure 14), and the integration between place of permanence and a hub of economic activities. The economic dimension was the most important focus of the renewal in terms of its objectives, while the social and environmental dimensions played a smaller role. The housing sub-dimension, frequent in urban QoL studies (Kran & Ferreira, 2006; Lotfi & Solaimani, 2009; Nahas, Pereira, Esteves, & Gonçalves, 2006), was not tackled in the renewal's interventions, therefore changes in land value and construction permits might have happened as a natural consequence of the renewal and external factors. Other social sub-dimensions such as health and education (see Table 2) were also not part of the renewal's scope, even though they are important factors in urban QoL studies (Eras, et al., 2014; Lotfi & Solaimani, 2009; Nahas, Pereira, Esteves, & Gonçalves, 2006). The environmental dimension was also a smaller part of the renewal, and infrastructure works such as waste, water, sanitation, and energy (Casas & Brea, 1990; Kran & Ferreira, 2006; Lotfi & Solaimani, 2009) were not part of the interventions, as can be confirmed by the small changes shown in Figure 27, Figure 28, and Figure 29. However, one intervention related to the environmental dimension was the addition to green spaces in the Savassi square, which proved to be effective in positively affecting the quality of life. For a small-scale urban regeneration work, the Savassi renewal was successful in reaching the pedestrian-friendly design it aimed for, and couldn't have tackled multiple aspects of urban QoL, due to its limitation in scale and purpose.

Impact assessments are important to prevent and monitor negative impacts on the urban environment, however, it was not developed for the Savassi renewal. The participant in the interview (Section 4.1) expressed some concern regarding the monitoring of the Savassi renewal, which was not carried out. The reason why an impact assessment was not developed for this renewal is related to the small scale of the intervention. As a small-scale project, the need for an environmental or neighbourhood impact assessment is not legally compulsory. This research then plays the role of assessing the impacts on the urban environment arising from the renewal.

5.2. Effects of the Savassi Renewal on Urban Quality of Life

This section summarizes the positive, negative, and lack of effects of the Savassi renewal on the local urban quality of life.

5.2.1. Positive Effects

The renewal had positive effects related to the economic, social, and environmental dimensions of urban quality of life. The economic dimension shows positive effects of two indicators for the Savassi neighbourhood. The density of economic services (Figure 20) and the richness of economic categories (Figure 21) increased, and at much higher rates than at the city level. Because the renewal had the boost of economic activities as one of its goals, it is possible to attribute the observed changes directly to the renewal. Those results relate to the concept of city-centre densification (Borsdorf & Hidalgo, 2013; Dattwyler & Zunino, 1992), which has the improvement of the city centre market as a main characteristic.

The social dimension presented positive effects on property ownership and land value. Property ownership (Figure 23) increased four times more for the adjacent neighbourhoods, compared to Savassi, and eight times more, compared to the city trend. Even though there was a small increase in owned properties for Savassi, the change cannot be directly attributed to the renewal, since the renewal did not include housing interventions. However, it could be considered that the renewal contributed to the overall attractiveness of the area, leading to an increase in property ownership. As for the land-value (Figure 24), the considerable increase in Savassi can be related to the concept of city-centre densification, which usually increases property values (López-Morales, Meza, & Arriagada-Luco, 2015). The land-value increase in Savassi is similar to the case of Santiago, in Chile (López-Morales, Meza, & Arriagada-Luco, 2015), as both renewals aimed at the recovery of the market value of central locations, which lead to the increase in local property prices. However, the land value of the renewal location did not increase as much as the land value of the Savassi neighbourhood. This is a counter-intuitive result and could be explained by the hypothesis that the presence of several bars and restaurants in the area did not benefit the residential segment due to an increase in sound pollution.

The Environmental Dimension was positively affected by the distance to the nearest green area (Figure 30). Improvements in this indicator are similar to the case of Malasia Ahmad and Simis, (2017), and can be directly attributed to the renewal, which included the implementation of green spaces as part of the interventions, improving the accessibility of adjacent neighbourhoods to those areas.

