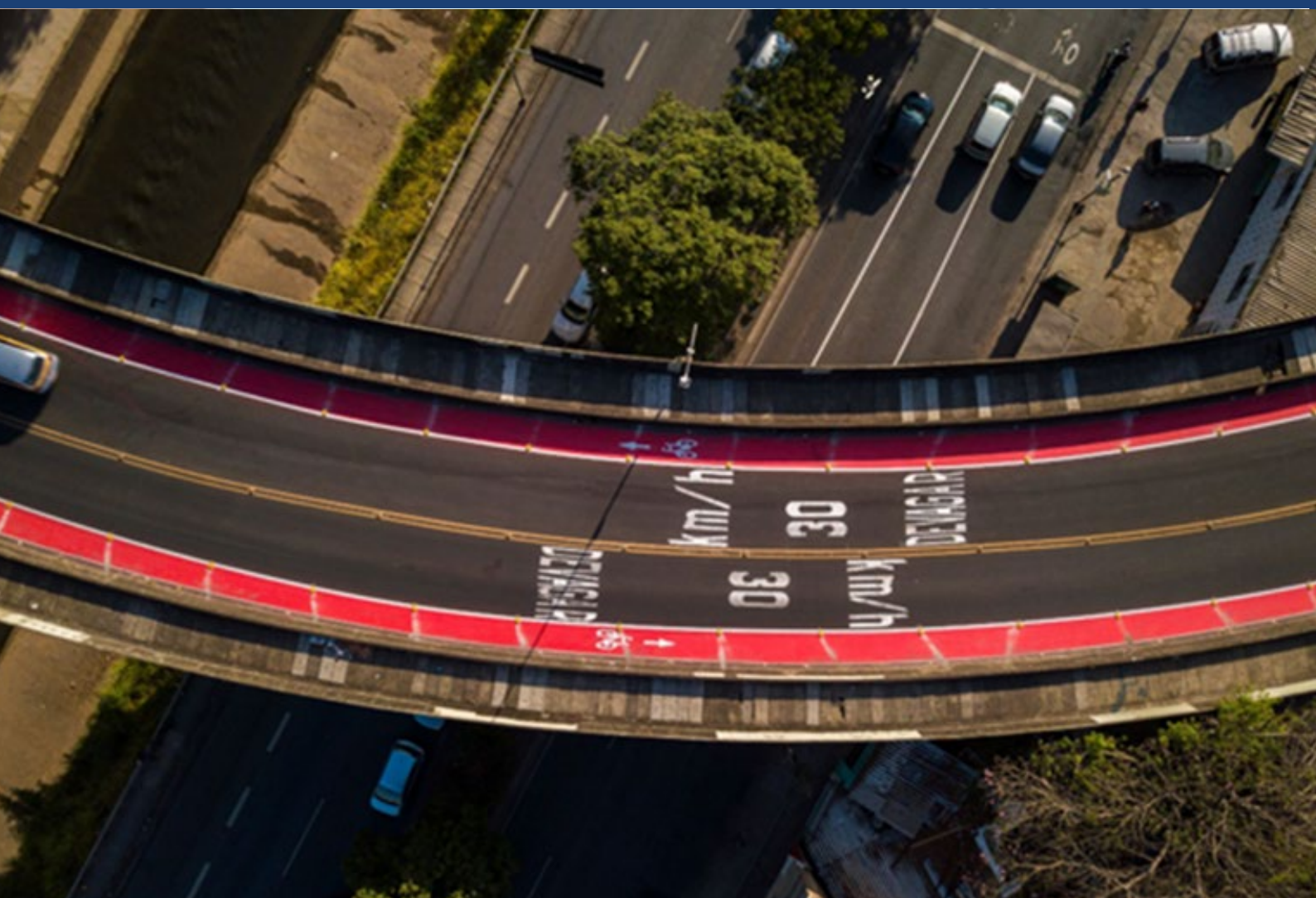




# Urban Pathways

## LOW SPEED, LOW CARBON POLICIES

### AN ASSESSMENT REPORT OF THREE 30KM/H ZONES IMPLEMENTED IN BELO HORIZONTE, BRAZIL



**Wuppertal  
Institut**

**UN HABITAT**  
FOR A BETTER URBAN FUTURE

**UN**  
environment  
programme

Author: Instituto Nossa BH

This publication is part of the Urban Pathways project

**Urban Pathways Secretariat**

[www.urban-pathways.org](http://www.urban-pathways.org)

Funded by



Federal Ministry  
for Economic Affairs  
and Climate Action

**IKI**



INTERNATIONAL  
CLIMATE  
INITIATIVE

on the basis of a decision  
by the German Bundestag



## **LOW SPEED, LOW CARBON POLICIES**

### **AN ASSESSMENT REPORT OF THREE 30KM/H ZONES IMPLEMENTED IN BELO HORIZONTE, BRAZIL**

# Urban Pathways

***The Urban Pathways project helps delivering*** on the Paris Agreement and the NDCs in the context of the New Urban Agenda and the Sustainable Development Goals. It has established a facility in close cooperation with other organisations and networks active in this area to support national and local governments to develop action plans and concrete implementation measures to boost low-carbon urban development. This builds on UN-Habitat's role as "a focal point on sustainable urbanisation and human settlements including in the implementation and follow-up and review of the New Urban Agenda". The project develops national action plans and local implementation concepts in key emerging economies with a high mitigation potential. The local implementation concepts are being developed into bankable projects, focusing on the access to urban basic services to create a direct link between climate change mitigation and sustainable development goals.

