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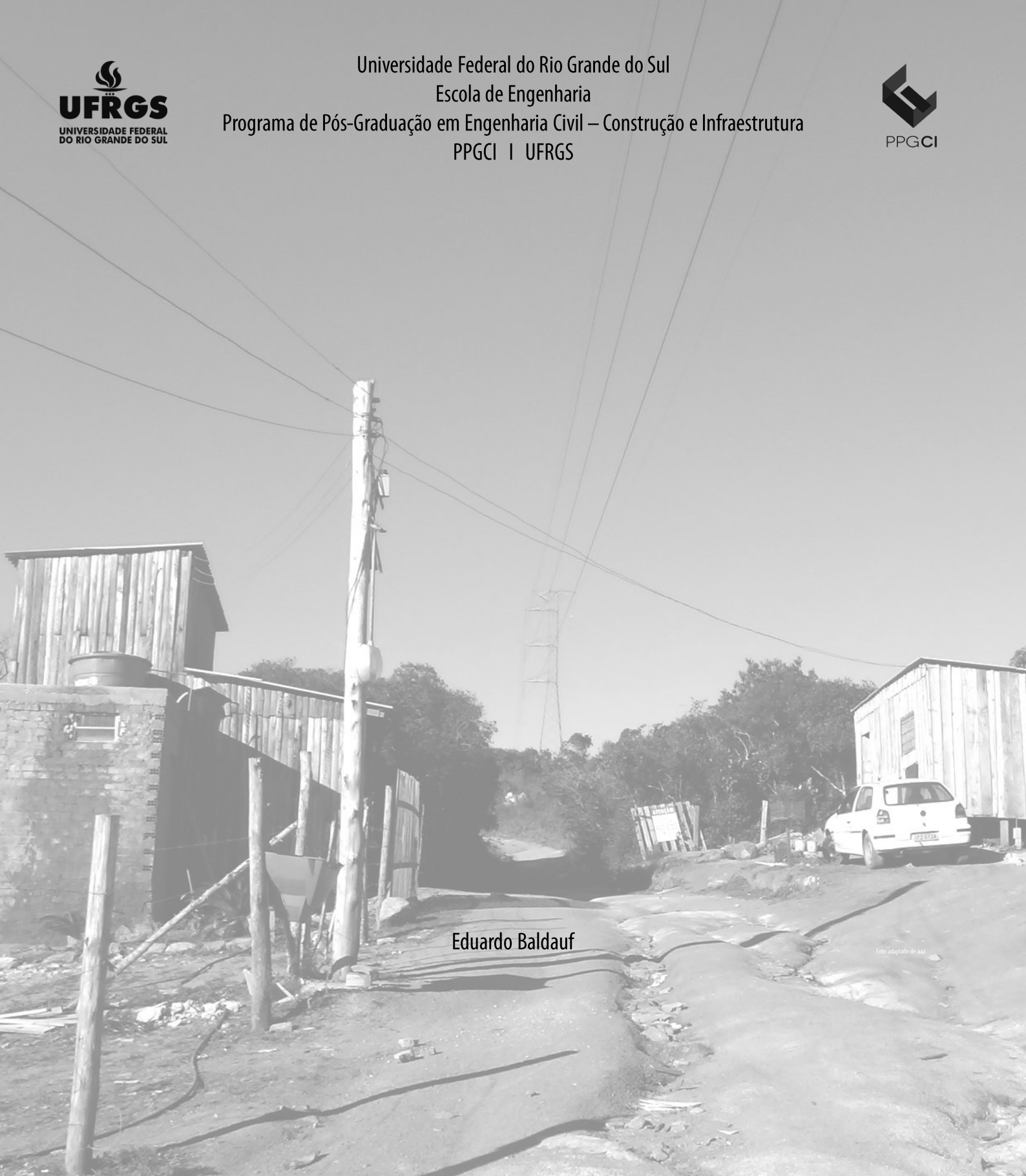

Eduardo Baldauf

A framework to classify and assess the perceived impact of small-scale resilient and sustainable transformation initiatives in disadvantaged communities

Porto Alegre
2021

EDUARDO BALDAUF

A FRAMEWORK TO CLASSIFY AND ASSESS THE PERCEIVED IMPACT OF SMALL-SCALE RESILIENT AND SUSTAINABLE TRANSFORMATION INITIATIVES IN DISADVANTAGED COMMUNITIES

Dissertação apresentada ao Programa de Pós-Graduação em Engenharia Civil: Construção e Infraestrutura, da Universidade Federal do Rio Grande do Sul, como parte dos requisitos para obtenção do título de Mestre em Engenharia

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Esta dissertação de mestrado foi analisada e julgada adequada para a obtenção do título de MESTRE EM ENGENHARIA CIVIL, área de pesquisa em Sustentabilidade e Gestão de Riscos, e aprovada em sua forma final pelo Professor Orientador e pela banca examinadora, designada pelo Programa de Pós-Graduação em Engenharia Civil: Construção e Infraestrutura, da Universidade Federal do Rio Grande do Sul.

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I dedicate this work to Juliana and Marina.

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“How sad to think that nature speaks and mankind doesn`t listen.”
(Victor Hugo)

ABSTRACT

BALDAUF, E. **A framework to classify and assess the perceived impact of small-scale resilient and sustainable transformation initiatives in disadvantaged communities.** 2021. Dissertation (Master of Science in Civil Engineering) - Postgraduate Program in Civil Engineering: Construction and Infrastructure, Engineering School, Federal University of Rio Grande do Sul, Porto Alegre, 2020.

Currently, the need to shift humanity's course away from the destruction of the planet is imperative, and several studies are facing the future of cities and the challenge to rethink them more sustainably. At the same time, humanity is already experiencing the effects of climate change and resource depletion, with consequences not only on the environment but also on the economy and society. The trend in worsening these effects demands actions in order to make cities more resilient. In this context, movements have arisen, frameworks have been developed and applied, and initiatives have been implemented to transform cities worldwide through small-scale interventions that intend to address these challenges. Such interventions are at the local level, consider strong community engagement, and aim to achieve radical change. This research recognises the great relevance of these initiatives and carries out a literature review on some significant examples. From identifying the characteristics of the studied initiatives, the differences between their contexts and the context of vulnerable Brazilian communities, and the scarcity of research addressing the topic and proposing approaches to this context, this research intends to fill this gap. Thus, the **research aim** was to develop a framework to classify and assess the perceived impact of small-scale resilient and sustainable transformation initiatives suitable for socio-environmentally vulnerable communities in Brazilian municipalities. The **research approach** adopted was constructive research, or design science research, conducted basically through a literature review, a practical application of the framework and a seminar for evaluation. The object of the empirical study was the community of Morro da Cruz, a neighbourhood in the city of Porto Alegre, where the practical application was carried out. As a more comprehensive conclusion, the **results** showed that, for communities in a state of socioeconomic vulnerability, environmental concerns must be part of a strategy that integrates the confrontation of environmental issues with the economic, social and cultural dimensions of sustainability. The economic vulnerability of the community, for example, played a decisive role in defining the level of interest of residents concerning the initiatives presented as potentially applicable to their reality. As the deployment of the activities developed throughout the research, a tool was proposed and designed to centralise information about dispersed initiatives in the city of Porto Alegre and to serve as a dynamic database, enabling consultation and updating of initiatives. Connecting initiatives with each other and with the population, allowing for sharing experiences, exchanging information and learning from each other, was identified as a fundamental issue in the initial process of implementing the small-scale resilient and sustainable transformation initiatives.

Keywords: Resilience; Sustainability; Small-Scale Initiatives

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ABBREVIATIONS AND ACRONYMS LIST

AEIS: Área Especial de Interesse Social (Special Areas of Social Interest)

APP: Área de Preservação Permanente (Permanent Preservation Area)

CBI: Community-Based Initiative

CEA: Centro de Educação Ambiental (Environmental Education Centre)

CEMME: Centro Cultural Marli Medeiros (Marli Medeiros Cultural Centre)

CEPAGRO: Centro de Estudos e Promoção da Agricultura de Grupo (Centre for the Study and Promotion of Group Agriculture)

CTVP: Centro de Triagem da Vila Pinto (Vila Pinto Sorting Centre)

DMC: Domestic Material Consumption

GHG: Greenhouse Gases

GRID: Gestão de Riscos de Desastres (Disaster Risk Management)

HDI: Human Development Index

ICT: Information and Communication Technology

IDHM: Índice de Desenvolvimento Humano Municipal (Municipal Human Development Index)

IPCC: Intergovernmental Panel on Climate Change

NGO: Non-Governmental Organization

NORIE: Núcleo Orientado para a Inovação da Construção (Building Innovation Research Unit)

PDDUA: Plano Diretor de Desenvolvimento Urbano e Ambiental (Porto Alegre Urban and Environmental Development Master Plan)

PNPDEC: Política Nacional de Proteção e Defesa Civil (National Civil Defense and Protection Policy)

PNUD: Programa das Nações Unidas para o Desenvolvimento (United Nations Development Programme)

PPGCI: Programa de Pós-Graduação em Engenharia Civil: Construção e Infraestrutura (Post-Graduate Program in Civil Engineering: Construction and Infrastructure)

SDG: Sustainable Development Goal

SU: Sustainable Urbanism

UAMPA: União das Associações de Moradores de Porto Alegre (Union of Porto Alegre Dwellers' Associations

UFRGS: Universidade Federal do Rio Grande do Sul (Federal University of Rio Grande do Sul)

UNEP: United Nations Environment Programme

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1 INTRODUCTION

This dissertation was developed within the Sustainable Buildings and Communities research line, which integrates the Building Innovation Research Unit (NORIE), of the Postgraduate Program in Civil Engineering - Construction and Infrastructure, of the Federal University of Rio Grande Sul (PPGCI/UFRGS). It intends to contribute to the work being developed by the research group in this field of knowledge.

This chapter presents the context and justification for the proposed topic. That is followed by the presentation of the research problem (gap of knowledge), the research questions, the research aim, the research objectives and the limitations of the work.

1.1 CONTEXT AND JUSTIFICATION

Studies on global climate in recent years have shown record temperatures being reached each year. In addition, greenhouse gases concentration in the atmosphere continue to rise, the global ocean heat content is at record levels, ocean acidification and sea levels continue to rise, and the thickness of the layers of Arctic and Antarctic sea ice is well below average (NOAA/NASA, 2017; WORLD METEOROLOGICAL ORGANIZATION, 2018, 2019, 2020, 2021; INTERNATIONAL ENERGY AGENCY, 2019).

In a report demonstrating that, when after three years of stabilisation, global CO_2 emissions started to rise again, in 2017, the United Nations Environment Programme (UNEP) stated that "now, more than ever, unprecedented and urgent action is required by all nations" (UNEP, 2018, p. XIV). A similar statement can be found in the article World Scientists' Warning to Humanity: A Second Notice, signed by more than 15,000 scientists from 184 countries, in 2017: "…soon it will be too late to shift course away from our failing trajectory" (RIPPLE et al., 2017, p. 1028). More recently, the term 'climate emergency' has come to be employed frequently, in an attempt to highlight the need for an urgent response to climate change. For example, in a study published in 2020, more than 11,000 signatory scientists declared that "clearly and unequivocally, planet Earth is facing a climate emergency" (RIPPLE et al., 2020, p. 8). Statements like those give an idea of the urgency in taking actions to try to reverse our actions that are contributing towards the collapse of the planet. Nevertheless, the data show that "the

world remains on course to exceed the agreed temperature thresholds of either 1.5°C or 2.0°C above pre-industrial levels, which would increase the risks of pervasive climate change impacts beyond what is already seen" (WORLD METEOROLOGICAL ORGANIZATION, 2021, p. 26). Effects of climate change and resource depletion are not yet fully predictable, but humanity is already experiencing it. According to the World Meteorological Organization, in 2018 "extreme weather impacted on lives and sustainable development on every continent" (WORLD METEOROLOGICAL ORGANIZATION, 2019, p. 2).

Consequences can be extremely serious, not only on the environment but also on the economy and society. One of the possibilities is, for example, that the effects of climate change and resource depletion start to cause tension scenarios across the globe. Some researchers, such as Kelley (2015), from the Department of Geography, at the University of Santa Barbara, California, believe that the civil war in Syria, which began in 2011, has climate change as one of its main driving factors. Just before the conflict, between 2006 and 2009, Syria faced the most severe drought in the country's history, being it attributed to global warming, that has led, along with other possible factors, to the migration of approximately 1.5 million people, from the countryside to the cities. This mass migration would have generated the social tension that resulted in the conflict (KELLEY et al., 2015).

The picture of the current stage of destruction in which the Earth is, resulting from environmental impacts caused by human actions, makes it clear that the current ways of living of a considerable portion of humanity are not sustainable, and a shift towards sustainability is imperative. Furthermore, the trend in worsening the effects of climate change (WORLD METEOROLOGICAL ORGANIZATION, 2019) requires efforts to make humanity more resilient.

Urban settlements play an essential role in causing world environmental impacts. Currently, cities are responsible for over two-thirds of the world's energy consumption and more than 70% of global greenhouse gases (GHG) emissions (C40 CITIES, 2018). Cities are also responsible for around 60% of the global 'domestic material consumption' (DMC) of raw materials (IRP, 2018). These raw materials include, for example, coal, iron, sand, gravel and wood, and DMC is the result of: the total domestically extracted raw materials, added to imported materials, and discounting from that the exported materials. UNEP estimates that the global DMC could increase from 40 billion tons, in 2010, to nearly 90 billion tons, by 2050, if humanity maintains

its current standards of consumption. After being processed to maintain the cities' systems in operation, all these inputs, somehow, result in outputs. As Rees and Wackernagel (1996) state, "…cities necessarily appropriate large quantities of useful energy and material from the ecosphere and 'dissipate' an equivalent stream of degraded waste back into it" (REES; WACKERNAGEL, 1996, p. 237).

Concurrently, urban settlements are highly vulnerable to the effects of climate change. The increase in the frequency and intensity of extreme weather events, like intense precipitation, cyclones and storms, as well as periods of intense heat and cold, in addition to continuously rising sea levels, are some of the issues that affect cities. These events have the potential to cause flooding, public health problems, impacts on the infrastructure and on the quality of life as they affect the access to basic urban services, and cause the disruption in urban supply lines, among others (THE WORLD BANK, 2011; BARTHEL; ISENDAHL, 2013; UN HABITAT, 2020). In particular, these consequences of climate change in cities mainly affect the most vulnerable populations, like those living in informal settlements, that frequently occupy areas that are unsuitable for urbanisation, such as steep slopes and riverbanks, thus becoming more exposed to hazards. In addition, precarious dwellings are also those more exposed to the impacts of climate change, as these constructions often are identified as having unstable structures, lacking adequate thermal insulation, or not being served by water, electricity or sewage systems. Furthermore, the livelihood of the urban poor and communities, living on the margins of society, is also threatened by potential economic crises or shortages, due to reduced food production caused by climate change (THE WORLD BANK, 2011; UN HABITAT, 2020).

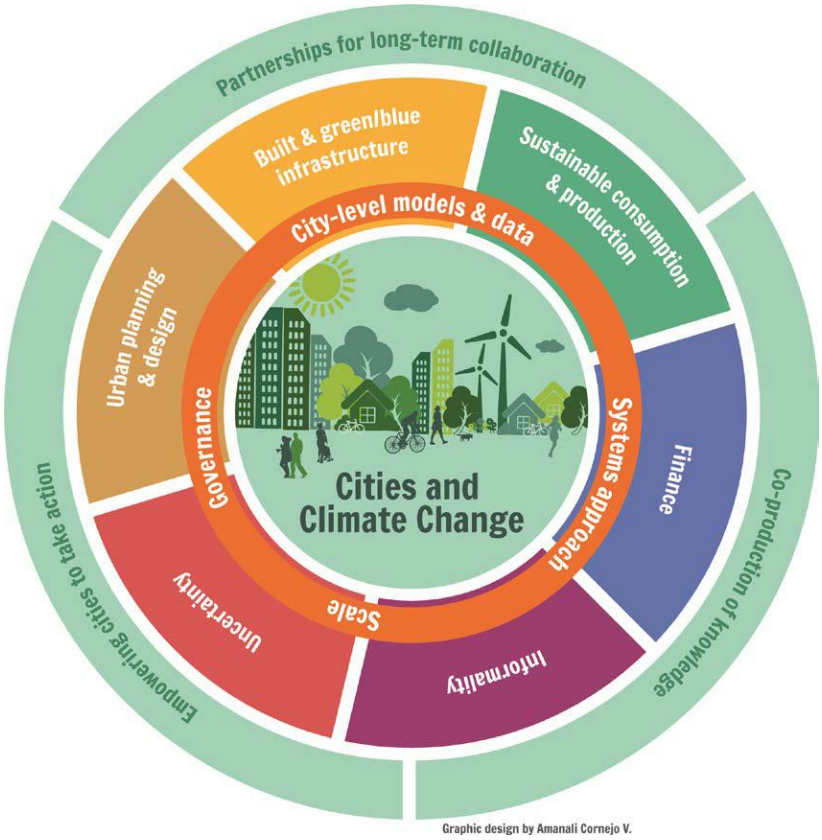
The challenges facing contemporary cities represent an opportunity for studies and actions to be developed to reduce their environmental impacts, as well as to adapt and mitigate the effects of climate change in urban areas. In fact, more and more studies have been carried out with this purpose (REES, 1997; HAUGHTON; HUNTER, 2004; FARR, 2008; HOPKINS, 2008; JABAREEN, 2013; TURCU, 2013; MEEROW; NEWELL; STULTS, 2016; PETCOU; PETRESCU, 2018). The sustainable cities' discourse has become broader since the Report of the World Commission on Environment and Development: Our Common Future (1987), also known as the Brundtland Report (REES, 1997; TURCU, 2013), which launched the 'classical' definition of sustainable development, which should "…meet the needs of the present, without compromising the ability of future generations to meet their own needs" (UNITED NATIONS, 1987). From then until nowadays, the union of sustainability and urban studies has given rise

to a vast literature, that intends to match sustainable development concepts to urban settlements, generating the debate about sustainable cities and urban sustainability. Resilience has also become a key term for studies and policies related to the urban context, and a goal in the cities' planning (HOPKINS, 2008; JABAREEN, 2013; MEEROW; NEWELL; STULTS, 2016; PETCOU; PETRESCU, 2018). Urban resilience, or thinking about resilient cities, is a topic that became popular in more recent years when compared to sustainable cities, and the tendency is for this debate to increase, as the challenges related to climate change are becoming increasingly complex (MEEROW; NEWELL; STULTS, 2016).

Therefore, resilience and sustainability became key terms in the cities' agenda. In addition, the role of urban settlements, in the context of global environmental, economic and social crisis, is gaining more attention from governments and international organisations. The United Nations 2030 Agenda for Sustainable Development, for example, adopted by all Member States in 2015, established the widely known 17 Sustainable Development Goals, of which Goal 11 is Sustainable Cities and Communities, aiming to "…make cities inclusive, safe, resilient and sustainable" (UN, 2015, p. 21). The Intergovernmental Panel on Climate Change (IPCC), a United Nations body, is also paying increasing attention to cities. The IPCC works through cycles of assessments on climate change and currently is in the Sixth Assessment cycle. The organisation intends to pay "special attention to cities in the Sixth Assessment Report, with the intention of a Special Report on climate change and cities, in the Seventh Assessment Cycle" (IPCC, 2017).

Following the conference *Cities and Climate Change Science Conference* (Cities IPCC), held in Edmonton, Canada, on 5–7 March 2018, an agenda called *Global Research and Action Agenda on Cities and Climate Change Science* was elaborated, compiling the contributions of the 700 participants (IPCC, 2018). The Agenda aimed to support the different stakeholders "in developing blueprints and action plans for new evidence-based research and knowledge that supports effective climate action in cities" (IPCC, 2018, p. 8), identifying crosscutting issues and knowledge gaps, key topical research areas and suggested approaches to implement the Agenda. Figure 1 presents the structure of the *Global Research and Action Agenda:*

Figure 1 - Structure of the *Global Research and Action Agenda*



Source: IPCC, 2018

Some of the issues, knowledge gaps and key topical research areas presented in the document are addressed in this research. Regarding the orange circle (inner circle of Figure 1), which presents the key crosscutting issues and knowledge gaps, the issue of *Governance*, for example, considers that the participation of non-state actors, such as communities and non-governmental organisations (NGOs), in climate change governance, is an issue to be explored and emphasises the need of more knowledge on "transformative climate change responses, that can address urban inequalities and ensure inclusive modes of governance" (IPCC, 2018, p. 11). Also, among the six topical research areas suggested to be addressed by new research and represented in the multi-coloured circle (middle circle of Figure 1), the topical areas of Informality and Sustainable Consumption and Production contain items addressed by this research. The green circle (outer circle of Figure 1) refers to the suggested approaches considering the implementation of the agenda (IPCC, 2018).

Within this context, where cities have to face climate change and its consequences, urgently and seriously, movements have arisen, frameworks have been developed, and initiatives have been implemented to transform cities worldwide through small-scale interventions. Such interventions intend to address these challenges and promote resilience and sustainability in the urban environment (HOPKINS, 2008; PETRESCU; PETCOU; BAIBARAC, 2016). Such interventions are intended to be developed at the local level, consider strong community engagement and aim to achieve radical change.

This research analyses two different movements or frameworks, namely Transition Movement and R-Urban, as they are proposals that encompass a wide range of actions in their scope, that are aligned with the concept of initiatives developed in this work. R-Urban is described as a framework (PETRESCU; PETCOU; BAIBARAC, 2016), while Transition intends to be a movement, which fosters 'Transition Initiatives' (HOPKINS, 2008). The concept was first denominated 'Transition Towns' but, due to its intention to be suitable for any scale of human groupings, it changed to this more embracing term (HOPKINS, 2008; TRANSITION NETWORK, 2016). After examining these two selected examples, initiatives developed in isolation and specific characteristics of other selected initiatives, that were considered relevant to the purpose of the research, are analysed.

The analysis of movements, frameworks or projects enables an understanding of their structure, identifying their strong and eventually weak points, and improving opportunities. Primarily, it allows taking lessons from these different inspiring proposals and actions, in order to propose a framework to classify and assess the perceived impact of small-scale resilient and sustainable transformation initiatives, that are considered suitable for disadvantaged neighbourhoods in Brazilian municipalities. The movements, frameworks or projects studied are also a source of examples of initiatives to be selected and listed, together with other research sources, to depict a broad overview of the existing initiatives throughout the world.

1.2 RESEARCH PROBLEM AND RESEARCH GAP

As mentioned previously, to deal with the challenge to make cities more sustainable, in the last three decades many urban projects have incorporated the proposal of sustainability, and new ideas and movements have emerged within this 'sustainable urban movement' (TURCU, 2013). The range of initiatives is vast, from region or city planning, to the neighbourhood scale, and

under diverse conceptual and ideological perspectives. The concept of resilience in the urban context, in turn, has come into focus more recently, but has rapidly gained importance. Currently, it is also the focus of several studies and initiatives being applied, with different levels of commitment, to urban design and planning, and to local actions, aiming to face the effects of climate change at a community level (HOPKINS, 2008; BARR; DEVINE-WRIGHT, 2012; PETRESCU; PETCOU; BAIBARAC, 2016).

Most urban interventions are planned and implemented in a way that can be called more 'conventional': masterplans for new developments, on a large scale, led by the real estate market or government-led initiatives, with no or little community participation, and involving large amounts of investment (ERNST et al., 2016; WILLIAMS, 2017); that is, characterizing a sort of more "top-down" initiatives. On the regional and urban scale, nowadays no other country has more examples of sustainable regional, and urban planning and design than China. After years of impressive urban "explosion" – from 17% urbanized, in 1976; to 60%, at present – in recent years, the country has started to think of eco-cities. This concept has been strongly embraced by the government, although there is no clear definition of what it means exactly. This ambiguity, in a way, helped to popularise the expression, particularly in China, where hundreds of cities proclaimed themselves as eco-cities, without the need to delve into its meaning (WILLIAMS, 2017). Regardless of the questionings by many authors about the sustainability outcomes achieved by Chinese eco-cities, the government planned to adopt a green development model, between 2015 and 2020, and one of the intended actions was to build many "eco-cities" – a proposal embraced by more than 100 municipal governments (HOLDEN; LI; MOLINA, 2015; WILLIAMS, 2017). Indeed, many so-called eco-cities are already designed, under construction or built, such as Liuzhou Forest City (STEFANO BOERI ARCHITETTI, 2021).

While some initiatives cannot be considered sustainable, although they are sold as such, some have indeed achieved their goals towards sustainability and resilience (LOMBARDI et al., 2011; HAMMARBY SJÖSTAD 2.0, 2019). For example, the residential district of Hammarby Sjöstad in Stockholm, Sweden, is a worldwide recognised project, that regenerated a brownfield area previously occupied by industrial and harbour activities. The development incorporates several measures to achieve sustainability, such as planning strategies that fosters non-motorised displacement and the use of public transport; stormwater management with low

impact; and a closed-loop system of water, waste, and energy flows, that allow the reduction of resources consumption, among many others (HAMMARBY SJÖSTAD 2.0, 2019).

In the last few years, a kind of development, that started with isolated initiatives in the 1970s, is spreading rapidly. Ecourban neighbourhoods have been disseminated as a sustainable alternative for constructing new additions to a city, at the neighbourhood scale. This neighbourhood-scale eco-urbanism is based on "political, social, and economic, as well as environmental, design and technical realms" (HOLDEN; LI; MOLINA, 2015, p. 11431). It is characterised by fragmentation, both in terms of motivations and visions, as in the way it expresses itself, through its designs, processes, structures and practices. Many expressions are used to name these frames, like "ecodistricts, écoquartiers, eco-cities, zero, low-carbon and carbon-positive cities, ecourbanismo, ecopolises, ecobarrios, ecovillages, One Planet Communities, and solar cities" (HOLDEN; LI; MOLINA, 2015, p. 11419). In their research, Holden, Li and Molina (2015) found 420 initiatives matching their criteria, which considers just-built or ongoing projects of ecourban neighbourhoods, and the authors estimated to have located around 80% of the existing initiatives around the world.

The brief vision of urban planning focused on sustainability, discussed above, gives an idea of the growth of an *eco* or *sustainable* approach to new cities or new neighbourhoods design. But existing settlements are also an important field of study for applying an approach based on sustainability and resilience to cities. In this sense, different ways of transforming the urban environment have been gaining attention in recent years, based on small-scale interventions, carried out through a "bottom-up" approach, and with a low budget. The existing literature throughout the world about these kinds of initiatives addresses mainly movements, frameworks or projects existing in developed countries (FORREST; WIEK, 2014). Considering that developed countries have low poverty rates among the population, most of the initiatives are led by the medium class, and often are focused mainly on the environment, comprising measures, such as reducing CO_2 emissions (CHARNOCK; ALEXANDER, 2006; FORREST, 2011; BARR; DEVINE-WRIGHT, 2012; FORREST; WIEK, 2014; LO, 2017). Initiatives that embrace the socioeconomic dimension of sustainability and resilience, in addition to the environmental dimension, are less common, although some of the groups and proposals studied in this research include this approach. In Brazil and other developing countries, where the existence of communities in socioeconomic vulnerability is significant, several initiatives to improve the living conditions of these communities were implemented (BIOSANEAMENTO,

2020; FLORESCER BRASIL, 2021; TETO, 2021). However, these initiatives are not always focused on resilience or sustainability and, sometimes, are proposed without a comprehensive consultation with the population to meet their real needs, which may result in the population's lack of interest in maintaining the project, compromising the degree of success of the action. Whether academic or not, what was not found in the literature was a survey and classification of existing initiatives, from which the most appropriate ones could be selected and submitted to the appreciation of local populations. Furthermore, literature and data about initiatives in Brazil are scarce, as well as researches addressing the topic. It is very difficult to know, for instance, which initiatives are in progress; where; or any kind of information, that could inspire or help other communities in implementing sustainable and resilient solutions in their neighbourhood. When citizens engage in experiences aiming to transform cities and communities in resilient and sustainable systems, "an undoubtedly major amount of learning emerges; and vice versa, sound knowledge/best practices on how to proceed with local sustainability oriented change processes could be a firm support for local actors in their quest for effective and efficient action" (NEVENS et al., 2013, p. 111).

Therefore, the investigation of existing initiatives, developed from a "bottom-up" approach, on a small-scale, with the objective of transforming communities under the lens of sustainability and resilience, and the proposal of a framework for the classification and assessment of initiatives with such characteristics, aiming at their implementation, in the context of socio-environmentally vulnerable Brazilian communities, represents a gap of knowledge with practical and theoretical relevance.

1.3 RESEARCH QUESTIONS

Based on the research problem and research gap, the following **main research question** was defined:

How to instrument communities, and stakeholders working in partnership with them, in the early stages of implementing small-scale resilient and sustainable transformation initiatives, in disadvantaged communities?

As an unfolding of the research aim, the **intermediate research questions** were defined:

- How to select the most suitable small-scale resilient and sustainable transformation initiatives, for a specific neighbourhood context?

- How well do dwellers know about existing resilient and sustainable transformation initiatives potentially applicable to their context?

- What is the interest of the dwellers in the implementation of resilient and sustainable transformation initiatives?

- What are the opportunities and obstacles to applying a framework for the classification and assessment of small-scale resilient and sustainable transformation initiatives in disadvantaged Brazilian communities, aiming at implementing these initiatives?

- How to gather and disseminate information about existing initiatives on a municipal scale, in order to share experiences, inspiring other communities and allowing them to benefit from acquired learning?

1.4 RESEARCH AIM AND OBJECTIVES

1.4.1 Research Aim

The aim of this research is to develop a framework to classify and assess the perceived impact of small-scale resilient and sustainable transformation initiatives, suitable for socio-environmentally vulnerable communities in Brazilian municipalities, in order to support the early stages of implementation of such initiatives.

1.4.2 Research Objectives

To achieve the research aim, and in line with the intermediate research questions, a set of objectives was established:

- Research objective 01: to propose a process for selecting the most suitable small-scale resilient and sustainable transformation initiatives for the studied neighbourhood.

- Research objective 02: to investigate how much dwellers know about existing resilient and sustainable transformation initiatives, potentially applicable to their context.

- Research objective 03: to investigate the interest of the dwellers in resilient and sustainable transformation initiatives.

- Research objective 04: to identify opportunities and obstacles to applying a framework for the classification and assessment of small-scale resilient and sustainable transformation

initiatives in disadvantaged Brazilian communities, aiming at implementing these initiatives.

- Research objective 05: to propose a way to gather information about existing initiatives on a municipal scale, allowing the dissemination of knowledge acquired from these experiences.

1.5 DELIMITATIONS

The proposed framework is not an entire process. This research recognises that the ideal process would comprise the full implementation of small-scale resilient and sustainable transformation initiatives in disadvantaged communities. To achieve this goal, it would be necessary to carry out a process much more complex than the one encompassed by the framework, that would involve a large number of knowledge disciplines and various stakeholders, around this objective.

The scope of the present work is restricted to the first part of this interdisciplinary process, comprising four stages: 1) The elaboration of a database, which serves as a source for the development of a more specific proposal for a given community; 2) The selection, characterisation and understanding of this specific community; 3) The selection of the most appropriate initiatives for this community; and 4) Consultation with the population, to ascertain their level of knowledge and opinion about the proposed initiatives. To accomplish the necessary steps to implement resilient and sustainable initiatives in a given community, a possible sequence for the process could involve: 1) Economic feasibility analysis; 2) A training stage, to enable residents to implement the chosen actions; 3) Planning the operationalisation of the project (management, structure, organisation); 4) Implementation of initiatives; 5) Monitoring the deployment of actions; and 6) Evaluation of results, based on the proposed objectives, with an emphasis on achieving sustainability and resilience for the community.

The spatial ‘cutout’ adopted in this research is that of the neighbourhood. Therefore, the framework for the classification and assessment of resilient and sustainable transformation initiatives is proposed for the neighbourhood scale, including also the private land and building scale. Despite Morro da Cruz, the chosen object for the empirical study, not constituting an official neighbourhood of the city, it will be considered and characterised as being so. Thus, the characteristics of the object of study delimit the research.

1.6 LIMITATIONS

The limitations of this research are related to aspects intrinsic to the theme and aspects related to the restrictions of its object of study, in the same way as to the conditions for carrying out the study itself.

The most significant limitations related to aspects intrinsic to the theme are the interdisciplinarity, transdisciplinarity and complexity of the topic. Studies about the transition of communities under the lens of sustainability and resilience reinforce aspects related to the interdisciplinarity and transdisciplinarity of the theme. Such studies are developed within the scope of several fields of knowledge, such as geography, ecology, engineering, psychology, urbanism, architecture and social sciences (ROBINSON; CARSON, 2016; FRANTZESKAKI et al., 2018a; SCHRÖDER et al., 2019). Also, "Transdisciplinary research is characterized by the involvement of non-academic actors in the research process" (SCHRÖDER et al., 2019). Thus, another indicator of the complexity of the topic is the diversity of stakeholders that can be part of this kind of study and process, matching the need of a 'social production' advocated by several authors. This vision leads to the concepts of co-design, co-creation and co-production (RYAN, 2013; FRANTZESKAKI et al., 2018a; PETCOU; PETRESCU, 2018; SCHRÖDER et al., 2019), which means the engagement of multiple stakeholders in the process of creating and producing sustainable and resilient transformation in communities. For several reasons, this research presented substantial limitations in terms of its capacity, as well as the viability, of involving multiple stakeholders, such as: the limited time for the development of the research (the usual period allowed for the development of a master's studies); the 'staff limitation' (the work was carried out by only one researcher, with a volunteer researcher, collaborating with the activity described in 5.3.3); and the coronavirus pandemic, requiring measures of social distance.

The restrictions of the research study object, and the conditions for carrying out the study, refer to the difficulty in making contact with a representative sample of the community, which would, proportionally, encompass the various aspects of its diversity. This limitation has become exponentially more serious, as mentioned in the previous paragraph, due to the coronavirus pandemic. Limitations related to the pandemic are addressed throughout the work.

Lastly, the evaluation of the utility and applicability of the website was partial, carried out only by the researcher. Considering that the website is a contribution not originally planned in the

research, having been one of the results of the practical evaluation of the artifact, there was no time to fully validate it.

1.7 DOCUMENT STRUCTURE

This dissertation is structured into six chapters. In this chapter, the scope of the research was presented. The following were explained: the context and justification; the research problem; the research questions; and the research objectives. In addition, the delimitations and limitations that established the study outline were indicated. Finally, this section describes the structure of the dissertation.

In Chapter 2, Literature Review, firstly a review of the leading general concepts adopted in the research is presented: transformation, resilience and sustainability. Then, some selected existing initiatives worldwide are analysed, and initiatives in the Brazilian context are presented. The main objectives of the literature review are the understanding of the concepts adopted and the formation of a base from which the work is developed.

Chapter 3 is dedicated to the Research Method adopted for the development of the study. The chapter describes the research design and the chaining and detailing of its stages, in order to answer the research questions and achieve the research aim and objectives. In other words, the work development process is explained.

Chapter 4 deals with the characterisation of the empirical study object. The biophysical/environmental, urban, sociocultural, economic and political characteristics of the Morro da Cruz community are presented, in addition to a description of existing initiatives in the neighbourhood. The acquaintance of the local reality, regarding the community's technical, economic and sociocultural aspects, is undoubtedly a crucial factor in proposing small-scale transformation initiatives.

Chapter 5 presents the results obtained in the three stages of the research, including the results of the application of a questionnaire within the community of Morro da Cruz. The definition of a framework, which corresponds to the research aim of the research, is presented. The chapter also analyses the results obtained in a seminar, that aimed at assessing the proposed framework's utility and applicability, and contributed to its refinement. The seminar also resulted in subsequent developments. Furthermore, some reflections are made on the possible theoretical contributions of the research, considering its development and the obtained results.

Based on the results obtained, Chapter 6 presents the conclusions and final considerations, based on the results. Among the considerations, the possible opportunities and barriers for applying a framework for the classification and assessment of small-scale resilient and sustainable transformation initiatives in disadvantaged communities, and, ultimately, for implementing these initiatives, are pointed out. Finally, recommendations are made for future studies that intend to deal with topics related to this research.

2 LITERATURE REVIEW

The literature review covered several topics directly related to the scope of this research. It aimed to provide the theoretical knowledge needed to understand the concepts and processes involved, thus supporting the following stages and delimiting the scientific fields directly related to this study, thus contributing to the achievement of the objectives proposed by the work. This chapter comprises two sub-chapters: “Transformation, Resilience and Sustainability” and “Initiatives”.

The sub-chapter 2.1, Transformation, Resilience and Sustainability, presents a review of these three concepts, when applied to the urban context, focusing on their application and significance in small-scale interventions. The sub-chapter 2.2, Initiatives, comprises a general review of the existing literature on initiatives, the concepts and approaches addressed and an investigation of some selected initiatives. These selected initiatives include movements, frameworks, or projects, encompassing a wide range of actions in their scope; or initiatives developed in isolation.

2.1 TRANSFORMATION, RESILIENCE AND SUSTAINABILITY

2.1.1. The Need for Transformation in Urban Settlements

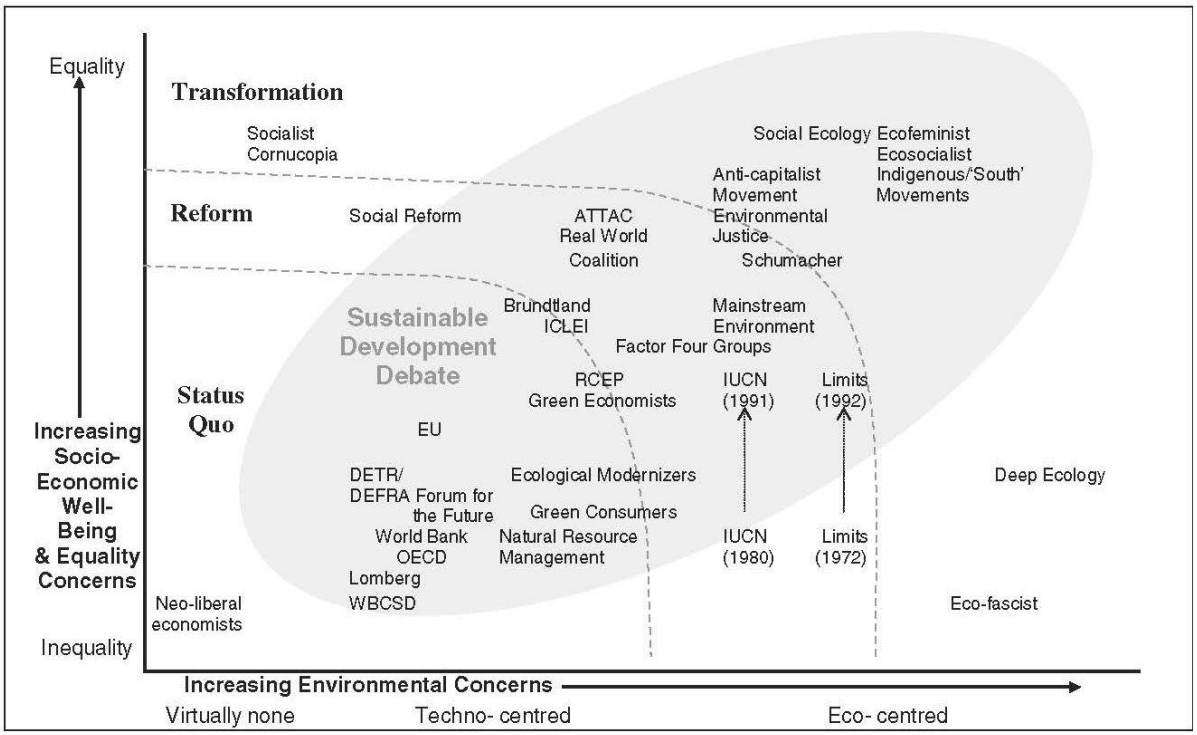
The context described in the introduction of this research is clear about the challenges on finding ways for dealing with the planet’s continuous and increasing degradation. In fact, environmental impacts caused by human activities have been studied for a long time. Regarding those related to climate change, we are reminded that humankind is “on notice of climate risks by the 1960s” (CENTER FOR INTERNATIONAL ENVIRONMENTAL LAW, 2016). In the last decades, important studies, reports, documents and conferences have been developed and promoted to address environmental impacts, and to try to establish guidelines on how humankind can face the related challenges. This debate raises the discussion of how deep or radical the changes must be, to cope with this issue.

Rees (1995) asks, in the title of his paper, what is necessary to achieve sustainability, reform or transformation, and compares the expansionist worldview and the ecological worldview, in face of this goal. The author understands that, at that point in time in human ecological history, “a

radical reconfiguration of planning values and goals" was needed, and "an unlikely tenfold reduction in the energy and material intensity of economic activity would be required to accommodate anticipated economic growth safely, posing an enormous challenge to planners in facilitating the transition to sustainability" (REES, 1995, p. 343).

Expanding this debate, Hopwood et al. (2005) mapped different approaches to sustainable development: Status Quo, Reform and Transformation. These three approaches correspond to three different levels of depth, in the changes that must be promoted in our society's political and economic structures, and in the relationships between human beings and the environment, to achieve sustainable development. The first approach holds that sustainable development can be achieved within current structures; the second, that a reform in structures is necessary, without rupture; the third considers that a radical transformation in economic and power structures is needed to achieve sustainable development (Figure 2).

Figure 2 - Mapping of different views on sustainable development



Source: HOPWOOD; MELLOR; O'BRIEN (2005).

The authors did not intend to be precise when mapping these different approaches. Instead, they argue that this mapping is open to debate, and the views of groups and individuals can change over time; thus, the classifications showed are just simplifications.

The radical change advocated by those within the spectrum of "transformation", in the debate on sustainable development, is grounded on the belief that the structures of society are responsible for an unsustainable way of life, which generates inequality and environmental degradation. Therefore, transformation is necessary and can be achieved just with the participation of those groups that, in general, are set apart from the decision-making processes, like local communities, which have to get involved through social and political actions (HOPWOOD; MELLOR; O'BRIEN, 2005). Studies addressing the required changes towards sustainable development are numerous, and many authors have supported the idea of transformation or radical change, that challenge the status quo, the notion of economic growth, the inequality between the rich and the poor and the exploitation of the environment (HAUGHTON; HUNTER, 2004).

The principle of transformation towards sustainable development has supported research and studies concerned with the design and implementation of human settlements. Lyle (1994) supports the idea of a profound shift in civilisation, with particular regard to the Paleotechnic tendency to put economic concerns as the primary value of humankind and the consequent emphasis on productivity. The author argues that this is the main reason for the current pattern of flows adopted by humanity, which is unsustainable and degenerative, since the flows of extraction, consumption and disposal are linear. Lyle proposes, instead, to design regenerative systems, which intend to restore nature's pattern of flows, that is cyclical and where materials and energy are continuously replaced within the process (LYLE, 1994).

Farr (2008) also believes that humanity's way of life is on the wrong track, referring to the American Lifestyle, and considers that human settlements must be aligned with the principles of sustainable urbanism. After studying some precedents, like Ian McHarg's *Design with Nature* (1969), Smart Growth, an environmental movement of the 1970s, and others, the author presents its proposal of Sustainable Urbanism (SU). The idea refers to a "walkable and transit-served urbanism, integrated with high-performance buildings and high-performance infrastructure. Compactness (density) and biophilia (human access to nature) are core values of SU". For the author, this idea "represents a generational shift in how human settlements are designed and developed" (FARR, 2008).