5.2.2. Negative Effects

One of the analyzed indicators shows negative effects on the local urban quality of life for the economic dimension. The number of new construction permits (Figure 22) decreased for the Savassi neighbourhood, as well as at the city level, while the adjacent neighbourhoods don't seem to have changed. The decrease in new constructions in Savassi is counter-intuitive, as it was expected that more constructions would emerge, as a result of the renewal's valuation of the area. However, the renewal location showed a slight increase in construction permits, which can be attributed to the renewal's intention of boosting economic activities. The decrease in the Savassi's new constructions might not be attributed to the renewal. As Brazil was immersed in an economic crisis during the analysis's years, it is more likely that this cooperated to the stagnation of new developments, rather than the renewal disabling the growth of the civil sector.

The employment rate (Figure 26), a powerful social indicator, as indicated in the research of Lotfi and Solaimani, (2009), shows an increase of 3,5% at the city level, and slight decreases for Savassi and adjacent neighbourhoods, respectively 0,3% and 0,4%. Those results are counter-intuitive, considering the Savassi's rate of employment could have benefited from the renewal's boost in economic performance. Even though the time scale of the analysis might lead to the assumption of an increase in employment, the economic crisis in Brazil could have, once again, influenced the results. However, the renewal location itself presented an increase in employment rates of between 2% and 7%. This result is similar to the case of the Asbury Park in New Jersey, in which the strengthening of the economic sector benefited the employment conditions of the area, enhanced by the increase of local private investments (Ammon, 2015).

5.2.3. Lack of Effects

A lack of effects is observed in specific indicators of the social and environmental dimensions. The former occurred with literacy rates, the latter occurred with waste collection, water supply, and sanitation systems The literacy rate (Figure 25) did not show considerable changes for either Savassi, adjacent neighbourhoods, or even the city of Belo Horizonte, which increased only 1,7%. Because the Savassi renewal did not include any social intervention that would tackle the education sector, and literacy rates were already high in Savassi before the renewal, the lack of change in this indicator is not unexpected.

Waste collection (Figure 27), water supply (Figure 28), and sanitation system (Figure 29) did not show major changes for Savassi, adjacent neighbourhoods, and at the city level. Even though the changes were positive at all scales, they were not large enough to be considered relevant changes. Infrastructure indicators are part of many QoL studies (Casas & Brea, 1990; Kran & Ferreira, 2006; Lotfi & Solaimani, 2009), and usually

present positive changes for quality of life. Infrastructure improvements can help to minimize the socialeconomic issues of low-income areas, as stated in the research of Kran and Ferreira, (2006). However, the scope of the Savassi renewal did not focus on the intervention on the local infrastructure, therefore, in this case, the changes are not apparent, rather than positive.

5.3. Gentrification Effects

The risks of gentrification in the Savassi renewal could be considered as a possibility for two main reasons. The first one is that city-centre renewals could cause the displacement of low-income groups due to the increase in land and property values (López-Morales, Meza, & Arriagada-Luco, 2015). The second reason because, as seen in the index results, the land value and property ownership increased for Savassi after the renewal, and those results are linked with gentrification effects in literature (López-Morales, Meza, & Arriagada-Luco, 2015).

The city-centre renewal model which causes gentrification usually includes demolition and housing renovation strategies (Mitchell, 2007). This model has "blight removal" as one of its central features (Mitchell, 2007), which consists of the elimination of any unwanted aspect of the urban environment. Blight removal is related to a consequent increase in property values, resulting in the displacement of low-income groups. The Savassi renewal, however, did not include demolition or housing renovations strategies, as it was limited to interventions in the public space. Because of this, it is possible to conclude that the character of the renewal itself was not accountable for a gentrification process. However, an increase in the land value of the Savassi neighbourhood was indeed observed, as well as the increase in property ownership.

The increases in land value and property ownership are related to gentrification effects, according to the findings of the Asbury Park revitalization study (Ammon, 2015). The land value (Figure 24) of the renewal's surroundings and adjacent neighbourhoods increased considerably after the renewal, compared to the city trend. Property ownership (Figure 23) had a slight increase for Savassi and a large increase for the adjacent neighbourhoods. Those results can be linked to a possible gentrification process that occurred after the Savassi renewal. However, the changes in land value and housing ownership cannot be exclusively attributed to the renewal.