## Project concept

***The project follows a structured approach to boost*** Low Carbon Plans for urban mobility, energy and waste management services that deliver on the Paris Agreement and the New Urban Agenda. The project works on concrete steps towards a maximum impact with regards to the contribution of urban basic services (mobility, energy and waste management) in cities to global climate change mitigation efforts and sustainable and inclusive urban development. This project makes an active contribution to achieve global climate change targets to a 1.5°C stabilisation pathway by unlocking the global emission reduction potential of urban energy, transport and resource sectors. The project will contribute to a direct emission reduction in the pilot and outreach countries, which will trigger a longer term emission reduction with the aim to replicate this regionally and globally to make a substantial contribution to the overall emission reduction potential.

## Project aims

***This project implements integrated urban services*** solutions as proposed in the New Urban Agenda providing access to jobs and public services in urban areas, contributing to equality and social coherence and deliver on the Paris Agreement and the Sustainable Development Goals. This is the first dedicated implementation action oriented project, led by UN-Habitat to deliver on inclusive, low-carbon urban services. Securing sustainability and multiplier effect, the project aims to leverage domestic and international funding for the implementation projects that will follow from this initiative





# Urban Pathways



## Urban Pathways Project and Replication Cities

# INTRODUCTION

This report is part of the “Urban Living Lab Center Initiative” project, which is in turn part of the wider programme Urban Pathways. The Urban Pathways (<https://www.urban-pathways.org>) has the objective to make an active contribution to delivering on the Paris Agreement at the city level in the context of the New Urban Agenda and the Sustainable Development Goals. It aims to make a direct contribution to sustainable urban development by focusing on implementation projects in the areas of mobility, energy, and resource management. The project is funded by the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and is implemented by UN-Habitat, the Wuppertal Institute and UN Environment. Urban Pathways started in four pilot countries (India, Brazil, Kenya and Vietnam) to develop a Living Lab framework, and it has been replicated across the partner regions. As of now, Urban Pathways has stretched its activities far beyond those countries, being active in 10 pilot cities and replicating activities in more than 15 cities. The Urban Pathways project builds on four pillars: Inform, Inspire, Initiate, Implement.

The Urban Living Lab Center provides a space for collaboration among implementation-oriented projects in the field of urban climate action. In the context of a joint collaborating center knowledge, network and outreach partners will be actively supported to co-develop training formats for local authorities, planners, practitioners and entrepreneurs. This will aim to foster local policy and planning capacities, improve the ability of local authorities to access funding and financing mechanisms and support the take-up of innovative business models by companies and start-ups in the partner regions. The Urban Living Lab Center is co-hosted by the Massachusetts Institute of Technology (MIT), Technical University Berlin (TUB) and the Wuppertal Institute, building on the collaboration with UN-Habitat. The Thematic Labs and Regional Hubs are the main format to engage in capacity building, policy, planning and innovation support at the local level, accelerating the deployment of sustainable urban development solutions at the local and regional levels.

The Brazil Thematic Hub of the Urban Living Lab Centre initiative focuses on the need for capacity building, assessment of previous initiatives which aimed on low carbon and low speed

mobility policy, and the implementation of a perennial intervention in the urban space which enables the replication of concrete mobility and climate resilience solutions, in particular for the peripheral spaces of large urban metropolises in developing countries. In addition, the project seeks to open dialogue with other local managers of cities within the scope of the Hub, such as São Paulo, Rio de Janeiro and Quito. The aim is to conceptualize and consolidate a public policy of urban interventions that reduce the speed of cars in the city, increase space for people, increase autonomy and self-management capacity and mitigate climate change.

Within this context, this report sought to analyze the three low-carbon, low-speed interventions in open public spaces that have taken place in Belo Horizonte since 2019. These interventions took place in different partnership formats between local government, NGOs, academia, and civil society. In addition, the intervention related to urban spaces with different natures: the first, on Simão Tamm Street in the Cachoeirinha neighborhood, is a thoroughfare in a peripheral neighborhood of the city, where there was a low infrastructure for public transport and a record of high vehicle speeds - and therefore accidents. The second, around the Anne Frank Municipal School, in the Confisco neighborhood on the border between Belo Horizonte and the city of Contagem, is an attraction for commuters, especially children and young people, that needed speed treatment to increase pedestrian safety. The last one, the Joaquim Ferreira da Luz Square, in the Santa Tereza neighborhood, is a space of low residential density and low displacement attraction, but with a leisure area linked to a small cultural gastronomic circuit.

These distinct spaces have also had distinct community arrangements and urban solutions. Some temporary and already removed, some permanent but already damaged, and some that are still successful. This variety of circumstances and aspects makes the research on the implementation process fundamental as an element to guide the understanding of this public policy and make recommendations for its development.