When talking about transformation, it is necessary to mention some references on 'sustainability transitions', a field of study which has been increasingly addressed by academia, over the last two decades. For Seyfang and Longhurst (2014), "A transition can be understood

as a fundamental shift in a ‘socio-technical system, reflecting significant changes across a range of different domains: technological, political, institutional, cultural etc.” (SEYFANG; LONGHURST, 2014). The field of study in sustainability transitions aims to understand and, potentially, exert influence on this process, in which communities worldwide (but, as noticed in this literature review, mainly in developed countries) started a shift, to become more sustainable in the face of issues, like: climate change, environmental degradation, economic decline and public health problems (FORREST, 2011; FORREST; WIEK, 2014; SEYFANG; LONGHURST, 2014). In response to the lack of positive and responsible actions, at national and global levels, to tackle these issues, sustainability transitions can be put into practice by different types of communities, in the urban or rural context, and at different scales, but “a particular type of sustainability transition is driven by civil society in the form of community-based, grassroots style initiatives” (FORREST; WIEK, 2014). According to the authors, these community initiatives have the “ability to engage and empower local people in a way that top-down efforts often fail”.

Despite describing the transformation process of an area by means of large-scale development programmes, driven by a top-down approach, Ernst et al. (2016) contribute to the discussion of the concepts of sustainable urban transformation and urban sustainability transitions, assuming the first (sustainable urban transformation) as a subset of the second (urban sustainability transitions). As key issues to the achievement of urban sustainability, the authors consider both the “poverty, over-population, unhealthy housing conditions, inadequate infrastructure, hygienic problems, poor water quality and uncontrolled pollution in developing countries” as well as the occurring “segregation and growing social tensions, local traffic problems, solid waste generation and the large consumption of energy and material, in developed countries” (ERNST et al., 2016). Some of the characteristics of sustainable urban transformation considered in the work of Ernst et al. (2016), such as being a process of radical change regarding economic, social, cultural, organisational, governmental, and physical aspects, are shared by initiatives like those studied in this research. As seen previously, these initiatives are frequently addressed both in the transition and in the sustainable urban transformation literature, demonstrating the interrelation between these concepts.

The Ecological Footprint,[1] a well-known sustainability metric, can be an important tool to help identifying the extent to which transformations are necessary in the urban context to achieve sustainability. With the aid of this approach, Moore (2015) suggests some lifestyle archetypes of urban dwellers and explores the extension to which transformation would be needed, in the ecological footprint per capita, with regard to: food, buildings, consumables, transportation, and water consumption. Results are striking. Considering the average world patterns of consumption and the earth's capacity to provide natural resources, some of the findings show that "a 73% reduction in household energy use, a 96% reduction in motor vehicle ownership and a 78% reduction in the per capita vehicle kilometres travelled" (MOORE, 2015, p. 4747) would be needed to achieve environmental sustainability.

Some researchers adopt the term 'urban regeneration' to designate the same process that other authors refer to as 'urban transformation' (PETCOU; PETRESCU, 2015, 2018; PETRESCU; PETCOU; BAIBARAC, 2016). For these authors, urban regeneration is seen as an intervention to transform urban areas by the adoption of a sustainable approach, promoting changes in the living conditions of deprived communities. R-Urban, for example, is defined as an initiative aiming at urban regeneration. However, despite being a strategy to deal with persistent sustainability problems in the urban context, urban regeneration "is often driven by motives other than sustainability transformation" (WOLFRAM, 2018a). In this sense, the expression 'urban regeneration' is often used in the literature to refer, for example, to new masterplans for degraded areas, as brownfields, that often regard exclusively commercial areas, and, many times, do not have sustainability as a goal. For this reason, the term 'transformation' was chosen and adopted in this dissertation.

2.1.2 Resilience and Sustainability in Small-Scale Urban Interventions

2.1.2.1 Resilience

"While there is much planners can do to help engineer sustainability, a strong argument can be made, that they might better spend their time planning for ecological failure and the subsequent socioeconomic crash" (REES, 1995, p. 358).

[1] Ecological Footprint is a comprehensive sustainability metric. It was created by Mathis Wackernagel and William Rees, in the early 1990s, as part of Wackernagel's PhD research at the University of British Columbia. Over the years, the Ecological Footprint concept has grown to become a household phrase around the world. The term "footprint" has become synonymous with human behaviour and its impact. Ecological Footprint accounting measures the *demand* on and *supply* of nature. (https://www.footprintnetwork.org/).

Holling (1973) was one of the first authors to disseminate the term resilience, first applied in the 1960s and 1970s in the field of ecology (FOLKE, 2006). Studying the behaviour of ecological systems, he highlighted two conditions: stability and resilience. Stability, in his research, "represents the ability of a system to return to an equilibrium state, after a temporary disturbance", while resilience is "a measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables" (HOLLING, 1973, p. 250).

Since its first application, the term resilience started to be adopted in different fields of knowledge. Folke (2006) analysed the resilience perspective, studying its emergence and development. One interesting aspect pointed out by him is that, besides the well-known feature of resilience, above mentioned, "in a resilient social-ecological system, disturbance has the potential to create opportunity for doing new things, for innovation and for development" (FOLKE, 2006, p. 253).

When applied to the urban context, resilience can be interpreted as a complex and dynamic concept. Urban settlements are exposed to hazards and, as seen in the introduction of this research, climate change is causing an increase in the frequency and intensity of extreme weather events. Considering the high vulnerability of urban settlements, urban resilience has emerged as a key goal to be achieved by cities nowadays. According to Meerow, Newell and Stults (2016), urban resilience can be referred to as:

> "The ability of an urban system - and all its constituent socio-ecological and socio-technical networks, across temporal and spatial scales - to maintain, or rapidly return, to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity" (MEEROW; NEWELL; STULTS, 2016, p. 39).

Urban resilience is a multidisciplinary issue, so that a wide range of stakeholders are involved in building it, including local communities, which requires a holistic view of the city (JABAREEN, 2013; 100 RESILIENT CITIES, 2019).

In the same direction, R-Urban, that, in a short statement, could be identified as "a framework for bottom-up resilient urban regeneration" (PETCOU; PETRESCU, 2018), expands the concept of urban resilience, going beyond the relation between **cities and physical hazards**, by also considering the **economic crisis** as an issue that also demands a **resilient attitude** in the urban settlement context. Besides that, the authors prefer to focus on resilience, instead of

sustainability, arguing that resilience is a more dynamic concept, addressing the idea of transformation and adaptation, before changing circumstances. Sustainability, instead, would not necessarily address the components of change and disequilibrium, being more related to maintaining the *status quo* of a system, through the balance between its inputs and outputs (PETCOU; PETRESCU, 2018).

Hopkins (2008) also emphasises the distinction between the resilience and sustainability concepts, adopting resilience as the key term for his *Transition Handbook*. According to him, resilience would be the only 'protection' against oil dependency, resulting from economic globalisation. In this sense, "cutting emissions without resilience building is, ultimately, futile" (HOPKINS, 2008, p.6). The overall concept for resilience adopted in the book is "the ability of a system, from individual people to whole economies, to hold together and maintain their ability to function in the face of changes and shocks from the outside" (HOPKINS, 2008, p.6).

One example given in the *Transition Handbook,* to illustrate the need for resilience, is the UK truck drivers' dispute in 2000. A parallel can be traced between this occurrence and the Brazilian truck drivers' strike, in 2018 (BBC NEWS BRASIL, 2018): both cases exposed the countries' fragility, when facing a disruption in the supply system, with society on the verge of food rationing and civil unrest.

2.1.2.2 Sustainability

The term sustainability started to be employed widely from the 1980s (TURCU, 2013). According to the author, "'sustainability' and 'sustainable development' have, generally, been defined as an aggregate of characteristics, including: economic security and growth; environmental quality and integrity; social cohesion and quality of life; empowerment and governance" (TURCU, 2013, p. 697). Since the term became widespread, until recent times, the combination of sustainability with urban studies has given rise to a vast literature, which intends to match sustainable development concepts to urban settlements, generating the debate about how to achieve sustainable cities.

Many public policies regarding cities include sustainability among the main targets to be achieved. For example, in the United Kingdom, urban regeneration policies consider sustainability as a goal (PEDIADITI; WEHRMEYER; CHENOWETH, 2006; LOMBARDI et al., 2011). For Lombardi et al., however, as the term sustainability is employed 'as an umbrella' covering different definitions and conceptualisations, the term can be used practically for any

purpose, such as the ‘growth-first’ and ‘develop at almost any cost’, that, according to the authors, remain dominant in the UK. From a case-based research study of the regeneration of Eastside, in Birmingham, the authors verified that “due to a very narrow definition of sustainability, and an approach of technological ‘add-on’ to urban regeneration, with little lifestyle change required, weak sustainability has, in fact, become a ‘fix’ policy in Eastside” (LOMBARDI et al., 2011, p.274). In a similar analysis, Church and Young (2014) wrote about the use of the term ‘sustainability’, declaring that it is used in initiatives ranging from “eco-villages, in rural Wales, to those based around tower blocks, in depressed urban areas” (CHURCH; YOUNG, 2014).

Thus, the concept of sustainability is very broad. When applied to cities, the approach often remains at the “status quo” level or is much more for marketing benefits, than a genuine intention to achieve sustainable development. Therefore, a definition of sustainability and a definition of the sustainable city concept is essential to clarify the ‘borders’ of any work. The idea of lifestyle change, for example, mentioned by Lombardi et al. (2011), is often not present in the debate about sustainable cities, and it is an important point when talking about transformation, the main aim of this research.

Hodson and Marvin (2017) analyse recent shifts in sustainable cities’ discourse and practice, in a critical review of the historical development of the concept. According to the authors, the urban sustainability discourse can be divided into three different periods. The first, represented a period of experimentation, with emphasis on proposal for the use of alternative technologies for energy generation and other environmental concerns, as strategies to overcome limitations to growth, as well as initiatives to stimulate people to become more aware of ecological issues. In the second period, these issues were disseminated by international institutions, focusing the debate on efficiency. From this perspective, the potential benefits of environmentally friendly new technologies for cities have been extensively explored, in order to “improve the performance of urban infrastructures, stimulate innovation and economic growth and, potentially, produce more justice and equitable urban environments” (HODSON; MARVIN, 2017, p. 19-20). Lastly, from the mid-2000s, multiple ecological logics have been developed by networks of cities, policymakers and academics, making the discourse on sustainable cities increasingly fragmented. The authors argue that the sustainable city has been absorbed into these new logics, which are much more narrowly techno-economically focused, and are

squeezing out traditional concerns with social justice and equity. They recognise that those three broad phases overlap, but are not widely accepted as such (HODSON; MARVIN, 2017).

The overall concept adopted in this dissertation is broad and includes all aspects concerning the sustainable cities' discourse, with basis on the widely known three pillars of sustainable development (ROBERT; PARRIS; LEISEROWITZ, 2005; UNITED NATIONS, 2015): economic, social and environmental. Some also includes the cultural dimension, as a fourth pillar (HAWKES, 2001), in which this dissertations is also based, and the governance aspect. This broad approach is the one adopted by the previously mentioned United Nations 2030 Agenda for Sustainable Development, one of the most important documents on sustainable development, which, very appropriately, has in its title the expression *Transforming our World*. Its 17 sustainable development goals (SDGs) and 169 targets, embrace issues, ranging from the eradication of poverty, considered the greatest global challenge, to the promotion of peace and justice, including goals related to food, education, energy, gender equality and environmental protection, among others. More specifically related to urban settlements, the document states that "sustainable urban development and management are crucial to the quality of life of our people", and the signatory countries commit to "work with local authorities and communities to renew and plan our cities and human settlements so as to foster community cohesion and to stimulate innovation and employment". Also, "the reduction and recycling of waste and the more efficient use of water and energy" are advocated as a means to reduce the environmental impact of urban settlements (UITED NATIONS, 2015, p. 9).

In accordance to the broad notion of sustainability, this research also seeks to contribute in the construction of a stronger sustainability, that certainly will require changes in our current way of living in cities. More specifically, it explores the notion of sustainable communities, focusing on initiatives, at the local level, with the potential to foster communities transformation towards sustainability. This idea is addressed by Connelly, Markey and Roseland (2011), when analysing two local food initiatives in Canada. They work with the notion of 'sustainable community development', which means applying the sustainable development concept at the local level, and advocating the connection between sustainability and social economy, in such a way to foster community transformation. This proposal would represent an attempt to respond to the failure of mainstream economic growth, in integrating environmental and social concerns, that resulted in the major crisis that humanity is facing nowadays, comprising: climate change, increasing social exclusion and rising inequality. The authors explore local initiatives with the

potential to “bring more environmental considerations into the social economy and use the social economy to advance equity concerns within sustainability” (CONNELLY; MARKEY; ROSELAND, 2011).

2.1.2.3 Why Resilience and Sustainability

The debate around the concepts of resilience and sustainability, in communities, is an open question. For some authors, resilience is part of the sustainable communities’ agenda and has gained increasing importance in the last decades (BARR; DEVINE-WRIGHT, 2012). The R-Urban and the Transition Movement, for example, go further and adopt just the term resilience, instead of the term sustainability, because the authors consider that resilience is a more dynamic concept, as sustainability does not include the issues of change and adaptation. Considering this trend in the application of the terms, “one could be forgiven for assuming that sustainability has been comprehensively overtaken by the language, if not substance, of resilience” (BARR; DEVINE-WRIGHT, 2012, p. 527). But the authors understand that the use of "resilience", as a term, is part of a set of changes, that have taken place in the context of local sustainability, in recent decades, that represent emerging transitions in the sustainability of communities.

Within the purpose of developing a framework for the classification and assessment of small-scale transformation initiatives, this research adopts both the terms resilience and sustainability. While recognising different interpretations, this work assumes that resilience and sustainability constitute different features of a system and may be complementary. Indeed, the idea is that resilience and sustainability could be both the goals for communities aspiring for transformation, since an urban settlement can be resilient but not sustainable, just as it can be sustainable but not resilient. In this sense, a less common approach to urban resilience understands that unsustainable urban systems may be resilient, which explains why some sustainable initiatives often fail to achieve significant change towards sustainability. The undermining of this resilience must be attained by urban strategies aiming at the transformation of cities (RADYWYL; BIGGS, 2013).

Thereby, a resilient community is the one capable of implementing changes, adaptations or transformations, which requires being creative when facing environmental, economic or social disturbances. These qualities mean returning to the normal operating, or finding new ways of operating when circumstances require. A sustainable community, in turn, is one whose environmental impact is, at least, within the limits that the planet can support, besides operating

with socioeconomic justice, and cultural vitality and respect. Citizens must participate in the community management and assume their own responsibility for achieving the expected functioning of the system.

2.2 INITIATIVES

"The only possible way to think about radical change in society is within its interstices" (HOLLOWAY, 2006). This statement matches the idea that permeates small-scale initiatives that aim to achieve radical change or transformation in urban settlements. Besides physical interstices in the built environment, the scope for that kind of action is also composed of interstices in economic cycles, political action and periods of time.

At the same time, cities are continuously changing and, as expressed by Lyle (1994), regarding the regenerative approach to community planning, it is not unusual to identify cities going through decline and regeneration processes. This urban pattern allows one to think of cities dynamically, and gives the opportunity to replace old parts with new ones, planned to be regenerative (LYLE, 1994). The connection of these two visions, taking advantage of empty spaces in the urban fabric or economic, political and temporal interstices, and regenerating obsolete or degraded parts of cities, provides a fertile field for interventions, that aim to make cities and communities more resilient and sustainable. In addition to these kinds of interventions, a series of initiatives do not necessarily interfere or change the common urban space and may comprise: interventions in the private properties; the use of common areas for activities, such as workshops and other; activities developed by the dwellers in their own houses, such as homemade products or repairing services; or even initiatives that do not manifest themselves in the spatial dimension, such as the implementation of local currency.

2.2.1 Literature on Initiatives

The existing literature about small-scale initiatives, aiming at communities' sustainability and resilience, addresses mainly cases in developed or post-industrial countries (FORREST; WIEK, 2014). With reference to the British context, Forrest and Wiek (2014) suggest that "while initiatives are in many ways a response to the effects of neoliberalism, as experienced in post-industrial countries, they are enabled by policies of neoliberalism that further roll-back the state and push responsibilities onto communities and individuals" (FORREST; WIEK, 2014, p. 68-69). The 'standard case' in developed countries often focuses on middle-class communities concerned about climate change, promoting initiatives to reduce their environmental impact.

Of course, this is a simplification, and there is a range of different experiences, contexts and degrees of complexities. In developing countries, or at least in Brazil, the lack of examples, in the same proportion, with characteristics similar to the above referred, whether in the literature or found in an internet search, gives the idea that the Brazilian middle class is still not aware of the seriousness of climate change and of the urgency to take actions to tackle with the problem. However, there are examples, such as those described in 2.2.5, and a significant part of them concern initiatives in disadvantaged communities. Considering that several of the initiatives have the potential to reduce expenses and/or generate income for the participants, it is perfectly understandable that this research has identified a larger number of initiatives among the Brazilian low-income population than among the middle and upper classes.

Researches developed in several countries address initiatives with a variety of approaches, as well as a variety of terms and concepts that are used to refer to them, sometimes generating specific fields of study. For example, 'Community-based Initiatives (CBIs)' (CELATA; SANNA, 2014), 'Local Sustainability Initiatives' (PESCH; SPEKKINK; QUIST, 2019), 'Grassroots initiatives' (SEYFANG; SMITH, 2007; WOLFRAM, 2018b), 'grassroots and domestic green practices' (LEWIS, 2015) are some of the terms frequently employed to refer to small-scale initiatives related to community sustainability and resilience.

By analysing community-based initiatives (CBIs), as a means to boost sustainable regional transitions, Celata and Sanna (2014) propose a methodological framework for the assessment of a wide range of initiatives, with the aid of a set of indicators, in the areas of: food, transport, waste and energy. The authors carried out an extensive literature review focused, mainly, on the food domain, about the impacts of the initiatives regarding its social, economic, political and technological dimensions. The work considered, as community-based initiatives:

> All those collective actions initiated and managed by communities, i.e. any group of individuals - not necessarily located in proximity - who feel that they share something in common, be that a connection through interest, place, lifestyle, culture or practice, and self-organized in order to deliver some benefit to its members, to engage in socially innovative activities, and to reduce environmental impacts, by committing their time and/or sharing their resources and/or implementing projects which serve the community. These initiatives may have received public money, but are not managed by public authorities; they may be not-for-profit as well as for profit; but their revenue-model should serve the community (CELATA; SANNA, 2014, p.4).

There is a great diversity of CBIs, and their objectives can also be very diverse and, sometimes, divergent. The aim of several initiatives is the reduction of environmental impacts and the

promotion of more environmentally sustainable forms of urban life. Specifically, in the social dimension, CBIs have a variety of aims, generating consequent social effects, such as enhancing social capital within the community. This social capital can be interpreted as connections among individuals and the promotion of social inclusion, potentially contributing to the community's social equity and social justice (CELATA; SANNA, 2014).

The political dimension of CBIs is related to the involvement and participation of individuals in these community actions. This "participation and civic engagement is the foundation of a strong democracy" (CELATA; SANNA, 2014, p.12). In addition, initiatives are an opportunity to promote the empowerment of the participants, enhancing their capacity to act politically. Finally, the political dimension is also expressed in the way initiatives relate to external stakeholders, such as other initiatives and organisations, and in the extent to which they have, or do not have, some external support (CELATA; SANNA, 2014).

Similarly to the social dimension, CBIs can also present a number of different economic aims and effects. As they have the potential to result in financial savings to the participants, or positively affect their income, the initiatives directly impact their economic situation. This improvement in the individual's and household's financial situation generates, in turn, indirect effects, which means allowing them to spend money on other necessities or preventing them from getting indebted. Initiatives also have the potential to generate an impact in the local economy, once they can, for example, leverage local production, commerce and services, thus contributing to the circulation of money in the local economy. Another economic dimension of CBIs is related to their financial sustainability or viability. In this sense, despite not requiring any substantial investment, in most cases, and tending to have low running costs, the economic sustainability of CBIs "can be difficult, given that most initiatives are not-for-profit" (CELATA; SANNA, 2014, p.23).

The last dimension of CBIs addressed by Celata and Sanna (2014) is the technological/innovative dimension and its consequent impacts. This field of study related to 'grassroots innovations' is gaining increasing attention in the literature, and studies have been developed to investigate the engagement of grassroots organisations in innovation processes. In this sense, Seyfang and Smith (2007) proposed to bridge two policy strands, regarding the UK's sustainable development strategy, that used to be addressed separately in the literature: 'ecological modernization and technological innovation' and 'community action and the social economy'. By bridging these two strands, the authors proposed a theoretical approach,

identifying the grassroots as important innovation sites towards the achievement of sustainability (SEYFANG; SMITH, 2007).

Seyfang and Longhurst (2014) point out that "these 'grassroots innovations' are formed in response to unsustainable mainstream systems, and aim to build and promote alternative systems of provision, to enable more sustainable forms of production and consumption" (SEYFANG; LONGHURST, 2014, p. 2). For Seyfang and Smith (2007), 'grassroots innovations' are "networks of activists and organisations, generating novel bottom-up solutions for sustainable development; solutions that respond to the local situation and to the interests and values of the communities involved" (SEYFANG; SMITH, 2007, p. 585). Operating in civil society arenas, where activists are committed to experimenting with social innovations and using greener technologies, these initiatives are radically different from mainstream businesses. Thereby, grassroots innovations have completely different characteristics from business innovation or market-based innovations, as shown in Figure 3:

Figure 3 - Comparing the characteristics of market-based and grassroots innovations.

	Market-based innovations	Grassroots innovations
Context	Market economy	Social economy
Driving force	Profit: Schumpeterian rent	Social need; ideological
Niche	Market rules are different: tax and subsidies temporarily shelter novelty from full forces of the market	Values are different: alternative social and cultural expressions enabled within niche
Organisational form	Firms	Diverse range of organisational types: voluntary associations, co-ops, informal community groups
Resource base	Income from commercial activity	Grant funding, voluntary input, mutual exchanges, limited commercial activity

Source: SEYFANG and SMITH (2007)

The technological/innovative dimension of CBIs comprises both technological and social innovation. In general terms, technological innovation can be described as the use and/or development of new sustainable technologies by local initiatives (PESCH; SPEKKINK; QUIST, 2019). Social innovations, in turn, are not related to the creation of technical artefacts, but to social practices (HOWALDT; SCHWARZ, 2010; CELATA; SANNA, 2014). This means that social innovations "don't result in tangible (technological or productive)

improvements, but in a change of attitudes, behaviour, social practices or forms of organization" (CELATA; SANNA, 2014, p. 34).

The topic of sociotechnical innovation in small-scale initiatives is also addressed by Pesch, Spekkink and Quist (2019). The authors denominate these initiatives as 'Local Sustainability Initiatives' and explore the development of sustainable technologies, under the perspective of sociotechnical innovation, combined with civic engagement, in order to prevent initiatives from being excessively instrumental – or, on the other hand, in ignoring the importance of technology and innovation. For the authors, most of the existing literature, when referring to the transition of communities to sustainability, focus on the social, political or economic aspects, and fail to look at the potential of initiatives in leveraging the use and development of sustainable technologies (PESCH; SPEKKINK; QUIST, 2019).

An approach widely used in the literature, when addressing grassroots innovations, is one which studies 'niches' (SEYFANG; SMITH, 2007; RYAN, 2013; CELATA; SANNA, 2014; SEYFANG; LONGHURST, 2014; WOLFRAM, 2018b; PESCH; SPEKKINK; QUIST, 2019). Seyfang and Longhurst (2014) understand niches as "spaces which shield experimental projects with radical innovations from too harsh selection pressures from incumbent regimes" (RAVEN, 2012 apud SEYFANG; LONGHURST, 2014, p. 3). Connecting to the topic of this research, many small-scale resilient and sustainable transformation initiatives can be part of the process of niche formation, development and acting. These niches are referred to in the literature in various ways, such as 'grassroots niches', 'innovative niches' and 'green niches', as sites for innovative bottom-up experiments and interventions.

2.2.2 The meaning of 'Initiatives' in this research

Considering the diversity of approaches in which the term 'initiatives' is used, a clear definition of what it means is fundamental. For this research, initiatives are actions and interventions carried out in existing urban settlements and communities, on a neighbourhood scale, through a bottom-up approach, with a low budget and a strong community engagement. Such actions and interventions must lead to positive environmental, social, economic or cultural impacts, bringing benefits to the community members and to the community itself, contributing to the transformation of the urban settlement into a more resilient and sustainable system. The initiatives can be individual or collective; however, even individual actions must be initiated and managed by the community, or with the participation of the community, with or without external support, and must also be targeted at collective benefits. Most initiatives have a

physical-spatial dimension, manifesting themselves by means of interventions in the urban fabric or in private properties, or with the use of existing public and private spaces for individual and collective actions. Examples of this type of initiatives are: rainwater harvesting; community gardens; guerrilla bike lanes; and professional workshops. However, some initiatives may not manifest themselves in the physical-spatial dimension, such as: local currency; community radio and storm alerts. Actions in the health sector or curricular education are not considered as being initiatives for the purpose of this research.

The overview on 'initiatives' provided in this sub-section reinforces the idea of the theme's interdisciplinarity, mentioned in the introduction as one of the features and limitations of this research. Hence, a vast and heterogeneous set of small-scale initiatives comprised the subject of this sub-chapter. Some movements, frameworks or projects, that encompass a wide range of actions in their scope, as well as initiatives developed in isolation, were investigated; and, in the following sub-sections, a description and analysis of these examples will be carried out.

2.2.3 Transition Movement

Transition is a widely employed concept associated to the notion of radical and structural change. The term is connected to the goal of achieving sustainable development and recently started to be applied to the urban context, giving rise to a new field of studies (NEVENS et al., 2013).

The Transition Movement "is about communities stepping up to address the big challenges they face by starting local" (TRANSITION NETWORK, 2016, p. 8). First denominated "Transition Towns", when it started, in 2005, in the city of Totnes, UK, by Hob Hopkins (BRANGWYN; HOPKINS, 2008; SMITH, 2011), the movement is currently associated with 962 initiatives and 27 hubs, registered on the website https://transitionnetwork.org. The "grassroots" initiative was also identified as being present in 43 countries, by September 2013 (TRANSITION NETWORK, 2019) and is composed of individuals organised as transitions groups/initiatives or transition hubs, constituting the Transition Network.

The publication *Transition Handbook: From oil dependency to local resilience* (HOPKINS, 2008) is about the foundation of a movement, which the author believes may turn out to be "one of the most important social, political and cultural movements of the 21st century". Its aim is to propose a large variety of pathways, based on resilience building, in response to peak oil,

climate change and the questioning of the current economic model (HOPKINS, 2008; SMITH, 2011).

The Transition Movement is focused on promoting possible solutions to these challenges, at the local level, asking communities to work together in a creative, playful and effective way, arousing their motivation and leveraging their knowledge, instead of waiting for governments to act. A central idea in the movement is the concept of relocalisation, which means to think about local production, local distribution and local consumption, freeing communities from being overly dependent on the global economy. Permaculture principles are among the most important intellectual influences in such movement, as Rob Hopkins, himself, is a permaculture teacher (BRANGWYN; HOPKINS, 2008; HOPKINS, 2008, 2011; SMITH, 2011; FEOLA; NUNES, 2014; LO, 2017).

According to Hopkins, Transition can be achieved by "rebuilding local agriculture and food production, localising energy production, wasting no people, rethinking healthcare, rediscovering local building materials in the context of zero energy building, rethinking how we manage waste" (HOPKINS, 2008). The movement is managed by the Transition Network, which supports, inspires and encourages people and communities, providing guidelines for transition, training and consultancy, for those who intend to be part of the movement, besides promoting the exchange of knowledge and learning, among existing local initiatives (BRANGWYN; HOPKINS, 2008; HOPKINS, 2008; FEOLA; NUNES, 2014; TRANSITION NETWORK, 2016). Figure 4 illustrates the meaning of a community in transition.

Figure 4 - The Essential Guide to Doing Transition Cover, showing a community in transition.

Source: TRANSITION NETWORK (2016)

Anyone who wants to take action can join the movement and is invited to establish official transition initiatives, which means: following the Transition Model principles and practices to promote change. These principles and practices are flexible, once built over time, and are based on the experience of transition in real communities. A set of criteria was established, and is in permanent development, to evaluate how ready the community is to begin its own transition. As stated in the Transition Initiatives Primer, "these criteria certainly aren't written in stone" (BRANGWYN; HOPKINS, 2008). The Transition Model proposes 12 steps for achieving transition, to guide communities to succeed in their transition initiatives. These steps are not prescriptive; they can be adapted by communities, once they were built through observation and seen as critical points in the experiences observed. A similar application is envisioned by the Model for seven essential ingredients and some suggested tools developed to guide the transition (BRANGWYN; HOPKINS, 2008; HOPKINS, 2011; FEOLA; NUNES, 2014; TRANSITION NETWORK, 2016).

Among the initiatives developed within the scope of the Transition Movement are: local currency; community photovoltaic solar panels; individual photovoltaic solar panels; community wind turbines; community gardens; and local entrepreneurism, comprising local production, commerce and services (BRANGWYN; HOPKINS, 2008; HOPKINS, 2008, 2011; TRANSITION NETWORK, 2016).

The Transition Movement is a widespread grassroots network, and one of its remarkable qualities is its capacity to inspire people worldwide. However, despite findings that show that "the majority of the transition initiatives considered themselves at least fairly successful" (FEOLA; NUNES, 2014, p. 246), it is not clear how effective the initiatives are – or, in other words, "if grassroots innovations can be successful in responding to climate change" (FEOLA; NUNES, 2014, p. 232). In fact, considering that each initiative has its particular characteristics, the type of action and its comprehensiveness may vary a lot.

Some other limitations have been identified in the Transition Movement. According to Lo (2017), one of these limitations would be the difficulty of implementing transition initiatives in large cities, once the relocalisation concept works better in small towns. In metropolitan areas, the movement has been implemented on the neighbourhood scale, in a fragmented way, usually with no connection among transition groups (LO, 2017). For the author, in large cities it is also more difficult to implement an alternative approach in face of the dominant urban policies.

Another limitation underlined is that the movement is seen as a middle-class issue (BARR; DEVINE-WRIGHT, 2012; LO, 2017) and "despite its attempts to be inclusive, the movement is mainly driven by white middle-class values, while disadvantaged communities are very much under-represented" (LO, 2017, p. 45). For Barr and Devine-Wright (2012), another point to be considered is the degree to which radical changes take place in communities engaged in the movement. It would be an illusion to think that most of the people involved, would radically change their lifestyles to sustainable ones; most participants would, instead, continue to maintain their consumption pattern (BARR; DEVINE-WRIGHT, 2012). For the authors, people with an ecological mentality and concerned about being resilient still are a minority.

Furthermore, being a movement based on local change, on the scale of neighbourhood, town or city, or even on schools or other spaces on the building scale, where groups of people can make change happen, the direct relation between the initiatives and the built environment or the urban fabric is clear. It means that transition involves intervention in the space. This vital aspect seems to be overlooked by the Transition Movement, representing a field to be explored by researchers.

2.2.4 R-Urban

R-Urban is defined as "a framework for bottom-up resilient urban regeneration", developed by an interdisciplinary research and design office based in Paris, called Atelier d'Architecture Autogérée (aaa), from 2008 (PETCOU; PETRESCU, 2015, 2018; PETRESCU; PETCOU; BAIBARAC, 2016). The context of the financial crisis of 2008 was crucial for the understanding that a radical change was necessary, for both political, economic and ecological aspects of society. From this outlook, the initiative "emerged in response to the slow pace of governmental procedures and lack of consensus in further addressing the challenges of the global crisis and evaluating their consequences for people's lives" (PETCOU; PETRESCU, 2018, p. 60). 'Resilience' is the term that represents the primary goal of the strategy, because, according to the authors, it has a transformative, besides an adaptative, quality. Transformation is advocated by the strategy as necessary, not only in the urban context, but also in the social and political domains, through societal change and political emancipation of the participants, aligned with the aspiration for environmental sustainability. R-Urban does not propose to achieve this transformation by creating a new model of city, but dealing with the challenges faced by existing cities, as the result of the "collapse of modern urban ideals and their many

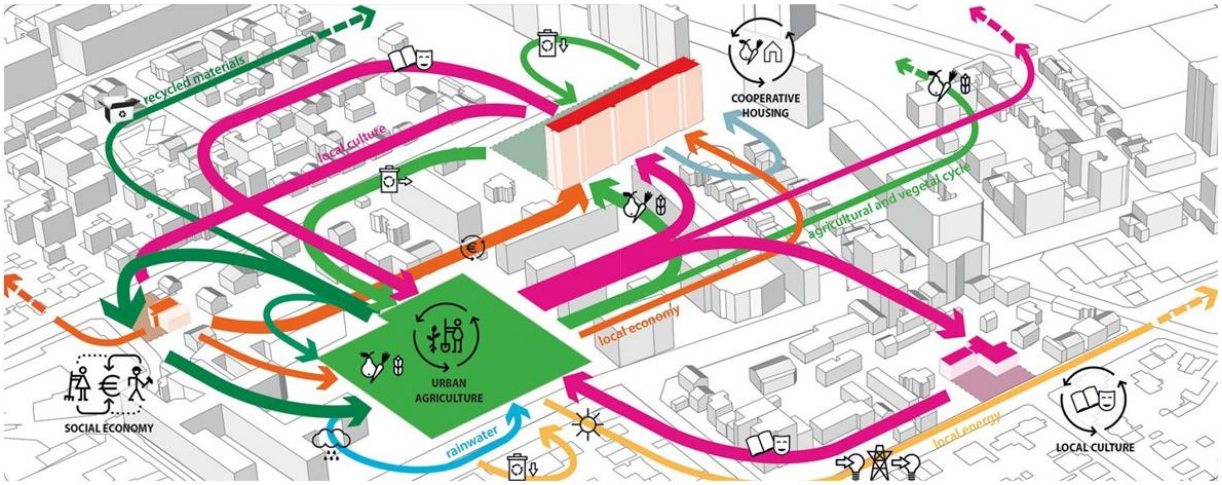
failures in addressing the future" (ATELIER D'ARCHITETURE AUTOGÉRÉ; PUBLIC WORKS, 2015, p.21).

R-Urban strategy is based on three main principles: networking, participation and circularity. These principles appear clearly in the functioning of the framework. The initiative operates through a network of 'civic hubs', which are collective spaces, self-managed, providing infrastructure for economic, ecological and cultural activities. The civic hubs are also the scene for "everyday life productive practices, such as food growing, cooking, beekeeping, repairing, recycling, compost making and community energy production, that contribute to boosting resilience in an urban context" (ATELIER D'ARCHITETURE AUTOGÉRÉ; PUBLIC WORKS, 2015; PETCOU; PETRESCU, 2018). The network can be composed of new or existing civic initiatives, conducted by local organisations or individuals, through the collective hubs.

A key concept on which R-Urban is centred is co-production, which means the engagement of multiple stakeholders in the process of designing and building infrastructure for resilience production. Architects, planners, designers, researchers, civil society, municipalities and public organisations work together in proposals, where professionals "play an active role as initiators, facilitators, mediators and consultants" (PETCOU; PETRESCU, 2018) in the project, fostering community participation. Through participation, citizens also play an active role in the task of changing the city and, concomitantly, of changing their lifestyles. The initiative emphasises the importance of existing social capital in neighbourhoods, and every citizen can get involved, if he or she so desires, in many different ways (ATELIER D'ARCHITETURE AUTOGÉRÉ; PUBLIC WORKS, 2015; PETCOU; PETRESCU, 2018).

The circularity of the strategy is achieved by applying the concept of locally closed ecological circuits, which is also related to the notion of circular economy. Thus, practices such as composting, collection and use of rainwater, filtering and reuse of greywater, waste recycling or reuse, and energy production, are linked to urban agriculture and heating systems, for instance. With the same purpose, production and consumption of local products are encouraged (ATELIER D'ARCHITETURE AUTOGÉRÉ; PUBLIC WORKS, 2015; PETCOU; PETRESCU, 2018). Figure 5 illustrates the key principles of R-Urban:

Figure 5 – Diagram showing R-Urban ecological principles.



Source: PETCOU; PETRESCU (2018)

Until recently, only two R-Urban projects were implemented: one was first developed in Colombes, a suburban town in the Paris area, and the other in the Hackney Wick area, in London. The two civic hubs that constituted R-Urban Colombes, Agrocité and Recyclab, had to be relocated due to political opposition and were rebuilt in the communes of Gennevilliers and Nanterre, in Paris. The characteristics of the two implementations are different, due to their particular contexts. R-Urban strategy was conceived to be applied in communities based in urban and suburban contexts, at the neighbourhood scale. The aim is that the network can "progressively scale up at the city and region level" (ATELIER D'ARCHITETURE AUTOGÉRÉ; PUBLIC WORKS, 2015).

A series of initiatives were planned to be developed in the two hubs in R-Urban Colombes, in the hub in R-Urban Wick, and are envisaged within the framework's scope. Some examples are: compost-powered heating; rainwater harvesting; phytoremediation; recycling hub; aquaponic gardening; micro-farm; collective gardens; local commerce (specifically, market and café); repairing; and small 'Do it Yourself' sessions; training and skills development/workshops in wood, metal and textile work, manufacture and assemblage of components for green buildings and co-working; eco-construction hub; cooperative eco-housing hub; car-sharing; use of local building materials, such as reused windows; use of sustainable materials, such as cladding systems issued from eco-construction and straw for insulation; building with reused of materials, such as recycled brick drying panels; and recycling and transforming locally salvaged materials into eco-construction elements for self-building and retrofitting (ATELIER D'ARCHITETURE AUTOGÉRÉ; PUBLIC WORKS, 2015).

In order to support the initiative implementation in other locations, the framework has elaborated principles and protocols, included in the 'R-Urban Charter'. The charter states that "The main R-Urban objective is to enable citizens to fight against Climate Change, by assembling competences, enabling collective practices of urban resilience, through civic networks and locally closed circuits" (ATELIER D'ARCHITETURE AUTOGÉRÉ; PUBLIC WORKS, 2015, p. 96). The charter invites citizens, institutions, professionals, and municipalities, among others, to join the initiative, both by connecting new projects to the existing networks or initiating new projects in other neighbourhoods, cities or even other countries. People can join the Charter, as project leaders interested in establishing new units, or just as members, interested in participating and supporting emerging units. In general terms, joining the Charter as a project leader allows getting the support of other members, in many aspects where the acquired knowledge can help to implement new R-Urban units (ATELIER D'ARCHITETURE AUTOGÉRÉ; PUBLIC WORKS, 2015).

Therefore, R-Urban is an inspiring experience, that aims to bring many benefits for the communities involved and contribute to the world challenges of facing climate change and resources depletion, besides economic crisis. The literature produced by the authors of the project provides some data about the improvements achieved by the already existing initiatives, regarding many ecological/environmental parameters. Compared with the standards, the results are very positive. They were summarised in the statement given in the R-Urban Charter, that states that "drawing on the skills and knowledge already acquired, we could reduce, on average, by 40% the carbon footprint of each of us, and by 50% our CO_2 emission" (ATELIER D'ARCHITETURE AUTOGÉRÉ; PUBLIC WORKS, 2015).

Being an initiative aiming to co-produce urban resilience based in commons, the places where R-Urban activities have been developed are neither public, nor private; the facilities are shared, and the practices are collective. The land is used by the community, that does not have, however, its ownership. This condition involves taking advantage of available interstices in the urban fabric, but this availability is, in general, temporary, thus depending on political negotiations and on the real estate market interests. Being at the mercy of such external interests is a controversial aspect of the project because, although the use of temporarily vacant land allows the development of a series of community activities, the risk of discontinuity becomes high, when the objective is to carry out a long-term activity. In R-Urban Colombes, this was a vital issue. After few years of the initiative's implementation, the newly elected Mayor did not

support the project. Therefore, he requested the demolition of the two hubs, forcing Agrocité and Recyclab hubs to be relocated and rebuilt in another place. Most of the information available about R-Urban, in France, is related to R-Urban Colombes. There is little information about the relocation process of the Hubs and their functioning in the new location, the Parisian communes of Gennevilliers and Nanterre. Furthermore, there is no report on how the community of Colombes, which was involved in the initiative, reacted to the change, and if they are still part of R-Urban or of another similar project.

Still related to the uncertainty of the continuity of this kind of project, a point to be commented on is that the author of this research tried to contact R-Urban Wicks, in London, via its email address on the initiative's website, to try booking a visit, but received no response. This situation may raise doubts about the perfect functioning of R-Urban Wicks, in the way it was conceived.

In terms of scientific knowledge, the lack of a clear and detailed method on how to plan, negotiate, implement, manage and evaluate such kind of intervention is a gap in the project. Actually, information about these steps is available, but it is not expressed in a structured way. A tool, such as guidelines, a road map or a well-structured framework, for example, would be very useful for those intending to carry out a similar project inspired by R-Urban.

2.2.5 Other International Cases

This section explores specific features of some other selected international movements, frameworks, projects and initiatives, that are considered relevant for the scope of the research. These examples are not described in detail; so, an overview of these initiatives is provided, and some relevant aspects are pointed out. It is important to highlight that an investigation and systematisation of small-scale resilient and sustainable initiatives worldwide was carried out, to achieve the research aim and research objectives. Most of the systematised initiatives were extracted from the examples referred above and from those described in the following pages.

2.2.5.1 Eco-Acupuncture

Eco-Acupuncture is a framework developed by a research unit in Melbourne, Australia, which "focuses on multiple small interventions in an existing urban precinct, that can shift the community's ideas of what is permissible, desirable and possible, and provide transformation points for a new trajectory of development to a resilient low-carbon future" (RYAN, 2013, p. 189). The process comprises niche interventions in existing communities, in response to climate

change, based on the co-creation of future visions for a better urban life. The framework also adopts the idea of transformation and radical change, concerning production, distribution, and consumption systems, through sociotechnical innovations.

Some initiatives proposed by Eco-Acupuncture are: training and employment "incubators"; food festivals and cultures; recreational activities; wetlands, using rainwater collected from the roofs of factories; 'food corridors', with community gardens, food markets and community cooking facilities; aquaculture (fish and vegetable production) in an abandoned school; eco-innovation training centre, 'men's shed' and a new business incubator, in an abandoned factory; bike lanes to connect to the other interventions; and expansion of school-based and community-based vegetable gardens (RYAN, 2013).

2.2.5.2 Ashton Hayes

Ashton Hayes, a village in the UK, started a carbon-neutral programme, in 2006, as an initiative of the community itself. The programme is about people and the community aiming to reduce their carbon footprint, through saving energy and using renewable energy to become England's first carbon-neutral village. The programme also aims to look for solutions that can absorb, or offset, remaining emissions, which could be obtained through planting trees, which would act to sequester carbon, or promoting renewable energy projects in the village. The community was supported by the University of Chester, which assessed and calculated the village's carbon footprint and mapped the biodiversity across the parish (CHARNOCK; ALEXANDER, 2006; FORREST, 2011; FORREST; WIEK, 2014). Based on the experience of the community, 'A Practical Toolkit for Communities Aiming for Carbon Neutrality' was developed by Ashton Hayes Parish Council, to help other communities, that have similar goals, to adopt and implement a carbon-neutral policy (CHARNOCK; ALEXANDER, 2006).