Even though the land value changes were considerable, the renewal location itself was less affected than its surroundings, which might indicate that the renewal was not the main driver of changes in the value of the land. As for the house ownership increase, the Savassi neighbourhood was not affected as much as the adjacent neighbourhoods, which presented a value four times higher. Furthermore, the changes in property ownership for Savassi were not much different from the city trend, which might indicate that the renewal was not the main reason for such an increase.

5.4. Spillover Effects on Adjacent Neighbourhoods

The operationalization of the areas to be checked for spillovers follows the method of geographical proximity. Because this research explores the effects of the Savassi renewal and is not built on a hypothesis, there was no assumption on which areas could have spillovers. In this case, spillovers are checked for beyond the boundaries of the renewal, in the neighbourhoods adjacent to Savassi, due to geographical proximity, as done in the research of Weber, Bhatta, and Merriman, (2007). The neighbourhood scale was chosen for this analysis because one objective of Urban Operations is to ensure improvements in the neighbourhoods surrounding the renewal (Prefeitura de Belo Horizonte, 2013).

Figure 33 represents the urban QoL changes in Savassi and adjacent neighbourhoods. All areas within Savassi presented either no relevant change or a positive change in urban quality of life. The areas adjacent to the renewal location show a positive increase within Savassi and appear to have caused a spillover to the neighbourhoods São Pedro, Santo Antônio, and Carmo. Figure 33 shows that Funcionários, Boa Viagem, Lourdes, São Pedro, and Santo Antônio had a considerable positive QoL

increase. Those neighbourhoods are close in proximity to the renewal location and have similar socioeconomic characteristics (see Table 4), and it is possible that the renewal influenced such changes, even though no clear spatial pattern is detected. The Serra neighbourhood presented many areas with no relevant QoL changes. Serra is the only neighbourhood in the study area which shares boundaries with a slum and therefore has different socio-economic characteristics compared to the other neighbourhoods (see Table 4). That difference in socio-economic aspects of the neighbourhood might explain the smaller changes in its urban quality of life. This effect is not necessarily undesirable, since the lack of relevant changes in certain indicators in Serra, such as land value, might indicate that there was no gentrification in the slum area, preventing dwellers from the risk of eviction.

Some indicators were highlighted in Table 8 as related to spillovers in literature. They are Density of Economic Services, Richness Density, Construction Permits, Land Value, and Employment rate. Figure 20 and Figure 21 show that there were no large changes for the density of economic services and richness of economic categories density, respectively, for the Savassi adjacent neighbourhoods. Richness density had a positive increase overall for those areas, but the map does not give insight into highly affected neighbourhoods. Figure 22 indicates high positive changes for construction permits. However, by looking at the scales, it is possible to conclude that those changes in the Savassi's adjacent neighbourhoods were not relevant, as the values are close to 0. Figure 24, on the other hand, shows a considerably high increase in land value for adjacent neighbourhoods, as well as for Savassi. By looking at the city trend, which changed about only 2% of the adjacent neighbourhood's rate, it is possible to relate the land value increase in those neighbourhoods and the Savassi renewal. As for the employment rates of the adjacent neighbourhoods (Figure 26), it did not present relevant changes to be attributed to the renewal.

It is not possible to completely attribute changes in the QoL of adjacent neighbourhoods to the renewal. External factors, for instance, other renewal interventions, that could have played a role in such changes are not considered in this research. For this reason, this research only explores and analyses the changes in those neighbourhoods but does not directly attribute them to the Savassi renewal.

5.5. Limitations of the Analysis

This research gives a good insight into the changes in quality of life for the study area but is it limited to some extent. The social indicators did not include more information on the profile of the residents, such as education levels and income, due to an incompatibility between the methodology of the Census of 2000 and 2010. Data availability limited the scope of the indicators, and the inclusion of social indicators showing the profile of the residents could have presented different results.