Thus, this report is composed as follows. In addition to this introduction, there is a section on the current socio-economic and urban mobility context of Belo Horizonte and Brazil. The third section discusses the data collection instruments used in this research. The fourth section discusses the concepts of eco-zone and 30 km/h Zone, and then addresses the context and

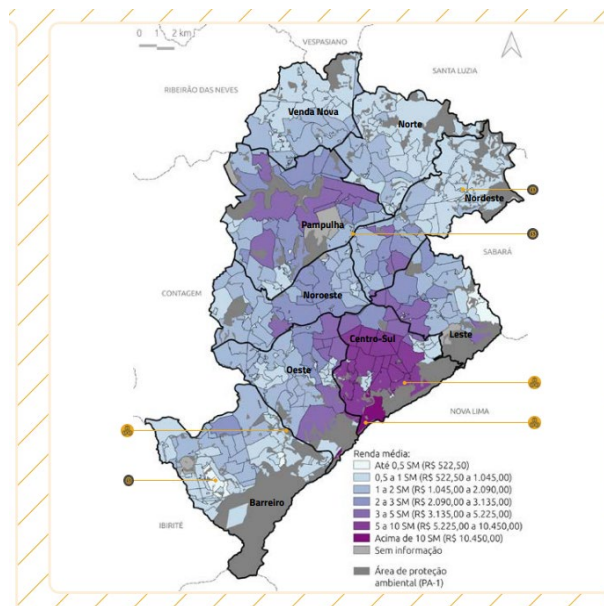
history of urban intervention in each of the three researched areas. The fifth section presents the data collected at each of the locations, by means of questionnaires, observation forms, interviews, and air quality meter, as well as an analysis of these results. The sixth section critically analyzes all the data in a comparative manner, and the seventh and final section presents public policy recommendations considering what has been evaluated.

## SOCIO-ECONOMIC AND MOBILITY CONTEXT

The metropolitan region of Belo Horizonte consists of 34 municipalities with more than 5.5 million inhabitants, making it the third largest urban agglomeration of people in Brazil. Belo Horizonte and its region act, in this way, as an articulating pole in a broader economic dynamic among the Midwest, Northeast and Southeast regions of the country. The region itself is also marked by considerable industrial activity in its western axis and by being a state-wide services and equipment center.

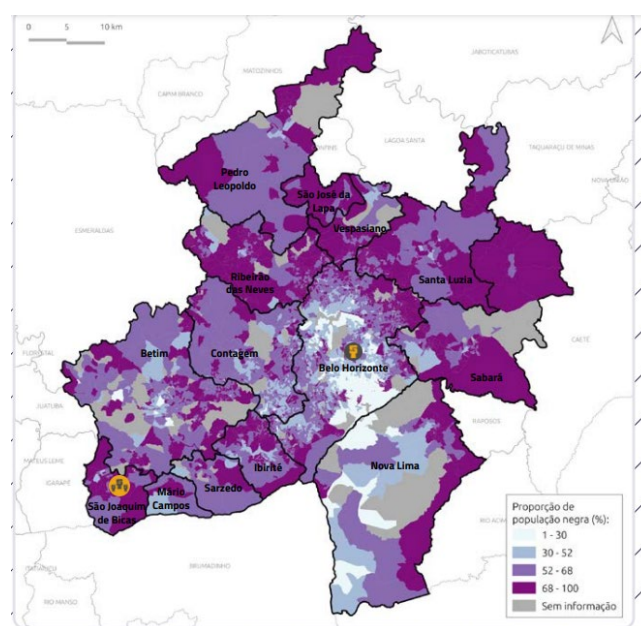
The RMBH (metropolitan region of Belo Horizonte) is also marked by profound social, economic, and racial inequalities that manifest themselves in its territory. In this sense, there is a marked discrepancy between the center-south axis of the metropolitan region, where wealth, urban equipment, and the white population are concentrated, and its vast peripheries - both municipal and metropolitan - in which there is a low-income black and brown population, often living in urban conditions of poor infrastructure and limited local employment opportunities. The following maps show the race-income overlap in the metropolitan and municipal territory.

**Figure 1- Belo Horizonte average income per neighborhood – 2021.**



Source: RMBH Inequality Map - 2021, p. 28

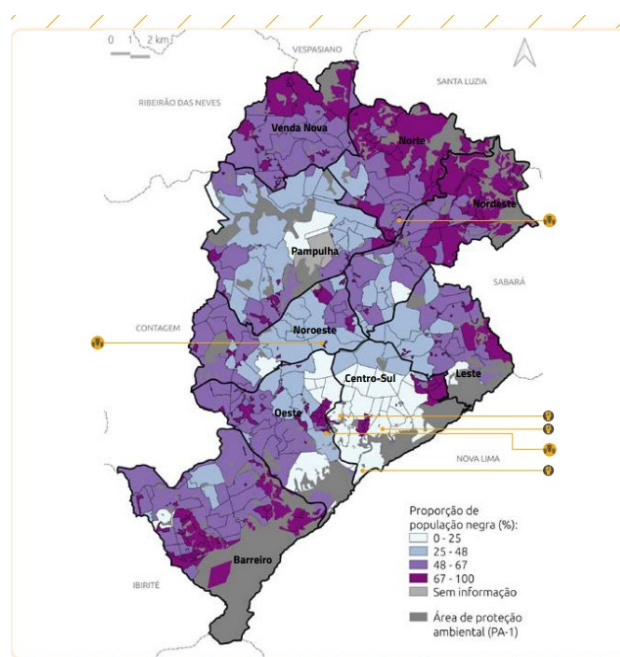
**Figure 2 - Belo Horizonte Metropolitan Area, selected municipalities, average income per territory – 2021.**