Aligned with the carbon-neutral programme aims, the initiatives in the village of Ashton Hayes include: Individual solar thermal panels; Individual wind turbines; and Green Urban Infrastructure, represented by trees, shrubs and greenery (CHARNOCK; ALEXANDER, 2006; FORREST, 2011; FORREST; WIEK, 2014).

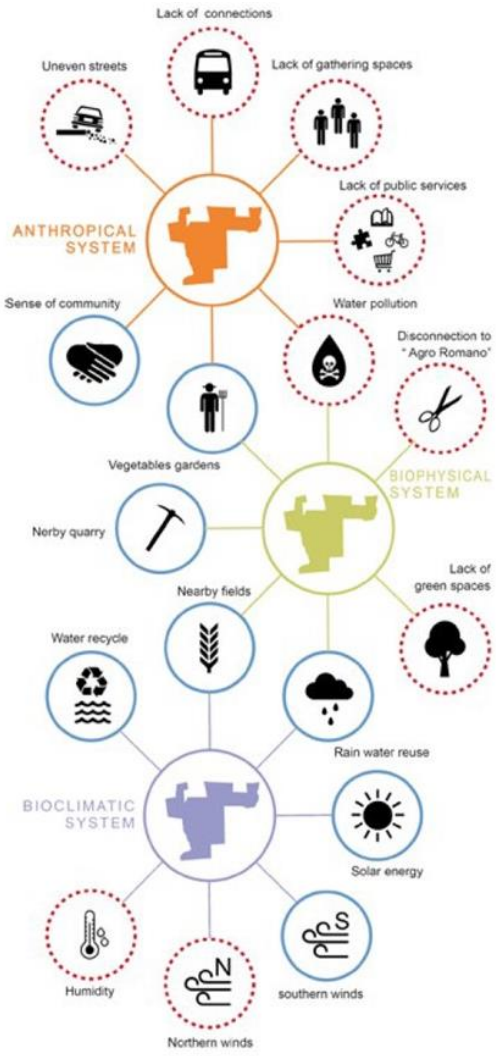
2.2.5.3 Tragliatella

Tragliatella is an area in the outskirts of Rome, where unauthorised residential settlements were the object of an experimentation, via a project developed by the Department of Planning, Design, Technology of Architecture, of Sapienza University of Rome (CANGELLI, 2018). The

project proposes a methodology for the urban regeneration of the settlements, which lack "primary urbanization works and essential services" and require "redevelopment processes in order to ensure their liveability" (CANGELLI, 2018, p.150). The regeneration strategies are not limited to the energy performance of the dwellings, but also comprise all environmental parameters related to the urban settlement, in order to rebalance the flow of system resources and between the system and the city, through analysing aspects, such as: soil permeability; heat island effect; micro-climatic comfort in outdoor spaces; among others (CANGELLI, 2018).

To support the project development, a qualitative and quantitative analysis of the anthropical, biophysical and bioclimatic systems, that characterise the territory, was carried out, identifying the strengths and weaknesses of the area (CANGELLI, 2018). Figure 6 shows a diagram with a summary of this analysis.

Figure 6 – Strengths and weaknesses identified in the area object of study.



Source: CANGELLI (2018)

The project developed for the area comprises a masterplan, and some initiatives could be extracted from the work, to provide examples for this research. These initiatives correspond to the proposition of watercourses along the sides of roadways; community gardens; research centre on agriculture and food; and aggregation spaces throughout the urban fabric, such as squares, small gardens and playgrounds for children.

2.2.5.4 Bologna

An area in the historic city centre of Bologna is the demonstration case of the work developed by BOERI et al. (2017), which addresses a methodology for the enhancement of resilience in the area. The work has a particularity, that is to focus on an urban historical context, characterised by a heritage fabric of high value. This context determines the proposal, which is the transformation of the area "into a low-carbon cultural and sustainable historic district" (BOERI et al., 2017, p.233). Among other activities, the most important is the conception of 'Living Labs on Cultural Heritage', introducing here the concept of 'Urban Living Labs' (BULKELEY et al., 2016; BOERI et al., 2017), present in the literature related to the theme of making cities more sustainable. Urban Living Labs are "sites devised to design, test and learn from innovation in real-time, in order to respond to particular societal, economic and environmental issues in a given urban place" (BULKELEY et al., 2016, p.13), where multiple actors work together in the entire process, within a co-creation approach. This is the case of the 'Living Lab on Cultural Heritage', in Bologna, aiming to promote "the co-design of a cultural district in the historic city, intended as a sustainable model of horizontal integration, that leads to culture-driven forms of local economic and social development" (BOERI et al., 2017, p. 235).

Examples of permanent and temporary initiatives planned in the intervention in the historic city centre of Bologna include: carbon-neutral cultural events; slow mobility; sustainable approaches for heritage-led regeneration; and green and blue infrastructure.

2.2.5.5 Ludwigsburg and the 'Transition Management' Approach

This literature review has addressed a number of theoretical approaches, that have been developed in the last decades, in the literature on sustainable and resilient urban contexts, bringing many different concepts to the discussion. Some of these approaches and concepts have been analysed and described in more detail, once they are considered aligned with the

topic of this research, and some have been mentioned more briefly, to contextualise the discussed idea.

In order to address the case of Ludwigsburg, it is necessary to introduce one more approach to the debate: 'Transition Management' (FRANTZESKAKI et al., 2018b). In general lines, Transition Management is "a theoretical and methodological framework that offers operational guidance on how to set up dialectic/engagement processes for change-oriented interventions in complex adaptive societal (sub-)systems" (FRANTZESKAKI et al., 2015).

The framework aims to orientate a transition of cities and neighbourhoods towards more sustainable urban environments. The basic assumptions and guiding principles of the approach are co-creation, learning, flexibility, and long-term thinking. The book *Co-creating Sustainable Urban Futures: A Primer on Applying Transition* (FRANTZESKAKI et al., 2018b) is a primer on managing the transition process in cities, describing the specificities related to the design and analysis of participatory co-creation processes for change-oriented interventions, and presenting five real cases of Transition Management, one of which is in the city of Ludwigsburg.

In Ludwigsburg, the framework's application occurred in a context where the city already had its strategies and programmes aiming at sustainability, with established participatory processes and a city department to deal with the topic. As a result, the transition management process worked more as a complementary process to the one already established (HÖLSCHER; WITTMAYER, 2018). As with the Transition Management approach, the considerations made by Hölscher and Wittmayer (2018), on the process carried out in Ludwigsburg, would need an extensive reflection to be wholly explained here, but this is not the focus of this research. Instead, some contributions to this research, associated to the Transition Management approach and its case studies, are described in Chapter 3. Besides that, some systematised initiatives of interest for this research were extracted from Ludwigsburg's experience, including: car-sharing; e-bikes; and exchange of used books (HÖLSCHER; WITTMAYER, 2018).

2.2.5.6 Ecovillage Movement

As is the case of the Transition Movement, Ecovillage is a worldwide movement led by the Global Ecovillage Network (https://ecovillage.org/). Currently, there are around 10,000 communities and related projects worldwide, integrating the network, with some projects and communities registered both in the Transition and in the Ecovillage networks. Jackson (2004)

refers to some statements made regarding the Ecovillage Movement, which consider it the most significant event of the last century, or the most important movement in history, if one considers the entirety of social movements to which ecovillages belong, and explains what the movement is about (JACKSON, 2004). The term "ecovillage" emerged in the early 1990s, and the movement started as a link between hundreds of small projects worldwide related to the issue. The Ecovillage Movement is about a new lifestyle, has an anti-globalisation approach, and is motivated simultaneously by the social, ecological and spiritual dimensions. For the author, "a new ecovillage-based development model, for North and South, may be what the planet needs, more than anything, to create true co-operation, while eradicating global inequities, mass migration, terrorism and creating a truly sustainable future" (JACKSON, 2004, p. 8-9).

Considering that the Ecovillage Movement is primarily about projects for new ecovillages, its object has not exactly the characteristics of the idea pursued in this research, which concerns interventions in existing urban settlements. However, many of the movement's concepts are aligned with those of this research.

2.2.6 Tactical Urbanism

Part of the initiatives studied in this sub-chapter are urban practices that can be classified within the Temporary/Tactical Urbanism spectrum. According to Dovey (2016), Tactical Urbanism is a "broad field of incremental urban transformations that fill interim periods of time and underutilized urban space" (DOVEY, 2016). The emergence of these terms, and many others such as 'insurgent urbanism', 'urban catalyst', 'austerity urbanism', 'sandpit urbanism', 'DIY urban design', 'pop-up urbanism', 'guerrilla urbanism' and 'city repair' (LYDON et al., 2012; DOVEY, 2016), shows the importance of these new approaches to urban thinking.

A vast range of actions can be considered temporary/tactical urbanism interventions, and many of these actions are not focused on sustainability or resilience. At the same time, small-scale initiatives focused on sustainability and resilience are not necessarily among temporary/tactical urbanism actions. However, the connection between temporary/tactical urbanism and sustainability and resilience gives rise to many possibilities that can inspire new urban interventions. As stated by Frantzeskaki et al. (2018a), "tactical urbanism (manifested in action-based networks, civil society initiatives and planning actions) is a [not only] way to localize global solutions, but also to create and design solutions at human scale from cities to deal with climate change" (FRANTZESKAKI et al., 2018a). From the range of actions or interventions

regarding tactical urbanism, some which also can foster community sustainability and resilience are:

- **Depave:** to remove unnecessary paving, reducing stormwater pollution, and replace it with green spaces, such as tree planting, urban farming, native vegetation, and social gathering (LYDON et al., 2012; DEPAVE, 2021).

- **Guerrilla gardening:** to grow food and flowers even without authorisation, on public or private land. Guerrilla gardeners often plant in vacant lots or in underutilised and abandoned places, action that is known as social gardening (LYDON et al., 2012; REYNOLDS, 2021).

- **Guerrilla bike lanes:** to provide increased safety for cyclists and pedestrians, draw attention to sites in the city that are unsafe for cyclists and vulnerable pedestrians,, and put pressure on local governments to make quick, substantive and proactive improvements in street safety (KOHLSTEDT, 2016).

- **Reclaimed setbacks:** to activate spaces between the dwellings and the sidewalks, making them more community oriented (LYDON et al., 2012).

- **Micro-Mixing:** to foster entrepreneurism, supporting existing businesses and incubating new ones, with the co-location of single retail spaces, for uses that can help each other (LYDON et al., 2012).

- **Pop-Up Town Hall:** to provide a place and forum for discussion of issues of community's interest (LYDON et al., 2012).

2.2.7 Initiatives in Brazil

While the literature on resilient and sustainable initiatives in developing countries advocates a change in lifestyle and reduction in consumption patterns to reduce the environmental footprint of individuals, consumption patterns for those living in disadvantaged communities, especially in developing countries, are often far below the minimum for a dignified life. Therefore, initiatives in disadvantaged communities, of course, are not aimed at reducing consumption patterns, but often combine the goals of resilience and sustainability with the goal of improving the community's living conditions. The literature on this particular context of disadvantaged communities is scarce, and the few examples about initiatives in these communities must be

searched in websites, news or conference presentations. Regarding the Brazilian context, this research has selected some examples.

2.2.7.1 Periferia Sustentável Project

The Periferia Sustentável (sustainable outskirts) is a project developed by the Favela da Paz Institute, an institution dedicated to art, culture, music, technology, sustainability and of food production projects, in Jardim Ângela, a slum in the city of São Paulo. The Periferia Sustentável Project was created by the initiative of a social entrepreneur, who is one of the founders of the Favela da Paz Institute. It has as its main goal executing and implementing systems for the generation and distribution of renewable energy in low-income communities in São Paulo. The project also seeks to develop other low-cost and sustainable functional technologies and, likewise, disseminate them in the outskirts of São Paulo. In addition, the project offers courses, lectures and workshops, that teach how to take advantage of the available natural resources, such as rainwater and solar energy (INSTITUTO FAVELA DA PAZ, 2020; SUSTENTAREA, 2020).

The Favela da Paz Institute was itself the object of the pilot project that gave rise to Periferia Sustentável. There, the following strategies were implemented: organic gardening; a biogas system, that supplies the needs of institute's kitchen, and provides biofertilizer for the garden; a rainwater capture and retention system, which reduces the Institute's consumption of water; and a solar panel system, which supplies power to the Institute's electronic devices, considerably reducing electricity consumption (INSTITUTO FAVELA DA PAZ, 2020; SUSTENTAREA, 2020).

2.2.7.2 Biosaneamento

The Biosaneamento (bioremediation) association is a non-profit organisation, that operates in implementing bioremediation stations, in communities not linked to a sewage network. The system consists of biodigesters, combined with a natural sewage treatment system utilising an adequate combination of plants that filter several pollutants. One of the products of the whole process is biogas, which is supplied to the families served, besides generating sludge, that can be used as a biofertilizer. The system works in a circular and self-sustainable way, as the sewage is purified and reintegrated into the ecosystem, improving the health of the community. In addition, the initiative provides the qualification of residents in operating the system, that this way get qualified to offer their services, thus generating income for the community. The project

is also supported by voluntary work and promotes environmental education workshops, capable of positively impacting the reality of families (BIOSANEAMENTO, 2020; ATADOS, 2021).

In view of the high rates of the population not served by sewage systems in Brazil, Biosaneamento contributes to the universalisation of basic sanitation in the country, and, in addition to that, the association also does the analyses of the context and territory where the work will be developed, to find the form of intervention that best serves the residents of each region. Through the engagement and joint action of residents, young volunteers and other agents of society, the association, so far, implemented the system in four communities, having built 12 biodigesters, which treat the sewage of three homes each, for a total of 200 beneficiaries, 50 trained residents and R$: 16.000,00 in revenue generated (BIOSANEAMENTO, 2020; ATADOS, 2021).

2.2.7.3 Agricultura Urbana e a Revolução dos Baldinhos Project

The Agricultura Urbana e a Revolução dos Baldinhos (urban agriculture and the small buckets' revolution) Project consists of a community management system for organic solid waste, promoted by the Centre for the Study and Promotion of Group Agriculture (CEPAGRO), in Florianópolis, capital city of the State of Santa Catarina. The project's general objective is to promote the use of organic waste and the development of urban agriculture, as a way of improving the quality of life of the population. The socio-environmental project was implemented in January 2008, in a region called Complexo Chico Mendes, in the Monte Cristo neighbourhood, and its protagonists are community leaders and the population of low-income neighbourhoods that, together, collect and transform the waste into compost, with the aid of the composting process. The area served is a peripheral urban space, where a large number of families live in poverty, and used to be affected by severe problems, such as rodent and pest infestation, intestinal diseases and others, due to the accumulation of waste. In 2014, the project directly involved approximately 1,600 people, of which: 500 were from 100 households where organic waste was collected; 600 people were educators and children, from four schools and day-care centres; and 500 people, from four neighbourhood institutions (ABREU, 2013; CEPAGRO, 2021).

The practical functioning of the project, since then, occurs with the regular distribution, to the participating families, of small buckets with lids, so that they deposit the compostable organic waste, separated at home, in such buckets. When the buckets are full, families take them to delivery points, consisting of large containers, distributed throughout the neighbourhood. These

containers are collected by community agents, twice a week, in wheelbarrows, and taken to a composting yard, where thermophilic composting takes place, through static windrows. The end product of the process is a fertilizer, which is used in community gardens and small family gardens (ABREU, 2013; CEPAGRO, 2021).

According to CEPAGRO (n.d.) and Abreu (2013), this community model provides social gains by strengthening the community, stimulating participation, and the valuing of public goods and spaces. Therefore, making people aware of the importance of the project is a fundamental step in the process, being an important key to the community's engagement in the project, since the success of this type of management model depends on the participation of all the agents involved. One of the outcomes of this community involvement, is that more care is taken with the inadequate disposal of waste on the streets, resulting in a series of benefits. Among these benefits are: a improved street hygiene; a decrease in health problems, such as malnutrition and diseases; the reintegration of young offenders; the production of healthy food, through urban agriculture, ensuring food security; the appreciation of the environment; and the improvement of the population self-esteem. In addition, a community solid waste management model, using composting techniques, represents potential savings, compared to the traditional model, by reducing costs in all stages: collection, transportation and disposal of waste, besides its savings potential by reducing the use of chemical fertilizers (ABREU, 2013; CEPAGRO, 2021).

When analysing the experience, its feasibility and its potential for replication, Abreu (2013) concludes that:

> "The community model of waste management, considered a form of social management, builds social capital through strong bonds of trust and reciprocity, stimulating empowerment, the valuing of the community, social participation and urban agriculture practices in the neighbourhood, and it has low cost compared to the municipal public model. Its adaptation to other contexts and its replication, as a public policy, would generate a new paradigm for the management of solid waste in cities" (ABREU, 2013, p. 5).

3 METHOD

This chapter presents the method adopted for the development of the research, explaining how the study was developed, so that the research questions were answered. The chapter is subdivided into two sub-chapters: Research Approach and Research Design. The sub-chapter 3.1, Research Approach, describes and justifies the chosen research approach. The sub-chapter 3.2, Research Design, presents the design of the research and the detailing of each of the research steps, concerning: the methods; techniques; and sources of evidence used in this study.

3.1 RESEARCH APPROACH

According to Yin (2013), the choice of the research approach should be made, based on the research questions identified. It depends on the following factors: type of research question; the limit between the phenomenon studied and its context; the necessary control over the object studied; and contemporary events (YIN, 2003).

The main research question of this dissertation enquires “how”, which leads to the aim of this research: the definition of a framework to support collective and individual – but collectively implemented – interventions, at the neighbourhood scale. Thus, the study aims to propose a solution for a real problem, with a theoretical foundation. Due to this characteristic, constructive research, or design science research, was considered the most appropriate research approach for the development of this work.

While natural science concerns explanatory and descriptive research, aiming to explain how and why things are the way they are, the constructive approach is prescriptive, seeking to devise artefacts to achieve specific goals (SIMON, 1969; MARCH; SMITH, 1995). It is a research procedure for producing knowledge through innovative constructions, with the purpose of solving real-world problems, in more effective ways and, thus, promoting a theoretical contribution to the field of study in which it is applied (KASANEN; LUKKA; SIITONEN, 1993; LUKKA, 2003).

The main characteristics of the constructive research described by Lukka (2003), can be identified in this dissertation, as shown in Figure 7, thus justifying the adoption of this approach.

Figure 7 - Comparison between the essential characteristics of the constructive research approach and the present research (based on: LUKKA, 2003).

Core features of the constructive research approach (LUKKA, 2003)	Process developed in this research
Focuses on real-world problems felt relevant to be solved in practice	The unavailability of sufficient scientific knowledge for supporting interventions aimed at transforming the urban environment, with a focus on resilience and sustainability in the neighbourhood scale, was identified
Produces an innovative construction, meant to solve the initial real-world problem	A framework for the classification and assessment of small-scale resilient and sustainable transformation initiatives, suitable for socio-environmentally vulnerable communities in Brazilian municipalities, was proposed
Includes an attempt for implementing the developed construction and, thereby, a test for its practical applicability	An empirical study was carried out in a neighbourhood of a Brazilian municipality, which supported the construction and practical evaluation of the framework
Implies a very close involvement and co-operation between the researcher and practitioners, in a team-like manner, in which experiential learning is expected to take place	The practical application of the questionnaire, as well as its refinement and the evaluation of the proposed framework, counted with the participation and collaboration of local actors and experts in the area, promoting learning that enabled the artefact development and enhancement
It is explicitly linked to prior theoretical knowledge	The development of the framework was carried out based on the literature review on small-scale initiatives and other related topics
Pay special attention, when reflecting on empirical findings for theory refinement	At the end of this research, a reflection on the contributions achieved within the field of study was carried out

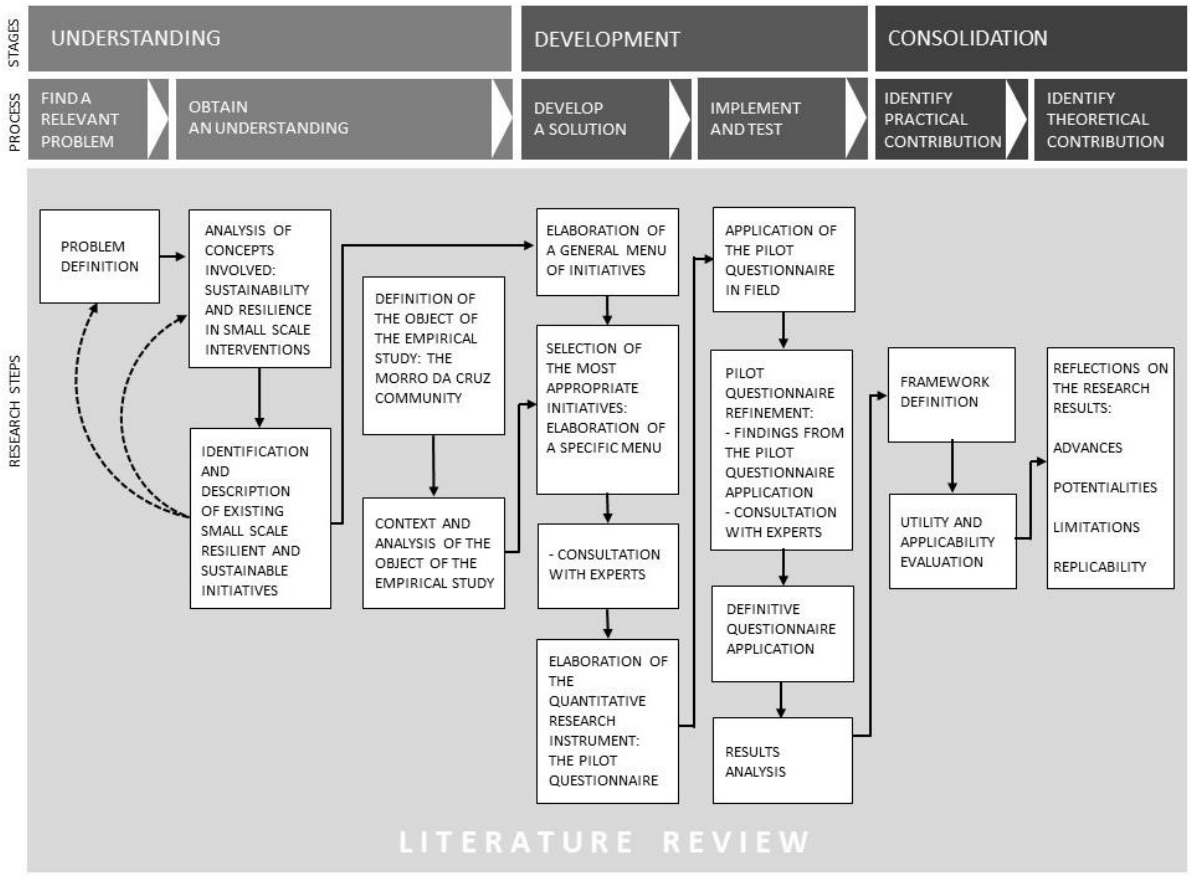
Source: the author.

3.2 RESEARCH DESIGN

The research process of this work was structured according to the constructive research approach, as proposed by Kasanen et al. (1993) and Lukka (2003). Figure 8 illustrates the research design, which consists of three main stages: understanding, development and consolidation. The literature review occurred throughout the whole work, and the steps did not always strictly follow the presented chronological sequence and may have occurred in an overlapping manner. As can be seen in Figure 8, the problem definition was supported by an in-depth analysis of the concepts involved in this research, as well as by the identification and understanding of existing small-scale resilient and sustainable initiatives. In order to understand

the real problem, an empirical study was carried out in a Brazilian municipality. The second stage, of developing, implementing and testing a problem-solving artefact, comprised, firstly, the definition of a database, from which the actions to be submitted to the population would be selected. In the sequence, the steps were: the selection itself, supported and validated by different processes and activities; the development of a research instrument; its refinement and; the analysis of the results of the survey. The third stage consisted of devising the framework for the classification and assessment of resilient and sustainable transformation initiatives, that would be suitable for socio-environmentally vulnerable communities in Brazilian municipalities, and the assessment of its utility and applicability.

Figure 8 - Research Design



Source: the author.

3.2.1 Understanding Stage

With the aid of an initial literature review, a relevant research problem was identified, and its research potential was first analysed. The deployment of the literature review process, presented in Chapter 2, allowed a deeper understanding of the topic, confirming the relevance of the research problem. In addition, the literature provided a general and comprehensive

understanding of the themes considered essential to support the development of the work and the creation of the artefact.

3.2.1.1 Research steps in the Understanding Stage

First, an analysis of the concepts of "Transformation", "Resilience" and "Sustainability" was carried out, establishing an understanding of these concepts, and the possibility of their application into the context of this work. Then, an analysis of existing small-scale initiatives, aiming at transformations in the urban space, in addition to those related to vulnerable communities, under the lens of sustainability and resilience, was performed. This analysis led to the reviewing of scientific works, based on real experiences, put into practice, or on projects for implementing initiatives, without their practical implementation. The analysis also included initiatives of groups, NGOs, associations, and members of communities, that were not necessarily studied by the academy yet. This step enabled the development of one of the contributions of this research: a general menu of initiatives, which will be more specifically referred to later.

Lastly, in the understanding stage, the definition of, and an investigation on, the empirical study object was conducted. The intention was to investigate a neighbourhood, in a Brazilian municipality, with some specific features, like: middle-low to low-income population; medium density; and, as far as possible, need and potential for transformation, regarding environmental, economic, social and cultural aspects. This need for transformation would be characterised, for example, by the extent of environmental degradation or by the unemployment level of local residents, while the potential for transformation would be characterised, for example, by the desire of such transformation by the community, and by the available land or the necessary resources, that would enable such local intervention.

3.2.1.2 Justification for the Object of Empirical Study

The problem of this research is focused on disadvantaged communities. Thus, to define the object of empirical study, an investigation was conducted among dwellers' associations, established in disadvantaged communities, and among Non-Governmental Organizations (NGOs), which developed activities in these types of communities, located in the city of Porto Alegre. One of the requirements for their choice was, in addition to being a disadvantaged or vulnerable community, with the features mentioned in the previous paragraph, the existence of such an association or organisation in the specific neighbourhood. The presence of these entities

would be helpful, both for the first contact with the community and later, for potentially allowing a future partnership, for the development of activities related to the research.

The first suggestion made by the Union of Porto Alegre Dwellers' Associations (UAMPA), after explaining them the work intended to be developed, in addition to the desired characteristics for the empirical object of study, was to approach the Morro da Cruz community. At the same time, a Non-Governmental Organization, based in Morro da Cruz, offered support for establishing the first contact with the community. After these two positive feedbacks and contributions from different entities, a first visit to the Morro da Cruz neighbourhood was scheduled, with the aim of confirming the community's potential in being the object for the above-mentioned empirical study.

In addition to the NGO contacted during the search for a neighbourhood to be studied, the first visit revealed that two more NGOs were based in Morro da Cruz, next to the community association, and that three others were carrying out occasional activities, in partnership, either with the permanent NGOs or with the community association. Some of the existing activities or initiatives developed by NGOs, as will be seen later in this document, were of great interest towards the purpose of this research. The existence of ongoing initiatives was also a desired feature for the object of the empirical study, insofar as this increases the likelihood of the community to become a receptor for the implementation of new actions. Also, it identifies possible stakeholders and users of the proposed tool, that is, the *framework to classify and assess the perceived impact of small-scale resilient and sustainable transformation initiatives in disadvantaged communities*.

Finally, a statement, given by the leader of the NGO, that supported the first visit, mentioned the dimension of a recurring problem in disadvantaged Brazilian communities. According to her, the municipal administration of Porto Alegre "has its back" to Morro da Cruz. Sometimes, bottom-up initiatives, that do not wait for the government to act, are the only possible option for these communities to become more resilient and sustainable.

An in-depth investigation of the object of the empirical study and its detailed characterisation are presented in Chapter 4, "Characterisation of the object of empirical study".

3.2.2 Development Stage

The development stage was structured in seven main steps: (i) elaboration of a general menu of possible initiatives; (ii) elaboration of a specific menu of initiatives; (iii) construction of a pilot

questionnaire; (iv) application of the pilot questionnaire; (v) refinements of this questionnaire; (vi) application of the definitive questionnaire; and (vii) analysis of the results of the survey.

3.2.2.1 Elaboration of a General Menu of Initiatives

The first step of this stage was the elaboration of a general menu of initiatives (Appendix A), which enabled an overview of existing resilient and sustainable transformation initiatives throughout the world and all the possible stakeholders, for the different types of initiatives. This overview was fundamental to the understanding and refinement of the contributions of this research. The actions and initiatives listed in the menu were developed in a variety of situations, ranging from scientific methodologies to practical implementations by community members. In the same way, information about these actions, as previously mentioned, was gathered from diverse sources, such as academic papers, websites, news or conference presentations.

The formatting and organisation of the menu was an iterative process, supported by the literature review, that informed about the most suitable way to categorise the initiatives. In addition, some key informations were selected to be displayed in the menu, in a simple and direct way, allowing an easy understanding. These key informations were aligned with the overall concepts adopted in this research, related to resilience and sustainability, as well as all other information considered useful for the practical application of the menu.

One of the references for the categorisation of the initiatives was the book *Co-creating Sustainable Urban Futures: A Primer on Applying Transition* (FRANTZESKAKI et al., 2018b). The process of Transition Management illustrated in the book, where five real cases are described, includes the drawing up of a vision for the city or neighbourhood, through dwellers' perception. In Carnisse, for example, this vision was based on six topics: social cohesion; ecology; housing; economy; inclusiveness and social infrastructure; and democracy and claiming rights (WITTMAYER; STEENBERGEN; BACH, 2018). In Ludwigsburg, another case where Transition Management was applied, as already addressed in the previous chapter, the pathways defined for the city, related to critical themes identified in the outlined vision, were: green in the city and circular economy; energy efficiency, renewable energy generation and energy awareness; civic participation, social interaction and cultural activities; mobility; and sustainable consumption (HÖLSCHER; WITTMAYER, 2018).

The previously mentioned work of Cangelli (2018), which proposes a methodology for the urban regeneration of unauthorised residential settlements in the outskirts of Rome, was also a

reference for the proposed categorisation in the general menu. Her study describes a project in which the general masterplan was produced, based on theoretical and technical insights, concerning four main topics: diffused and renewable energy production technologies; innovative methods of economic development; solutions for sustainable mobility; and technologies for the sustainable management of resource flows. Many proposals were developed for the community, from these general topics, in line with the local anthropical, biophysical and bioclimatic systems illustrated in the previous chapter, in Figure 6 (CANGELLI, 2018).

The initiatives compiled in the general menu are first categorised into ten main categories or dimensions: *Energy; Water;, Waste; Production / Distribution / Consumption; Training and Skills Development; Mobility; Green / Blue Urban Infrastructure; Culture and Society; ICT;* and *Buildings*. Then, each category is subdivided into themes, which give a more specific characterisation to the actions or initiatives, in a total of 34 themes, for the ten categories. For example, the category *Waste* has been subdivided into two themes: *Recycling and Reusing Waste*, and *Composting*.

In addition to the organisation of actions/initiatives in categories and themes, the other key information presented in the general menu refers to the link between the initiatives and sustainability, resilience and the possible stakeholders involved in its implementation. Pontrandolfi and Manganelli (2018) understand that "an effective urban regeneration process is based on compliance with the criteria of environmental, social and economic sustainability" (PONTRANDOLFI; MANGANELLI, 2018). As this research considers, besides the environmental, social and economic dimensions of sustainability, the cultural dimension, the general menu presents a topic that shows whether the initiative has the potential to leverage or improve sustainability in the community in the above mentioned four dimensions.

Regarding resilience, the menu has a similar field. Pontrandolfi and Manganelli (2018) advocate that resilience is a fundamental issue in the urban regeneration agenda; but, unlike the concept adopted in this research, the authors believe that the level of resilience of existing settlements is included in the notion of environmental sustainability. Although, for some authors such as Pontrandolfi and Manganelli, the idea of resilience might be contained in the overall concept of sustainability, other authors consider that such issues are the other way round, with resilience totally replacing the concept of sustainability, as seen in the introduction. This research works with the two concepts, independently, advocating that resilience is the capability of a

community to change, adapt or transform and can be achieved in the face of environmental, economic or social disturbances (MEEROW; NEWELL; STULTS, 2016; ROBINSON; CARSON, 2016). For this reason, the field, in the menu, concerning resilience, indicates whether the initiative has the potential to foster resilience in face of disturbances in these three dimensions: environmental, economic or social.

The last field of the menu indicates the possible stakeholders, for each initiative. Academic works describing or proposing urban interventions, aiming at the transition or transformation of communities, consider the stakeholders an essential part of the description. However, it is not usual to find in the literature a classification of different interventions, according to the different groups of people involved, as is the case in this research. Tactical urbanism, an approach encompassing several tactics to city-making through short-term, low-cost, and scalable interventions, indicates the stakeholders for the different tactics. Due to the characteristics of the approach, Lydon et al. (2012) classified the stakeholders as tacticians, in his book *Tactical Urbanism Vol. 2*. The list includes: City Agencies; Mayor's Office; BIDs; Non-profits; Entrepreneurs; Developers; Local Activists; Community Groups; and Artists (LYDON et al., 2012). For the general menu of initiatives in this research, the possible stakeholders were defined as: Local Communities; Government; Private Initiative; Academics; Professionals; and Non-Governmental Organizations.

3.2.2.2 Elaboration of a Specific Menu of Initiatives

From the broad and extensive framework of actions represented by the general menu of initiatives, a selection was made of those more aligned with Morro da Cruz community's technical, economic, sociocultural and political reality. The technical reality concerns the biophysical, environmental and urban aspects of the neighbourhood, which indicate the most appropriate actions, from the technical feasibility perspective. This phase of the research (as those in sub-items 3.2.2.3, 3.2.2.4 and 3.2.2.5), was carried out along a regular module of the master's course. For this reason, the first selection of initiatives was carried out by a group of students composed by two MSc and one PhD student.[2] The community's participation in the elaboration of the specific menu of initiatives was a highly regarded requirement. So, a questionnaire with open questions was created, to be applied to a group of dwellers. The

[2] The author; MSc student Matheus Scaglia Mainardi; and PhD student Eduardo Bonow Simões.

questionnaire was supposed to guide the realization of a focus group, intended to promote a discussion that would allow to pick up some key information within the community. It was conceived as a way to easy the identification of the most significant problems, under the community's perspective. Based on the issues related by the dwellers, the specific menu could propose initiatives, with the potential to suggest solutions to some of these issues. However, the limitations of time required to complete the module prevented this activity from being carried out. In this research phase, the specific menu of initiatives was validated by a sustainability specialist, professor and PhD in civil engineering.

Following the same principle adopted for the general menu, the selected initiatives for the specific menu were categorised into five categories or dimensions: *Energy*, *Water*, *Waste*, *Economy* and *Culture and Community*. These categories, and the correspondent initiatives, are the constructs to be measured by the instrument for data collection.

The elaboration of the general and the specific menu of initiatives comprised the qualitative phase of the development stage. The following steps comprised the quantitative phase.

3.2.2.3 Elaboration of a Pilot Questionnaire

This step is based on collecting primary data, where information is sought from primary sources; that is, raw data collected by the research team through the process of surveying. The research technique used is communication, meaning that the data is obtained through the respondent's communication. In the case of this research, the data collection tool was a questionnaire.

The pilot instrument for data collection was a questionnaire structured in the form of a spreadsheet, to be applied directly and in person to residents of Morro da Cruz (Appendix B). The main objective of the questionnaire was to verify the level of interest of Morro da Cruz residents in the application of individual and collective actions, which could make the neighbourhood more sustainable, or increase the community's resilience. These actions were part of a process of transformation and regeneration, based on a bottom-up, low-budget approach. The questionnaire also had as objectives: to verify the level of knowledge of the community regarding the resilient-sustainable actions presented; to identify the community's perception of the feasibility of implementing these measures within the community; and to determine whether the community has a greater interest in collective or individual actions. For

this purpose, three questions were elaborated, associated to each one of the 15 initiatives selected, being the answers divided into a 5-point scale (Figure 9).

Figure 9 – Questions and scale of responses

Aspect to be investigated	Question	Scale of Responses				
Level of knowledge	Do you know or have you heard of this action?	I certainly don't know	I probably don't know	I'm not sure	I probably know	I certainly know
Level of interest	Do you think that residents would like to learn and apply these actions at home and/or in the community?	I'm certainly not interested	I'm probably not interested	I'm not sure	I'm probably interested	I'm certainly interested
Perception of the feasibility	Do you think it is easy to do this action in your home and/or community?	Certainly difficult	Probably difficult	I'm not sure	Probably easy	Certainly easy

Source: by the author.

Support material for the questionnaire was also developed, consisting of images of initiatives considered potentially more difficult to be understood, and a card, with emojis, graphically illustrating the scale of responses (Appendix C and D).

3.2.2.4 Application of the Pilot Questionnaire

In the application phase of the pilot questionnaire, it was decided to apply the largest possible number of questionnaires, as considered necessary for content validation, without defining a sample set previously. In order to standardise factors external to individual interest, a standard hypothetical scenario was conceived, and presented to all respondents. The intention was, for example, to avoid a situation where economic difficulties could influence the respondents' response. The following premises were proposed to the residents: a) the residents themselves would carry out the actions; b) training, to implement the initiatives, would be available to residents; c) there would be no costs to the residents, related both to training and materials, associated to the implementation of these actions.

Data collection was carried out on November 30, 2019. The team of researchers who went to the field was composed of two postgraduate students, who applied the questionnaire in different locations: a) at the headquarters of a NGO, which held a thrift store that allowed the presence of residents in the place; b) in the vicinity of the Community Association; c) at Morro da Cruz Square, located at Vinte e Cinco de Julho Street; and d) in front of some residences. The survey

was carried out for, approximately, three hours, that allowed to apply 15 questionnaires. Some pictures of the application of the questionnaire are shown in Figure 10.

Figure 10 – Questionnaire Application

Source: by the researchers, including the author.

3.2.2.5 Pilot Questionnaire Refinement

The pilot questionnaire refinement included three technics: a) refinement from the experience that the researchers had during the practical application of the questionnaire; b) consultation with experts; c) observation/non-structured interviews. An activity of the focus group was scheduled for the end of March 2020, with some Morro da Cruz dwellers, with the support of two NGOs. However, due to the social distance measures required due to the coronavirus pandemic, the activity was cancelled. The idea behind the activities of this focus group was to collect information within the community to check the suitability of the selected initiatives, similar to the objective of the focus group foreseen in the elaboration stage of the specific menu of initiatives, which was also not possible to be accomplished. The activity would also allow for the detection of any existing problem, within the community, still not detected by the research, and with the potential to be challenged by small-scale resilient and sustainable transformation initiatives. The failure to carry out this activity was partially offset by the non-structured interviews with dwellers, carried out during on-site visits, by information provided by the NGOs and by parallel information obtained during the pilot questionnaire application.

3.2.2.5.1 Experience during the Practical Application

With basis on the experience that the researchers had, during the practical application of the questionnaire, a series of problems, difficulties and opportunities for improvement were

identified. Subsequently, these observed issues were subject to analyses, that led to the improvement of the quantitative questionnaire. Figure 11 describes the problems observed and the consequent changes made to the instrument.

Figure 11 – Description of issues observed and the consequent changes

Observed Problem	Change Made
Long time to apply the questionnaire. The application of the questionnaire took about 15min to 20min, depending on the researcher and the respondent	The questionnaire application time was reduced according to the change described in the following item
Most of the answers were at the extremes of the answer scale - options 01 or 05 - especially in question 01	The answer scale of question 01 was simplified, in such a way to offer only two alternatives: I know and I don't know
There were difficulties, on the part of some i respondents, in understanding the permeable pavement initiative	An image of permeable pavement was included in the survey support material
Many initiatives were explained differently for each respondent, according to the "feeling" of the researcher, when applying the questionnaire, in an attempt to provide the most precise explanation to each respondent	The wording of the descriptions for each initiative has been revised, incorporating elements used by the researchers, when applying the pilot questionnaire, and promoting changes based on practical experience; this is allowed the questionnaire to be applied by anyone, without the need for additional explanations, ensuring a single standard questionnaire for all administrations
There was difficulty in defining, specifying and filling in the item "position in the family", in the field "respondent data"	The item "position in the family" was removed from the "respondent data" field
Some respondents reported that raising chickens and pigs is an existing activity in Morro da Cruz	In the "biodigester" initiative, the possibility of transforming chicken and pig faeces into biogas was included

Source: by the author.

3.2.2.5.2 Consultation with Experts

After the refinement of the questionnaire, based on the practical application, the instrument of data collection was submitted, via email, to the analysis of four experts, whose occupations and qualifications are shown in Figure 12.

Figure 12 – Experts Consulted

Expert 1	Founder and leader of an NGO working in Morro da Cruz, former Greenpeace volunteer
Expert 2	Founder and leader of an NGO working in Morro da Cruz, PhD in Anthropology
Expert 3	Professor, PhD in Engineering and Architecture, LEED® Accredited Professional, Internal Auditor ISO 14.001, Energy Efficiency Consultant in Buildings, consultant in environmental certifications and sustainability in the built environment
Expert 4	Master in Architecture and Urbanism, LEED® Accredited Professional, Internal Auditor ISO 14.001, Energy Efficiency Consultant in Buildings

Source: by the author.

The purpose of the consultation was to check the adequacy of the selected categories and initiatives to the research context, opening the possibility of a review of these categories and initiatives, based on the result of the consultation. The experts suggested no exclusion, replacement or structural changes. Expert 1 agreed with the entire instrument. Expert 2 compared it with Anthropology, saying she was used to a different reality, less technical, more focused on conversations with the community, but made no reservations about the questionnaire. Experts 3 and 4 made some observations and suggestions, which resulted in changes and improvements in the description of the initiatives contained in the questionnaire. Appendix E shows these observations and recommendations.

3.2.2.5.3 Observation/Non-Structured Interviews / Focus Group

On November 12, 2019, this author had the opportunity to go, along with a research group from UFRGS, called GRID (Disaster Risk Management), to an on-site activity in the communities of Chácara do Primeiro, and Rua da Represa, next to Morro da Cruz. The activity was carried out at the headquarters of the local Community Association. The building is of a very precarious construction and, considering the temperature, that was high that day, the feeling of warmth by all participants was very strong. A few days after this on-site activity, this author had access to an initiative, that represented a potential solution to the problem of thermal insulation detected at the Community Association's headquarters. In partnership with local NGOs, an NGO outside Morro da Cruz implemented a system for the thermal insulation of the rooms occupied by these NGOs, in Morro da Cruz, being of a precarious construction like the Chácara do Primeiro, and Rua da Represa Community Associations. The thermal insulation was carried out using Tetra Pak packaging, popularly known as "milk cartons". According to local observation, and from the feedback from the rooms' users, the result was excellent, once the thermal comfort of the rooms improved significantly.

Based on the success of this experience, the author of this research decided to make a change in one of the constructs of the instrument for data collection: the replacement, in the category *Energy*, of the initiative *Use of LED lamps*, by the initiative *Thermal Insulation*, described as "application of a material inside the house, which can be milk cartons, for example, to decrease the heat in the summer and decrease the cold in the winter". The decision to promote this change in the questionnaire was also reinforced by the fact that the use of LED lamps is a natural consequence of governmental policies and the market, since the sale of incandescent lamps is no longer allowed in Brazil, and the cost of LED lights tends to decrease.