Another limitation of this research worth highlighting is the fact that the changes in urban quality of life in the study area cannot be completely attributed to the renewal. Other factors that are not part of the scope of this research, such as inflation, economic crisis, and even other renewals close to the study area, might have contributed to positive or negative changes in QoL.

An even further limitation could be the restriction in the number of interviewees. Originally, the goal of this research was to interview as many people involved in the Savassi renewal project as possible. However, external circumstances due to the Corona pandemic made it impracticable for more people to be involved in this research.

Even with limitations, this research was able to reach its objectives, achieving consistent results, and providing knowledge about the effects of the Savassi renewal in the urban quality of life of residents.

6. CONCLUSIONS

This research assessed the effects of urban renewal on the urban quality of life of residents and investigated possible spillovers to neighboring areas. The study was applied to a case study in Belo Horizonte, Brazil, and provided knowledge that can contribute to the study of Brazilian urban renewals and their possible effects and spillovers. This research was successful in reaching its objectives. The first research objective was tackled by analyzing the main characteristics of the Savassi renewal, through literature review and an interview with a key informant. The literature review provided knowledge on the legislations of urban renewals in the city of Belo Horizonte, the types of impact assessments applied, and the main characteristics of a renewal in the Brazilian context. The interview gave insights into specific aspects of the Savassi renewal such as the main stakeholders, what were the main objectives of the development, and how was the renewal project developed. The second research objective was addressed through a literature review on urban quality of life studies. The literature review gave insight into the dimensions, sub-dimensions, and indicators used in urban quality of life assessments, supporting the selection of QoL dimensions of this study. The third research objective was reached by developing an approach that assessed changes in urban quality of life in Savassi and the surrounding neighbourhoods. This approach was developed by selecting suitable indicators, according to literature, to assess changes in the economic, social, and environmental dimensions of urban QoL through an index.

The overall results of the index approach show that there were improvements in the urban quality of life of the study area, after the urban renewal. The economic dimension was the most benefited, showing economic growth in terms of density of economic services and number of economic categories for the Savassi neighbourhood. Those findings agree to the premises of the renewal of reassigning importance to the city centre market, an approach that has been explored in recent South American renewals. The social dimension was positively affected to some extent, as increases in land value and property ownership resulted from the analysis. Nonetheless, those positive impacts might be negative for specific segments of society, as they could have led to a gentrification process in the area, affecting low-income groups. However, the Savassi renewal cannot be considered fully accountable for any gentrification process in the area because external factors, such as other renewals or construction of new housing developments in the neighbourhood, could have contributed to this phenomenon. Such external factors are beyond the scope of this study and are not considered. The environmental dimension was the least affected, showing no relevant changes for most indicators, except for accessibility to green spaces. This is coherent with the renewal approach, which did not include environmental infrastructure improvements, such as waste collection and water supply, but focused on the implementation of green areas in the Savassi square.

Spillovers were detected to some extent in the analysis. The results show that the surrounding neighbourhoods of the renewal area changed considerably in some cases, regarding, for instance, land value, property ownership, and accessibility to green areas. However, even though there are apparent spillovers, they cannot be attributed directly to the renewal, as there might be external factors influencing those results. Overall, it is possible to conclude that small scale renewals can affect the urban quality of life of residents. As presented in the literature review of this research, small scale renewals can influence the three dimensions of QoL analyzed in this study (Figure 34). However, for the case of Savassi, it was found that the economic and social dimensions benefited more from the renewal, compared to the environmental dimension. The difference in which QoL dimensions are affected is due to the content of the renewal. In the case of Savassi, the renewal was applied to a prestigious area of the city, aiming at the restoration of its economic value, and prioritizing the pedestrian in the urban design. The results of this research are comparable to the results of the Braga corridor renewal, which had similar objectives and interventions (Soewarno, Hidjaz, & Virdianti,

2017). However, different interventions might lead to different effects in QoL. This is the case of the Urban Landscape Program in Malaysia, which had considerable changes in environmental conditions due to the content of the renewals, which consisted of the creation of pocket parks and urban squares (Ahmad & Simis, 2017).