Source: RMBH Inequality Map - 2021, p. 28

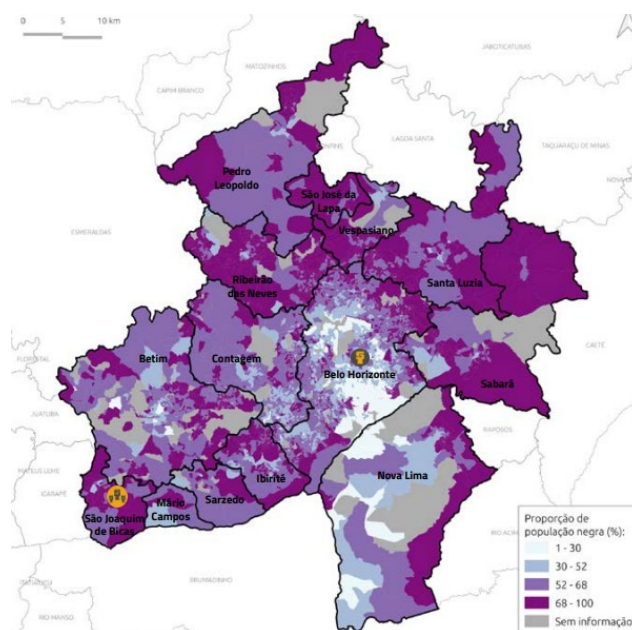


**Figure 3 - Belo Horizonte black and brown population per neighborhood – 2021.**



Source: RMBH Inequality Map - 2021, p. 23

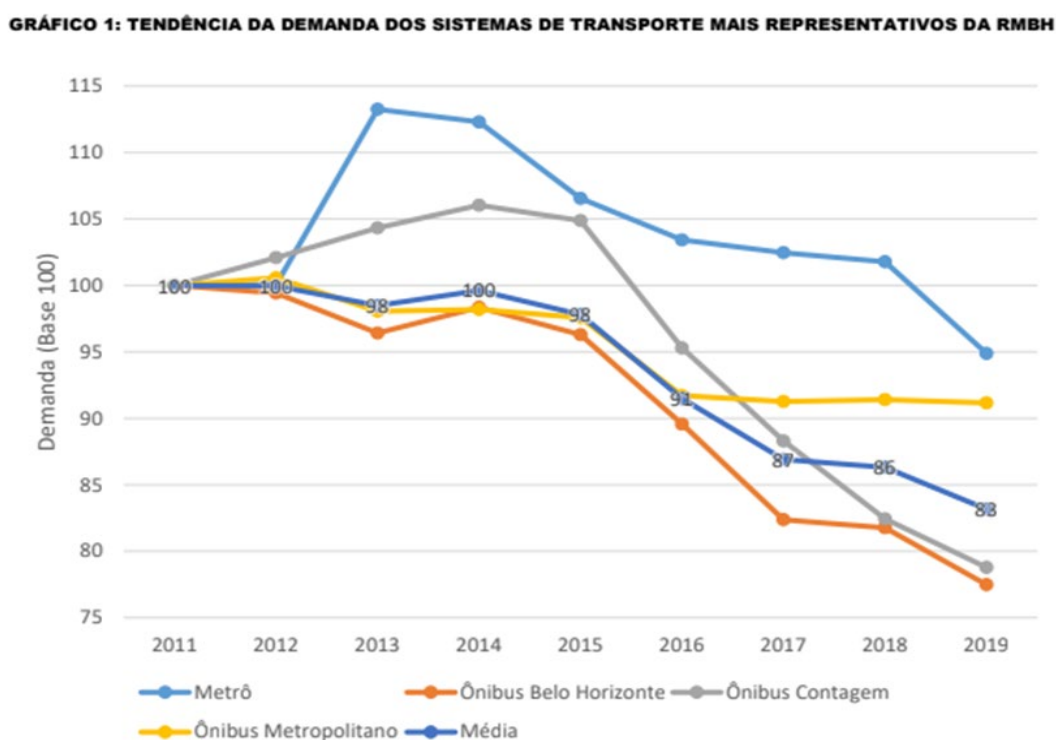
**Figure 4 - Belo Horizonte Metropolitan Area, selected municipalities, black and brown population per neighborhood – 2021.**



Source: RMBH Inequality Map - 2021, p. 22

This economic and spatial context conditions the nature of intra-urban commuting in the city. Thus, the large flux of people from the peripheries to the center at peak hours generates a typical “industrial” pressure on the road system and on the main avenues of the city. At the same time, in the last three decades there were no significant structural investments in public transportation - except for the municipal BRT system - which ended up conditioning a systemic crisis of demand and quality in this mode of transportation, even before the advent of the covid-19 pandemic, as can be seen in the following graph.