Lastly, during a non-structured interview with an expert, who has a PhD degree in civil engineering, it was suggested to include two additional questions in the questionnaire to compile the respondents' preference concerning the initiatives. Thus, a question was included, asking the respondents to point out the three individual initiatives they found most interesting, and another asking the respondents to indicate the three collective initiatives they considered less interesting.

3.2.2.6 Application of the Definitive Questionnaire

The application of the definitive questionnaire was supposed to be carried out on-site, personally, at the end of March 2020, soon after the focus group meeting. Unfortunately, as with the focus group activity, the face-to-face application of the questionnaire had to be cancelled, due to the social distance measures required by the coronavirus pandemic. Soon after the cancellation, the supervisor of this research suggested postponing the application of the questionnaire, until the end of the pandemic and, consequently, once the social distancing measures were eased. At that time, knowledge about the pandemic was scarce, and there was great uncertainty about how long it would last. After a few months of waiting, and without the possibility of a short-term solution to the pandemic – or, at least, to safely resume face-to-face activities involving a large number of people – the supervisor agreed with the adaptation of the questionnaire to an online application.

Due to that, the questionnaire was adapted to be accessed online, and the link was sent via a social media application to the Morro da Cruz dwellers, preceded by a presentation message which explained, in a few words, what the message was about. In addition, the support material designed to provide respondents with a better understanding of the initiatives, used during the application of the pilot questionnaire and composed of images of the initiatives, was

incorporated into the online questionnaire. The objective was to provide the clearest possible description of the presented initiative, and the images complemented the description of the initiative, written in a simple and direct language. A solar water heater, for example, was described as a 'system for heating water, that is placed on top of the roof, and can be made, for example, from PET bottles. This type of heater transforms the sun's heat into hot water.' The description was accompanied by the image shown in Figure 13.

Figure 13 – Support image for the initiative 'solar water heater'

Source: (PENSAMENTO VERDE, 2014).

The questionnaire was sent between August 15 and 21, 2020. Before being sent, the online questionnaire was submitted to the evaluation of an expert in statistics, a professor with a PhD degree in production engineering. Some improvements were made in the questionnaire after the expert's contributions. Figure 14 shows the home page of the questionnaire. The entire questionnaire is included in Appendix F.

Figure 14 – Home Page of the Questionnaire

Source: developed by the author in Google Forms.

The application of an online questionnaire was an opportunity to test this distribution method, particularly in the context of a disadvantaged community. At the same time, if compared to administering a face-to-face questionnaire, the online distribution of the questionnaire brought some significant limitations to the research.

A number of strengths referred to in the literature on online surveys were experienced in the application of the online questionnaire, such as: speed and timeliness; convenience for respondents; ease of data entry and analysis; ease of follow up; and absence of researcher bias (EVANS; MATHUR, 2005; VAN SELM; JANKOWSKI, 2006). Other potential strengths, such as global reach, were not fully utilized, since the target population was a specific community, restricted to the neighbourhood scale. In fact, how to reach the target population was the first challenge faced by this research when it was determined to apply an online questionnaire. Then, two NGOs working in Morro da Cruz were contacted and made available

a list of mobile phone numbers of neighbourhood residents, to whom the link to the questionnaire was sent.

Regarding the weaknesses of online surveys, the most perceived in this research was the low response rate (EVANS; MATHUR, 2005; VAN SELM; JANKOWSKI, 2006). Furthermore, some limitations related to the survey distribution method (Web based), combined with the characteristics of the target population (a disadvantaged community), are highlighted. These limitations comprise the following aspects:

- **Sampling:** The link for the questionnaire was sent to the available list of mobile phone numbers. There was no other way to contact the residents of Morro da Cruz, in order to invite them to participate in the online survey. For this reason, a sample planning, aiming at obtaining the most representative sample of the target population, applying probability sampling, for example, could not be developed and implemented. Therefore, the sampling of this research was a non-probability sampling, by convenience. The final sample of the population being studied corresponds to around 6% of the valid contacts provided by the NGOs, which is approximately the percentage of respondents, considering the total number of contacted people (see section 5.3.1).

- **Illiteracy:** A significant part of the adult population in Morro da Cruz is illiterate, condition that was detected by the researchers, when applying the pilot questionnaire. On the occasion, some of the respondents made clear this characteristic. Also, when the definitive questionnaire was submitted online, it was possible to identify that some of the people contacted, via the social media application, were illiterate, asking for a voice message to be sent, because they were unable to read the written message. So, an audible version of the survey would be very valuable, but the researcher had no knowledge about the feasibility of this kind of alternative.

- **Digital Inclusion:** Three factors are required for digital inclusion: equipment (personal computer, mobile phone, tablet); internet connection; and some specific knowledge, on how to use the available hardware and software. The lack of access to one of these three requirements results in digital exclusion, preventing people from being part of the so-called ‘digital world’. Many Morro da Cruz dwellers fall into the group, with no equipment and/or no internet connection and/or no knowledge, thus becoming unable to participate in a survey like the one being described. Even a social action led by an

NGO during the pandemic was criticized, because the only way they were able to contact people was via a social media application, making those excluded from the digital world remain unassisted by the social action. Some of the potentially most affected groups, regarding digital inclusion/exclusion, besides the illiterate, are the poorest sector of the population (having no access to equipment and/or internet connection), and the elderly (having more difficulty on learning how to operate hardware and software).

- **Personal contact with the target population:** As experienced during the application of the pilot questionnaire, personal contact with the respondents would allow collecting additional information that is not included in questionnaires, and this information can be particularly important for the research being conducted. In addition, in a face-to-face application, the researcher can provide additional explanations, that would facilitate the understanding of the questions by the respondent. However, care must be taken not to compromise the uniformity required in this sort of research.

3.2.2.7 Results Analysis

The last step in the development stage was the analysis of the online survey results and of some results of the pilot survey. First, some information collected during the application of the pilot questionnaire were analysed in more detail, due to its specific characteristics, and the contributions to the research, made by this "parallel" data, which were not part of the original questionnaire, were addressed. Then, the results of the definitive questionnaire were studied and enabled the framing of two main groups of data: the profile of the respondents and their position regarding the proposed initiatives, considering their level of knowledge, degree of interest and perception of feasibility of what was being proposed/discussed. Ultimately, this enabled a conclusion to be made, on the most appropriated initiatives towards the community of Morro da Cruz.

3.2.3 Consolidation Stage

In the last stage of this research, an artefact was elaborated, consisting of a proposal for a framework to classify and assess the perceived impact of small-scale resilient and sustainable transformation initiatives in disadvantaged communities. After the framework's definition and the design of the artefact, an analysis of the construct's utility and applicability of this framework was conducted, aiming at validating the artefact. This analysis was performed with

the aid of three sources of evidence: a seminar, for the evaluation of the artefact by experts; the researcher's evaluation; and the feedback given by the dwellers during the application of the questionnaire. At this step, other significant contributions emerged, bringing new elements to the discussion on the research results. The last phase consisted of reflections on the research results, in order to identify and analyse the theoretical contribution of the research.

3.2.3.1 Proposal for a Framework

For the construction of the proposal for a framework, the data generated during the previous steps were gathered and analysed. The processes performed during the research were systematised as a sequence of stages, with corresponding activities. Figure 15 summarises the sources of evidence for developing the framework, and the goals that were achieved through these sources.

Figure 15 – Sources of evidence and corresponding goals

Source	Goal
Analysis of academic papers, websites, news, conference presentations, on-site visits, non-structured interviews	To gather information about existing resilient and sustainable initiatives
Analysis of documents, websites, maps, legislation, on-site visits, survey, non-structured interviews	To understand and characterize the neighbourhood and the community, in its technical and human aspects
On-site visits, survey,non-structured interviews	To collect the dweller's opinion about the initiatives
Experts	To refine some of the processes, tools/instruments and evaluate the artefact

Source: by the author.

3.2.3.2 Practical Evaluation of the Framework

Considering this is classified as a constructive research, the proposed artefact has to be evaluated. According to March and Smith (1995), the evaluation of the artefact makes it possible to verify the progress achieved and its functionality. The evaluation of the proposed framework, as mentioned earlier, was carried out based on two defined constructs, utility and applicability. The artefact was submitted to the evaluation of experts, in an online activity, in the form of a seminar. In this activity, the researcher presented the proposal for a framework to four experts, as described in Figure 16, and then, a discussion was carried out.

Figure 16 – Experts participating in the seminar

Expert 1	Professor, PhD in Environmental Sciences Linked to Building
Expert 2	Professor, PhD in Civil Engineering

Expert 3	Founder and leader of an NGO, working in Morro da Cruz, PhD in Anthropology
Expert 4	Architect and Urban Planner- works with the design of electrical and plumbing systems, having been working on the development of projects with a focus on sustainability

Source: by the author.

After submitting the artefact to the evaluation by experts, the researcher carried out a further evaluation of the framework, based on his own experience and on some feedback obtained from the respondents, in parallel to the application of the online questionnaire.

As an additional result of the evaluation of utility and applicability, this stage of the research gave origin to the emergence of new possible contributions of the research, by exploring some aspects that had not been addressed until then. This discussion gave rise to the proposition of a website.

3.2.3.3 Reflections on the Research Results

The reflections on the research results correspond to an analysis of the theoretical contribution of the work, considering the advances obtained, the potentialities and limitations of the framework, and its replicability potential.

4 CHARACTERISATION OF THE OBJECT OF THE EMPIRICAL STUDY

The characterisation of the object of the empirical study is based on the available data about the Morro da Cruz community, regarding several aspects: general; biophysical; environmental; urban; historical; economic; social; political; and cultural; obtained, mainly, through secondary research sources. The whole of the information was collected from official data, made available at several sources, among which, can be highlighted: the Porto Alegre City Hall; and the platform Atlas of Human Development in Brazil. In addition to secondary research sources, some data collection techniques were applied, as primary research sources, to provide a comprehensive understanding of the object of the empirical study, like: local observation; thorough on-site visits; and non-structured interviews.

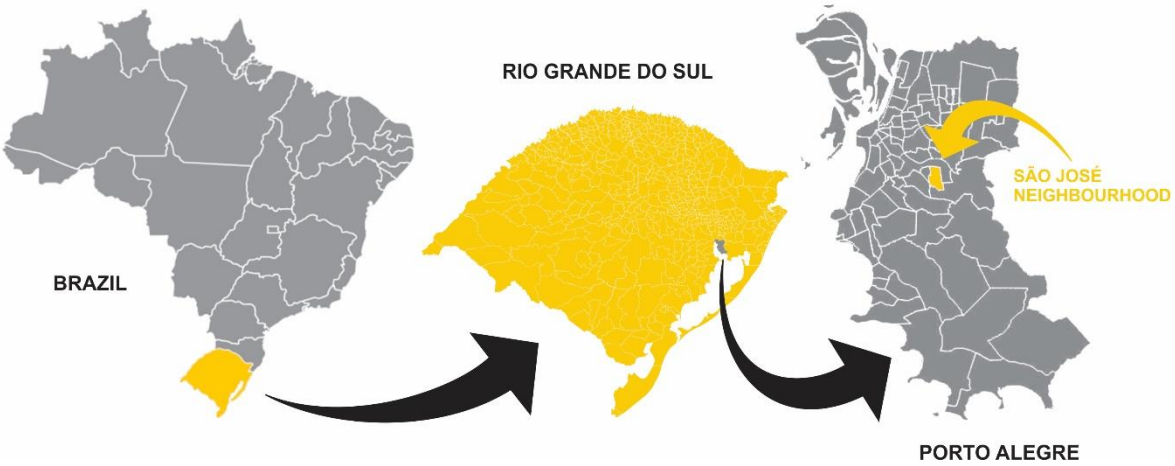
Brazil is a country where the housing shortage is historically a significant issue. The increase of urban population, especially in the second half of the 20th century (MARICATO, 2000) and the consequent need for dwellings for the low-income people, boosted a spontaneous solution for this shortage, based on illicit constructions. These constructions are built in informal settlements, usually either on the periphery of urban centres, or in risk and preservation areas, that, over the years, end up being acknowledged by municipal authorities as an integral part of the urban fabric, being regularised and incorporated into the "official" city. Morro da Cruz is an example of this type of settlement.

Performing a quantitative and qualitative analysis of the characteristics of the territory, and of the communities inhabiting it, is crucial for the development of an intervention proposal. Identifying local sources of renewable energy; available spaces in the urban fabric for implementing a diversity of initiatives; the potential of community spaces to foster social inclusion and quality of life; and features that can leverage small-scale economies; are some examples of aspects that can be decisive when directing proposals. In short, it is worth referring what Lyle (1994) wrote about regenerative design: “besides an analysis of the potential of implementation of a model within the community, it is necessary a physical analysis of the landscape, like topography, flows of water, energy, etc.” (LYLE, 1994).

4.1 LOCATION

The Morro da Cruz Community is part of the São José neighbourhood, located in the city of Porto Alegre, capital of Rio Grande do Sul, the southernmost state of Brazil (Figure 17).

Figure 17 - Location of São José Neighbourhood



Source: by the author.

There is no official map clearly defining the boundaries of Morro da Cruz ("hill of the cross"). The community, where the studies were developed, is located in the southeast part of the São José neighbourhood, corresponding to the upper part of the hill. Part of Morro da Cruz – an area with a shape similar of a triangle, and located in the east part of the neighbourhood – exceeds the borders of the São José neighbourhood. It is a most recent occupation, a new informal part of the settlement, located alongside a path that leads to the top of the hill. Through a cross-checking of available data identifying the studied area – the map of São José neighbourhood and another showing vulnerable areas denominated as Morro da Cruz / Vila São José / Chácara dos Bombeiros – and an on-site visit, the estimated boundaries of Morro da Cruz were designed using a satellite image (Figure 18). For the purpose of this research, the territorial limits of Morro da Cruz will be assumed as the ones shown in Figure 18. However, the precise area housing Morro da Cruz's community is uncertain and difficult to define. According to the map "subnormal agglomerations of Porto Alegre" (OBSERVAPOA, 2017), for example, the Morro da Cruz area, considered in this work, would comprise, in addition to Morro da Cruz community, five other villages: São Guilherme, São José Comunitária, Vale dos Canudos, Vargas and Cacimba. But, according to this map, even the Morro da Cruz community association and the local school would be outside the boundaries of the village of Morro da

Cruz. For this reason, and also based on information resulting from the non-structured interviews, these other villages will be considered subdivisions of Morro da Cruz. Additionally, there are, also, non-official subdivisions in the area, such as “Campo da Lixa”, for example, a name given by the local population to part of the Morro da Cruz area.

Figure 18 - Satellite image with the boundaries of the São José neighbourhood and estimated physical limits of Morro da Cruz

Source: By the author, using an image from Google Earth Pro.

4.2 BIOPHYSICAL / ENVIRONMENTAL ASPECTS

The municipality of Porto Alegre has an area of 496,684 km^2 and its natural physical conformation is a result of the interface of several landscapes of the southern portion of South America, composing soft contrasts. The urban area of the city is concentrated on the banks of a lake, Guaíba. A ring of hills of granite rocks, occupying nearly 65% of the city’s territory, frames the lowland region, that is where the urban city centre is located. Among this ring of small and rounded hills is Morro da Cruz, with an approximate altitude of 120m. The centre of Porto Alegre is nearly 10m above sea level (MENEGAT et al., 1999; PORTO ALEGRE, 2020).

Regarding the territorial scale of the studied area, more detailed data are available only for the area of São José Neighbourhood, corresponding to 3,56 km², and for the combined area of Morro da Cruz, Vila São José and Chácara dos Bombeiros, equivalent to 1,65 km² (OBSERVAPOA, 2010; ATLASBRASIL, 2020). Considering that the area within the estimated boundaries of Morro da Cruz (as shown in Figure 18) includes parts of permanent preservation areas and less-occupied areas, when these areas are added to the above mentioned, the total area increases to 1,8 km².

4.2.1 Risk and Permanent Preservation Areas

As mentioned at the beginning of this chapter, Morro da Cruz emerged as an informal settlement, that, over the years, started to be considered "nearly" official by the municipal authorities. However, it must be pointed out that part of its occupation was developed over risk or permanent preservation areas, therefore, as such, unsuitable for human occupation.

The topography of Morro da Cruz makes it a vulnerable system, particularly when considering two natural disasters: floods and mass movements, being the most vulnerable areas located in some neighbouring villages, alongside a stream called Arroio Moinho (the blue line on the left side of the Risk of Flood and Mass Movements image, shown in Figure 19). The banks of this stream have already been the scene of natural disasters, such as one in 2017, when a house was destroyed by a flash flood and resulted in death (JORNAL DO COMÉRCIO, 2017). This disaster was wrongly reported by the media as occurred in Morro da Cruz, showing the difficulty, mentioned above, in clearly establishing the physical limits between the different existing villages. Anyway, the risk of flash floods, as well as mass movements, constitutes a significant issue also in Morro da Cruz, where several dwellings are located in areas susceptible to such disasters (Figure 19).

Figure 19 - Satellite images showing Risk and Permanent Preservation Areas

Source: By the author, edited from SMAMS and ObservaPoa.

Figure 19 also shows the Permanent Preservation Areas (APPs) located in the region. Permanent Preservation Areas are defined by the Brazilian forest code (Federal Law 12.651/12), as (BRASIL, 2012a):

> A protected area, covered or not by native vegetation, with the environmental function of preserving water resources, the landscape, geological stability and biodiversity; facilitating the flow of fauna and flora; protecting the soil; and ensuring the well-being of human populations". (BRASIL, 2012 Art. 3º)

According to municipal legislation, Porto Alegre has the following APPs: shores of the Guaíba lake; shores that are located close water courses; springs surroundings; tops of hills; slopes steeper than 45°, or parts of these; and wetlands areas (SMAMS, 2019). Regarding the studied area, two types of APPs can be identified: hill tops and water courses. As can be seen in the image, there are some dwellings located both inside the APPs and in the above-mentioned risk areas. During an on-site visit, the local dweller who guided the visit made a comment about a family working as garbage collectors, that built their house on an area having a stream, configuring a high-risk situation (Figure 20, left).

4.2.2 Climate

The city of Porto Alegre is located in a climatic transition zone, and can be identified as having a humid subtropical climate, with each one of the four seasons being well characterised by a

specific combination of climatic elements. Specifically in relation to rainfall, this is well-distributed along the year (MENEGAT et al., 1999). However, as pointed out in the introduction of this research, the planet's climate is changing rapidly, the same happening with the climate of Porto Alegre. According to Roberto Aquino, Reader at the Department of Geography at UFRGS, "Rio Grande do Sul has always had the four seasons of the year well defined, but in the coming years, we must face the intensification of both heat, rain and drought" (GAUCHAZH, 2019a).

4.3 URBAN ASPECTS

The São José neighbourhood had its origin in a formal urban settlement, located in the lower part of its current area, having Bento Gonçalves Avenue as its northern limit. The original settlement had a regular layout, with standardised lots, that were commercialised in the real estate market. From this allotment, towards the south and uphill, a less-ordinated settlement started to expand, being the whole area today referred to as Morro da Cruz (SMC/PMPA, 2020).

4.3.1 Legal Aspects

Porto Alegre's Urban and Environmental Development Master Plan (PDDUA) identifies certain areas in the urban fabric as integrating the city planning strategy, denominated Special Areas. According to their specific features, these areas can be classified as Special Areas of Institutional Interest; Special Areas of Urban Interest; or Special Areas of Environmental Interest. Special areas have their own urban regimes, that are defined in such a way to fit the specific characteristics that make them to be classified as special.

Among the Special Areas of Urban Interest, there is a subcategory, the Special Areas of Social Interest (AEIS) –that are subdivided into four types. Some areas located in Morro da Cruz are classified as Special Areas of Social Interest I (AEIS I), and others, as Special Areas of Social Interest II (AEIS II). In general terms, AEIS are those areas "intended for the production and maintenance of Social Housing" (PORTO ALEGRE, 1999, Art. 76). AEIS I and II comprise self-constructed settlements, by a low-income population (AEIS I), or irregular or clandestine allotments (AEIS II), built either in public or private areas. These AEIS are included, by the municipal government, in land and urban regularisation programs, with the intent of avoiding the removal of dwellers, except in cases of houses at risk or population surpluses. As a result of these public policies, part of Morro da Cruz is regularised, and dwellers have the right to stay

on the land. But there are also non-regular areas, particularly those located in risk or permanent preservation areas, where public authorities just tolerate the presence of residents on the site, without officialising their right to land.

4.3.2 Urban Infrastructure

Settlements, like Morro da Cruz, due to their irregular origin, can be characterised as having a precarious infrastructure. Although largely neglected by municipal governments, some basic urban improvements have been implemented in these neighbourhoods over the years, such as public transport, energy and water supply systems and sanitation, even if just partially. This is the case of Morro da Cruz, where streets, provided with the necessary basic urban infrastructure, intersect with precariously served streets and alleys, where the community does not have full access to essential public services (Figure 20).

Most households are supplied with running water and electricity, being also served by garbage collection (ATLASBRASIL, 2020)[3]. The dwellings with more precarious infrastructure, often, are also those with difficult access, being located in areas of a great declivity, where occupations occur between rocks and trees, or built on irregular settlements. In general, the first case corresponds to risk areas or water courses APPs, and the second to hilltop APPs.

Figure 20 - Vinte e Cinco de Julho Lane (left), served with infrastructure, and Santa Teresa Street (right), with no pavement and without sewage system. The figure illustrates also that the standard of dwellings may vary greatly.

Source: by the author.

[3] The data taken from Atlas do Desenvolvimento Humano no Brasil (ATLAS BRASIL),in this and in the subsequent pages of this chapter, refer to the geografic area corresponding to Morro da Cruz, Vila São José and Chácara dos Bombeiros, according to ATLAS BRASIL classification. As there is not much data available, in relation to the delimitation of Morro da Cruz, this study adopted these data to portray the Community of Morro da Cruz..

4.3.2.1 Streets

The urban fabric of Morro da Cruz, as mentioned before, consists of a combination of streets with basic infrastructure and precarious streets and alleys. Just the main streets are paved and wide enough to enable traffic of cars and buses. The secondary streets are, in general, dirty and offer more difficult for traffic, especially for larger vehicles, like buses and trucks. The narrow and bumpy alleys allow just pedestrians to pass through, sometimes in particularly challenging walks.

4.3.2.2 Energy Supply, Water Supply and Waste Management

According to Atlas Brasil (2020), the indicators on households served by water, electricity and garbage collection, in Morro da Cruz, are above those of the State of Rio Grande do Sul and country's averages and below the indicators associated to the municipality of Porto Alegre. Table 1 presents these indicators.

Table 1 – Energy, Water and Garbage Collection

Indicator	Morro da Cruz (2010)	Porto Alegre (2010)	RS (2010)	Brazil (2019)
% of the population in households with running water	97,93	99,55	96,17	85,50
% of the population in households with electricity	100,00	99,91	99,71	99,50
% of the population in households with garbage collection	99,86	99,64	99,24	84,40

Source: ATLASBRASIL, 2020; IBGE, 2020.

4.3.2.3 Sewage System

The data shown below, regarding the sewage system, refer to the São José neighbourhood, as a whole. According to (OBSERVAPOA, 2010), in 2010, 87.26% of the households in the neighbourhood were being served by an appropriate sewage system. On the other hand, in the same year, 25% of the streets in the region were not supplied with sewage collection.

Table 2 compares the percentage of households supplied by an adequate sewage system, in the São José neighbourhood and in Brazil.

Table 2 – Sewage System

Indicator	São José (2010)	Brazil (2019)
% of the population in households with an adequate sewage system	87,26	68,3

Source: OBSERVAPOA, 2010; IBGE, 2020.

4.3.2.4 Urban Drainage

There is no available data on the percentage of households in Morro da Cruz served by a drainage system. The online system, for consulting urban information and administrative limitations on land in the city of Porto Alegre, on that respect, only provides a map, showing the existing public drainage network in the region. The map shows that the drainage system covers only partly the area located at the north of Santa Tereza Street. Based on the map, it is possible to estimate that nearly 50% of the streets in this area are served by drainage system. From Santa Tereza Street towards the south, no drainage system could be identified on the map. On-site observations confirmed a considerable number of streets where rainwater flows in the open, shaping ditches in the dirty streets. Due to the hilly topography, there are also many watercourses in the region that collect rainwater. In the occurrence of extreme rain events, these watercourses get flooded and the population living alongside them is exposed to the risk of flash floods, as mentioned earlier in this chapter.

4.3.2.5 Transport

Two different public means of transportation are available in Porto Alegre: conventional buses and micro-buses (locally called ‘Lotação’). There are no Lotação lines to Morro da Cruz, probably because it is a more expensive means of transportation, as it offers more comfort. Thus, Morro da Cruz is served just by three conventional bus lines.

There are no bike lanes in the neighbourhood. Bike lanes started to be implemented in Porto Alegre only in recent years, but the infrastructure for this transport mode is still precarious in the city. Anyway, the lack of public investments is not the only barrier to implementing bike lanes in Morro da Cruz. In fact, the local topography is so accentuated that it is almost impossible to use bicycles, at least as a mobility option.

4.3.3 Dwellings

Morro da Cruz residents have a heterogeneous socioeconomic configuration, and this heterogeneity ends up being reproduced in the pattern created by the dwellings. Thus, “houses considered as ‘of rich people’ coexist with very precarious houses" (SCALCO, 2012, p.38). If, on the one hand, it is possible to find well-constructed dwellings, with good quality materials and comfort, and endowed with all the necessary facilities, on the other hand there are very precarious dwellings, constructed with inappropriate materials, even without a toilet or any sanitary installation, and, often, consisting of just one room to accommodate all the dwellers (Figure 20).

4.3.4 Parks/Public Squares

There is only one official public square in the community of Morro da Cruz - the Morro da Cruz square. It is a tiny square, close to the Civil Police Station and Community Association. At the beginning of this research, information obtained from residents and NGO members showed that the square had been long neglected by municipal authorities, so that the residents took over the maintenance of the space. With the support of NGOs, they implemented some modest improvements. More recently, at the end of 2019, the square was revitalised by the Porto Alegre municipal administration, as part of a program to renovate around 600 squares and parks in the city.

On-site observations revealed that the population usually uses Morro da Cruz square, which characterises it as an important urban facility. The square is also frequently used by an NGO, that provides activities for children, that use to play on the existing sports court.

In the absence of sufficient public squares and parks, the community organises itself to appropriate existing spaces in the urban fabric, such as vacant lots, to create leisure spaces. The Campo da Lixa Square is a square created by a group of residents in an area called Campo da Lixa. It is a rare case of empty grounds within the urbanised area of the neighbourhood. An urban transport company currently occupies part of the land as parking plot for its buses, while the remainder had recently been appropriated by this group of residents. They have some support from politicians, who have provided them with the basic requirements for the place, such as street lighting, so that the residents’ demands were met, to a certain extent.

In the absence of other public squares and parks, the community organises itself to appropriate existing spaces in the urban fabric, such as vacant lots, to create leisure spaces, like Campo da

Lixa Square, a square created by a group of residents in a local area called Campo da Lixa. It is a rare case of an empty ground located in the urbanised area of the neighbourhood. An urban transport company currently occupies part of the land, as a parking plot for its buses, while the remainder had recently been appropriated by the above-mentioned group of residents. They have got some support from politicians, who have provided them with the basic requirements for the place, such as street lighting, so that the residents' demands were met, to a certain extent.

Figure 21 presents an image of Campo da Lixa Square.

Figure 21 – Campo da Lixa Square.

Source: Campo da Lixa's Facebook page.

4.3.5 Edges/In-Between Spaces

Edges and in-between spaces are interstices in the urban structure of cities and neighbourhoods, constituting remaining open spaces, after the formal division of the land in public and private lots. Such spaces have gained more attention in recent years and are being reused, for example, in tactical urbanism actions. Urban agriculture and community spaces are some options for utilising edges/in-between spaces, for resilient and sustainable initiatives.

As Morro da Cruz is an informal settlement, occupied by people in a situation of socioeconomic vulnerability, the plots of land are small, and every square metre makes a difference. Therefore, houses are often built in areas of irregular shapes, so that every corner is used for housing purposes, with almost no public interstices remaining in the urban fabric of Morro da Cruz.

4.4 SOCIOCULTURAL AND ECONOMIC ASPECTS

The United Nations Development Programme in Brazil (PNUD Brasil) defines an index, that measures three dimensions of human development in cities: longevity, education and income. This index is the Municipal Human Development Index (IDHM). The three dimensions are the same as those referred to by the global Human Development Index (HDI); however, when applied to Brazil, the methodology is adapted to the country's context and to the available national indicators. The index can give a general idea of the quality of life in cities and, as the case of this research, in the community of Morro da Cruz. Its numeric value can vary from 0 to 1, and the closer to 1, higher the human development of a locality. In Morro da Cruz, the index, in 2010, was 0,643, considered medium on a scale that has five levels: very low, low, medium, high and very high. For the city of Porto Alegre, the IDHM was 0,805, in 2010, and classified as very high (ATLASBRASIL, 2020).

4.4.1 Demography

In 2010, the population of Porto Alegre was 1.409.351 (IBGE, 2011). In the same year, the population of Morro da Cruz was 16.315 (ATLASBRASIL, 2020). Of this total, according to Atlas Brasil (2020), the majority of the inhabitants were women (51,73%). The population age structure in the studied neighbourhood was: 30,54% of people, under 15 years; 64,90% of people, between 15 and 64 years ; and 4,55% of people, over 65 years.

4.4.2 History and Culture

The region of Porto Alegre began to be populated in 1752, with the arrival of 60 Azorean Portuguese couples, who immigrated to Brazil, through the Treaty of Madrid, to settle in the Missions region, in the northwest of Rio Grande do Sul. However, as the demarcation process of these lands, where the Azoreans were supposed to go to, took too long, they remained in a place, at that time called Porto de Viamão, that was Porto Alegre's first denomination.

The city of Porto Alegre was officially founded on March 26, 1772, as parish of São Francisco do Porto dos Casais, a name that was changed a year later to Nossa Senhora da Madre de Deus

de Porto Alegre. As of 1824, the city began to receive immigrants from various parts of the world, such as Germans, Italians, Poles, Spaniards, Africans and Lebanese. This characteristic makes Porto Alegre a plural city, presenting a considerable cultural and religious diversity (PORTO ALEGRE, 2020).

As referred to in sub-chapter 4.3, the origin of the São José neighbourhood goes back to the implementation of a formal urban settlement. This settlement started to be implemented in 1875, by José Inácio Barcelos, being then called Arraial de São José. In this area, a chapel was built, in honor of St. Joseph, and the first mass on the site was celebrated on April 11, 1880 (SMC/PMPA, 2020). Today, the church is related to a particularly important event in the Catholic life of the city: the procession of the passion of Christ, which will be referred to later in this section.

The less-ordinated part of the settlement developed uphill, on its south side, constituting today the community of Morro da Cruz, was first called Chácara José Murialdo (SMC/PMPA, 2020). The name Morro da Cruz (Hill of the Cross) is due to the cross that is situated at the top of the hill. According to Fonseca (2004), the official name of the location is, instead, Vila São João. It was not an irregular occupation originated by invasions, but a territory subdivided by the city hall, in the 1950s, in order to accommodate people removed from downtown slums. After this period, irregular occupations associated to invasions began to occur, to the point that Morro da Cruz, in the early 2000s, became the region with more land invasions in the metropolitan area of Porto Alegre (FONSECA, 2004). In Morro da Cruz, immigrants from various parts of Rio Grande do Sul state can be found, such as from the cities of Bagé, Minas do Butiá and São Francisco de Paula, as well as from other States, such as Santa Catarina.

Despite the several precarious aspects addressed earlier, Morro da Cruz has some particularities, which give to the place a unique atmosphere, that are difficult to find within the urban environment, including a countryside aura, due to the existence of permanent preservation areas, where people keep horses, chickens and pigs. According to some authors, this atmosphere coexists with the qualities of a metropolis, such as the presence of schools, hospitals and transportation options. For Evangelista (2010), Morro da Cruz, like other peripheries, was an inhospitable territory in the past decades, due to the distance to the most basic public services, such as transport, education and health, as well as the lack of basic sanitation, and the very rugged geography. These geographic and territorial barriers, added to other difficulties faced by disadvantaged populations, became social barriers, isolating Morro da Cruz residents from

the rest of the city. In this sense, the physical isolation, reduced nowadays due to improved transport and to the availability of some basic public services, such as schools, is not such a big barrier as the invisibility of the population. Morro da Cruz is ignored by the formal city and has a mystical and distant aura in the imagination of most of the population. The place is considered violent and is regarded as having strong connections with drug trafficking, by the media and the wealthier population. Two terms employed by the media to define the Morro da Cruz residents are: slum dwellers and poor (EVANGELISTA, 2010; SCALCO, 2012). Unfortunately, the connection with drug trafficking is not just an image created by the media or present in the imagination of the population of Porto Alegre. According to some testimonials, collected in non-structured interviews, drug trafficking is indeed a serious issue in Morro da Cruz, although this would not be a fair reason to stigmatise the neighbourhood.

The Catholic Church and religion have an important role in Morro da Cruz, exerting a significant influence on the community (SCALCO, 2008; EVANGELISTA, 2010). Two activities can be considered the most significant examples of this influence: the work developed by the Leonardo Murialdo Institute and the Morro da Cruz' Way of the Cross.

The Leonardo Murialdo Institute is the leading philanthropic institution in Morro da Cruz and one of the most considerable social assistance and education institutions in Porto Alegre. The Institute was established in Porto Alegre, in 1953. In 1954, the São José chapel was elevated to the category of parish and, at the same time, the institute began several activities in the, so-called, Vila São José. The institution's activity area is mainly in social and educational actions, primarily with children, adolescents and impoverished young people. The institution is based on a professional qualification and formal and popular education, giving young people access to the labour market (MURIALDO SOCIAL, 2020).

The staging of the Via Crucis, in Morro da Cruz, is one of the main religious events in Porto Alegre (Figure 22). The traditional procession of the passion of Christ, which annually attracts thousands of people to the São José neighbourhood, marked 60 years in 2019. On that occasion, 30 professional actors, and around 80 extras, participated in the staging. The event is part of the city's cultural and tourist agenda and is supported by the Municipal Secretary of Culture (SCALCO, 2008; GAUCHAZH, 2019b).

Figure 22 – The staging of the Via Crucis.

Source: G1, 2018.

4.4.3 Economy and Education

The available data regarding income, the population's financial situation, and employment in Morro da Cruz are from 2010. According to Atlas Brasil (2020), in that year, all the indicators for Morro da Cruz were well below the municipal average (Table 3).

Table 3 – Income, financial situation and employment indicators

Indicator	Morro da Cruz (2010)	Porto Alegre (2010)
Per capita monthly income (BRL)	499,50	1.758,27
% of extremely poor (with per capita monthly household income below BRL 70.00)	3,20	0,92
% of poor (with per capita monthly household income below BRL 140.00)	10,26	3,82
% of vulnerable to poverty (with per capita monthly household income below BRL 255.00)	33,43	12,51
Population activity rate - 18 years of age or older	66,51	70,64
Population unemployment rate - 18 years of age or older	6,49	5,37
Degree of formality of employed persons - 18 years or older	67,99	72,79

% of employed persons with income of up to 1 minimum wage	11,64	10,43
% of employed persons with income of up to 2 minimum wage	78,77	60,27

Source: ATLASBRASIL, 2020.

Regarding educational indicators, Morro da Cruz is also below the municipal indexed numbers. There are many education indicators available (not transcribed here). For the purpose of this research, the most important information relates to adult education rates: the vast majority of adults, aged 25 and over, are literate, but with incomplete elementary education (48,83%), or with complete elementary school level, but with no complete high school attendance (26,8%). This type of investigation is also the subject of the questionnaire applied in the empirical study.

4.5 POLITICAL ASPECTS/EXISTING INITIATIVES

The investigation of the political aspects of the community, carried out below, refers to the identification of existing forms of organisation where the community discusses and organises itself to deal with local issues, either on its own, or with the support of external organisations. This identification results, mainly, in the characterisation of existing initiatives.

In addition to the Leonardo Murialdo Institute, mentioned in section 4.4, that focus on social assistance and education, there are groups, non-governmental organisations (NGOs) and associations with projects under development in Morro da Cruz. This research was allowed to access all of the initiatives mentioned in this section, by on-site visits. The study of each one was complemented by other sources of information, such as newspapers and media reports and the organisation's website. The personal contact with leaders and members of the groups, which were very attentive and helpful, was also very important. Many of the identified actions and initiatives can be considered consistent with the idea of community sustainability and resilience, presented in this research, in its four dimensions: economic, social, environmental and cultural. However, the research recognises that this embraces a vast field of knowledge.

The Morro da Cruz Community Association is led by some community members. It deals with matters of interest to the community, at large, and works in partnership with some NGOs, in order to contribute to the achievement of their goals. The NGOs in Morro da Cruz have as their primary focus: providing assistance to underprivileged children in the community, through educational activities at the contrary daypart to regular school hours; sewing classes, including

the making clothes, working with jeans and making dolls of various ethnicities; and computer classes. More activities are planned to be implemented by some of the groups working in the community. These NGOs, sometimes in partnership with NGOs based outside Morro da Cruz, also develop some specific activities, such as composting and urban agriculture workshops. However, these two activities, in particular, reached a small audience when previously developed, according to observation and feedback from the stakeholders.

An interesting action, put into practice recently, by an NGO outside of Morro da Cruz in partnership with local NGOs, involves the improvement of thermal insulation in the rooms occupied by these local NGOs. As mentioned in Chapter 3, the strategy to achieve this was to use Tetra Pak packaging, popularly known as “milk cartons”, that inspired one of the initiatives included in the survey questionnaire of this research.

Besides initiatives and projects developed by or with the support of groups, NGOs and the Community Association, there is, at least, one private initiative aligned with the focus of this research, once it is related to the economic dimension of sustainability and has the potential to leverage the resilience of the community. It is a social entrepreneurship project developed in the “Morro da Cruz Centre”. The project encompasses an “Entrepreneur’s Space” for those interested in testing business, before opening a company in the Morro da Cruz Centre; and a place for professional training courses, such as graphic design, tourism, hospitality, management and marketing, employing the distance learning model (JORNAL DO COMÉRCIO, 2019).

5 RESULTS

This chapter presents the research results of the three stages that comprise the development of the work. First, the results corresponding to the understanding stage, with an analysis of the object of the empirical study. After that, the results of the development stage, comprising the general menu and the specific menu of initiatives. Lastly, the results of the consolidation stage, where the survey results and the definition of the framework are presented.

5.1 RESULTS OF THE UNDERSTANDING STAGE

The characterisation of the object of the empirical study, carried out in Chapter 4, allowed an analysis of Morro da Cruz and the identification of the features that referenced the development of the empirical study and, consequently, the framework definition and testing. The selection of initiatives from the general menu, to create a specific menu of initiatives suitable to the object of the empirical study, is based on the results of this stage. The biophysical, environmental, urban, economic and sociocultural aspects of Morro da Cruz form the basis for identifying the potentialities and barriers regarding the community, under the lens of the proposition of possible interventions.

5.1.1 Analysis of Technical Aspects of Morro da Cruz

Next, are presented the main biophysical, environmental and urban features extracted from the characterisation of Morro da Cruz. Some considerations about the influences of these features in conceiving interventions, actions and initiatives are formulated.

- **Sharp topography:** Morro da Cruz is an extremely steep hill, as previously seen, presenting a topography that contributes to the segregation of the neighbourhood from the rest of the city. Initiatives like bike lanes, bike-sharing and skating are not appropriated in this context. In terms of mobility, solutions must include public transport improvement. The topography represents an obstacle also for the activity of waste collection and its sorting. In addition to the difficulty of walking up and down the hill, waste collectors work individually, and there's no specific locations within the community where to store and sort waste. Companies that work with waste recycling and buy from waste collectors do not collect in small quantities, how would be the case in Morro da Cruz, where, in addition to that, the truck that collects waste would have to

face the unfavorable topography. This difficulty would be reduced with the creation of a sorting centre, bringing together all the collectors, making easier the storage, sorting and further sale of wastes.

- **Vulnerability to flash floods and mass movements:** Undoubtedly, the presence of dwellings in risk areas – more specifically, in the case of Morro da Cruz, areas susceptible to flood and mass movements – raises the issue of housing shortage. In the absence of better and safer places where to live, people have no option but to occupy inappropriate areas and, in many cases, areas whose occupation is prohibited by law. Preventing the occupation of risk areas is one of a number of possible prevention actions included in the scope of disaster risk management and, like all other prevention actions, is difficult to be carried out by small-scale initiatives. Within the scope of disaster risk management, the interventions addressed in this research can be characterized, mostly, as mitigation actions. What can be pursued by small-scale initiatives in Morro da Cruz, for example, is to mitigate the effects of extreme rain, which causes floods and mass movements, or to promote the reforestation of areas where vegetation has been removed. Among the options studied in this research to achieve these objectives are: the collection, storage and use of stormwater, either from the individual properties or from critical points on the whole of the urban region; the adoption of sustainable urban drainage solutions, such as permeable pavements or rain gardens; the conception and adoption of strategies towards the creation of a Green Urban Infrastructure, such as community gardens, and of a Blue Urban Infrastructure, such as ponds and water mirrors. Lastly, and considering the prevention, mitigation and preparation actions provided for, in the National Civil Defense and Protection Policy (PNPDEC) (BRASIL, 2012b), several preparation actions can be addressed by small-scale initiatives to contribute towards disaster risk management, such as the use Information and Communication Technologies (ICT), for extreme events alert.

- **Existence of permanent preservation areas (APPs) on hilltops and alongside watercourses:** Some of the APPs in Morro da Cruz have already been partly occupied by irregular settlements, or by even large properties, where horses are bred. Any proposal for a more sensible use of these areas, or for preserving the environment, is a delicate issue, subject to the approval by public authorities and to environmental agencies appraisal. For this reason, this possibility was not considered in this research,

despite the existence of a lake at the top of the hill, where aquaculture activity could be considered.

- **Humid subtropical climate, with sweltering summer and heat intensification trend over the years:** Porto Alegre has been subjected, historically, to high temperatures in summer, and the heat intensification global trend tends to further aggravate this situation. The experience associated to increasing thermal insulation with the use of Tetra Pak packaging, described in sub-item 3.2.2.5.3, is a highly effective initiative of dealing with this problem, that also contributes to keep houses warmer on cold winter days. Furthermore, considering the annual average number of sunny days, solar energy use is also an excellent sustainable and resilient alternative, either generating energy with photovoltaic solar panels, or heating water with solar thermal panels. Other solutions to address the heat intensification trend over the years include the above-mentioned Green and Blue Urban Infrastructures.

- **Rain and drought intensification trend over the years:** Initiatives aimed at facing the intensification of both rain and drought are basically the same as those listed earlier, to cope with flash floods: collection, storage and use of stormwater, either in individual properties or on the whole of the urban region; sustainable urban drainage solutions; Green Urban Infrastructure; and Blue Urban Infrastructure. In the case of the drought intensification trend, solutions that consider rainwater storage are the most complete and appropriate, as they contribute in two ways: mitigating the effects of extreme rain and saving water for periods of drought. This kind of initiative can be individual, with roof rainwater harvesting in the residences, or collective, with public detention basins in the whole community, for example.