The approach to analyze changes in quality of life developed in this research was successful in detecting the main aspects affected by small scale renewals. Nonetheless, the dimensions to be selected for this kind of research should be specific to each renewal, according to its objectives and interventions. Large scale renewals could need a different set of QoL dimensions to be analyzed, focusing on specific aspects such as health, education, and infrastructure for instance. Renewals that focuses on the rehabilitation of degraded areas could, for instance, count with in-depth social analysis, addressing the impacts on the population in a qualitative approach. The selection of QoL aspects to be analyzed in this research was then applicable to small scale renewals, focusing on a pedestrian-friendly economic recovery of the city centre.

The findings of this research could support policymakers in future urban renewal developments. As the results of this study suggest, a gentrification process started after the Savassi renewal, which is seen by an increase in land value and property ownership. Even though the Savassi renewal could not be the only factor influencing gentrification, those effects could have been minimized, had an impact assessment been developed before the renewal. It is not usual in Brazil that small-scale renewals have impact assessments. As seen in the Brazilian literature and in the interview, small-scale renewals are not likely to have large effects on the urban environment, which is why impact assessments are restricted to large-scale developments. However, the findings of this study could support the application of impact assessments in small-scale renewals, to avoid gentrification effects. This application is encouraged especially due to the heterogeneous character of neighbourhoods, which present different socio-economic profiles, and therefore, can be impacted in different ways from a renewal.

Recommendations for further investigations around this topic are suggested, as a way to improve its findings and extend its applications. As a further development of this research, qualitative methods such as focus groups could be carried out with residents, local shop owners, and the people involved in the project of the Savassi renewal. This type of communication would give more insight into the renewal and could, for instance, investigate the shop owners' role in the interventions and relate their inputs to the outcomes of the renewal in terms of urban quality of life. Another suggestion for further research steps would be to include subjective QoL as part of the analysis. A mixed-method approach could aggregate to the analysis of change in the local urban QoL, by including the resident's perceptions of the urban space.

In general, the findings of this research indicate that urban renewals impact the urban quality of life of residents across different domains. It is important to stress that not all QoL changes can be directly attributed to the renewal, as external factors not part of the analysis can be influential to the results. However, the changes in the urban environment produced by small-scale renewal projects can be of influence on the lives of residents, improving their quality of life conditions in specific dimensions, depending on the objectives of the renewal. Nonetheless, small-scale renewals can instigate gentrification effects to some extent, which could be minimized by the application of impact assessments. This research contributes to the development of an approach that geographically indicates locations that had quality of life affected by urban renewals. In that sense, it is expected that the findings of this research will be useful to future planning of urban renewals in Brazil, giving good insights into what the changes in urban quality of life might be, depending on the adopted strategies.

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APPENDIX

Table 10: Translation of the interview guidelines

INTRODUCTION

- Present me
- Ask for consent to record
- Explain the scope of the thesis (general information, objectives with the interview)

URBAN RENEWAL

• What were the objectives of the renewal? Why target an area that was considered prestigious in the city?

• How did the demand for the renewal in Savassi came to exist?

• What were the potentials of the area to be tacked in the renewal for growth? The economic potential was the only reason?

- How was the urban design of the renewal developed? What were the guidelines of the urban design?
- Were there any limitations to the renewal project? In which way?
- What were the successes of the renewal? Were the main objectives reached?
- Is it your belief that Savassi benefited from the renewal? In which way?

LEGISLATION:

- What was changed in the urban legislation so that the renewal could take place?
- Was any impact assessment (NIA or EIA) developed for the area? If so, what was considered in the assessments? Was it developed before or after the renewal?
- What were the results of the impact assessment?

SPILLOVERS:

• Is it your belief that the Savassi's surrounding neighbourhoods benefited somehow from the renewal? In which way?

• In contrast, do you think there were negative aspects of the renewal reflected in the surrounding areas?

URBAN QUALITY OF LIFE:

- Was the quality of urban life considered in the development of the renewal project? In which way?
- Do you think the renewal brought changes in the urban quality of life of citizens? In which way?