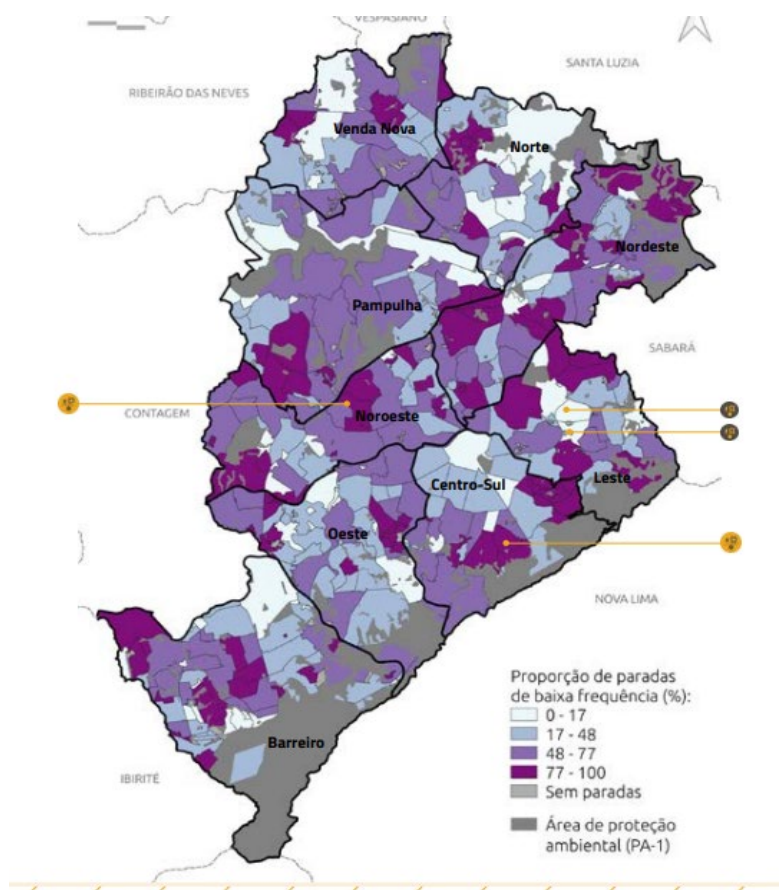
Figure 5 – Graphic with demand trends of the most representative transportation systems in the metropolitan region of Belo Horizonte.



Source: Diagnosis of the metropolitan plan for public transportation, metropolitan agency, 2022, p. 54.

The fall in demand with the lack of investment and revenue in the public transportation system generates a vicious circle that generates loss of passengers and then cuts in routes and schedules that are not profitable from the point of view of fair remuneration. This interruption in transportation services affects precisely in the most peripheral and socially vulnerable neighborhoods, as can be seen in the following map, generates a systemic pressure for the solution of displacement to be for the individual modes.

**Figure 6 - Proportion of bus stops with low frequency (less than 4 buses per hour) in Belo Horizonte, weekday, 2021.**



Source: RMBH Inequality Map - 2021, p. 54

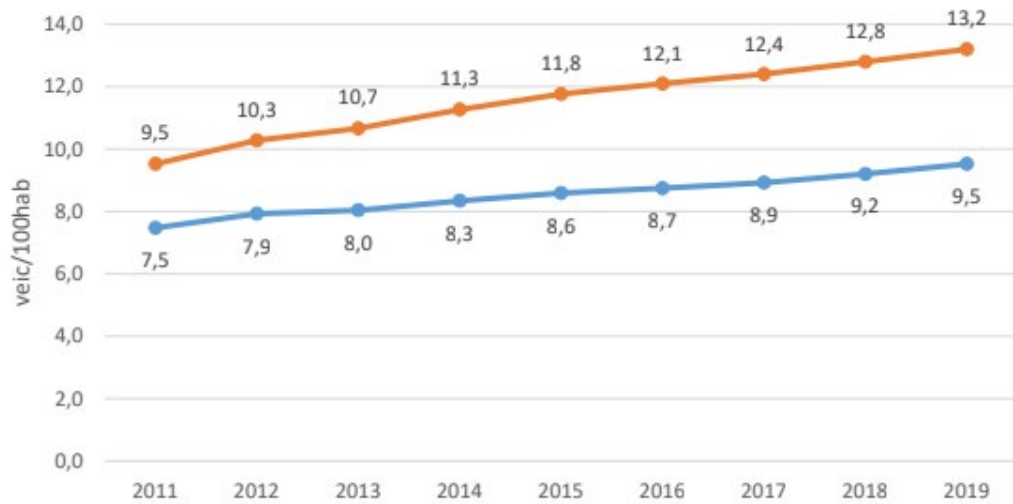
This pressure for motorization follows a national trend resulting from easier access to the purchase of motorcycles and cars - through financing and income growth (between 2003 and 2015) - a significant cheapening of this means of transportation in comparison with public transportation, and a generalized loss of quality and effectiveness of the latter mode. In addition, the dispersion of the urban area without public transportation coverage accentuated this process. However, as will be seen in the following graphs, the motorization trend in Brazil is significantly more accelerated in the Metropolitan Region of Belo Horizonte. A factor that contributes to this is the presence of Localiza - the largest car rental network in the country, with headquarters in Belo Horizonte, but even discounting this outlier, the numbers remain alarming.