- **Informal settlement, with almost no interstices within the urban fabric:** Most collective and community initiatives require a physical space where to be implemented. Considering that Morro da Cruz has virtually no interstices within the urban fabric, there are, basically, two types of areas not yet occupied by dwellings or commercial and service activities, besides the Morro da Cruz square: Permanent Preservation Areas and private areas, with the potential to host community initiatives. A map was prepared to show possible areas for collective interventions, excluding APPs. The map also shows the key urban spaces and equipments, in Morro da Cruz and surroundings (Figure 24).

One example of a previously private abandoned area, that has been converted into an area offering opportunities for activity of community interest, is that of a former church, that was inaugurated in December 2020, as the new base of an NGO (Figure 23 and number 11 in Figure 24).

Figure 23 – Former church converted into the new base for an NGO.

Source: Coletivo Autônomo Morro da Cruz

- **Precarious infrastructure:** Some data presented in sub-section 4.3.2. could give an idea that infrastructure is not a critical issue in Morro da Cruz. Information provided by Atlas Brasil (2020) concerning the percentage of the population living in households with running water, electricity, and garbage collection shows that the conditions in Morro da Cruz are better than the Brazilian average, and not far below of those of Porto Alegre. However, when including data concerning all the indicators, such as those of sewage systems, combined with the observation of the local conditions, the vision of Morro da Cruz infrastructure reveals a precarious reality. As previously mentioned, despite the existence of streets provided with the necessary basic urban infrastructure, there are precariously served streets and alleys, where the community does not have full access to essential public services. One example is the so-called Beco das Pedras, an alley where the access to the houses is difficult. There, as in other parts of Morro da Cruz, such as the most recently established irregular settlements, the population is not served by a sewage system, garbage collection or, in some cases, by any basic infrastructure service. This scenario stresses the importance of initiatives related to black and greywater treatment, with the potential application and use of biomass

biodigesters, for example. Benefits related to urban infrastructure, once implemented, would be provided also by some interventions mentioned in previous topics, such as: sustainable urban drainage; and collection, storage and use of stormwater.

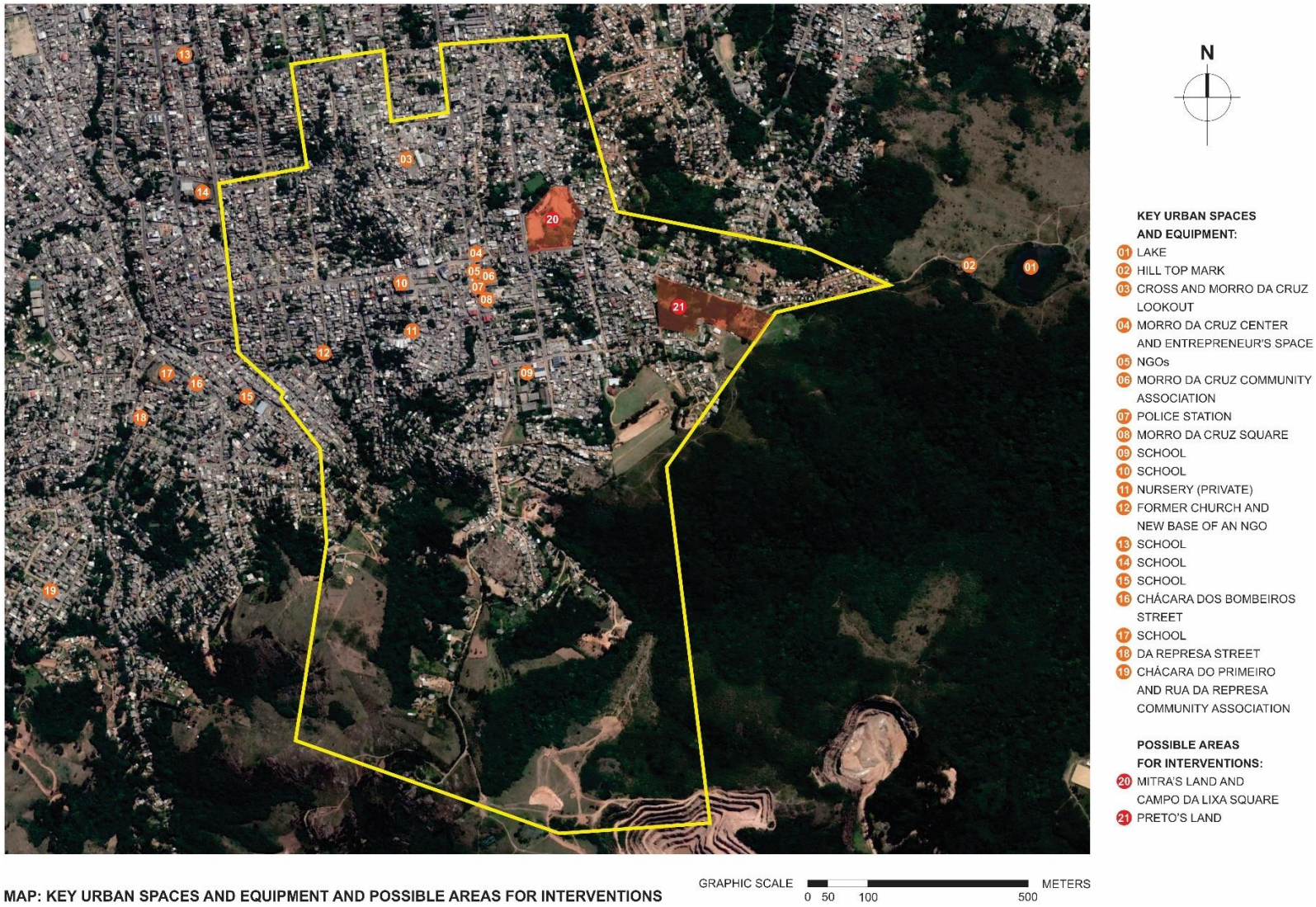
- **Precarious dwellings:** Despite the existence of dwellings of quite a satisfactory standard, as seen in 4.3.3, these residences coexist with very precarious ones. The inexistence of toilet or sanitary installation is an example of how serious the habitational issue in Morro da Cruz is. In the scope of this research, proposals for providing houses of such basic benefits were not considered. However, some possible interventions, such as sustainable black and greywater treatment, are related to the topic. Furthermore, solutions for thermal insulation, previously mentioned, are also related to the issue of precarious dwellings.

Finalising the analysis of Morro da Cruz's biophysical, environmental and urban aspects, the map in Figure 24 shows the key urban spaces and equipment in Morro da Cruz and surroundings and possible areas (identified by numbers) for collective interventions. Two of these were considered as potential areas for interventions:

- The first, is number 20, an area of about 1,5 hectares belonging to the metropolitan mitre of the Archdiocese of Porto Alegre, and located in the region of Morro da Cruz, known as Campo da Lixa. As mentioned in 4.3.4, part of the area is currently occupied as a bus company parking lot; another part was recently occupied by the community to create the Campo da Lixa Square; while the remainder is still an empty ground.

- The second, is number 21, an area of about 2,5 hectares belonging to a resident of the region, considered the "owner of Morro da Cruz", because he possesses a lot of land in the neighbourhood, that was the result of an irregular occupation, many years ago. According to a resident, who conducted an informal guided visit in the region, part of this private area was used as a community garden, between 2008 and 2013. On that occasion, the owner lent the land, and the resident considers that this negotiation can be renovated.

Figure 24 – Map showing key urban spaces and equipment and possible areas for interventions.



Source: by the author

5.1.2 Analysis of the Human Aspects of Morro da Cruz

Morro da Cruz's economic, sociocultural, and political aspects, addressed in the characterisation of the studied area, combined with the biophysical, environmental and urban aspects, analysed in the previous sub-section, identifies the context in which the proposals were developed. The present sub-section analyses these economic, socio-cultural and political features, under the lens of orientating the most appropriated sustainable and resilient interventions, actions and initiatives for the community.

First of all, it must be pointed out that this research is focused on a disadvantaged community. Primary and secondary research sources, used to frame the picture of Morro da Cruz, showed the socioeconomic reality and the heterogeneous configuration of the community where even the dwellers see themselves as facing different socioeconomic realities. Considering this scenario, the central premise for conceiving potential interventions was to list possible low-cost actions and initiatives. Thus, for example, the implementation of photovoltaic solar panels, a widespread measure, adopted by communities in a more favourable economic situation, to make them more sustainable, as occurs in many communities in Europe, was not considered, due to its relatively high cost.

In addition to having low cost, which enhances the financial viability of the interventions, the socioeconomic reality of the community made it very desirable to conceive solutions having the potential to reduce expenses and generate income for the population. Initiatives like solar water heating or rainwater harvesting, for example, can reduce the electricity and water expenses and generate medium and long-term savings.

Regarding income generation, although the data on the unemployment rate, presented in sub-section 4.4.3, are not so negative, the results of the questionnaire application show a much more critical situation, as will be seen later in the Chapter, probably partially due to the currently occurring coronavirus pandemic. This scenario further increases the importance of initiatives that can result in a source of income for the residents of Morro da Cruz, such as urban agriculture or recycling cooperatives, or that can improve their professional qualification, thus increasing the chances of getting a job, such as, for example, professional workshops.

Following this line, besides the previously mentioned sewing schools and computer classes (referred to in sub-section 4.5), a successful experiment was carried out in November and

December 2020, by an NGO, in partnership with a Foundation owned by a construction company. The project consisted in the presentation of videos on construction, refurbishment and entrepreneurship by volunteers from the Foundation. During these video presentations, participants could clarify any technical doubts, with the construction company's responsible sectors. This research had access to some participants' testimonials, provided by the leader of the NGO, who revealed that the participants were very grateful for the opportunity, and demonstrated that the learning was significant and very helpful.

The cultural venues at Morro da Cruz, the more important and best known of which is the procession that celebrates the Passion of Christ, but that are also present in other cultural activities involving the community, has led to the inclusion of cultural workshops in the role of initiatives to be submitted to the dweller's appraisal. Besides the cultural dimension, this kind of initiative has the potential to discover new talents and direct people to a professional activity. Also, cultural activities are an effective instrument to get young people out of drugs misuse, trafficking, and crime. As seen in the previous chapter, drug trafficking is a relevant and worrying issue in Morro da Cruz.

Some situations identified in Morro da Cruz, during the study, are specifically related to women. Two situations were identified: the existence of many female heads of household, and a serious problem of domestic violence. Some reasons can be pointed out as responsible for these situations, such as the existing community relation with drug trafficking and alcohol consumption, among others, although should be made clear that this research doesn't intend to reflect on these reasons. However, according to an information received at a meeting with the local community association, in which the author took part, some years ago a resident used to gather women from the community, at her home, to discuss matters of female interest, but this practice no longer exists. These circumstances indicate that the creation of a women's group would be highly convenient and desirable.

5.2 RESULTS OF THE DEVELOPMENT STAGE

The results of the development stage comprise, first, the general menu of initiatives, that constitutes the database from which the actions to be submitted to the population were selected, and the specific menu of initiatives, which are the chosen actions. Finally, the last part of this sub-section presents the results of the application of the questionnaires and an analysis of those results.

5.2.1 General Menu of Initiatives

The general menu of initiatives, the construction and structure of which were described in section 3.2.2.1, gathers 97 possible small-scale resilience oriented and/or sustainable transformation initiatives distributed among the previously described categories and themes. Certainly, the menu is not a static list and must be updated continuously, as new initiatives are developed or researched. Figure 25 shows the first page of the menu. The entire menu can be consulted in Appendix A.

Figure 25 – First page of the General Menu of Initiatives.

Categories	Themes	Actions / Initiatives / Examples	Sustainability				Resilience			Possible stakeholders					
			en	ec	so	cu	en	ec	so	co	go	in	ac	pr	ng
Energy	Solar energy use/generation	Community photovoltaic solar panels (or photovoltaic distributed generation cooperatives)													
		Individual photovoltaic solar panels													
		Individual solar thermal panels													
	Wind energy generation	Community wind turbines													
		Individual wind turbines													
	Biomass energy generation	Biomass combustion (e.g. agricultural products and residues in thermal power stations)													
		Biomass gasification													
		Biodigesters for biogas production													
		Compost-powered heating													
	Use of geothermal energy	Geothermal heating													
		Geothermal cooling													
	Energy-saving and thermal comfort	Thermal insulation of dwellings (e.g. use of Tetra Pak packaging)													
Water	Collection, storage and use of rainwater / stormwater	Rainwater harvesting (run-off from an individual property)													
		Stormwater harvesting (run-off from an urban region)													
	Greywater treatment	Phytoremediation (to remove heavy metals and other pollutants)													
		Evapotranspiration and infiltration bed													
	Blackwater treatment	Evapotranspiration and infiltration bed													
	Sustainable urban drainage	Permeable pavements/surfaces													
		Filter and infiltration trenches													
		Rain garden													
		Green roofs													
		Wetlands and ponds													

Source: by the author

5.2.2 Specific Menu of Initiatives

As mentioned earlier, 15 initiatives were selected to be submitted to Morro da Cruz dwellers for their consideration. During the development stage, from the application of the pilot questionnaire, to the application of the definitive questionnaire, a refinement was conducted, and the initiative "Use of LED Lamps" was substituted by "Thermal Insulation". Figure 26 shows the selected initiatives, their correspondent categories and whether the initiative is of an individual or collective nature.

Figure 26 – Specific Menu of Initiatives.

	CATEGORIES / DIMENSIONS				
	ENERGY	**WATER**	**WASTE**	**ECONOMY**	**CULTURE AND COMMUNITY**
INDIVIDUAL INITIATIVES	Solar Water Heater	Rainwater Harvesting	Composting at Home	Private Vegetable Garden	
	Biodigester	Sustainable Sewage Treatment		Homemade Products	
	Thermal Insulation	Permeable Pavements			
COMMUNITY INITIATIVES			Community Composting	Community Vegetable Garden	Cultural Workshops
			Recycling Cooperative		Professional Workshops
					Women Group

Source: by the author.

The individual or collective nature of the initiatives has many facets: place, participation, training, results. Individual initiatives are those to be implemented in the dweller's house or property, and community initiatives are those to be implemented in a community place or land. Individual initiatives can be taken forward by one individual, and community initiatives are collectively conducted, requiring a group of participants. However, for the success of this kind of proposition, which aims to contribute to the transformation of a community to a more sustainable and resilient system, community participation is fundamental, and even individual initiatives have to be embraced collectively. This means the population's engagement in learning and executing the initiatives that have the highest level of community interest. The execution of individual initiatives, even occurring in a private property, can also be carried out

collectively, when residents contribute with each other to achieving the collectively aimed goals. In addition, the outcomes of individual initiatives can be individual or collective. Still, even individual outcomes can be part of an integrated system, benefiting the whole community and, from a more holistic point of view, contributing to global sustainability.

5.2.3 Survey Results

Chapter 3 describes the development of a pilot questionnaire, its application and refinement, and the conception of a definitive questionnaire and its application. Although having the results of the pilot questionnaire application analysed and published (BALDAUF et al., 2020), the results were still preliminary, requiring their confirmation by the application of a definitive questionnaire to a larger sample of the population. Therefore, the results analysed in this sub-chapter refer predominantly to the data collected through the definitive questionnaire; that is, the responses to the questionnaire shown in Appendix F. Nevertheless, some information have not resulted from the questions formulated for the survey, but were collected in parallel, in conversations with the respondents, during the pilot questionnaire application. Therefore, this sub-chapter starts addressing these informations, understood as outcomes from the pilot questionnaire application, as some data so obtained were important for both the development of the study and the conclusions, being referred to below:

- Some respondents reported that an economic activity in Morro da Cruz is the raising of chickens and pigs. This information was taken in consideration, not with a focus on economics, but on the refinement of the questionnaire, resulting in the inclusion of the possibility of transforming chicken and pig faeces into biogas in the “biodigester” initiative, as shown in Figure 11.

- A lack of awareness was detected on the dwellers, about the existence of the NGOs and the work developed by them. Some questionnaires were applied in Morro da Cruz square, about 50 metres away from the headquarters of three NGOs, and the residents revealed that they were not aware of their existence.

- A female protagonism in the community resulted revealed, since a considerable part of the respondents’ families did not include the figure of a man, as the "head of the family".

The definitive questionnaire, being an online instrument, did not favour obtaining information other than those resulting from the answers to the questions formulated. Even so, some

additional information was gathered from the respondents' feedback, via text or voice message, and are also considered outcomes from the definitive questionnaire application. These information reinforce some aspects examined during the characterisation of the object of the empirical study:

- A fraction of the population of Morro da Cruz has been abandoned, especially those living in permanent preservation areas. Nobody cares about them (although being also necessary to consider the context of the coronavirus pandemic, at the time when the questionnaire was applied, that potentialised this sense of abandonment). This perception of abandonment was expressed by a dweller who lives at 9 de Junho Street. The dweller referred that, in such street, "people have good houses, beautiful houses" and are not so abandoned as people living in permanent preservation areas. In addition, for this dweller, the noise resulting from loud music is another critical issue.

- The existence of drug trafficking points is a serious problem.

The definitive questionnaire was sent via a social networking application to 1,394 contacts. Around 12% of these contacts were unavailable, repeated or were from people outside Morro da Cruz. Of the remaining contacts, 74 answered at least part of the questionnaire, but the number of responses for each question varied from 65 to 68.

Next, the most significant outcomes of the survey will be presented, being the complete responses included in Appendix G.

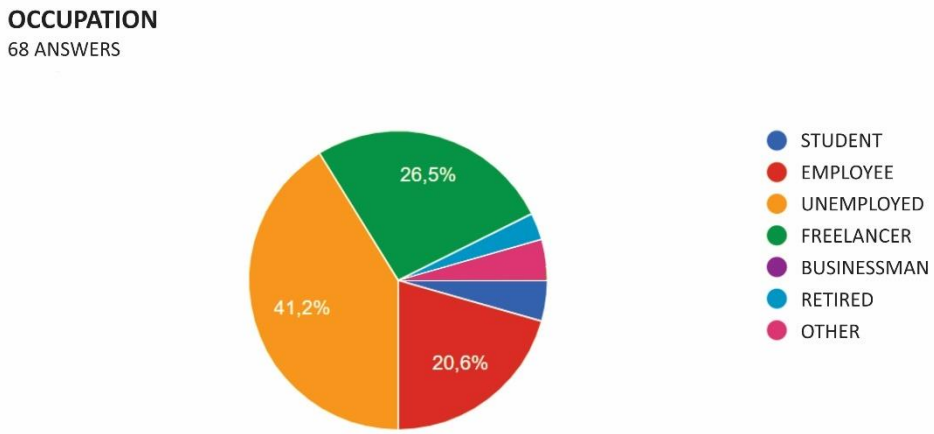
5.2.3.1 Respondents' profile

The above mentioned female protagonism in the community was reflected by the number of female respondents, that constituted 92,5% of the respondents; 7,5% self-declared themselves as being male; and no participants marked the "other" option. Almost all the respondents were aged between 21 and 50 years old (95,5%), being 38,8% from 21 to 30 years old; 35,8%, from 31 to 40 years old; and 20,9%, from 41 to 50 years old.

Regarding the number of persons living in each house, most respondents live in a house with three dwellers (29,4%) or four dwellers (32,4%). Houses with two dwellers are the reality for 13,2% of the respondents, and the rest are distributed in houses with 5, 6 or 7 or more dwellers.

Regarding the respondents' occupations, the data collected showed a critical situation, where 41,2% of the respondents declared themselves as unemployed. As speculated earlier, this situation can be partially credited to the coronavirus pandemic, but even considering the negative effects of the pandemic in the labour market, the data obtained are very impressive. Furthermore, the results obtained in the application of the pilot questionnaire, before the coronavirus pandemic, presented a very similar indicator: on the occasion, 40% of the 15 respondents declared themselves unemployed. Further data on the occupation of respondents shows that 26,5% of the respondents declared themselves freelancer and just 20,6% employee. The remaining 11,7% were students, retired or other. Figure 27 identifies the distribution of occupation of the respondents.

Figure 27 – Occupation of the respondents.



Source: by the author, adapted from the answers in Google Forms.

Finalising the analysis of the profile of the respondents, data obtained on the level of education showed that: 30,9% of the respondents had completed high school; 23,5%, had an incomplete elementary school attendance; and 17,6%, had not completed high school. The remaining results are: complete higher education, 8,8%; incomplete higher education, 8,8%; complete elementary school, 7,4%; and read and write, 2,9%.

One of the significant limitations of this research potentially profoundly impacted the results on the level of education of the respondents: as the questionnaire was sent via a social networking application, the issue of illiteracy arises, besides the discussion on digital inclusion. A significant part of the Morro da Cruz residents is illiterate and, consequently, not able to answer a written questionnaire. This issue was first detected during the application of the pilot questionnaire, when some respondents already declared themselves illiterate. Unfortunately,

the results of a written questionnaire exclude this portion of the population. The detailed discussion about this, and other limitations, of applying an online questionnaire were addressed in section 3.2.2.6.

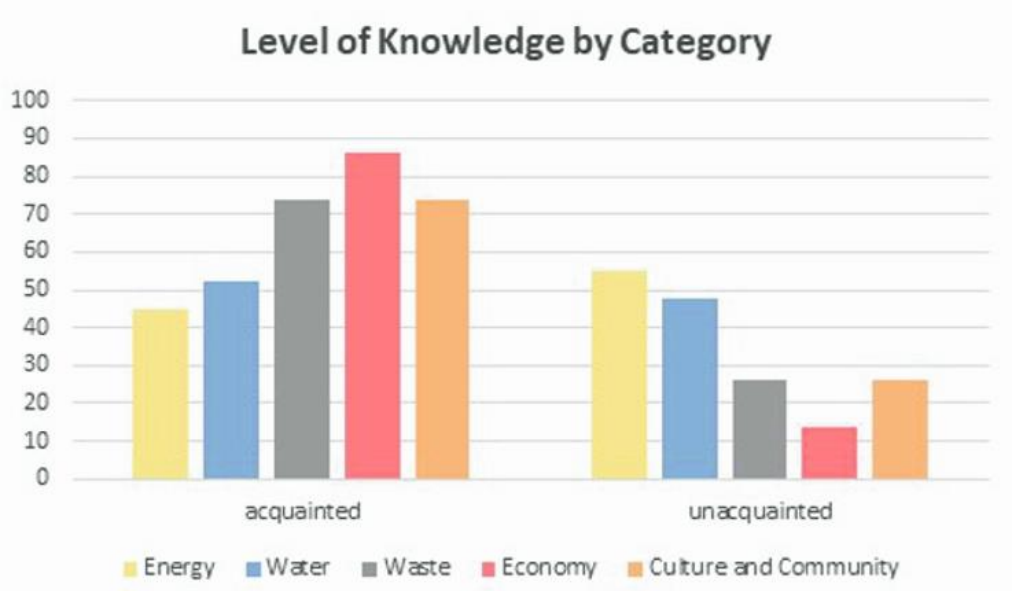
5.2.3.2 Level of knowledge

The first goal of the survey was to investigate the level of knowledge of Morro da Cruz dwellers about the proposed initiatives. As explained in Chapter 3, the description of the initiatives was written in a simple and direct language, and was accompanied by an image, thus doing the best to assure that the respondent would know, or not, the initiative presented. Even in case of unfamiliarity, an effort was made so that he/she would be able to understand clearly what it was about, in order to assess the extent to which he/she would be interested.

Among the 15 initiatives submitted to the respondents' appreciation, the three which presented the highest level of acquaintance were: 'recycling cooperative' (94,0%), 'homemade products' (92,5%) and 'private vegetable garden' (90,9%). It is an interesting point that the most known initiative is an activity related to the recycling industry sector, a relatively recent economic sector. It is particularly so when this initiative is compared to the production of homemade products and, even more, to an agricultural activity, represented by the initiatives 'private vegetable garden' and 'community vegetable garden', the latter, particularly, ranked eighth, in terms of such level of knowledge. This result probably reflects, as previously mentioned, the issue that many people work as garbage collectors, within the Morro da Cruz's community; therefore, this is a well-known activity in the neighbourhood, and even those who do not work with collecting and recycling waste are acquainted with this activity.

Still regarding the level of knowledge question, the initiatives with the lowest level of acquaintance were: 'biodigester' (83,3% declared not knowing about it), 'sustainable sewage treatment' (66,7% declared not knowing about it) and 'permeable pavements' (56,1% declared not knowing about it). The results showed that the lowest levels of knowledge were obtained for the initiatives belonging to Energy and Water categories, which represent the most technological and innovative solutions. Figure 28 shows the level of knowledge, by category.

Figure 28 – Level of knowledge by category.



Source: by the author.

5.2.3.3 Level of interest

The second question answered by the respondents referred to their degree of interest in implementing an initiative. The 15 initiatives were presented in a sequence, and, for each one, the respondent had to answer about his level of interest on the subject. Besides declaring his interest on each initiative, the respondent was asked to indicate what he/she considered to be the three most interesting initiatives, among the nine individual initiatives, and the three most interesting initiatives, among the six community initiatives. The results on the level of interest, when compiling the answers for each individual initiative, are a little different from the results of the two general questions, when the respondents chose the three most interesting individual initiatives and the three most interesting community initiatives.

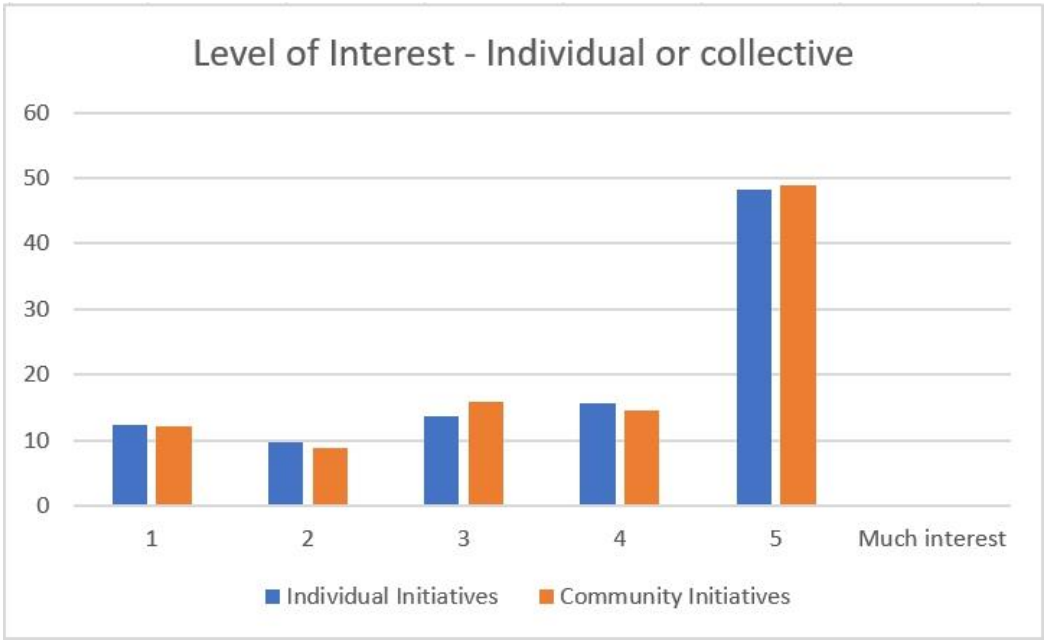
When compiling the answers for each individual initiative, it was found that those ranking highest, in terms of level of interest on the part of the respondents, that was evaluated considering the responses marked at levels 4 and 5 of the response scale, were: ‘private vegetable garden’ (89,5%), ‘professional workshops’ (80,9%) and ‘homemade products’ (73,1%). ‘Rainwater harvesting’ was in third place, when considering just level 5 in the response scale (much interested), but it felt down to fourth place, when also considering level 4 (interested).

The three initiatives of greatest interest to respondents are those with the potential to generate or increase personal and family income (‘private garden’ and ‘homemade products’) or develop skills aimed at a professional activity, enhancing the chance of getting a job (‘professional workshops’). These results reflect the high unemployment rate among respondents, as shown in the ‘Respondents’ profile’ section.

On the other hand, the initiatives with a lower level of interest on the part of the respondents, taking into consideration the responses marked at levels 1 and 2 of the response scale, were: ‘sustainable sewage treatment’ (41,5% declared none or little interest), ‘biodigester’ (39,4% declared none or little interest) and ‘recycling cooperative’ (28,8% declared none or little interest). Results suggest that sewage is not a vital issue for the respondents, being a severe problem just in some specific parts of Morro da Cruz, such as the alley called “Beco das Pedras”.

By comparing the level of interest in individual or community initiatives and considering their average, among the responses, results show equity in the level of interest for the two types of initiatives. Figure 29 shows the average level of interest, considering all individual and community initiatives.

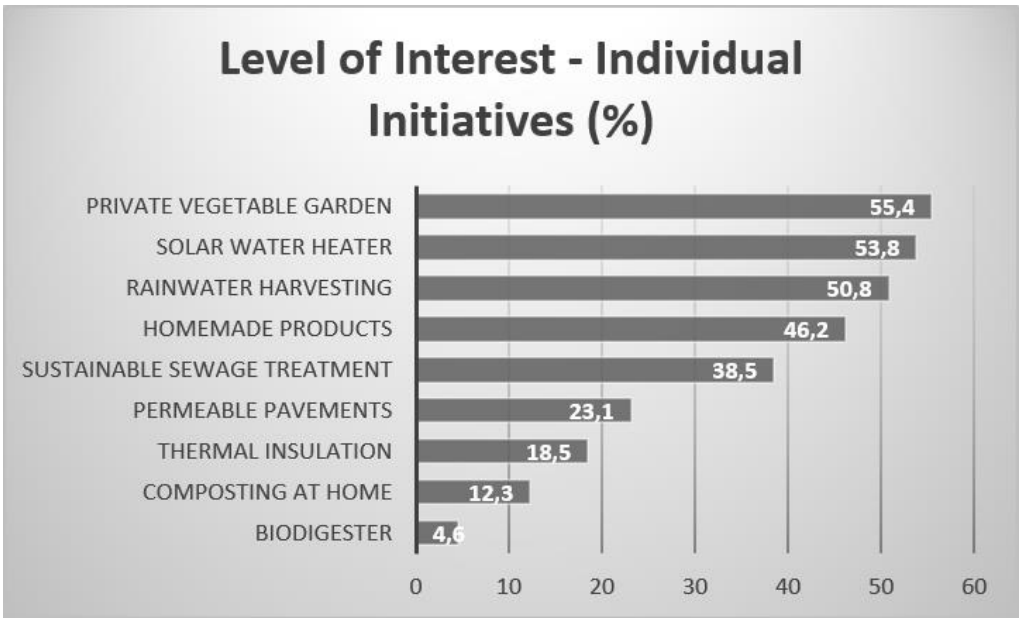
Figure 29 – Average level of interest in individual or collective initiatives.



Source: by the author.

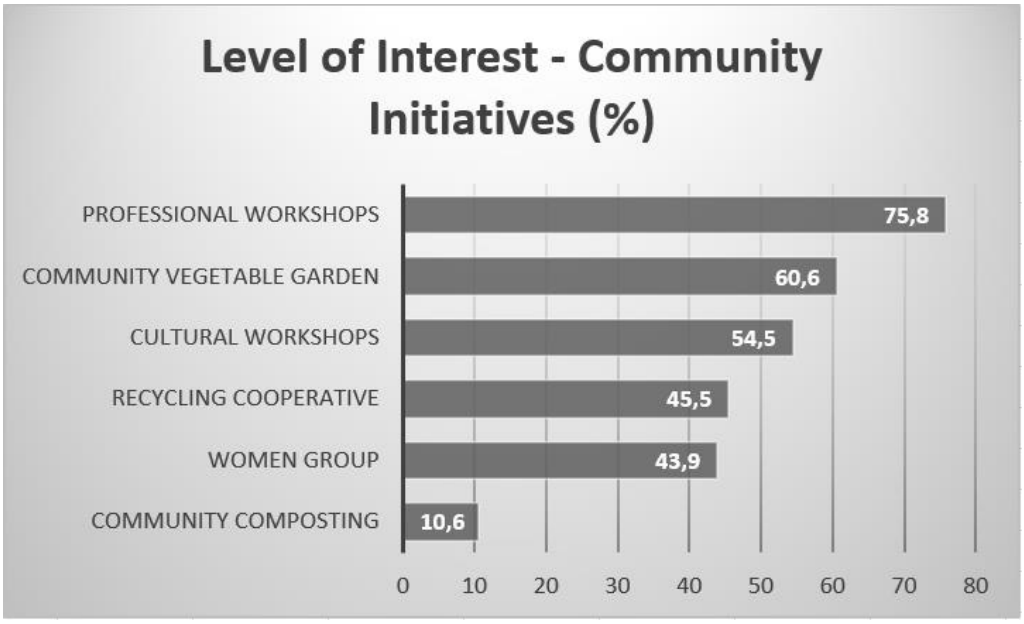
As mentioned at the beginning of this sub-section, at the end of the questionnaire the respondents were asked to indicate which initiatives they considered as being the three most interesting, among those classified as individual or collective. Figure 30 and Figure 31 show the results of these questions, presenting the ranking of preference for individual and for community initiatives, respectively.

Figure 30 – Level of interest in individual initiatives.



Source: by the author.

Figure 31 – Level of interest in community initiatives.



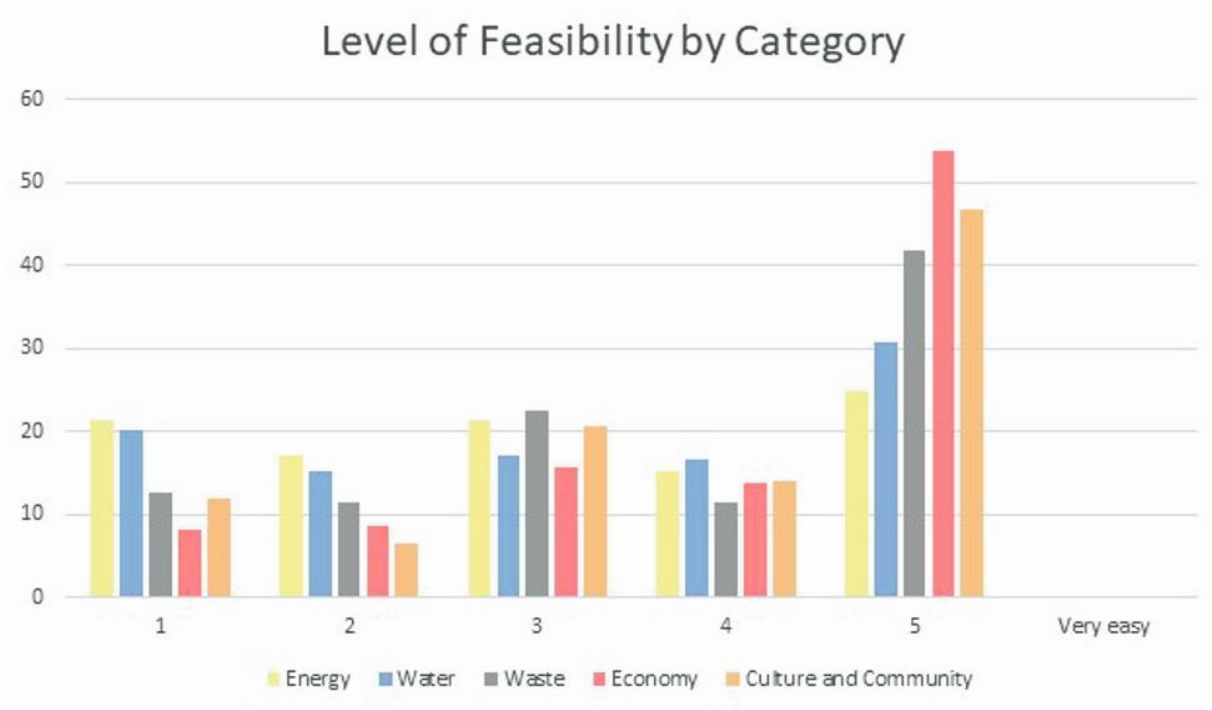
Source: by the author.

5.2.3.4 Perception of feasibility

The perception of the feasibility of the initiatives, from the respondents' point of view, indicates a relationship between this indicator and the levels of knowledge and interest. In general terms, initiatives that arouse greater interest are considered easier to execute, and with which the respondents have a higher level of familiarity. In comparison, initiatives that arouse less interest were those considered more difficult to implement, consequently showing the respondent's lower level of familiarity with them. Thus, there is a probable tendency that the respondents have a greater interest in some initiatives that they consider easier to implement; the respondents would also be most resistant to other initiatives, when considering them difficult to execute, which could be partly credited to the lack of knowledge on how to carry them out.

In this sense, initiatives belonging to the Energy and Water categories, which were the categories with which the respondents had a lower level of familiarity, and represent the most technological and innovative solutions, were considered most difficult to implement. Considering levels 1 and 2, of the response scale, meaning difficult or very difficult, the initiatives considered with the lowest level of feasibility are: 'biodigester (60,6%), 'sustainable sewage treatment' (60,0%) and 'solar water heater' (30,3%). Among the initiatives seen as having the highest level of feasibility, the three first, corresponding to the levels 4 and 5 of the response scale, are: 'private vegetable garden' (78,8%), 'rainwater harvesting' (65,2%) and 'homemade products' (65,1%). The exception for the tendency shown above is 'rainwater harvesting', once, even being considered as a technological solution, it was considered quite feasible. However, in general, the tendency is confirmed, as shown in Figure 32, which represents the average of the results, by category, on the respondents' perception about the feasibility of the initiatives.

Figure 32 – Level of feasibility by category.



Source: by the author.

From the results of the survey, a conclusion can be made regarding which initiatives would be the most recommended for Morro da Cruz. Analysing both the results - on the level of interest; and on the perception of feasibility of implementing the initiatives - the recommended initiatives are 'private vegetable gardens' and 'professional workshops'. These initiatives had the respondents' preference, both in the individual questions and in the grouped questions (when respondents were asked to choose the most interesting individual and the most interesting collective initiatives, among all options). With basis on the definition of the recommended initiatives, the process of implementing them in the community could continue, following the possible sequence of stages, mentioned in sub-section 1.6, with the involvement of all stakeholders.

5.3 RESULTS OF THE CONSOLIDATION STAGE

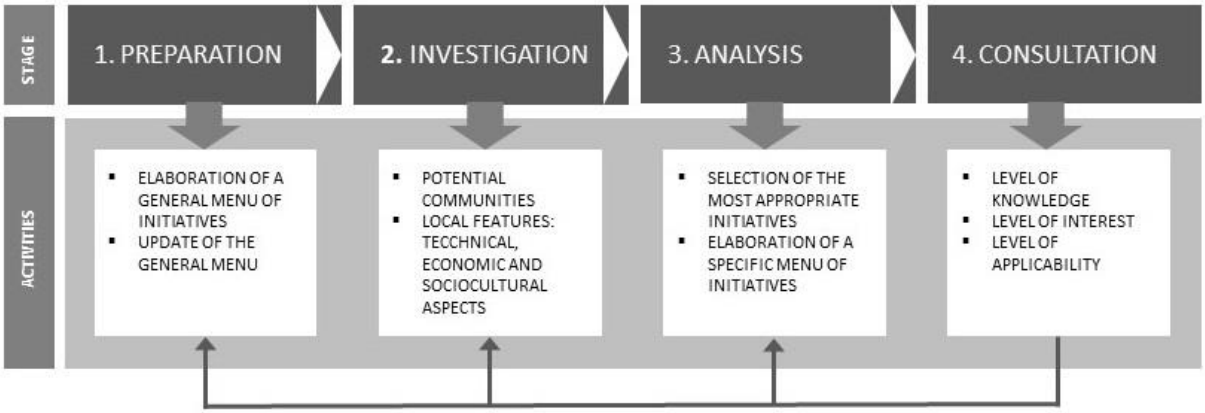
The first part of this sub-section concerns the definition of the framework to classify and assess the perceived impact of small-scale resilient and sustainable transformation initiatives in disadvantaged communities. In the second part, the results of the practical evaluation of the framework, especially the results of a seminar with experts to evaluate the utility and applicability of the framework, are explained and analysed. Then, the developments after the

seminar are explained, bringing new elements that were added to the research and explored throughout the work. Lastly, discussions on the theoretical contribution of the research are carried out.

5.3.1 Proposition of a Framework Towards Replicability

The contents of this sub-section intend to answer the main research question, describing the artefact proposed for achieving the research aim. A framework is proposed, in order to instrument communities, and stakeholders working in partnership with the communities, to investigate, analyse, assess and make decisions in the early stages of implementation of small-scale, resilient and sustainable transformation initiatives, in socio-environmentally vulnerable communities. As pointed out in the chapter of introduction, the proposed artefact does not embrace the entire process of implementing initiatives, focusing on the first stages of this complex and transdisciplinary process. An overview of the framework, showing the stages and activities proposed, is given in Figure 33.

Figure 33 – Stages and activities of the framework.



Source: by the author.

The framework is divided into four distinct stages: (a) Preparation; (b) Investigation; (c) Analysis; and (d) Consultation, with the corresponding activities being shown in the Figure. Although being the stages and activities designed in a sequence, the process is iterative. Therefore, previous activities can be reviewed or refined after the completion of subsequent activities, so that, during the development of one stage, it is possible, and sometimes necessary, to return to the previous stage. The process proposed in the framework is, ultimately, the main work developed throughout this research.

5.3.1.1 Preparation Stage

The lack of a database to be consulted, from which the selection of initiatives to be proposed to a given community could be made, made it necessary to elaborate a general menu of initiatives, as explained before. For this reason, the preparation stage, specifically in this research, comprised the elaboration of this 'first version' of the general menu. It is intended that this general menu may serve as a basis for consultation for possible future works. The preparation stage would, then, comprise the permanent and necessary update of the content of an "open" menu, given that: first, this research certainly will not succeed in gathering all existing initiatives around the world and; second, initiatives are continuously being created. The general menu update can be based on different sources of data, such as: books, papers, news, reports, conference presentations, organisation websites, field research, documentaries, and television broadcasts.

5.3.1.2 Investigation Stage

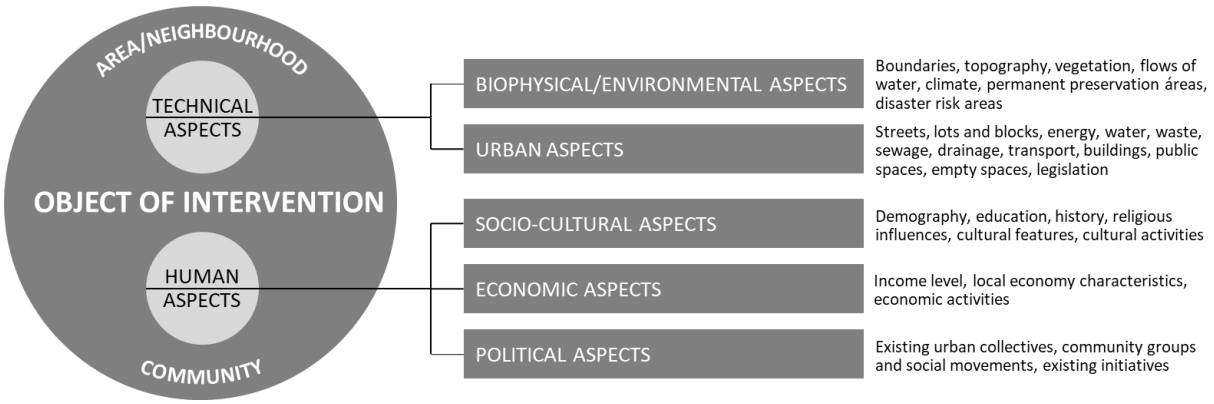
The investigation stage comprises the selection, characterisation and understanding of the community object of intervention. The process of selecting the community object of the empirical study of this research was explained previously, but it can occur in different ways and for different reasons, depending mainly on who is involved in such action. Many times, for example, the action may be initiated by the communities themselves. Therefore, the selection of the community is not a step determined by an external actor, but is intrinsic to the stakeholder's interests.