Figure 7 – Motorization rate by car, Belo Horizonte metropolitan area.



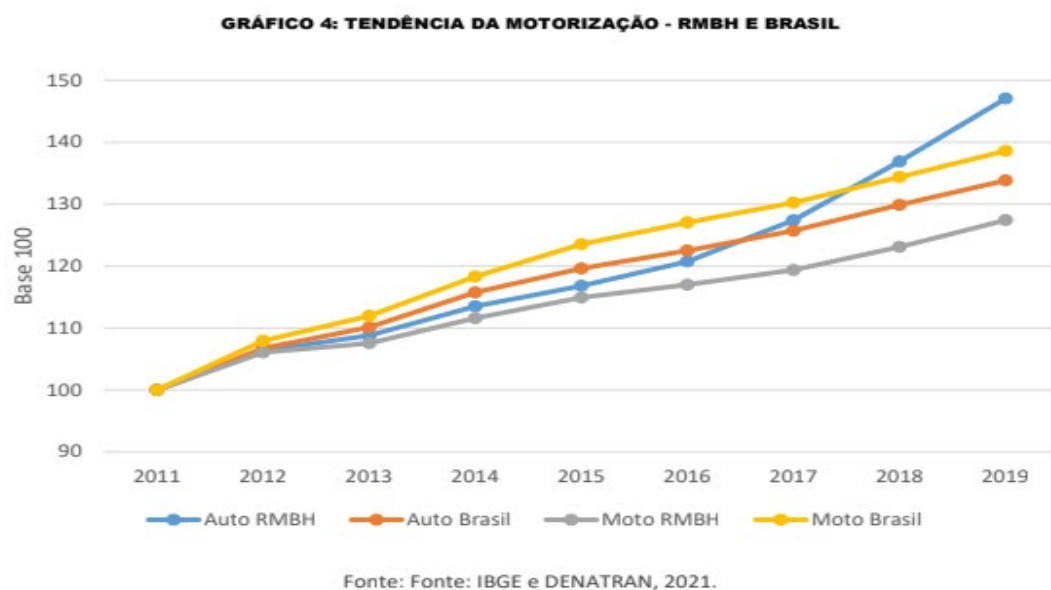
Source: Diagnosis of the metropolitan plan for public transportation, metropolitan agency, 2022, p. 55.

**Figure 8 - Motorization rate by motorcycle, Belo Horizonte metropolitan area.**



Source: Diagnosis of the metropolitan plan for public transportation, metropolitan agency, 2022, p. 55.

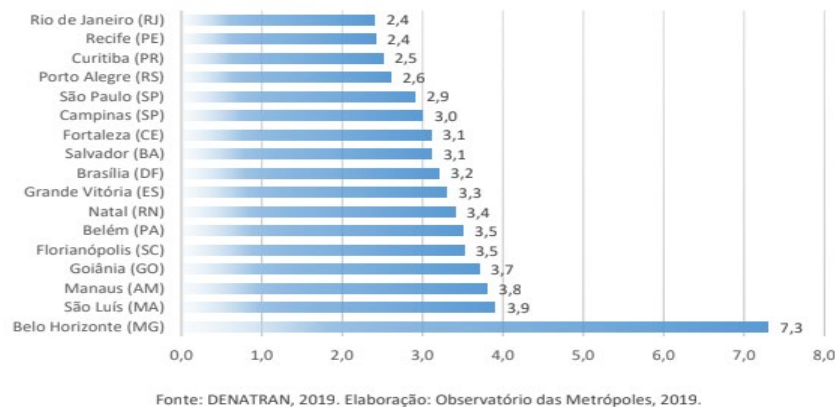
**Figure 9 - Motorization Trends, Metropolitan Region of Belo Horizonte and Brazil.**



Source: Diagnosis of the metropolitan plan for public transportation, metropolitan agency, 2022, p. 55.



**Figure 10 - Percent change in auto fleet growth, selected cities, 2018.**



Source: Diagnosis of the metropolitan plan for public transportation, metropolitan agency, 2022, p. 56.

The concrete consequence of this process for the region and the municipality of Belo Horizonte is, in first place, an increase in the flow and pressure on the regional road system. In parallel, there is an increase in the number of accidents with victims, putting pressure on the health system, and a systematic worsening of air quality. The theme of the Urban Pathways project and the urban interventions addressed here in this report are measures, albeit specific, that seek to reverse this scenario, both in its causes and its consequences. Encouraging local centralities and neighborhood autonomy, displacement by active modes of transport, reducing the speed of motorized transport, and increasing space for pedestrians, create a move in the direction of combating the epidemic of motorized transport. However, in view of the numbers presented here, it is evident that measures such as eco-zones and 30 km/h Zone must have their scale expanded to become more effective and, simultaneously, must be combined with other measures such as high investment in public transportation infrastructure, changes in its management, remuneration, and concessions to make it more attractive. In addition, measures are needed to restrict automobiles that have as an assumption in their design the fight against social and spatial inequalities, burdening precisely the richest to enable the poorest to have access to the city in a fair, equitable and sustainable way.

Next will be presented the context of the implementation of the 30 km/h Zones in three neighborhoods in Belo Horizonte, one low-income, one middle-income, and one upper-middle-income.