The characterisation and understanding of the neighbourhood and its community must be carried out through an in-depth investigation of the local technical and human aspects. As previously mentioned, the technical aspects concern the biophysical, environmental and urban features of the intervention area, and the human aspects concern the economic, sociocultural and political characteristics of the community. The following biophysical/environmental local features can be surveyed, among others: area boundaries; topography; vegetation; flows of water; climate; potential effects of climate change (such as: the increase in the risk of extreme events – drought, storms, heat waves and rising sea level); permanent preservation areas and disaster risk areas (subject to floods, flash floods, mass movements, erosions, volcanic eruptions, etc.). Among the urban features to be surveyed are: streets; lots and blocks; energy and water supply; waste management; sewage systems; urban drainage systems; transport; building characteristics; public spaces; and empty spaces. This information can be searched,

mainly, on secondary data sources, such as: maps; official documents; scientific works; websites of municipalities and organisations; surveys carried out by the government and official bodies; books; and, also, through primary data sources, such as: on-site visits and site mapping. Also, the municipality's urban legislation has to be examined, under the lens of potential interventions to be proposed. In this stage, the production of maps, images and diagrams helps to make a comprehensive portrait of the area.

Next, are listed some of the elements to be described, among the human aspects of the community. Economic aspects refer to: income level; local economy characteristics and economic activities. Sociocultural aspects are related to: demography; education level; history; religious influences; cultural features; and cultural activities. The political aspects of the community concern information about: forms of organisation, such as existing urban collectives; community groups and social movements; level and forms of participation; and existing initiatives. As with the technical aspects, this investigation can be done through secondary data sources, but primary data sources here are very important. On-site visits; non-structured interviews; workshops and focus groups; are some of the data collection techniques that can be used to discuss local problems with the community and to conduct a survey of these problems under the dwellers' lens. Figure 34 shows the proposed structure for characterisation and understanding of the intervention object, comprising the different categories of aspects to be investigated, and examples of the corresponding elements to be described.

Figure 34 – Structure for characterisation and understanding of the intervention object.



Source: by the author.

5.3.1.3 Analysis Stage

In the analysis stage, the results of the previous stages were examined to select the most appropriate initiatives for the community. The first stage, of preparation, provides the list of all initiatives possible to be implemented in the community. The second stage, of investigation, provides the necessary information to select the initiatives considered in line with the community's characteristics, needs, and aspirations.

The process of initiative selection can involve researchers, professionals, experts and the community itself. It has to be developed as an iterative process, where the discussion contributes to the selection refinement. In case of the participation of community members, these persons must have a good understanding of initiatives. As seen in sub-section 5.2.3.2, the level of knowledge, regarding the initiatives proposed in the empirical study of this research, was, in general terms, low, reaching less than 50% for the average of the three initiatives in the 'energy' category, for example. If the community members involved in this stage have insufficient knowledge about initiatives, an activity to introduce them to unfamiliar initiatives is recommended, in order to provide them with the necessary repertory, to choose the most suitable options. After all, a person tends not to select something which he/she is not familiar with.

The selected initiatives comprise the submitted. It is interesting to create a balance between initiatives from different categories, to contemplate solutions for different themes and issues that the community may be struggling with. In this research, the initiatives were classified and distributed in five categories/dimensions: 'energy', 'water', 'waste', 'economy' and 'culture and community'. However, this classification can vary according to different contexts.

5.3.1.4 Consultation Stage

The last stage of the framework comprises a consultation with the population, to identify their level of knowledge about the proposed initiatives, their degree of interest in implementing each initiative, and their perception of the initiatives' feasibility. In addition to these key points to be investigated, this stage also includes the characterization of the profile of the population consulted. Lastly, the results of the consultation stage allow ranking the initiatives that were considered the most suitable for the community object of intervention, enabling the initiators of the process and community leaders to select those that will be carried out.

This stage of the framework corresponds to a quantitative phase, where scientific methods are employed, aiming at the reliability and validity of the process, and focuses on groups' and individuals' behaviours (MOREIRA, 2002). In this sense, it provides quantitative results that allow a solid basis from which conclusions can be formulated, in accordance with the aspirations of the population consulted, so that decisions can start to be taken. A primary data source from which to obtain these results, consists of a questionnaire to be applied to a probabilistic sample representative of such population. Such data collection instrument must be elaborated with the results of the analysis stage. These results, supposed to be the most suitable initiatives for the community, are, then, submitted to the dwellers' appreciation, in order to collect the intended above mentioned information.

The most likely users of this framework are the initiators of the process of implementing transformation initiatives, such as: the community, supported or not by external stakeholders; non-governmental organisations; institutions; researchers; professionals; and activists, working in partnership with the community. The community can act through: community associations; community groups; community organisations; as well as urban collectives and social movements. These groups are forms of citizen mobilisation, aiming at achieving their demands and claiming fundamental rights, with basis on resistance processes and creative practices, with some characteristics in common, such as flexibility and horizontality (ROSA, 2013; MELCHIORS, 2019).

5.3.2 Practical Evaluation of the Proposed Framework

In this sub-section, the proposed framework is evaluated, under the perspective of their practical contribution, with basis on: the results of the seminar; the researcher experience; and the Morro da Cruz dwellers' feedback.

The seminar with experts was online and took place on January 7, 2021, with the participation of four experts, as mentioned in Chapter 3. This activity was both very rich and contributed to the enrichment of the process, counting with the curricular diversity and complementarity of knowledge of the participants, that much contributed to a comprehensive discussion. The main remarks, recommendations and conclusions arising from the seminar were the following:

a) The research theme is relevant. The proposed work contributes to the necessary task of changing the context, the reality of the inhabitants of Morro da Cruz, as an attempt of increasing the dignity of the population. This type of community is a 'time bomb', which

means that tensions can ‘explode’ at any time, due to the growing and collective feeling of both the lack of social inclusion and of attention on the part of public authorities.

b) The existing initiatives in the city in such direction are all too isolated, dispersed and punctual. There is also a lack of centralisation of these actions, including those being developed, for example, within universities. This reality prevents the sharing of experiences, so that others can benefit from the learning acquired in each initiative, in such a way to allow reproducing them in other places, thus exchanging and enriching experiences and the whole process. Instead of that, what is noticeable is a total lack of contact between the different actions taking place in the city. In this sense, a communication tool, that would allow to meet this need, would also be considered a sustainable initiative.

c) People living in these communities learn from experiences; so, the best way to introduce them to previously unknown initiatives would be made possible with practical examples, allowing such communities to discuss and start adapting possible alternatives, according to each specific reality. Two forms of introducing initiatives through practical examples have been raised in the seminar: (i) the possibility of learning from the experience of other communities, mentioned in the previous item; (ii) the development of ‘prototypes’ or ‘pilot projects’ for some initiatives within the community, which would serve as a test for their further application, either on a similar or on a larger scale.

d) It would be important to improve and increase the channels for listening to the residents, in such a way to make the initiators of the process more adequately aware of the processes occurring within each community, thus enabling a better understanding of the whole. For example: trying to understand why things happen in the way they use to, or what impact the functioning of the community has on the individuals and on the whole of people’s lives. In addition to numbers, it is necessary to better diagnose the population’s needs, in such a way to obtain a better understanding of how these communities see themselves. So, what other tools, in addition to those applied in the research, could be incorporated in the diagnosis of the community, so that this diagnosis could be improved and become even more accurate and beneficial to such a community?

e) In order to better instrumentalise the community, one more option would be to involve schools, and even the local health centre, in the task of disseminating and raising awareness, supporting and reinforcing the implementation of initiatives.

f) The results of the research can, therefore, become something like an embryo for: (i) providing knowledge and disseminating solutions that, as they become better known by the general population, would arouse higher interest. Making these solutions largely known would provide residents a better understanding of the benefits that the initiatives could bring to their lives, besides the potential environmental and/or community benefits; (ii) enabling the emergence of cooperatives in the communities, for the implementation of initiatives.

Some issues discussed during the seminar were already raised during the research development and mentioned throughout the work. The literature review on the Transition Movement showed the fragmentation and lack of connection between initiatives, when implemented in the neighbourhood scale, within metropolitan areas. Also, the verified lack of awareness by Morro da Cruz dwellers about the existing initiatives in the neighbourhood can be partially credited to the inexistence of an effective communication tool, which could gather information about existing initiatives and make them available for consultation.

Another fundamental point that has to be mentioned, regarding the development of this research, was the impossibility of carrying out additional presential activities, due to the coronavirus pandemic. This impossibility, as already mentioned, constituted a significant limitation. The identified need for more direct contact with the residents, to have a more comprehensive understanding of the community, occurred, partially, due to this limitation. However, the discussion on this topic, during the seminar, prompted reflections on other possible tools, that would allow to respond to the need of better listening to the population. These tools are listed in section 5.3.1.2, which describes the investigation stage of the framework, as the possible primary data sources, for that qualitative phase, on that specific stage. Regarding the tools used during the development of this work, on-site visits were made and non-structured interviews were applied. Besides that, there was also the intention to organise a focus group. However, workshops were not considered. Later, for the proposal of the framework, the promotion of workshops, which are a powerful tool for building an accurate community diagnosis, was included among the recommended tools.

In section 5.2.3, it was mentioned that, when the survey instrument is applied online, it is difficult to obtain further information, in addition to those sought through the questions included in the questionnaire. The same is true about getting feedback from the respondents. Even so, two respondents sent their impressions about the survey, via the social networking application through which the link to the online questionnaire was sent. The comments were short, but positive:

Comment 1: 'Hi. I liked the research. Interesting subjects.'

Comment 2: 'I found the questions interesting.'

Although having received feedbacks from only two respondents, the absence of negative feedback enabled the author to conclude that, from the respondents' point of view, the survey was positive and aroused their interest.

5.3.3 'Porto Alegre Initiatives' Website

After the practical evaluation of the proposed framework, it was clear that centralising information about the dispersed initiatives in Porto Alegre would be extremely useful, both as a way of creating a 'database' for consultation, and of a tool to connect initiatives with each other and with the population. An initiative in this sense would allow the sharing and the learning from other experiences and the exchange of information. In particular, it would be a way of presenting initiatives, which the population is not acquainted of, through practical examples. Such a strategy of exchanging information and creating a network of initiatives is widely addressed in the literature. The idea is encompassed, for example, in the concept of niches formation as "a process in which intermediaries distil lessons from current initiatives and offer transferable knowledge to new ones, who, then, reinterpret and apply it in their local contexts. This supports the consolidation of learnings and replication of successful practices" (WOLFRAM, 2018b, p.12).

Rosa (2013), in his book 'Microplanejamento. Práticas Urbanas Criativas' (Micro Planning. Creative Urban Practices) maps and analyses what he calls 'micro-practices', in the city of São Paulo. These micro-practices refer to bottom-up micro-interventions in the urban space, i.e. "projects and initiatives that manipulate spaces intending to generate urban quality and better environments to live, on a local scale" (ROSA, 2013, p.14). Eighteen urban intervention initiatives are presented in social, economic, sports and cultural domains, such as: community gardens; arts centre; a boxing school and gym located under an overpass; and an open-air

cinema. The book was written based on the observation that there was no comprehensive mapping of these micro-practices in the city of São Paulo, this fact leading to the population's unfamiliarity with them, making them invisible. The intention was to create a platform to show different occurrences of this type of initiative, documenting, disseminating and sharing experiences, thus organising a network of these practices (ROSA, 2013).

Following a similar reasoning, and as a deployment of the practical evaluation of the framework, a tool was developed to overcome the lack of centralized information on existing initiatives in Porto Alegre, and to allow the exchange of experiences and ideas among all actors. The elected tool for this purpose was a website called 'Iniciativas Porto Alegre', https://iniciativassustent.wixsite.com/portoalegre (Figure 35). The website includes a map where initiatives of such a nature are located, and information about each mapped initiative is provided. The general menu of the initiatives developed in this research is also included. Existing actions in the city are made available by this tool, allowing the sharing, analysis and learning from previous practical experiences.

Figure 35 – Homepage of the Porto Alegre Initiatives website.

Source: by the author.

The website was designed in a way that allows it to be constantly updated, as new initiatives are found or developed, whenever they are considered interesting and deserving to be included

in the network. During the website's construction, a thorough search was made to identify as many as possible existing sustainable and resilient initiatives, within the urban context of the city of Porto Alegre. This search was accomplished by contacting people engaged in the sustainability field, NGOs, websites, social media and publications. In addition to initiatives located in Morro da Cruz, described in Chapter 4, a list of identified sustainable and resilient initiatives in the city was elaborated, so to be included in the first version of the website, as follows:

- **Centro de Educação Ambiental (CEA):** The Environmental Education Centre (CEA) is a garbage collectors' association, located in a neighbourhood called Vila Pinto. The main initiative of the CEA is the Vila Pinto Sorting Centre (CTVP), a recyclable material sorting shed. The association also includes the Marli Medeiros Cultural Centre (CEMME), where various activities are developed, including services to community residents, from children to the elderly, in multiple areas such as: education, culture, sports and professional qualification (ÁVILA, 2019; CEA, 2021).

- **Horta Escolar Comunitária do Jardim do Salso:** A community school garden, in Jardim do Salso neighbourhood, one of the 12 projects of the Amigos do Salso Group (information obtained from a member, via email).

- **Misturando Arte:** A group of people together aiming at the promotion of the local economy of Cascata's neighbourhood, generating work and income, with environmental responsibility, with basis on self-management and popular education. The group activities are mostly based on the practice of co-operation, solidarity and care for the environment (MISTURANDO ARTE, 2021).

- **Instituto TodaVida:** TodaVida Institute is an NGO, that works with environmental education, tactical urbanism, planting urban forests and develops several street actions. In the planting of urban forests, which is carried out in public schools, the NGO promotes environmental awareness and education among students and neighbours, involving the entire community. The organisation has already implemented two urban micro forests in schools, in the Restinga and Ipanema neighbourhoods (information obtained from the president of the NGO, via a messaging app).

- **Horta Comunitária da Lomba do Pinheiro:** The Lomba do Pinheiro Community Garden is a community project, developed in partnership with voluntary municipal secretaries and university institutions. It works with sustainability, agroecology and citizenship. The project has, among its objectives: multiplying knowledge; recovering the territory's history; the implementation of home gardens; the promotion of healthy and organic food consumption; and stimulation of the sense of citizenship (HORTA COMUNITARIA DA LOMBA DO PINHEIRO, 2021).

- **Engenheiros sem Fronteiras:** 'Engineers Without Borders' is a non-governmental, non-partisan and non-profit organisation, that carries out activities based on engineering and is oriented towards human development. It works on social projects, that contribute to improving the quality of life of local communities. It develops and executes projects with the help of volunteers, seeking excellence in planning and an execution plan with the participation of the society, mainly by members involved with the community, listening to their needs, and establishing partnerships and friendships (ESF POA, 2021).

The artefact proposed in this research aims to support the early stages of implementing initiatives, through a sequence of steps or activities. The 'Porto Alegre Initiatives' website, in addition to the potential practical contributions discussed above, is understood as an instrument to support the process covered by the framework. The preparation stage of the framework consists of elaborating and updating the general menu of initiatives. But how to keep this information available and constantly updated? The emergence of new initiatives is a dynamic process, with new things happening all the time. Thus, a website is the best way to store this information in an integrated way, allowing the inclusion of new initiatives as they are created, with this information always available for consultation. The classification adopted in the research for the general menu, that is, its division into categories/dimensions and themes, is also adopted and explained in the website.

In a similar way, initiatives registered and mapped in the website, corresponding to existing initiatives in Porto Alegre, can be updated at any time. This information can support the last stage of the framework, consultation. To submit the selected initiatives for appreciation by the Morro da Cruz dwellers, a description of each initiative was included in the questionnaire, along with an image. Even so, it is not clear whether this material provided enough information to support the dweller's response. For this reason, existing initiatives in the municipality would

be the best reference to describe and present initiatives to a given community, in case of replication of the framework, and the website is the instrument that provide this information.

The website also contains the theoretical definition, developed for this research, of what initiatives are. The explanation of what is understood as ‘initiatives’ is necessary for the selection and justification of which initiatives will be part of the website.

5.3.4 Discussion on the Theoretical Contributions

This sub-section intends to bring together some reflections on the results achieved by the research, and to identify and analyse the theoretical contributions obtained. The reflections are organised in terms of advances obtained, the potentialities and limitations of the research, and the replicability potential considering the research results.

Five main contributions were identified in the research with possibilities of contributing to the **advancement of knowledge**. The first two contributions identified are related to the discussion on concepts and definitions. Throughout the literature review chapter, an analysis and synthesis of these concepts and definitions were made, in order to clarify their meaning within the research context. Sub-section 2.1.2.3 explains why the research adopts both ‘resilience’ and ‘sustainability’ as goals to be achieved by communities, when aligned with the studied initiatives, thus offering a contribution to the debate on the meaning of resilience and sustainability for communities in the urban context. The research tries to clarify what is to be understood by the two terms, within the scope of this work. A similar analysis and definition is made regarding the term ‘initiatives’, as presented in sub-section 2.2.2. After a literature review on the topic, a definition of what is here understood as ‘initiatives’ is proposed, considering the context of ‘small-scale resilient and sustainable transformation initiatives’, addressed by the research.

The third advancement, in theoretical terms, refers to the fact that this research, as far it was possible to identify, is the first academic work to collect, compile, and categorise such a large number of initiatives, found in an also very large range of sources, by means of a literature review. The research has advanced in relation to previous works, not only in creating a 'menu', with a wide and comprehensive scope of initiatives, but also in structuring the whole of this information. The initiatives were categorized and classified, both in terms of their potential to generate benefits, in the different dimensions of resilience and sustainability, and in terms of

possible stakeholders that potentially would be able to contribute in the implementation of each initiative.

The research also proposed a process approach, to support the early stages of implementation of small-scale resilient and sustainable transformation initiatives, in disadvantaged communities. This is the fourth identified contribution for the advancement of knowledge, since no previous work was identified, in the consulted literature, with a similar proposition of systematisation, for implementing this type of initiative, expressed, like in this research, in the form of a framework. The development of the work allowed, further, the creation of a tool that, in addition to other purposes, is a complementary instrument, supporting the replication of the framework.

Finally, this work also advances, in terms of theoretical contribution, by clearly addressing what, here, has been defined as ‘initiatives’ in developing countries, more specifically in the context of disadvantaged Brazilian communities. This type of context is minimally explored, from a scientific perspective, particularly in Brazil.

Regarding its **potentialities**, in theoretical terms, the research is understood, above all, as an opportunity of diffusion, and consequent possibility of advances, in the study of the topic, by Brazilian researchers. From this perspective, a vast range of disciplines can address the whole subject, or some of the related themes, carrying out, for example, studies on just one type or category of initiatives. Being an interdisciplinary/transdisciplinary and complex topic, it provides a wide variety of research possibilities. And, amid this range of possibilities and different realities, the results of this research can, to a certain extent, contribute to the construction of new reflections.

In addition to proposing an approach to the meaning of 'resilience', 'sustainability' and 'initiatives' within the scope of research, another concept was extensively studied and explored throughout this work, as it is understood as fundamental at this point of the human history: the concept of 'transformation'. Although no particular definition of 'transformation' is proposed for this research, it is clear that the idea here is that 'transformation' does not refer to a single big change. Rather, it can be achieved by several small actions, following the reasoning of Holloway (2006) in the statement mentioned in Chapter 2, which considers that, in order to be successful in promoting radical change, or, in this case, transformation, it is necessary to work

in the interstices of society (HOLLOWAY, 2006). But how transformative are the initiatives addressed in this work? The scope of the research did not provide for such an investigation. However, it can serve as a basis for studies that explore the theme and measure the degree of transformation provided by each initiative, allowing us to know which initiatives would be the most transformative for a given community.

Also with regard to the potentialities, being the proposed framework just the first part of a process to implement small-scale resilient and sustainable transformation initiatives in disadvantaged communities, as pointed out previously, this research potentialises the development of studies addressing the subsequent possible stages of the process, according to what was suggested in sub-section 1.5. A set of related studies has the potential to cover the entire process.

The **limitations** of the research results are related to the previously mentioned interdisciplinarity/transdisciplinarity, and to the intrinsic complexity of the topic. The impossibility of aggregating views, from all the different areas of knowledge that could complement and enrich the research, and the impossibility of involving multiple stakeholders, in addition to those who participated in the study, end up causing the results to be limited to a specific situation. Thus, the research results are linked and appropriate to the conditions in which the study was developed.

Lastly, concerning the **replicability potential**, it is understood that the framework, which is the research aim and possibly the main result of the research, could be easily reproduced in other studies. All the stages could be replicated in other contexts, even in contexts with different technical and human characteristics. Certainly, it is worth considering that the empirical study of this research was developed in a specific reality, and some details of the study are specifically related and restricted to meet this reality. Thus, it is necessary to consider the specific reality where the framework will be replicated. In any case, the proposed general process can serve as a basis for carrying out other studies, even in different contexts.

6 FINAL CONSIDERATIONS

This chapter presents the final considerations of the research, starting with a brief discussion of the general purpose of the topic addressed. Then, the subsequent considerations are made through a synthesis of the conclusions obtained during the development of the work, as well as the recommendations for future research, in order to continue the evolution of the approached process and contribute to a deeper study of the topic.

Ultimately, the present research attempts to contribute to the debate on, and practice of, making communities more resilient and sustainable. The need of embracing this vision is widely explained in the chapter of Introduction, and it is clear to (unfortunately, still a small) part of humanity. The climate emergency (RIPPLE et al., 2020) was one of the strongest reasons for addressing this topic. The focus on disadvantaged communities is partially justified because these communities are the most affected by consequences of climate change, as also seen in the Introduction. However, the notion of sustainability focusing mainly on environmental issues, in response to climate change, could be questioned: why implement initiatives to reduce the environmental impact in disadvantaged communities, when the poorest 50% of humanity were responsible for just 7% of global CO2 emissions, in the period between 1990 and 2015? The wealthiest 10% of humanity, on the other hand, accounted for 52% of the emissions in the same period (GORE; ALESTIG; RATCLIFF, 2020).

Therefore, the notion of sustainability, that emerges in the context of this research, reinforces addressing the four dimensions of sustainability: environmental, social, economic and cultural. Results show that, for communities in socioeconomic vulnerability, environmental concerns must be part of a strategy that integrates this goal with the economic, social, and cultural dimensions, bringing potential benefits in terms of income, expenses reduction, skills development, social inclusion, social integration, welfare, empowerment and cultural vitality, among others. This research advocates that it is no longer possible to think of solutions to economic, social and cultural issues, without considering the environment, given the alarming process of environmental collapse underway throughout the world. In this sense, the research attempts to translate the broad concept of sustainability, in its four dimensions, to the micro and small scale. By focusing on specific issues of interest to local communities, this work explores and contributes to this notion of sustainability.

6.1 CONCLUSIONS

From the definition of the research problem and the research gap, the research questions and consequent research aim and objectives were established. An analysis of the activities developed throughout the research and the results obtained allowed some considerations about these initially defined aim and objectives, and the process to achieve them.

The first reflections and considerations to be addressed concern the objectives that have been worked on to achieve the research aim. The first objective was **to propose a process for selecting the most suitable small-scale resilient and sustainable transformation initiatives for the studied neighbourhood**. A substantial part of the research is related to this objective. The proposed process comprises elaborating the general menu of initiatives, the characterisation and understanding of the community object of intervention, and selecting the most appropriate initiatives. The selection is grounded on the previously investigated characteristics of the community, which provide the necessary knowledge to propose a specific menu of initiatives, from the general menu.

During the development of the process, it was possible to conclude, first, that no previous work, among the consulted literature, presented a broad list of as many as possible initiatives and a categorisation, similar to the proposed in this research. Second, it was considered that a structure should be proposed to systematise the characterisation and understanding of the community, as shown in Figure 34. But, considering the process developed in this research, it was also concluded that, for a thorough characterisation and understanding of the community, an improvement in the ways of listening to the residents was necessary, applying new tools to help in the diagnosis. As seen throughout the work, the coronavirus pandemic significantly restrained the personal contact between the researcher and the dwellers. Lastly, with regard to the selection of initiatives, the understanding was that initiatives to be submitted to dwellers' appreciation must be categorised. Still, the specific menu must comprise initiatives from different categories, making it possible to propose solutions to different issues. This leads to a discussion about the community's level of knowledge, concerning the proposed initiatives, an issue that will be discussed below.

To achieve the second objective**, to investigate how much dwellers know about existing resilient and sustainable transformation initiatives, potentially applicable to their context**, and the third objective, **to investigate the interest of the dwellers in resilient and sustainable**

transformation initiatives, a questionnaire was applied to the community. From the questionnaire results, it has been possible to conclude that, with regard to the second research objective, there is a relatively low level of knowledge, on the part of the respondents, about the initiatives presented, especially those that incorporate higher levels of innovation and technology. With regard to the third research objective, the main conclusion has been that the economic vulnerability of the community play a decisive role in defining the level of interest of residents regarding the initiatives presented. The highest levels of interest have been on initiatives that could represent a positive economic impact on the residents' lives, either through activities that could generate income, reduce expenses or facilitate their insertion in the labour market.

Combined with a question that aimed to investigate the dwellers' perception of the feasibility of the proposed initiatives, the survey results could raise some reflections. It has been found that, in general terms, initiatives that present higher levels of knowledge arouse greater interest and are considered easier to execute. In comparison, initiatives that present lower levels of knowledge arouse less interest and are considered more difficult to implement. Here, it is interesting to contextualize the researcher's intention when submitting, for dwellers appreciation, some less 'popular' alternatives: researches based exclusively on peoples' opinion, would tend to submit for the consideration of the community mostly those initiatives that they know better, and those that have the potential to confront their immediate economic necessities. However, this research intended to introduce new alternatives, with which people were less familiar, and that would combine the environmental concern with the economic, social and cultural problems faced by the community.

The fourth objective was **to identify opportunities and obstacles to applying a framework for the classification and assessment of small-scale resilient and sustainable transformation initiatives in disadvantaged Brazilian communities, aiming at implementing these initiatives**. This was achieved by reflecting on the outcomes of the practical application, and on perceptions of local actors and experts. Based on these reflections, it can be concluded, first, that the vulnerability, itself, of the communities, may become an opportunity. Since disadvantaged communities have several needs, often basic needs for achieving a dignified life, and sometimes are exposed to hazards, these communities provide opportunities for proposals aiming to improve their living conditions and quality of life, both for the individuals and for the whole community. Analysing specifically the economic

vulnerability, it can also constitute an opportunity, to the extent that it can leverage people's engagement and participation, as the initiatives can lead to new work opportunities or to the development of professional skills.

On the other hand, economic vulnerability can also be pointed out as an obstacle, since, although the proposed initiatives are of low cost, they still require a minimum investment to be implemented. Thus, this resource has to be sought with external financers either by the community, or by organisations involved. In the case of the framework proposed in this research, the cost, or the supposed cost, of initiatives can influence dwellers' opinions, but the real impact of the cost on the implementation of the initiatives would be felt in a later stage of the process, which is not addressed in this work. In this sense, the scarcity of financial resources could be a potential future obstacle. Likewise, other potential obstacles, as the lack of technical knowledge and experience on the part of residents to implement the initiatives, can be foreseen when considering subsequent stages of the whole process of implementing small-scale resilient and sustainable transformation initiatives.

The last objective of this research was **to propose a way to gather information about existing initiatives on a municipal scale, allowing the dissemination of the knowledge acquired from these experiences**. It was detected that such initiatives were too dispersed in Porto Alegre, having occurred without connection between themselves and between them and potential people interested in knowing about them.

The importance of this objective, in the context of the research, was already explained in 5.3.3. But, based on the results of this objective, it is possible to conclude that gathering information about existing initiatives can be helpful, not only in the context of Porto Alegre, but also in other municipal contexts, or even on a regional or national scale. The research found a similar proposal in Rosa, 2013, but a website is certainly a more flexible, dynamic and accessible tool than a book, allowing updating and expanding the coverage of the mapping, besides being accessible to anyone, anytime, anywhere.

Finally, the entire process developed throughout this research led to the achievement of the research aim, **to develop a framework to classify and assess the perceived impact of small-scale resilient and sustainable transformation initiatives, suitable for socio-environmentally vulnerable communities in Brazilian municipalities, in order to support the early stages of implementation of such initiatives**. Actually, a significant part of this

research can be considered a pilot application of the framework. Aligned with the research procedure of a constructive research, after establishing a theoretical basis this research developed a process, that would be a test for the implementation of the framework. This way, theory and practice were intertwined and contributed to each other to the achievement of the research aim.

The framework is considered the main original contribution of the present work. As pointed out previously, no similar proposal addressing initiatives with the same characteristics as those addressed in this research was identified in the reviewed literature. The framework is one of the envisaged theoretical contributions, but, at the same time, its objective is to orientate practical application in existing communities. In this sense, results showed both the theoretical and practical relevance of the research and, more specifically, of the proposed framework. Besides being an original artefact, thus contributing to the advancement of knowledge, the framework aims to face the real needs of disadvantaged communities, offering potential solutions to deal with these needs. But results also revealed some difficulties, particularly on better listening to the target population and on providing them a comprehensive explanation about possible actions and initiatives to be implemented in their community. This led to a discussion on how to capture the community's needs, as accurately as possible, and how to make available examples of confirmed cases, where initiatives were successfully implemented, in order to facilitate ways of better understanding and learning such process by the dwellers.

Eventually, it is concluded that there is still a long way to go in order to explore the full potential of the framework, as a tool to instrument communities and stakeholders in the early stages of implementing small-scale resilient and sustainable transformation initiatives in disadvantaged communities, especially when considering that the proposed framework comprises only the first stages of a complete process of implementing initiatives. The discussion developed in the course of this research suggests that the continuation of the present study in future works represents a fertile field to be explored.

6.2 RECOMMENDATIONS FOR FUTURE RESEARCH

There are several opportunities for further research. Paraphrasing Forrest (2011), it can be declared that "this study has only scratched the surface of this research field" (FORREST, 2011, p. 185). Thus, the following suggestions are presented as opportunities for future research:

a) Replication of the framework in other disadvantaged communities.

b) Development of possible subsequent steps of the process, the initial steps of which are given through the framework proposed in this research. Combined with this work, future research addressing the topic could cover the entire process of implementing the initiatives. The whole process can be conceived as a method, for example, and future research could address one or more stages, following the sequence suggested previously in sub-section 1.5: (i) analysis of the economic feasibility; (ii) training and capacitation for the practical implementation of the chosen actions; (iii) planning the operationalisation of the project (management, structure, organisation); (iv) supporting the implementation of initiatives; (v) monitoring the deployment of actions; and (vi) evaluation of the results.

c) Adaptation of the framework to a different context, that is, to middle- or upper-class neighbourhoods.

d) Deepening the analysis of resilient and sustainable initiatives, separated into different areas of knowledge. Future works may address more specific initiatives, focusing, for example, on technical, social, economic or cultural innovation in disadvantaged communities.

e) Analysis of existing cases of resilient and sustainable initiatives, making it possible, for example, to evaluate the process and propose improvements.

f) Study of initiatives with a focus on measuring the degree of transformation they provide. Development of a methodology on how to measure ‘transformation’ for this context, allowing to compare the potential for transformation between different initiatives.

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APPENDIX A - General Menu of Initiatives

Categories	Themes	Actions / Initiatives / Examples	Sustainability				Resilience			Possible stakeholders					
			en	ec	so	cu	en	ec	so	co	go	in	ac	pr	ng
Energy	Solar energy use / generation	Community photovoltaic solar panels (or photovoltaic distributed generation cooperatives)													
		Individual photovoltaic solar panels													
		Individual solar thermal panels													
		solar cooker or solar oven													
	Wind energy generation	Community wind turbines													
		Individual wind turbines													
	Biomass energy generation	biomass combustion (e.g. agricultural products and residues in thermal power stations)													
		biomass gasification													
		Biodigesters for biogas production													
		compost-powered heating													
	Use of geothermal energy	Geothermal heating													
		Geothermal cooling													
	Energy saving and thermal comfort	Thermal insulation of dwellings (e.g: using Tetra Pak packaging)													
Water	Collection, storage and use of rainwater / storm-water	rainwater harvesting (run-off from an individual property)													
		Stormwater harvesting (run-off from an urban region)													
	Grey water treatment	Phytoremediation (to remove heavy metals and other pollutants)													
		Evapotranspiration and infiltration bed													
	Black water treatment	Evapotranspiration and infiltration bed													
	Sustainable urban drainage	Permeable pavements / surfaces													
		filter and infiltration trenches													
		Rain Garden													
		Green roofs													
		wetlands and ponds													

Categories	Themes	Actions / Initiatives / Examples	Sustainability				Resilience			Possible stakeholders					
			en	ec	so	cu	en	ec	so	co	go	in	ac	pr	ng
Water		Detention basins	■				■				■				
		watercourses along the roadways' sides	■				■				■				
		Depave	■				■			■					
Waste	Recycling and reusing waste (belongs also to "Production / Distribution / Consumption")	recycling hub	■	■	■		■	■	■	■		■	■	■	■
		Associations of garbage collectors (e.g: CEA Vila Pinto)	■	■			■	■		■		■	■	■	■
	Composting	Retention of solid organic waste in the dwellings	■	■			■			■			■		■
		Community management of solid organic waste	■	■	■		■	■	■	■			■		■
Production / Distribution / Consumption	Urban Agriculture / Vegetal products	Community Gardens / micro-farms	■	■	■		■	■	■	■			■		■
		vertical planting systems	■	■			■	■		■			■		■
		aquaponic gardening	■	■			■	■		■			■		■
	Animal products	Beekeeping		■			■	■		■			■		■
		Aquaculture		■			■	■		■			■		■
		Egg production		■			■	■		■			■		■
	Finance	Local Currency		■	■			■		■			■		■
	Local entrepreneurism: production	Beer		■			■	■		■			■		■
		Jams		■			■	■		■			■		■
	Local entrepreneurism: commerce and services	market and café		■				■		■					■
		Repairing (e.g. bicycles, clothing and household linen, shoes and leather goods)		■				■		■					■
		Micro-mixing		■				■		■					■
training and skills development	Training and employment "incubators" / workshops	Sewing (e.g: Morro da Cruz)		■	■			■	■	■			■	■	■
		Manufacturing of patchwork handbags and accessories (e.g: Morro da Cruz)		■	■			■	■	■			■	■	■
		repairing and small DiY sessions		■	■			■	■	■			■	■	■
		wood, metal and textile work		■	■			■	■	■			■	■	■
		Knitting		■	■			■	■	■			■	■	■
		Crocheting		■	■			■	■	■			■	■	■
		Cooking		■	■			■	■	■			■	■	■
		wood, metal and textile work		■	■			■	■	■			■	■	■
		manufacture and assemblage of components for green buildings		■	■			■	■	■			■	■	■
		Eco-construction hub	■	■	■			■	■	■			■	■	■

Categories	Themes	Actions / Initiatives / Examples	Sustainability				Resilience			Possible stakeholders					
			en	ec	so	cu	en	ec	so	co	go	in	ac	pr	ng
training and skills development		co-working workshops													
	educational services	research centre on agriculture and food													
Mobility	Public transport improvement	More bus routes / services and frequency													
		cable car (e.g: Rio de Janeiro, Medellin)													
	Slow mobility (proximity and connection with the rest of the city)	walking (short distances to destinations)													
	Sustainable mobility	Bike lanes													
		Guerrilla bike lanes													
		Car sharing													
		Bike sharing													
		e-bikes													
		Skating													
Green / Blue Urban Infrastructure	Green Urban Infrastructure	Trees, shrubs and greenery													
		Urban micro forest													
		Community Gardens													
		Guerrilla gardening													
	Blue Urban Infrastructure	Detention and retention basins													
		Ponds, water mirrors													
Culture and Society	aggregation spaces throughout the urban fabric	Squares													
		small gardens													
		playgrounds for children													
		Cultural spaces													
		Reclaimed setbacks													
	Events	Food festivals and cultures													
		Carbon neutral cultural events													
	Activities	Recreational activities													
		Women group													
		Community radio													
		Music (talent workshops)													
		Cultural workshops													
		Pop-up town hall													
	Sharing practices	Exchange of used books													
		Co-housing													
		Co-working													
		cooperative eco-housing hub													

Categories	Themes	Actions / Initiatives / Examples	Sustainability				Resilience			Possible stakeholders					
			en	ec	so	cu	en	ec	so	co	go	in	ac	pr	ng
ICT	ICT for management of energy, water, materials and waste flows	electricity and water use (e.g: Environmental Dashboard)													
	ICT for extreme events alert	Storm alert													
		Wind alert													
		Heat waves alert													
		Flood alert													
Buildings	Use of sustainable materials	cladding systems issued from eco-construction													
		straw for insulation													
	Reused materials	recycled brick drying panels													
	Bioclimatic architecture	Many initiatives related to buildings listed in the categories “Energy” and “Water”													
	Sustainable buildings														
	Eco-construction	Eco-construction hub													
		recycling and transforming locally salvaged materials into eco-construction elements for self-building and retrofitting													
		Use of local building materials													

Abbreviations:

Sustainability:
en = environmental sustainability
ec = economic sustainability
so = social sustainability
cu = cultural sustainability

Resilience:
en = in the face of environmental disturbances
ec = in the face of economic disturbances
so = in the face of social disturbances

Stakeholders:
co = community
go = government
in = private initiative
ac = academia
pr = professionals
ng = non-governmental organizations

APPENDIX B - Pilot Questionnaire

Data: Entrevista N°: Local: Entrevistador:

APRESENTAÇÃO

Olá, sou estudante de mestrado na UFRGS e estou desenvolvendo um trabalho para saber o que a população do Morro da Cruz acha sobre algumas ações que poderiam ser feitas nas suas casas ou no bairro.

INSTRUÇÕES

Este trabalho é apenas uma pesquisa para a universidade, não existe nenhuma previsão de que estas ações sejam realizadas. Não há resposta certa ou errada, as suas respostas serão tratadas em conjunto com as respostas obtidas com seus vizinhos. Vamos explicar as ações que estamos pesquisando e gostaríamos que você desse sua opinião sobre elas. Para responder considere a seguinte situação:

(i) você não iria gastar dinheiro para aprender, fazer, e participar das iniciativas ;
(ii) você e/ou mais membros da sua família iriam aprender a construir e fazer vocês mesmos as iniciativas em sua casa e/ou comunidade;
(iii) você e/ou mais membros da sua família iriam receber treinamento adequado para fazer essas iniciativas.