# DATA COLLECTION INSTRUMENTS

The analysis of the three low-carbon, low-speed interventions sought to understand a diversity of environmental, social, urban and political aspects that have changed or were part of the process of transformation of space. In other words, data was not only collected about the present moment, but also on a time scale that covers the entire process of planning and realization of these projects.

Three different questionnaires were prepared for each location, and they were applied in person to those who frequent the spaces. A questionnaire was also distributed online and aimed at cyclists who ride on the streets where the interventions were made in the Santa Tereza neighborhood. In order to complement the answers to the questionnaires, a guided spatial observation was carried out that covers physical aspects of public and private spaces, and the behavior of people in these spaces.

Semi-structured interviews were also conducted with politically important characters in each region who were part of the planning and realization of the urban interventions. Finally, as in the Confisco and Santa Tereza interventions, a device to measure air quality parameters was used to understand the local context. Where possible and feasible, before and after comparisons were made, although it is understood that further research is needed to define a concrete scenario for air quality in the municipality.

## Questionnaires

A questionnaire<sup>1</sup> was elaborated for each of the three locations where the EcoZones were implemented to understand the perspective of those who use the sites today and those who lived through the changes made. Between 25 to 38 questions were conducted by the interviewers in person, at peak times of each location, considering the types of predominant urban uses at each location.

The common objectives in the three questionnaires applied include:

---

1 The full questionnaires are available in annex I to IV of this report

- Measuring the sense of safety and sense of traffic speed by those on foot and by bicycle
- Measuring the main local modes of transportation used and which modes of transportation are most in demand
- Measuring the satisfaction of car users with the changes made to roads and parking lots
- Evaluate the changes from the perspective of those who currently use the site
- The social, racial and income categorization of interviewees.

In the Santa Tereza neighborhood, we also conducted an additional questionnaire about the implementation of bike lanes and 30 km/h Zone for cyclists who frequent these projects. In this case, we opted for an online questionnaire, because it was not viable to interrupt the cyclists' commute to complete the questions.

The objectives included:

- Measure the sense of safety
- Measure the main modes used by cyclists and which modes are in demand
- Evaluate the changes from the perspective of those who currently use the site by bicycle
- The social, racial and income categorization of the respondents.

The three questionnaires, which contain different specific questions for each neighborhood, were pre-tested on site and adapted before being applied to the broad public.

### **Semi-structured interview**

Interviews are one of the most employed methods in qualitative research. This is a research

strategy that has the collection and analysis of data usually emphasizing words than quantification (Bryman, 2012). In this study, the semi-structured interview was used, where the researcher has a guide, a list of questions or topics to be covered, but there is a flexibility in its execution. This flexibility occurs for the researcher, who can adjust the questions during the interview depending on the development of the interview, and for the interviewed, who can choose how to answer the questions, and the depth (Duarte, 2005).

The interview was designed in such a way that its sequence allows its development resembling a conversation. In this way, it intended to consider the interviewee's thought sequence, seeking to continue and follow a logical sense of the conversation in a natural way (Boni and Quaresma, 2005).

The main objective of the conducted interviews was to qualify the personal trajectory of the community leaders and how they perceive the conflicts that occur in the urban space. In this sense, the interview wanted to better understand how they saw the changes in the urban space made by the assessed previous interventions.

All interviews were conducted in Portuguese, and followed the guide presented in Annex V.

### **Observation sheet**

Observing the conformation and physical condition of the streets, urban equipment and how people move or stay in space, it is possible to understand the spatial characteristics that contribute to an accessible urban mobility for those on foot or with active modes of transportation. For this reason, a guided observation of spatial and behavioral characteristics was conducted in the approached locations to complement the results obtained with the questionnaires.

With the observation sheet about physical space, we collected data about the types of uses and state of conservation of public and private spaces on the streets of the surveyed locations. This information is important to understand if there is a heterogeneity of urban uses that promote a life in public spaces and mobility with active modes of transportation. Streets with a mix

of residential and commercial uses, for example, have the ability to shorten routes and are conducive to walking and bicycling. At the same time, the condition of sidewalks, accessibility, and the environmental quality of public space have a responsibility to enable this mobility (Litman, 2017).

Observing the human occupation of space was possible to understand the characteristics of the people who use the space, such as gender, age, and the main behaviors of who use and walk in the public spaces. Types of walking, functional or or casual activities, adequate use of the sidewalk and crosswalks, difficulty to walk, conflicts with different means of transportation and different uses of space, animal companions, and more.

The data was collected on the same days and at the same times as the questionnaires were applied, in other words, considering the peak moments of activity at each location, and with the help of street view of Google Maps to collect aspects of the physical space.

### **Air quality meter**

In addition to the application of questionnaires, an air quality meter was implemented in the three locations to assess whether the interventions had any impact on the air quality of the site compared with their previous state. Of the three sites, only the Cachoeirinha neighborhood did not have its attributes measured previously because such measurement was not yet a part of the project at the time. Anyway, even without comparison, the measurement basis is interesting to understand the local conditions in which the three interventions were inserted.