	NÍVEL DE CONHECIMENTO					**NÍVEL DE INTERESSE**					**NÍVEL DE APLICABILIADE**				
	Você conhece e/ou já ouviu falar dessa ação?					Você acha que os moradores teriam vontade de aprender e fazer essas ações em casa e/ou na comunidade?					Você acha que é fácil fazer essa ação na sua casa e/ou comunidade?				
INICIATIVAS	Certamente não conheço	Porvavelmente não conheço	Não tenho certeza	Provavelmente conheço	Certamente conheço	Certamente não tenho interesse	Provavelmente não tenho interesse	Não tenho certeza	Provavelmente tenho interesse	Certamente tenho interesse	Certamente não aplicaria	Provavelmente não aplicaria	Não tenho certeza	Provavelmente aplicaria	Certamente aplicaria
ENERGIA															
1 - Aquecedor solar de garrafa PET, que transforma o calor do sol em água quente, possibilitando enconomia de luz															
2 - Biodigestor, que produz gás para o fogão a partir do esgoto															
3 - Lâmpadas de LED, que são mais econômicas e duráveis que as lâmpadas de filamento															
ÁGUA															
1 - Captação da água da chuva na residência, que economiza o uso da rede pública															
2 - Sistema de tratamento de esgoto, que ajuda a cuidar dos arroios e acabaria com mal cheiro e doenças															
3 - Pavimentos permeáveis na sua casa, que permitem que a chuva seja absorvida pela terra, evitando que a água fique empoçada															
RESÍDUOS															
1- Compostagem do lixo orgânico através de composteira, que produz adubo para a horta (usa o lixo organico: restos de comida, fruta, vegetais)															
2- Composteira comunitária, onde todos os vizinhos podem depositar seu lixo orgânico (cozinha) para utilizar como adubo na orta															
3- Cooperativa de reciclagem, onde o lixo reciclável (seco) pode ser tratato e transformado em uma fonte de renda															
ECONOMIA															
1 - Horta particular, onde podem ser cultivados produtos para o consumo familiar e comércio com os vizinhos															
2 - Horta comunitária, onde os vizinhos podem se reunir para plantar e posteriormente consumir os produtos naturais															
3 - Fabricação de produtos caseiros para comercialização com os vizinhos, complementando a renda familiar (doces, compotas, vegetais)															
CULTURA E COMUNIDADE															
1 - Oficinas culturais (aula de música, dança, teatro, ...)															
2 - Oficinas profissionalizantes (costura, gastronomia, marcenaria, ...), para ensinar aos jovens e adultos uma nova fonte de renda															

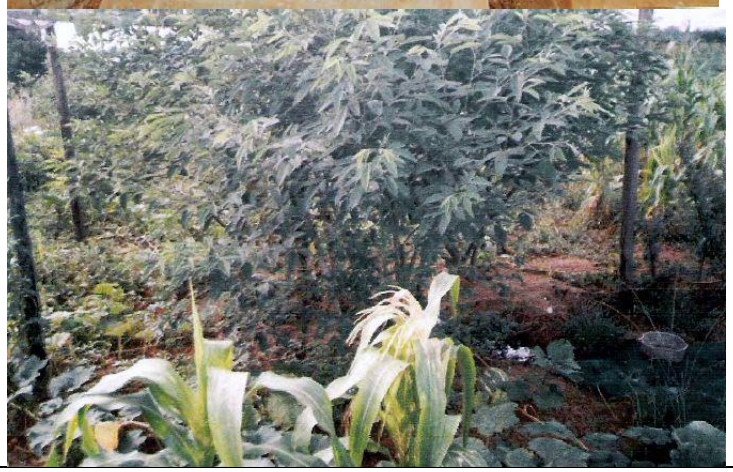
3 - Grupo de mulheres, que é um espaço de conversa e apoio para àquelas que desejam solucionar problemas domésticos ou da comunidade															

DADOS DO ENTREVISTADO					
SEXO: ( )M ( )F ( )Outro	Idade:	Posição na família:	N° de pessoas na família:	Profissão:	Escolaridade

OBSERVAÇÕES - ESPAÇO PARA PREENCHIMENTO EXCLUSIVO DO ENTREVISTADOR	
ENERGIA	
ÁGUA	
RESÍDUOS	
ECONOMIA	
CULTURA E COMUNIDADE	

APPENDIX C - Support Material - Images

ENERGIA	1 - Aquecedor solar de garrafa PET, que transforma o calor do sol em água quente, possibilitando economia de luz (Fonte da imagem: https://www.pensamentoverde.com.br/economia-verde/voce-sabia-aquecedor-solar-garrafa-pet/)	
	2 - Biodigestor, que produz gás para o fogão a partir do esgoto (Fonte da imagem: https://www.klarconstrutora.com.br/responsabilidade-social)	
ÁGUA	1 - Captação da água da chuva na residência, que economiza o uso da rede pública (Fonte da imagem: http://gaiabrasil.com.br/2015/03/paulistanos-usam-cisternas-caseiras-para-agua-da-chuva-saiba-como-fazer/)	

	2 - Sistema de tratamento de esgoto, que ajuda a cuidar dos arroios e acabaria com mal cheiro e doenças (Fonte das imagens: Ercole, 2003)	 
RESÍDUOS	1- Compostagem do lixo orgânico através de composteira, que produz adubo para a horta (usa o lixo orgânico: restos de comida, fruta, vegetais) (Fonte da imagem: https://donadicas.com/como-fazer-adubo-organico/)	 
	2- Composteira comunitária, onde todos os vizinhos podem depositar seu lixo orgânico (cozinha) para utilizar como adubo na horta (Fonte da imagem: Abreu, 2013)	 

ECONOMIA	3- Cooperativa de reciclagem, onde o lixo reciclável (seco) pode ser tratado e transformado em uma fonte de renda (Fonte da imagem: https://jornalnh.com.br/noticias/regiao/2018/12/2350471-jornal-nh-se-destaca-no-premio-cooperativismo.html)	
	1 - Horta particular, onde podem ser cultivados produtos para o consumo familiar e comércio com os vizinhos (Fonte da imagem: https://www.vivadecora.com.br/revista/horta-vertical/)	
	2 - Horta comunitária, onde os vizinhos podem se reunir para plantar e posteriormente consumir os produtos naturais (Fonte da imagem: https://www.camaraitapevi.sp.gov.br/agora-e-lei-horta-comunitaria-educativa-ganha-regulamentacao-em-itapevi/)	

APPENDIX D - Support Material - Card with Emojis

Certamente não	Provavelmente não	Não tenho certeza	Provavelmente	Certamente
				

APPENDIX E - Observations and Suggestions from Experts 3 and 4

ENERGIA
1 - Aquecedor solar de água que se coloca em cima do telhado e pode ser feito, por exemplo, de garrafa PET. Esse tipo de aquecedor transforma o calor do sol em água quente.
Especialista 3: incluir dados sobre os efeitos do aquecimento da água em garrafas PET devido À sua composição química: é prejudicial à saúde?
2 - Biodigestor, que é um sistema que produz gás para ser usado no fogão, por exemplo, a partir do esgoto de casa ou das fezes de galinhas ou porcos.
Especialista 3:questiona o uso em microescala **Especialista 4:** questiona a viabilidade, citando BedZed e sugere que um sistema como o proposto por Ercole seria mais viável. Estudar uma união entre este item e o item 2 da categoria “água”?
3 - Utilização de lâmpadas de LED, que são mais econômicas e duráveis que as lâmpadas antigas comuns
Especialista 3: questiona os efeitos nocivos aos olhos – uso onde não for problemático **Especialista 4:** verificar se é possível parceria com distribuidora para implementação
ÁGUA
1 - Captação da água da chuva que vem do telhado de casa e armazenamento desta água em tonéis, para utilização no vaso sanitário ou para lavar roupa e limpar o pátio, por exemplo.
Especialista 3: indicar os usos adequados para a água captada
2 - Sistema de tratamento de esgoto no qual todo o esgoto da casa é tratado em caixas enterradas no pátio, tipo fossas, e no final é absorvido por plantas, não sobrando nada de esgoto.
Especialista 4: A ideia que nada sobre de esgoto é um pouco idealizada. Ver, por exemplo, que o lodo residual tem inúmeras aplicações que poderiam ser inseridas em um circuito de permacultura
3 - Pisos ou pavimentos permeáveis na sua casa, que permitem que a chuva seja absorvida através deles, evitando que a água fique empoçada
Especialista 4: combinar com a inserção de espécies vegetais que atuem como esponjas e fixadoras do solo?
RESÍDUOS
1- Compostagem do lixo orgânico em casa, através de uma composteira, que é uma caixa onde se coloca cascas e restos de frutas, vegetais e ovos e eles são transformados em adubo
Especialista 4: melhor ainda se consorciada a algum produto que possa ser desenvolvido pela comunidade, ou que tenham a tecnologia oriunda da reciclagem de materiais comuns. enfatizar que não há mau odor no processo.
2- Compostagem comunitária, onde cada um separa seu lixo orgânico (cascas e restos de frutas, vegetais e ovos) e a comunidade se organiza para coletar esse material nas casas e levar para um local da comunidade onde ele será compostado e se transformará em adubo
Especialista 4: conflito com a anterior? (de repente posso pensar em como organizar iniciativas individuais X coletivas)

3- Cooperativa de reciclagem, para onde o lixo seco (reciclável) é levado e separado para ser vendido para empresas que fazem a reciclagem
Especialista 4: necessidade de uma logística bem integrada para ser economicamente viável. Talvez possa ser pensado uma parceria com outras cooperativas próximas para ação integrada. Acredito que vocês estejam olhando a questão ambiental aqui, mas para as pessoas que trabalham com isso é um negócio. Cuidado para que não se originem como concorrentes ao que já está consolidado. Posso argumentar que no bairro existem muitas pessoas que trabalham com isso e não existe um centro de reciclagem como em outro bairros de poa
ECONOMIA
1 - Horta particular, onde podem ser cultivados produtos para o consumo familiar e comércio com os vizinhos
Especialista 4: Vinculado ao item 01 de Resíduos
2 - Horta comunitária, onde os vizinhos se reúnem para plantar em um local da comunidade e posteriormente podem consumir os produtos naturais
Especialista 3: além de consumir, podem comercializar **Especialista 4:** "No mundo de 2020", acredita ser muito mais interessante propor às pessoas a produção de alimentos desde sua comunidade do que o tratamento do lixo produzido por outrem…
3 - Fabricação de produtos caseiros, como bolos, pães, doces, compotas, cerveja, para vender no bairro ou até mesmo em outros locais
Especialista 4: Idem comentário do item anterior. Sugeriu estratégias para comercialização
CULTURA E COMUNIDADE
1 - Oficinas culturais, onde as pessoas podem aprender a tocar algum instrumento musical, cantar, ou ter aulas de dança e teatro
Especialista 4: Impossível dissociar da já marcante encenação da paixão de Cristo. Esse evento deveria ser melhor trabalhado na comunidade de fiéis da cidade. Um local citado poderia estar focado nesse evento, como capacitor de que a comunidade melhore e amplie a festa, e as pessoas possam atuar em dezenas de outras que ocorrem no estado.
2 - Oficinas profissionalizantes, como costura, culinária e marcenaria, onde as pessoas podem aprender uma atividade que pode se tornar um trabalho e uma fonte de renda
Especialista 3: projetos de ensino não se enquadrariam? Alfabetização, aulas de idiomas... **Especialista 4:** Ótimo, principalmente se for integrado com o tratado/pensado com as proposições de ordem econômica
3 - Grupo de mulheres, que é um espaço onde as mulheres podem conversar sobre problemas domésticos ou da comunidade e receber apoio
Especialista 4: Poderia estar vinculado a alguma rede de apoio do município que envolva Assistência Social, Psicologia, Clínica–Geral, etc

APPENDIX F – Definitive Questionnaire

Pesquisa sobre iniciativas sustentáveis no Morro da Cruz

Bem Vindo!

Vamos falar sobre iniciativas sustentáveis? Para isso, convidamos você a participar desta pesquisa, através da qual queremos saber a sua opinião a respeito de algumas iniciativas que poderiam ser implementadas na sua casa ou no seu bairro, com o objetivo de qualificar o ambiente onde você vive. Lembramos que trata-se de uma pesquisa universitária, não havendo nenhuma previsão de implementação dessas iniciativas.

O tempo estimado para responder as perguntas é de 12 minutos.

Sua participação é muito importante!

Instruções

Vamos apresentar e explicar cada uma das iniciativas que estamos pesquisando e gostaríamos que você desse sua opinião sobre elas. No total são 15 iniciativas, uma por página. Nas páginas de 1 a 9 são apresentadas ações individuais, que podem ser feitas na própria casa, e nas páginas de 10 a 15 são apresentadas ações coletivas, que podem ser feitas junto com a comunidade.

Para responder considere a seguinte situação:
(I) você não iria gastar dinheiro para aprender, fazer, e participar das iniciativas ;
(II) você e/ou mais membros da sua família iriam aprender a construir e fazer vocês mesmos as iniciativas em sua casa e/ou comunidade;
(III) você e/ou mais membros da sua família iriam receber treinamento adequado para fazer essas iniciativas.

Não há resposta certa ou errada, as suas respostas serão tratadas em conjunto com as respostas obtidas com seus vizinhos.

Sua participação na pesquisa é anônima e ao responder e enviar o questionário você está concordando em participar.

1. AQUECEDOR SOLAR DE ÁGUA

Sistema para aquecimento da água que se coloca em cima do telhado e pode ser feito, por exemplo, de garrafa PET. Esse tipo de aquecedor transforma o calor do sol em água quente.

(Fonte da imagem: https://www.pensamentoverde.com.br/economia-verde/voce-sabia-aquecedor-solar-garrafa-pet/)

1. Você conhece ou já ouviu falar?

   Marcar apenas uma oval.

   - ◯ sim
   - ◯ não

2. Você teria interesse em aprender essa iniciativa e fazer na sua casa?

   Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

3. O que você acha de fazer essa iniciativa na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

2. BIODIGESTOR

Sistema que produz gás para ser usado no fogão, por exemplo, a partir do esgoto de casa ou das fezes de galinhas ou porcos.

(Fonte da imagem: https://www.klarconstrutora.com.br/responsabilidade-social)

4. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

5. Você teria interesse em aprender essa iniciativa e fazer na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

6. O que você acha de fazer essa iniciativa na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

3. ISOLAMENTO TÉRMICO

Aplicação de um material no interior da casa, que pode ser caixas de leite, por exemplo, para diminuir o calor no verão e diminuir o frio no inverno.

(Fonte da imagem: http://brasilsemfrestas.com.br/)

7. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

8. Você teria interesse em aprender essa iniciativa e fazer na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

9. O que você acha de fazer essa iniciativa na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

4. CAPTAÇÃO DE ÁGUA DA CHUVA

Captação da água da chuva que vem do telhado de casa e armazenamento desta água em tonéis, para utilização no vaso sanitário ou para lavar roupa e limpar o pátio, por exemplo.

(Fonte da imagem: http://gaiabrasil.com.br/2015/03/paulistanos-usam-cisternas-caseiras-para-agua-da-chuva-saiba-como-fazer/)

10. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

11. Você teria interesse em aprender essa iniciativa e fazer na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

12. O que você acha de fazer essa iniciativa na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

5. TRATAMENTO DE ESGOTO SUSTENTÁVEL

Sistema de tratamento no qual o esgoto da casa é separado e tratado em caixas enterradas no pátio, tipo fossas, e no final é absorvido por plantas. O processo gera um lodo que pode ser usado na agricultura.

(Fonte da imagem: Ercole, 2003)

13. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

14. Você teria interesse em aprender essa iniciativa e fazer na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

15. O que você acha de fazer essa iniciativa na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

6. PISOS PERMEÁVEIS

Pisos ou pavimentos que permitem que a chuva seja absorvida através deles, evitando que a água fique empoçada. Pode ser usado junto com plantas que funcionam como espojas e absorvem bastante água.

(Fonte da imagem:
Esquerda: https://lajlucas.com.br/aprovada-norma-de-pavimento-permeavel/
Direita: https://www.aecweb.com.br/cont/m/rev/pavimentos-permeaveis-evitam-acumulo-de-agua-no-piso_10955_10_15)

16. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

17. Você teria interesse em aprender essa iniciativa e fazer na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

18. O que você acha de fazer essa iniciativa na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

7. COMPOSTAGEM EM CASA

Compostagem do lixo orgânico em casa, através de uma composteira, que é uma caixa onde se coloca cascas e restos de frutas e vegetais e eles são transformados em adubo.

(Fonte da imagem: https://donadicas.com/como-fazer-adubo-organico/)

19. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

20. Você teria interesse em aprender essa iniciativa e fazer na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

21. O que você acha de fazer essa iniciativa na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

8. HORTA PARTICULAR

Plantação de frutas, verduras, temperos e vegetais em geral em casa para o consumo familiar e/ou comércio com os vizinhos

(Fonte da imagem: https://www.vivadecora.com.br/revista/horta-vertical/)

22. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

23. Você teria interesse em aprender essa iniciativa e fazer na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

24. O que você acha de fazer essa iniciativa na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

9. PRODUTOS CASEIROS

Fabricação de produtos caseiros, como bolos, pães, doces, compotas e cerveja, para vender no bairro ou até mesmo em outros locais

(Fonte da imagem: https://donfanews.com.br/noticias/2834/produtos-caseiros-e-coloniais-estao-a-venda-no-salao-paroquial.html)

25. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

26. Você teria interesse em aprender essa iniciativa e fazer na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

27. O que você acha de fazer essa iniciativa na sua casa?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

10. COMPOSTAGEM COMUNITÁRIA

Cada um separa seu lixo orgânico (cascas e restos de frutas e vegetais) e a comunidade se organiza para coletar esse material nas casas e levar para um local da comunidade onde ele será compostado e se transformará em adubo

(Fonte da imagem: Abreu, 2013)

28. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- sim
- não

29. Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse						Muito interesse

30. O que você acha de fazer essa iniciativa na comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil						Muito fácil

11. COOPERATIVA DE RECICLAGEM

Local para levar o lixo seco (reciclável), separar e vender para empresas que fazem a reciclagem

(Fonte da imagem: https://jornalnh.com.br/noticias/regiao/2018/12/2350471-jornal-nh-se-destaca-no-premio-cooperativismo.html)

31. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

32. Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

33. O que você acha de fazer essa iniciativa na comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

12. HORTA COMUNITÁRIA

Local da comunidade onde os vizinhos se reúnem para plantar frutas, verduras, temperos e vegetais em geral e posteriormente podem consumir e/ou vender os produtos orgânicos.

(Fonte da imagem: https://www.camaraitapevi.sp.gov.br/agora-e-lei-horta-comunitaria-educativa-ganha-regulamentacao-em-itapevi/)

34. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

35. Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

36. O que você acha de fazer essa iniciativa na comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

13. OFICINAS CULTURAIS

Onde as pessoas podem aprender a tocar algum instrumento musical, cantar, ou ter aulas de dança e teatro.

(Fonte da imagem: http://www.comunica.ufu.br/evento/2015/06/curso-de-teatro-da-ufu-encena-espetaculo-vem-buscar-me-que-ainda-sou-teu)

37. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

38. Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

39. O que você acha de fazer essa iniciativa na comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

14. OFICINAS PROFISSIONALIZANTES

Como costura, culinária e marcenaria, entre outros, onde as pessoas podem aprender uma atividade que pode se tornar um trabalho e uma fonte de renda.

(Fonte da imagem: https://gauchazh.clicrbs.com.br/donna/noticia/2019/10/quem-e-a-estilista-que-capacita-costureiras-no-morro-da-cruz-ha-tres-anos-ck26gcdwp09rk01r2vu3albi8.html)

40. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

41. Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

42. O que você acha de fazer essa iniciativa na comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

15. GRUPO DE MULHERES

Espaço onde as mulheres podem conversar sobre problemas domésticos ou da comunidade e receber apoio.

(Fonte da imagem: https://redesuldenoticias.com.br/redemais/mulheres-na-luta-guarapuavanas-criam-grupo-de-apoio-feminino/)

43. Você conhece ou já ouviu falar?

Marcar apenas uma oval.

- ◯ sim
- ◯ não

44. Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Nenhum interesse	◯	◯	◯	◯	◯	Muito interesse

45. O que você acha de fazer essa iniciativa na comunidade?

Marcar apenas uma oval.

	1	2	3	4	5	
Muito difícil	◯	◯	◯	◯	◯	Muito fácil

OPINIÃO GERAL

46. Das iniciativas individuais (números 1 a 9), marque as 3 que você considera mais interessantes:

Marque todas que se aplicam.

- [ ] Aquecedor solar de água
- [ ] Biodigestor
- [ ] Isolamento térmico
- [ ] Captação de água da chuva
- [ ] Tratamento de esgoto sustentável
- [ ] Pisos permeáveis
- [ ] Compostagem em casa
- [ ] Horta particular
- [ ] Produtos caseiros

47. Das iniciativas coletivas (números 10 a 15), marque as 3 que você considera mais interessantes:

Marque todas que se aplicam.

- [ ] Compostagem comunitária
- [ ] Cooperativa de reciclagem
- [ ] Horta comunitária
- [ ] Oficinas culturais
- [ ] Oficinas profissionalizantes
- [ ] Grupo de mulheres

SEUS DADOS

Você não informará seu nome e seus dados não serão tratados individualmente, apenas em conjunto com os dados dos demais entrevistados.

48. Sexo

Marcar apenas uma oval.

- ◯ Masculino
- ◯ Feminino
- ◯ Outro

49. Idade

Marcar apenas uma oval.

- ◯ Até 20 anos
- ◯ 21 a 30 anos
- ◯ 31 a 40 anos
- ◯ 41 a 50 anos
- ◯ 51 a 60 anos
- ◯ Mais de 60 anos

50. Número de moradores na sua casa

Marcar apenas uma oval.

- 1
- 2
- 3
- 4
- 5
- 6
- 7 ou mais

51. Ocupação

Marcar apenas uma oval.

- Estudante
- Empregado(a)
- Desempregado(a)
- Trabalhador(a) autônomo(a)
- Empresário(a)
- Aposentado(a)
- Outra

52. Escolaridade

Marcar apenas uma oval.

- ◯ Lê e escreve
- ◯ Ensino fundamental incompleto
- ◯ Ensino fundamental completo
- ◯ Ensino médio incompleto
- ◯ Ensino médio completo
- ◯ Superior incompleto
- ◯ Superior completo

APPENDIX G – Responses

Pesquisa sobre iniciativas sustentáveis no Morro da Cruz

74 respostas

Publicar análise

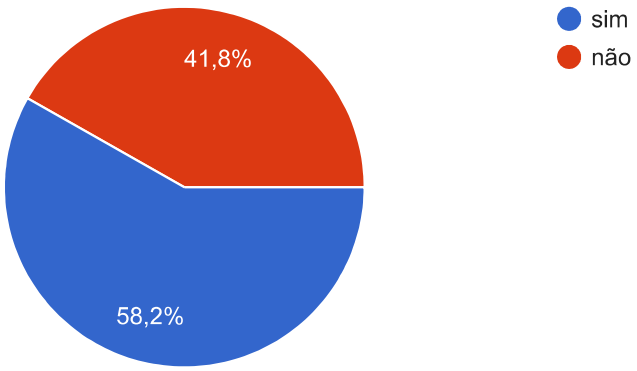
Bem Vindo!

Instruções

1. AQUECEDOR SOLAR DE ÁGUA

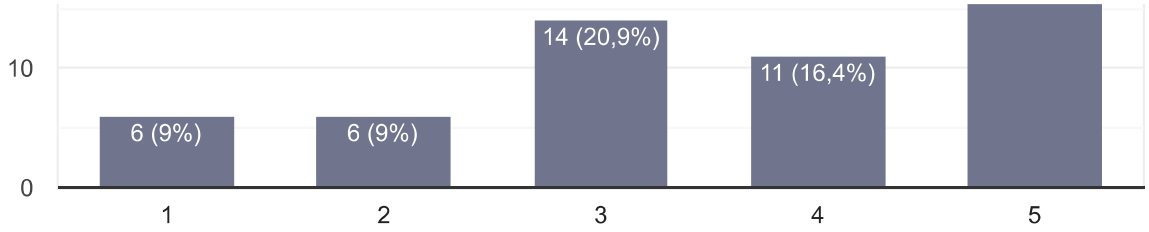
Você conhece ou já ouviu falar?

67 respostas



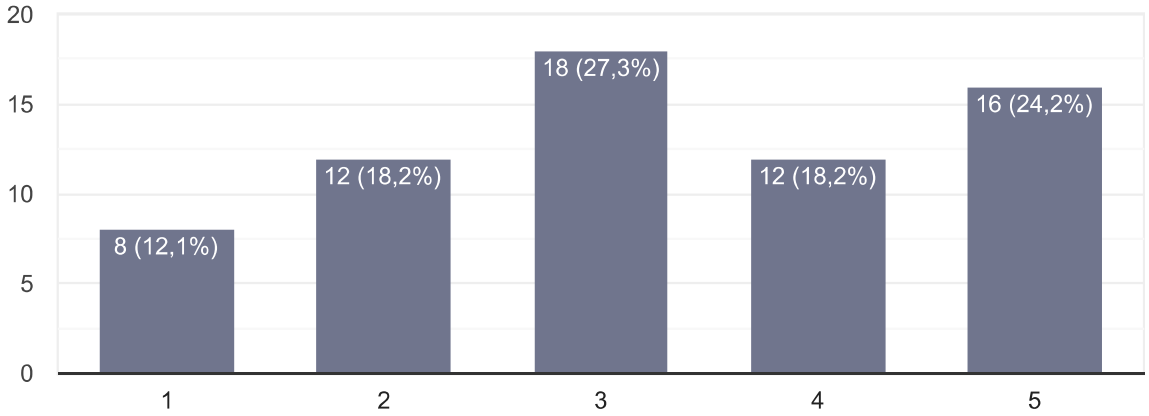
Você teria interesse em aprender essa iniciativa e fazer na sua casa?

67 respostas



O que você acha de fazer essa iniciativa na sua casa?

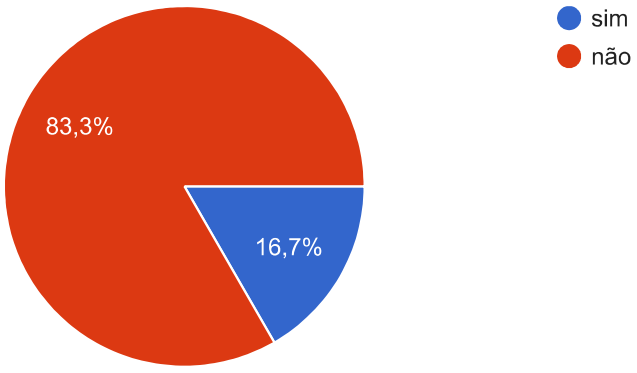
66 respostas



2. BIODIGESTOR

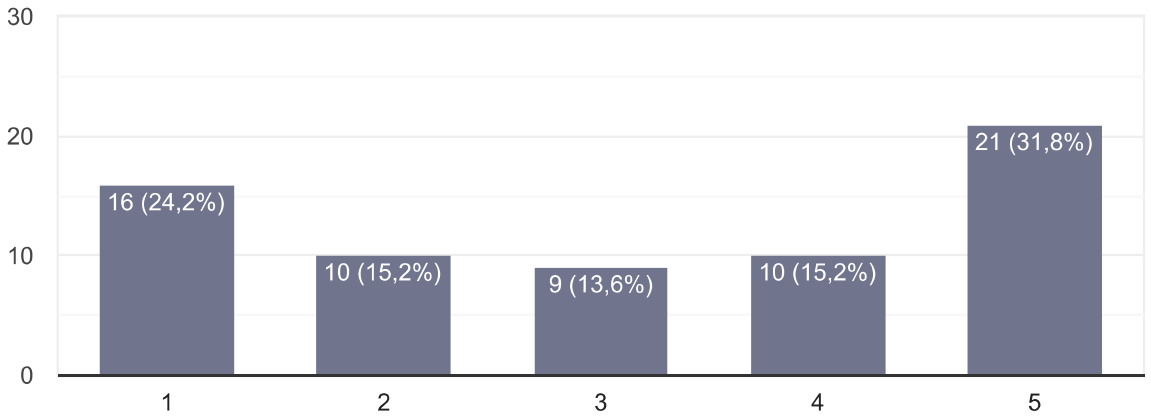
Você conhece ou já ouviu falar?

66 respostas



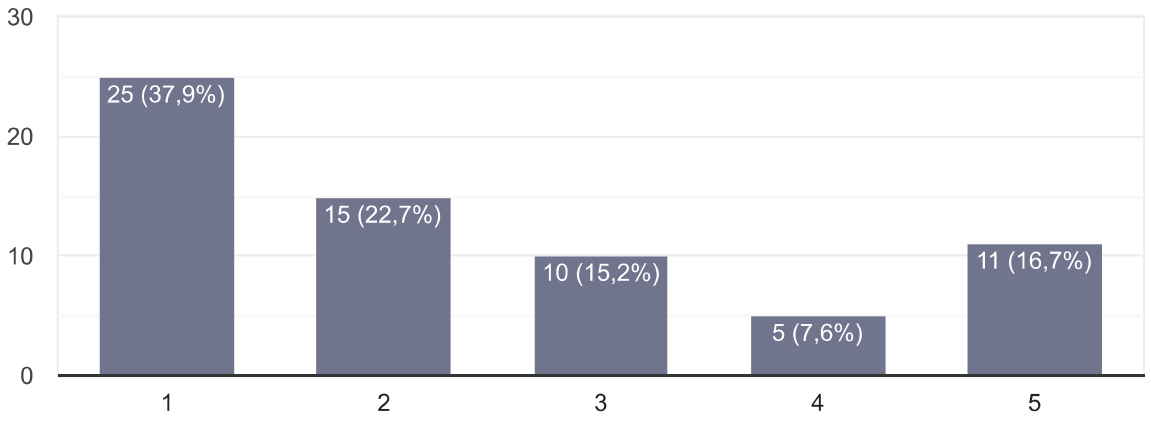
Você teria interesse em aprender essa iniciativa e fazer na sua casa?

66 respostas



O que você acha de fazer essa iniciativa na sua casa?

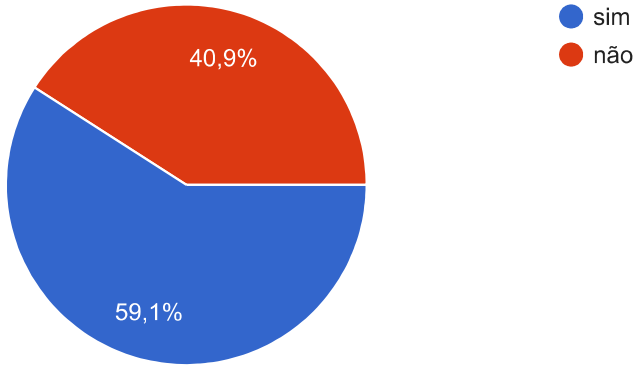
66 respostas



3. ISOLAMENTO TÉRMICO

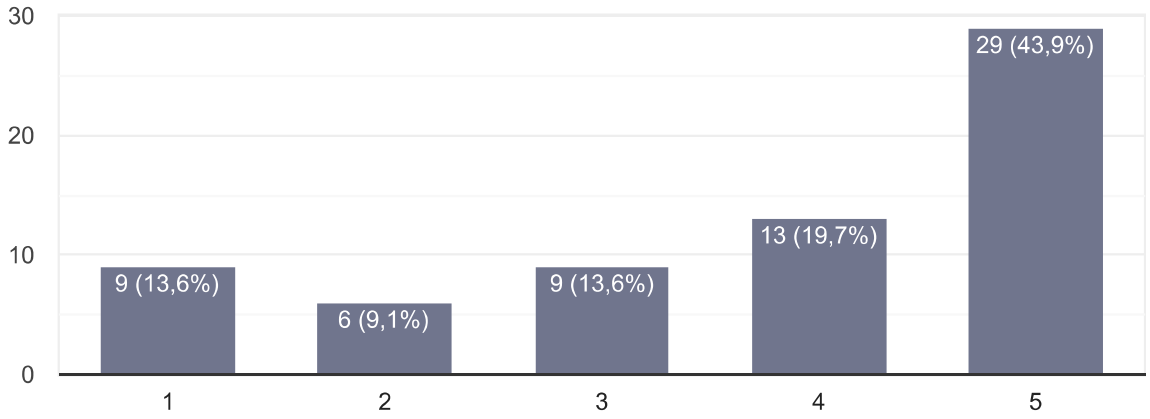
Você conhece ou já ouviu falar?

66 respostas



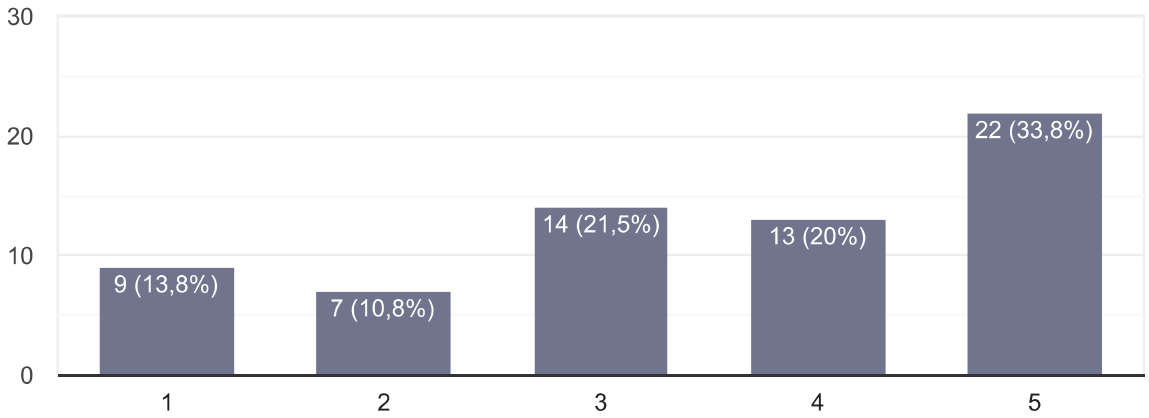
Você teria interesse em aprender essa iniciativa e fazer na sua casa?

66 respostas



O que você acha de fazer essa iniciativa na sua casa?

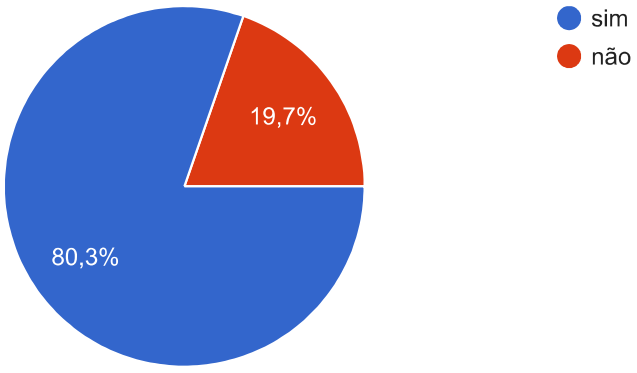
65 respostas



4. CAPTAÇÃO DE ÁGUA DA CHUVA

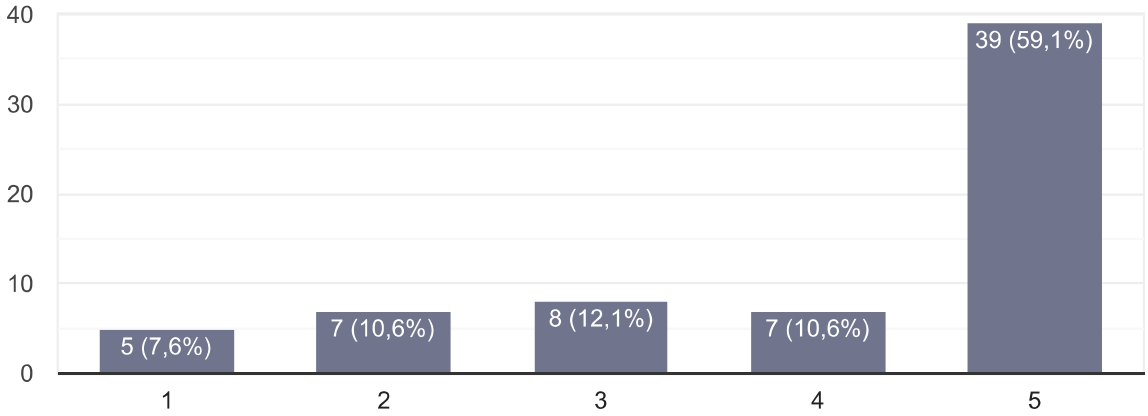
Você conhece ou já ouviu falar?

66 respostas



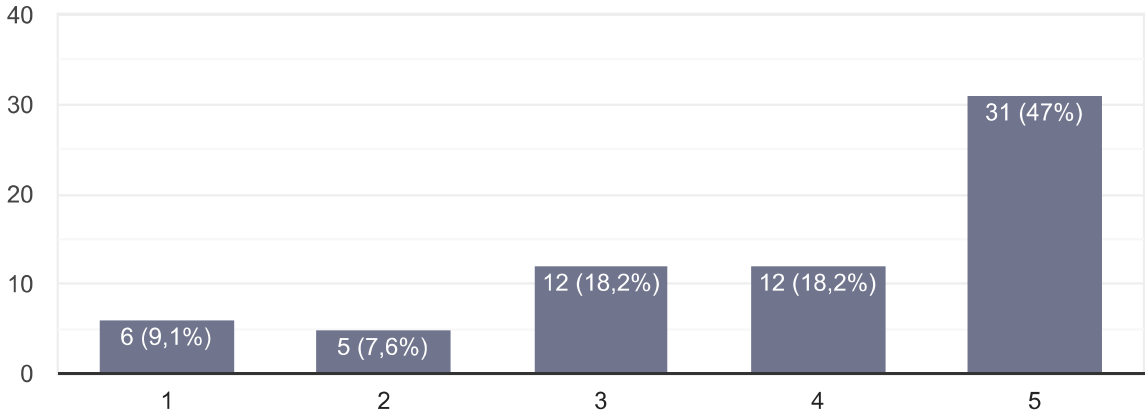
Você teria interesse em aprender essa iniciativa e fazer na sua casa?

66 respostas



O que você acha de fazer essa iniciativa na sua casa?

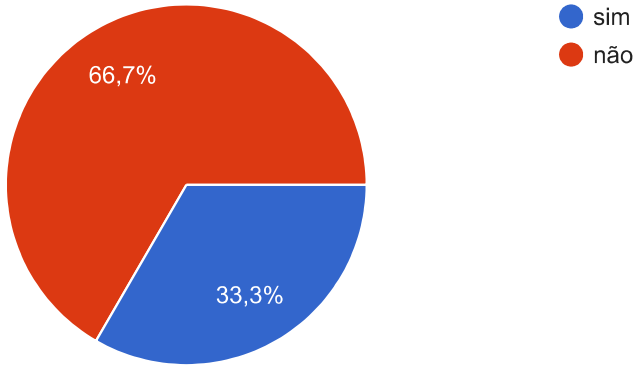
66 respostas



5. TRATAMENTO DE ESGOTO SUSTENTÁVEL

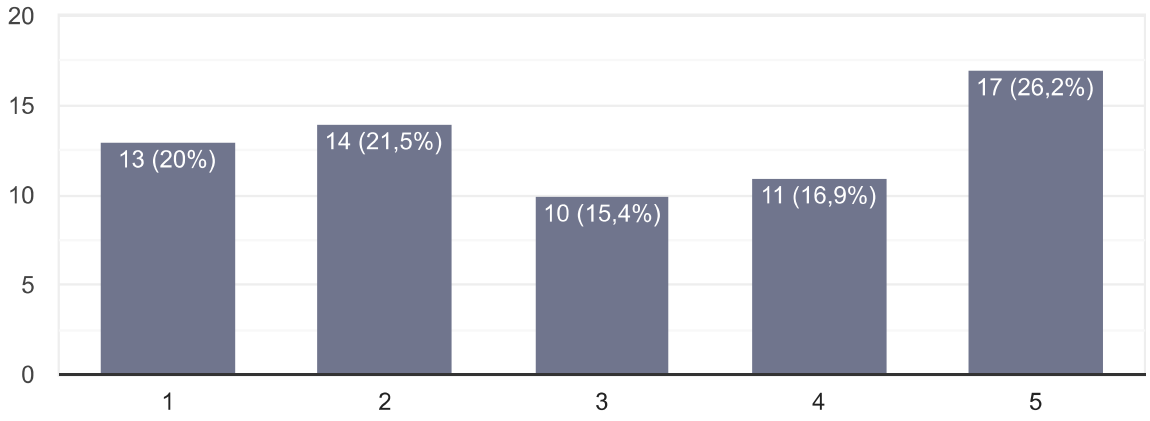
Você conhece ou já ouviu falar?

66 respostas



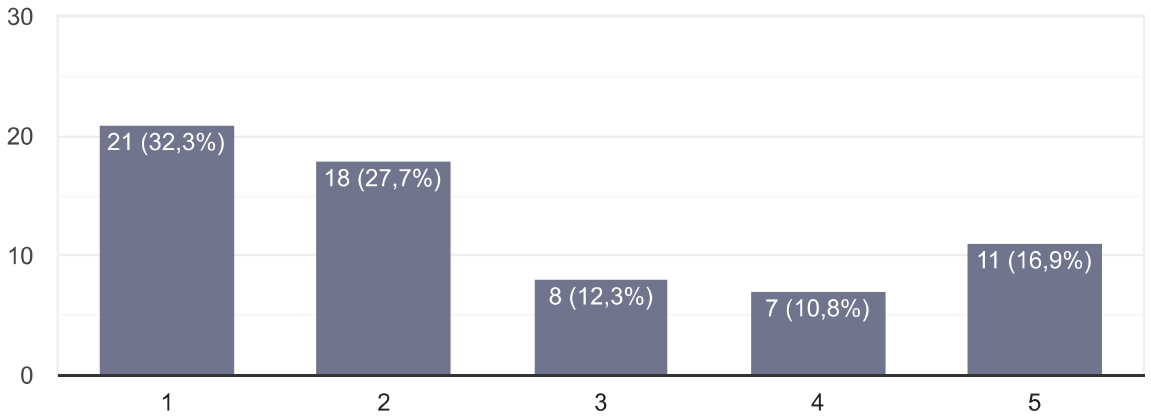
Você teria interesse em aprender essa iniciativa e fazer na sua casa?

65 respostas



O que você acha de fazer essa iniciativa na sua casa?

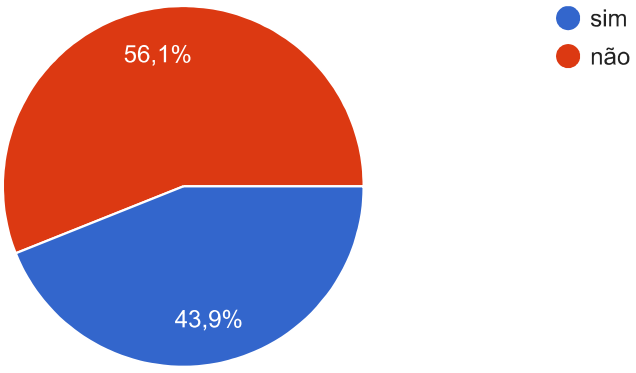
65 respostas



6. PISOS PERMEÁVEIS

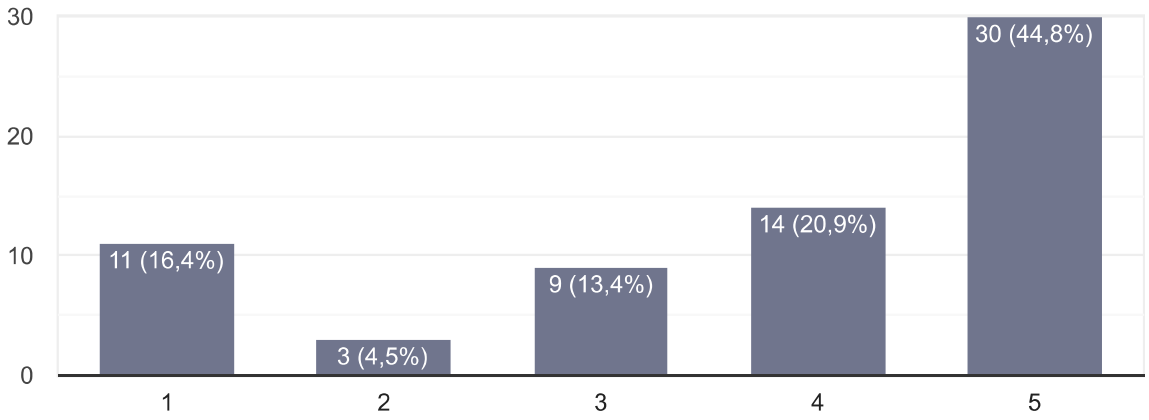
Você conhece ou já ouviu falar?

66 respostas



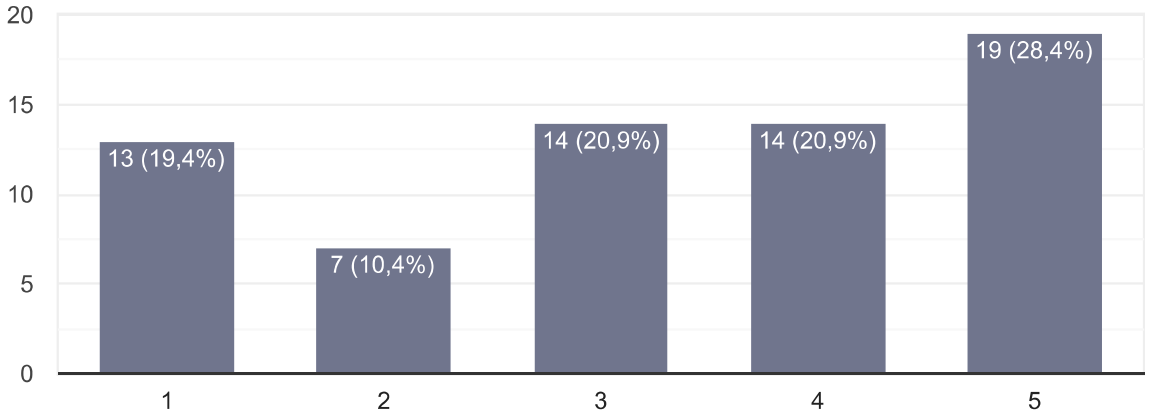
Você teria interesse em aprender essa iniciativa e fazer na sua casa?

67 respostas



O que você acha de fazer essa iniciativa na sua casa?

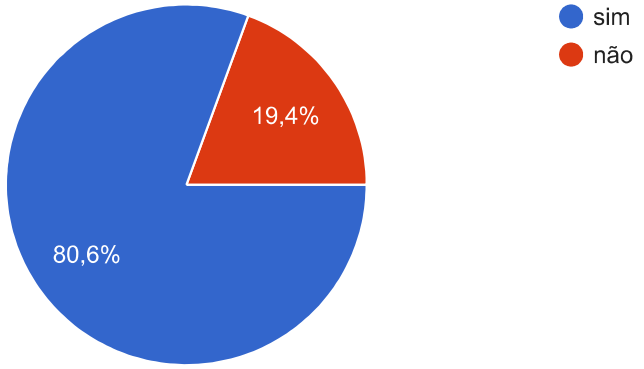
67 respostas



7. COMPOSTAGEM EM CASA

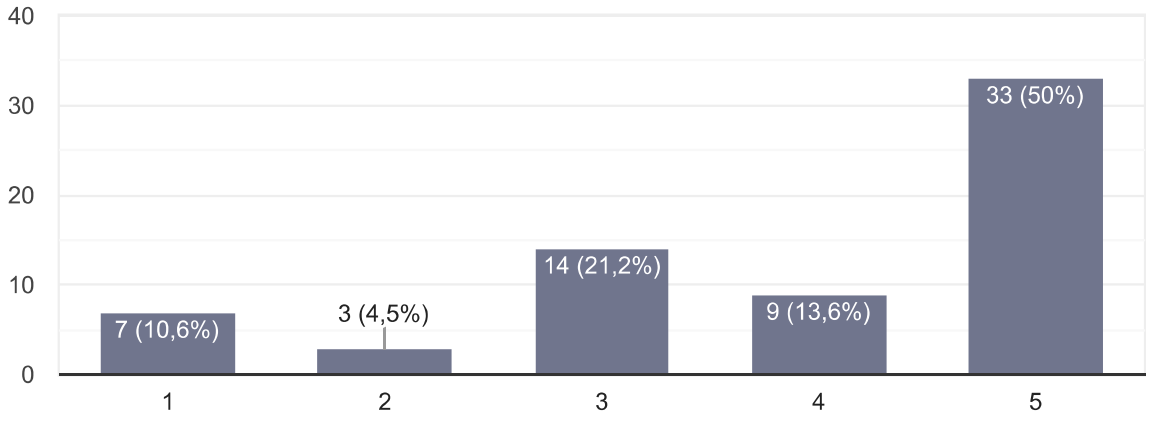
Você conhece ou já ouviu falar?

67 respostas



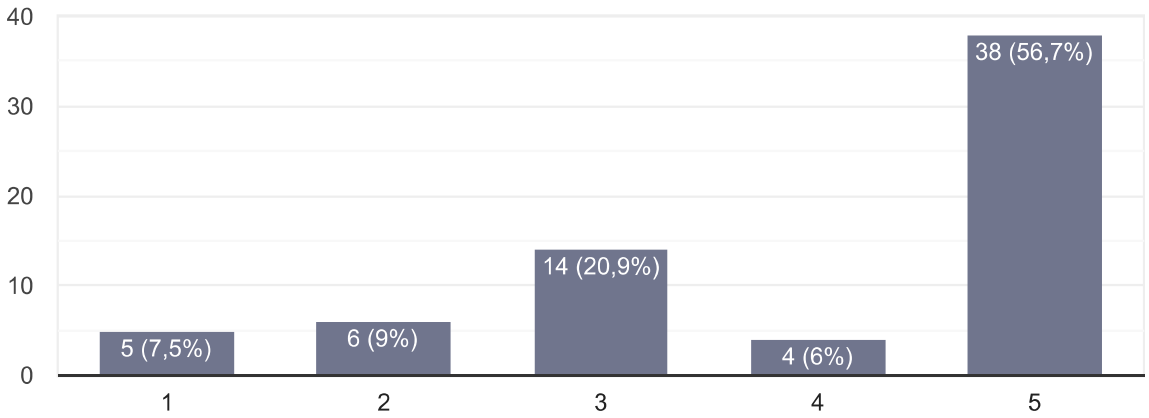
Você teria interesse em aprender essa iniciativa e fazer na sua casa?

66 respostas



O que você acha de fazer essa iniciativa na sua casa?

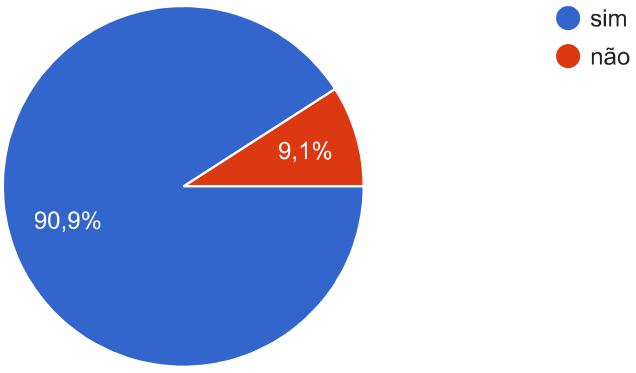
67 respostas



8. HORTA PARTICULAR

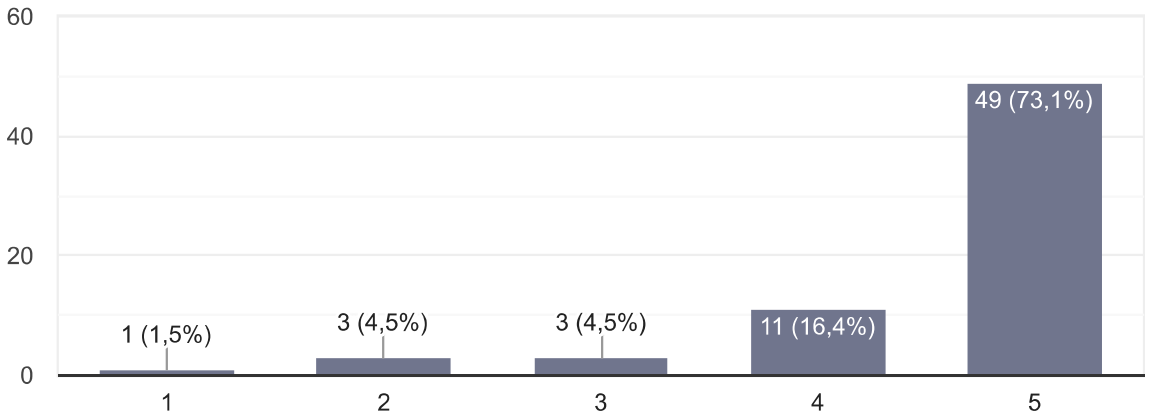
Você conhece ou já ouviu falar?

66 respostas



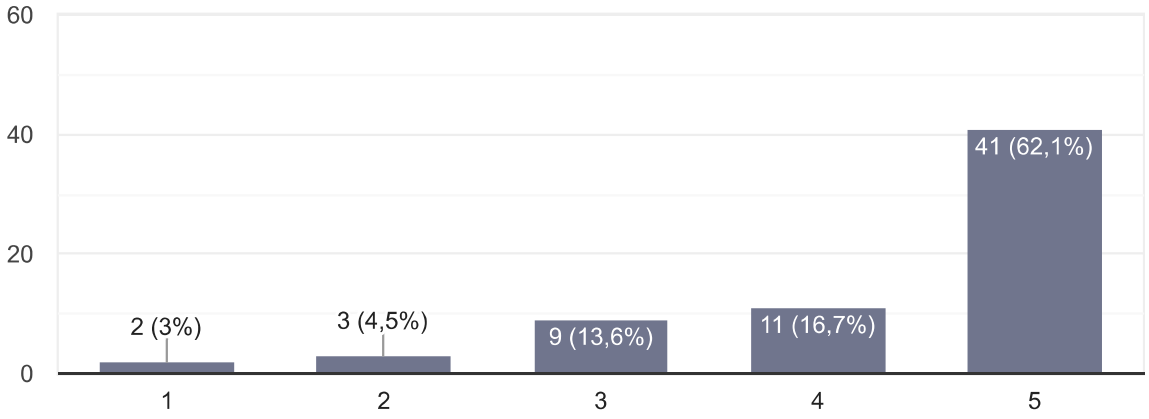
Você teria interesse em aprender essa iniciativa e fazer na sua casa?

67 respostas



O que você acha de fazer essa iniciativa na sua casa?

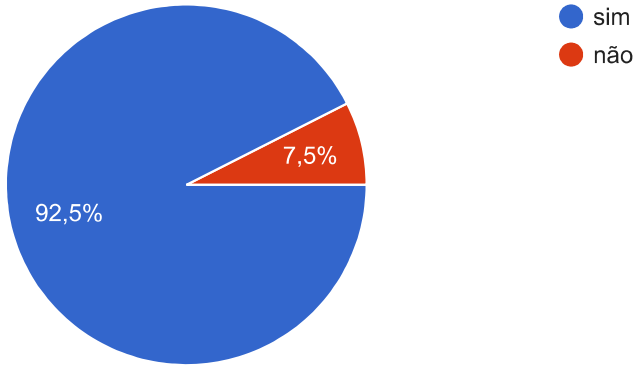
66 respostas



9. PRODUTOS CASEIROS

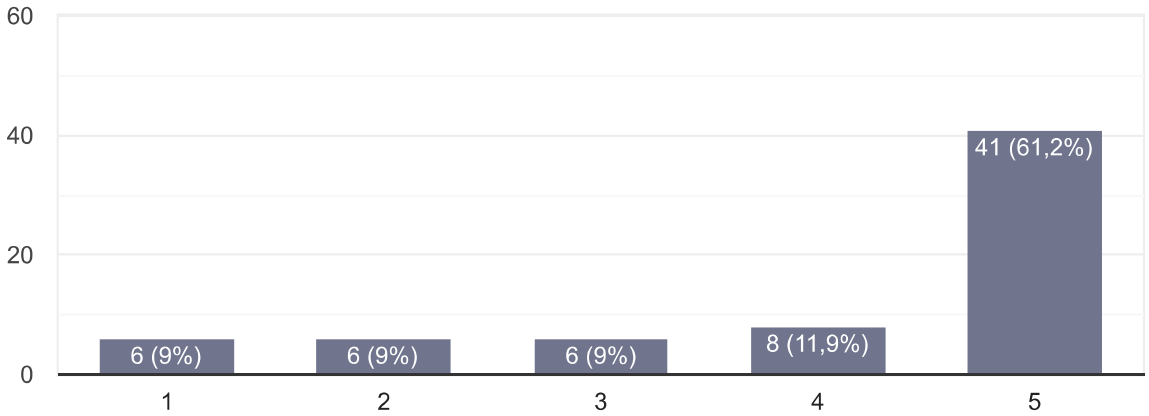
Você conhece ou já ouviu falar?

67 respostas



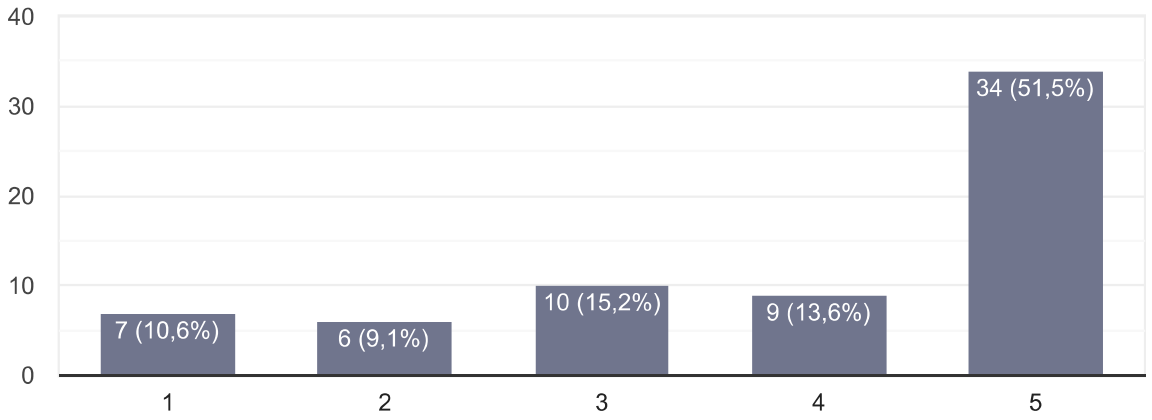
Você teria interesse em aprender essa iniciativa e fazer na sua casa?

67 respostas



O que você acha de fazer essa iniciativa na sua casa?

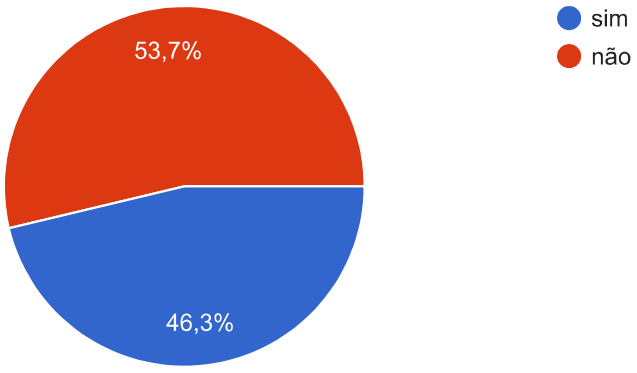
66 respostas



10. COMPOSTAGEM COMUNITÁRIA

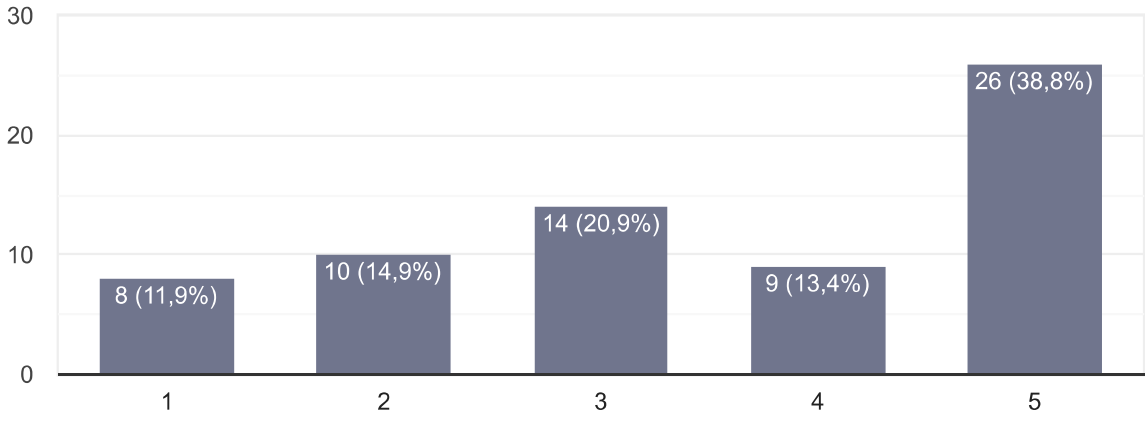
Você conhece ou já ouviu falar?

67 respostas



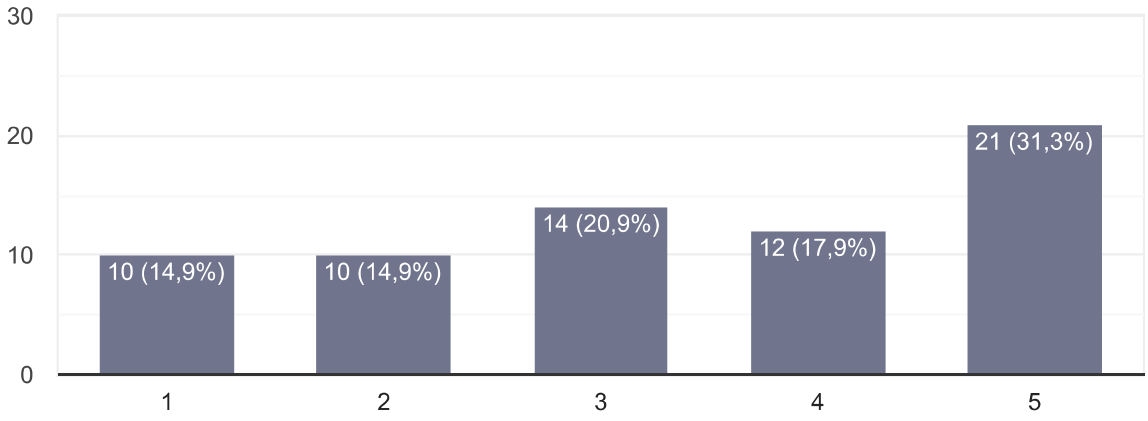
Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

67 respostas



O que você acha de fazer essa iniciativa na comunidade?

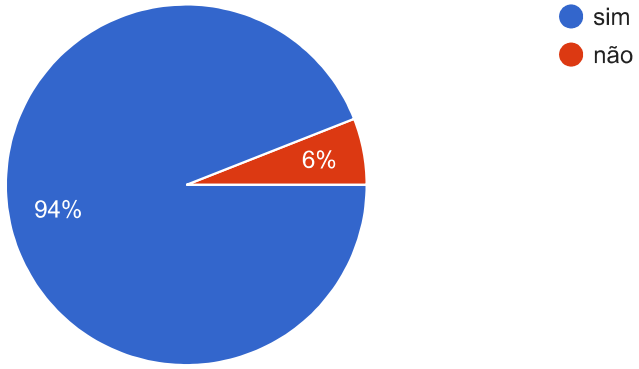
67 respostas



11. COOPERATIVA DE RECICLAGEM

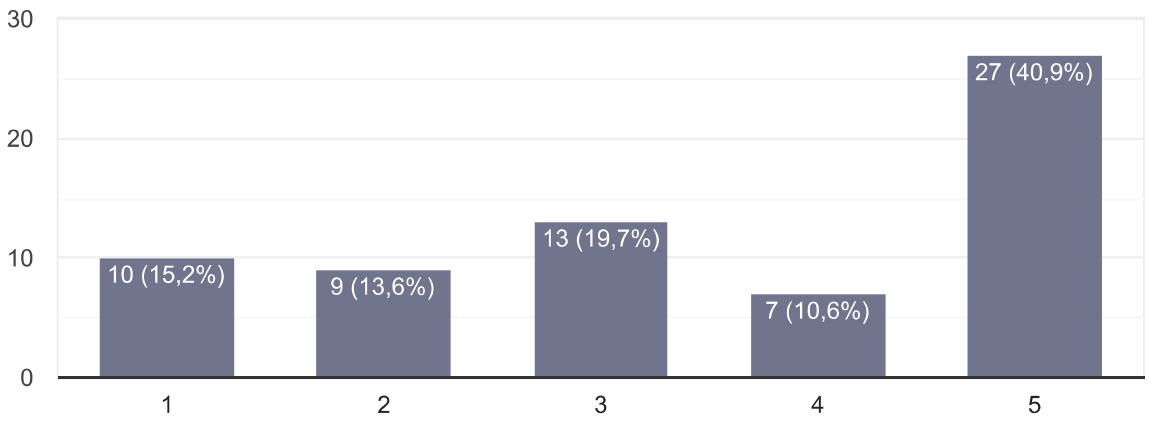
Você conhece ou já ouviu falar?

67 respostas



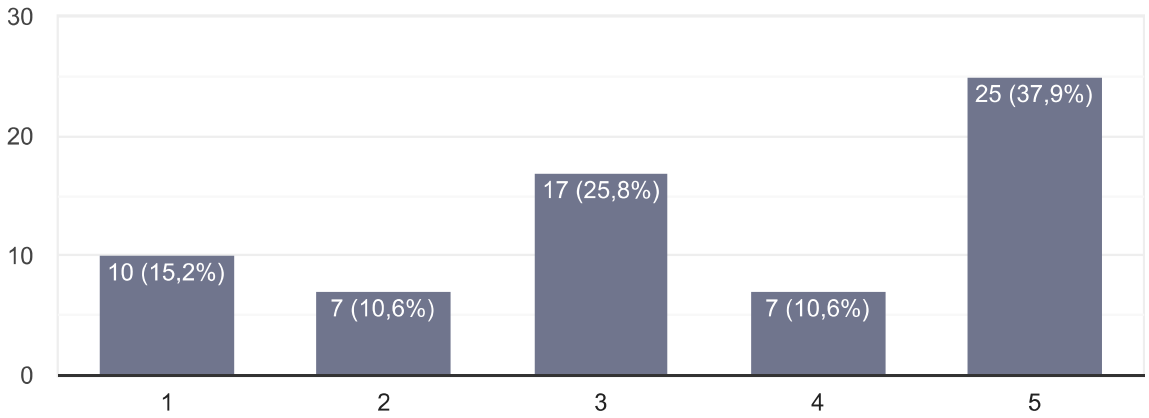
Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

66 respostas



O que você acha de fazer essa iniciativa na comunidade?

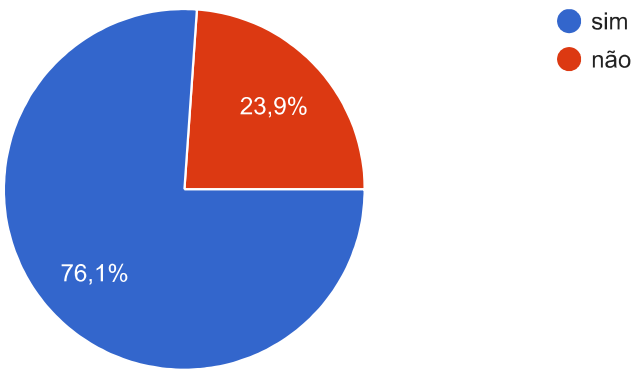
66 respostas



12. HORTA COMUNITÁRIA

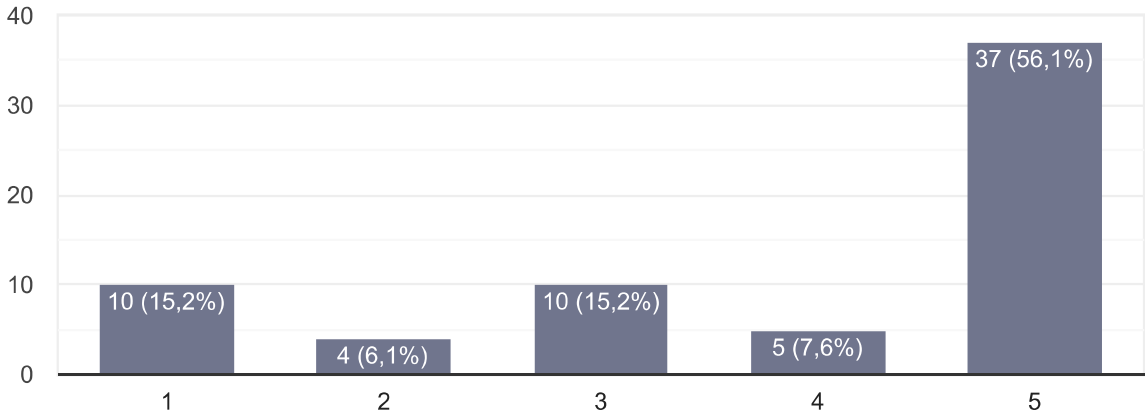
Você conhece ou já ouviu falar?

67 respostas



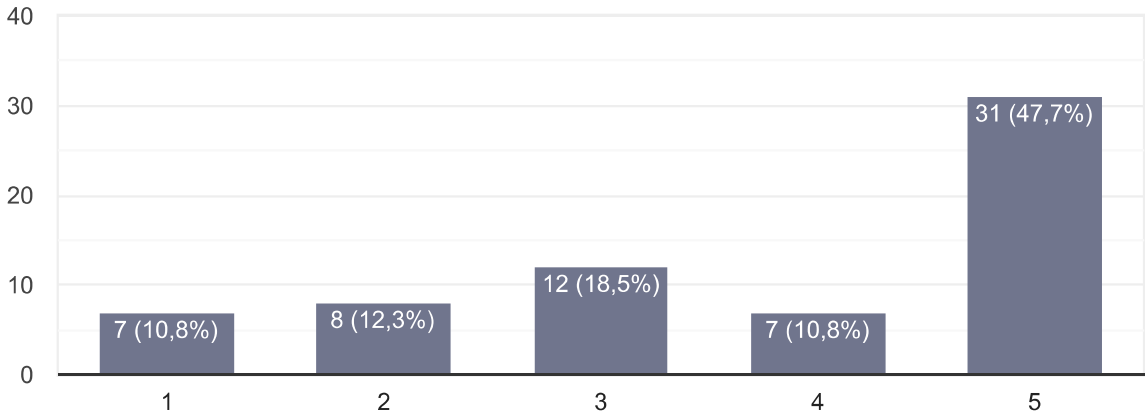
Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

66 respostas



O que você acha de fazer essa iniciativa na comunidade?

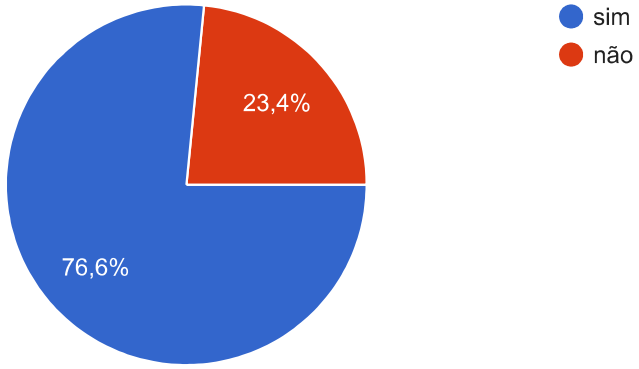
65 respostas



13. OFICINAS CULTURAIS

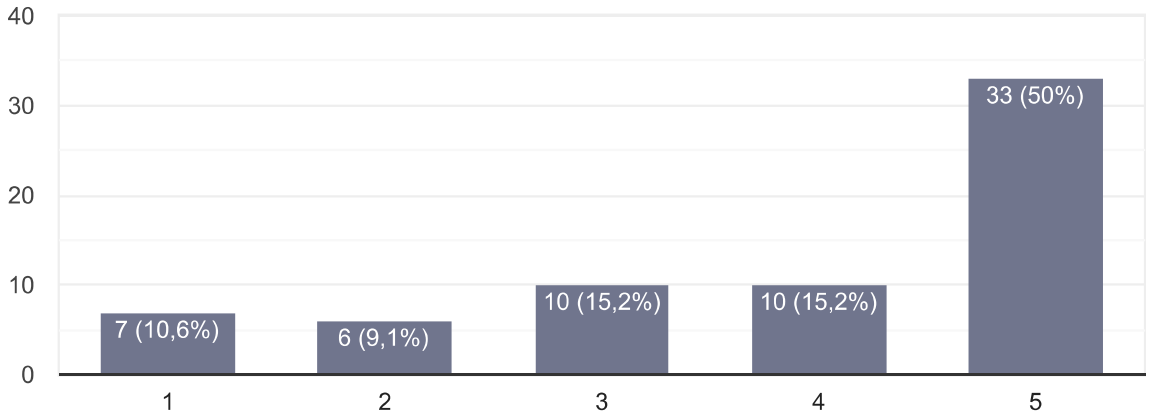
Você conhece ou já ouviu falar?

64 respostas



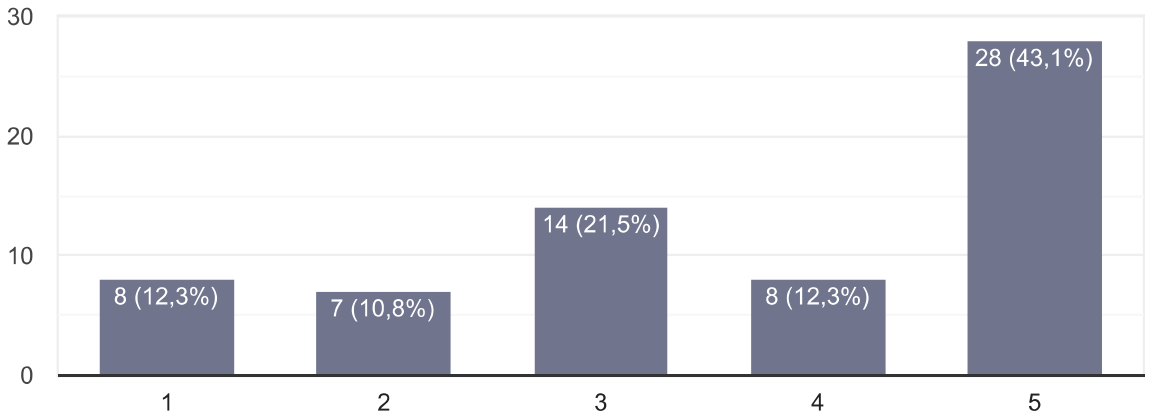
Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

66 respostas



O que você acha de fazer essa iniciativa na comunidade?

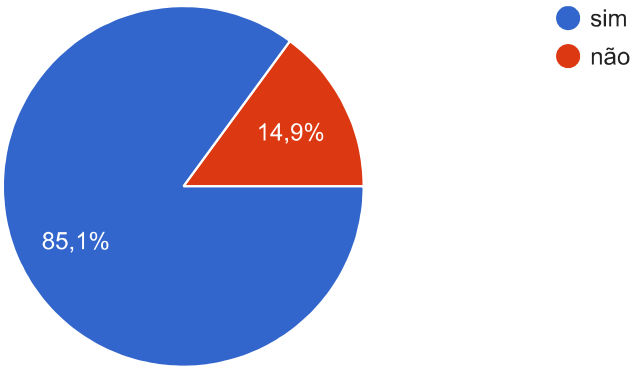
65 respostas



14. OFICINAS PROFISSIONALIZANTES

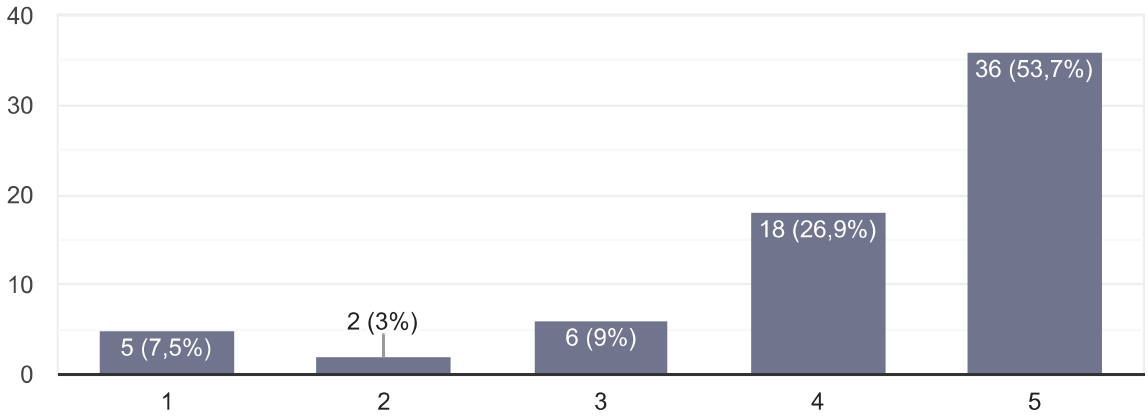
Você conhece ou já ouviu falar?

67 respostas



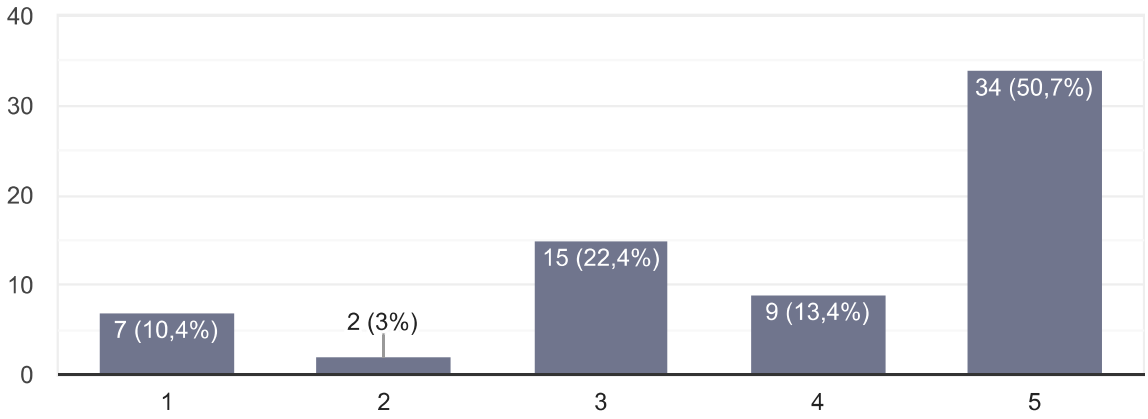
Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

67 respostas



O que você acha de fazer essa iniciativa na comunidade?

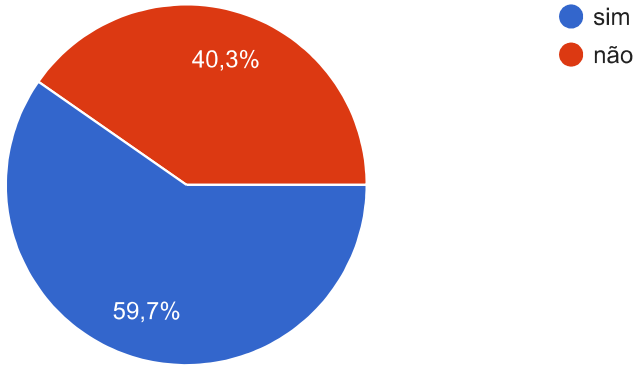
67 respostas



15. GRUPO DE MULHERES

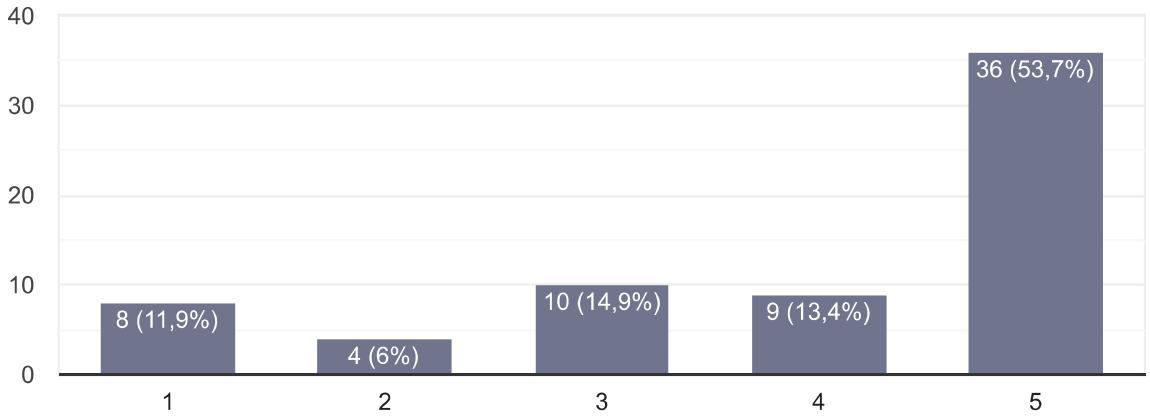
Você conhece ou já ouviu falar?

67 respostas



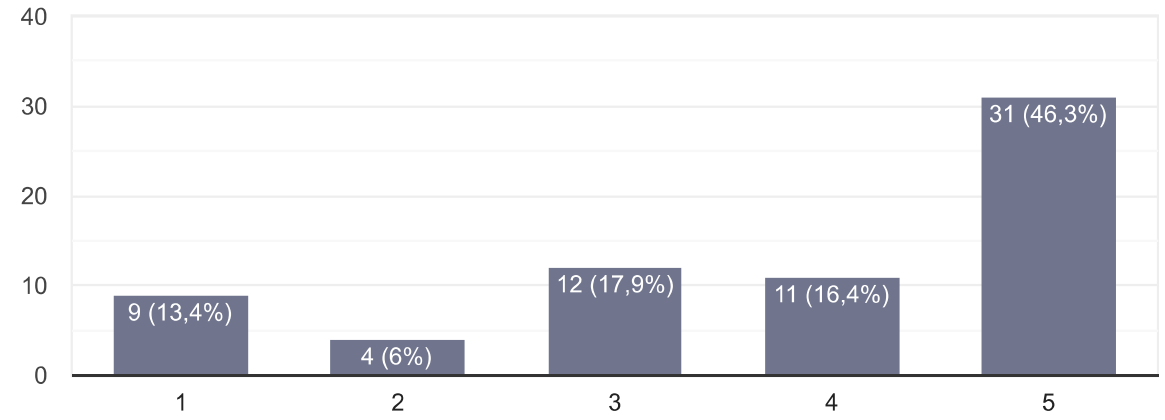
Você teria interesse em aprender essa iniciativa e fazer junto com a comunidade?

67 respostas



O que você acha de fazer essa iniciativa na comunidade?

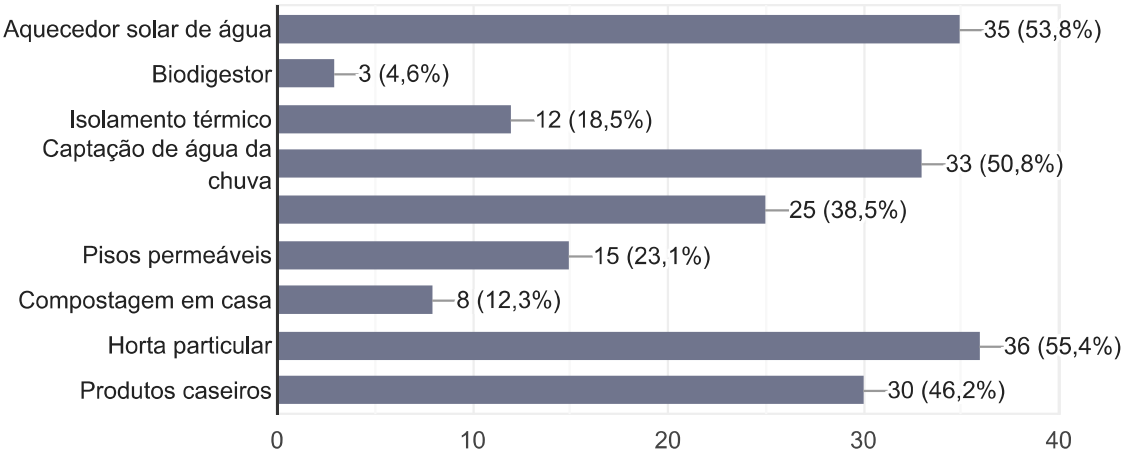
67 respostas



OPINIÃO GERAL

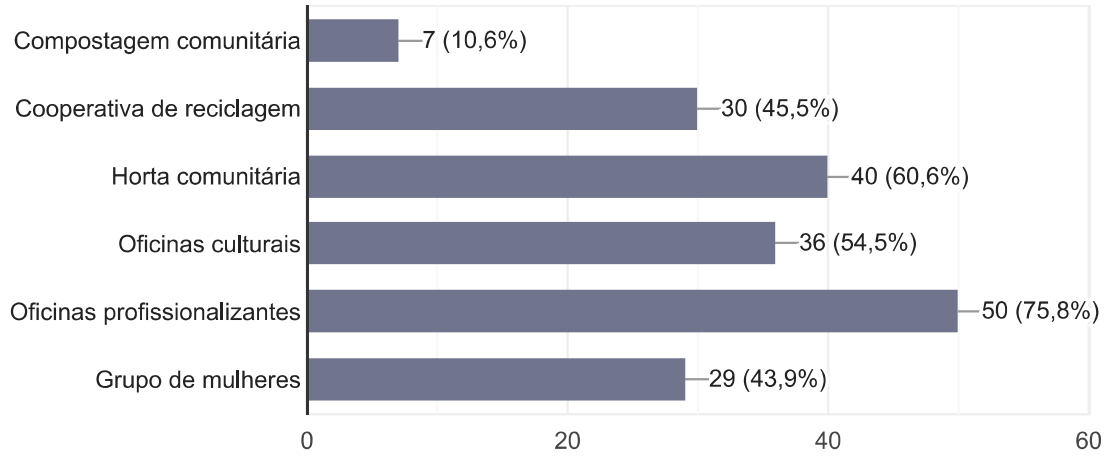
Das iniciativas individuais (números 1 a 9), marque as 3 que você considera mais interessantes:

65 respostas



Das iniciativas coletivas (números 10 a 15), marque as 3 que você considera mais interessantes:

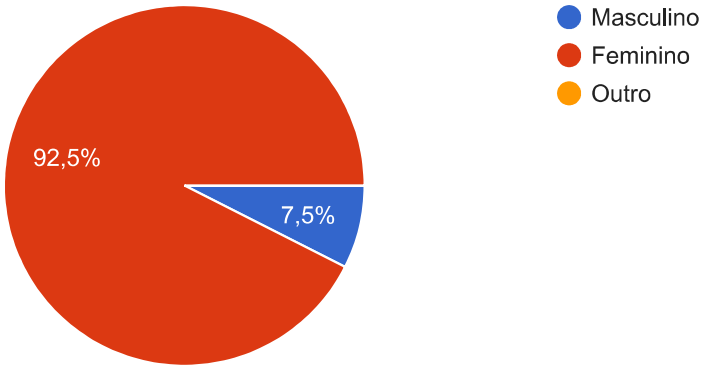
66 respostas



SEUS DADOS

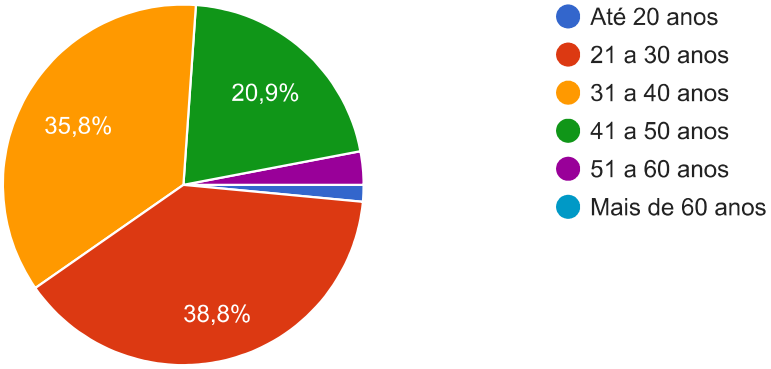
Sexo

67 respostas



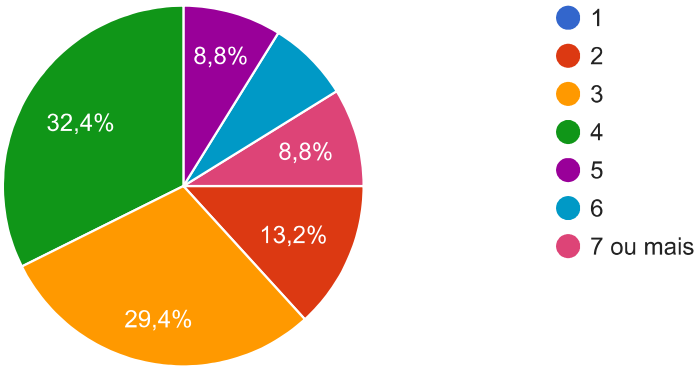
Idade

67 respostas



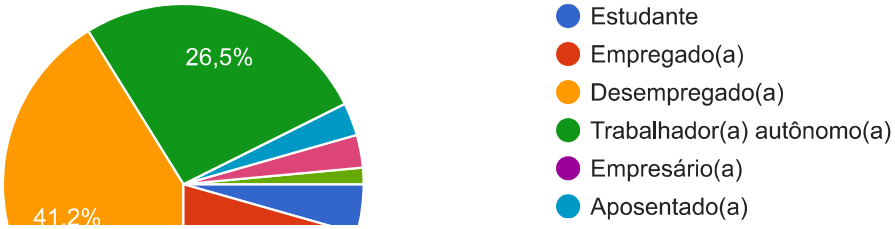
Número de moradores na sua casa

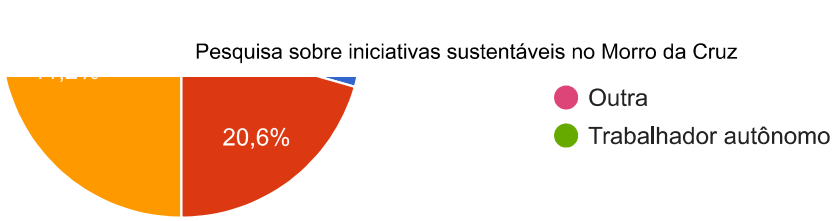
68 respostas



Ocupação

68 respostas





Escolaridade

68 respostas