The equipment utilized to measure the air quality was the smart citizen kit, a collaborative platform of measurement and data collection whose data are available online on smartcitizen.me. The equipment measures noise, air temperature, air humidity, barometric pressure, concentration of equivalent CO<sub>2</sub> in the air, presence of particulate matter of different sizes (diameter below 10, 2.5 and 1 nanometer) in the air, as well the presence of volatile organic compounds.



# URBAN INTERVENTIONS

## CONCEPTS AND ANALYZED LOCATIONS

### Fundamental concepts

In this topic, the concepts of 30 km/h Zone and EcoZone will be addressed. These concepts are considered fundamental for a good understanding of the interventions and, consequently, the report.

### 30 km/h Zone policy in Belo Horizonte

Reducing speed limits is a measure that can be adopted to reduce traffic fatalities, being a contemporary trend in cities that has the right to life as a priority (ITDP Brasil, 2016). The 30 km/h Zone intervention projects are included in this context. These projects were born in Buxtehude, Germany, with the aim of reducing traffic mortality rates, and providing greater harmony in the coexistence of different means of transport (WRI Brasil, 2014). In general, the measure seeks to review the priority of road circulation, clearly granting the preference of users who are moving through active means of transport (Trevisan, 2021), such as on foot, bicycle, skateboard, non-motorized scooter, etc. The positive results of the implementation of the measure in Germany made it spread, and it can already be seen in other locations, such as Brazil (WRI Brasil, 2014).

30 km/h Zones are places with a regulated maximum speed of 30 km/h. Through the regulation and establishment of the 30 km/h limit, roads can be shared by cars and active modes of transport in a safe way. That is because, in a collision with a car at 30 km/h, the chance of survival of a pedestrian is 90%, while at 50 km/h, the index drops to 15%, and at 60 km/h it drops to only 2 % (WRI Brazil, 2014).

However, for the speed reduction to be effective, only the implementation of signaling devices is not enough, and it is necessary that the design of the road does not induce speed gain. Thus, the 30 km/h Zones include traffic calming measures, devices aimed at reducing the speed of motor vehicles and favoring the flow of pedestrians and cyclists, increasing their safety. Through the redesign of the street geometry, the insertion of urban furniture and landscaping, encouraging permanence, these areas have their sidewalks and spaces intended for coexistence requalified (Trevisan, 2021).

### EcoZone

The concept of EcoZone is related to small, low-cost, cross-sectoral projects, concentrated

in residential neighborhoods, which, through a variety of activities, including tactical urbanism, awareness-raising, community participation and impact assessment, simultaneously address sustainable mobility issues. and waste treatment. EcoZone's objective goes beyond urban intervention, seeking to promote empowerment of local communities, raising awareness, and promoting social cohesion (Trevisan, 2021). EcoZone merges the concepts of Low-emission Zone (LEZ) and Zero Waste and can contribute to significantly reducing GHG emissions from the transport and waste sectors of a city (Urban Pathways, 2022).

## Cachoeirinha

Cachoeirinha neighborhood was chosen as the first location for 30 km/h Zone intervention to be implemented in Belo Horizonte. The neighborhood is in the Northeast region of the city, as shown in Figure 11, in which the neighborhood is highlighted in pink.

Figure 11 - Location of Cachoeirinha neighborhood.



Source: PBH (2022)

It was carried out for the implementation of the project on a temporary basis. Temporary implementation has the benefit of allowing the intervention to go through a trial period, with its efficiency being evaluated and receiving contributions from the target audience for potential changes to subsequently be installed permanently (Trevisan, 2021).

The main axis defined for intervention was Simão Tamm Street, used by vehicles that cross the neighborhood and by students from schools located in the region. The original width of the space destined for the car naturally induced an excessive gain in speed, while the reduced width of the sidewalks meant that many of the pedestrians used the street (Trevisan, 2021).

**Figure 12 - Simão Tamm Street before the intervention.**



Source: Trevisan (2021, p.96)

Data collected for intervention planning were classified volumetric counts of vehicles and pedestrians; survey of regulated and practiced speeds; survey of existing urban signage and equipment; and survey of bus lines that circulated in the areas affected by the intervention. In addition, the main community leaders were identified, interviews were carried out with the resident population, traders and service providers, and prior contacts were made with the direction of schools in the region and workshops were planned with students. The workshops with the students were held in February and April 2019.

After the planning stage, the intervention team matched the project initially prepared with the suggestions collected during the workshops and meetings. Finally, the intervention was scheduled to take place between April 26 and 29, 2019 and registration was opened for volunteers interested in collaborating with the implementation.

**Figure 13 - First day of assembly of the intervention on Simão Tamm Street.**



Source: Trevisan (2021, p.104)

**Figure 14 - Implementation of the intervention on Simão Tamm Street.**



Source: Trevisan (2021, p.106)



The area received temporary urban furniture, landscaping elements and removable signage, in addition to the following physical measures to reduce vehicle speed: implementation of chicanery; sidewalk widening; reduction of the radius of curvature at intersections.

The intervention was completed on April 26, 2019, and an opening party was held by the Residents' Association. In the two days following the conclusion, painting activities and a bicycle repair workshop and a conversation circle about urban mobility, gender and bicycles were also carried out.

**Figure 15 - General view of Simão Tamm Street, after the opening of the intervention.**



Source: Trevisan (2021, p.111)

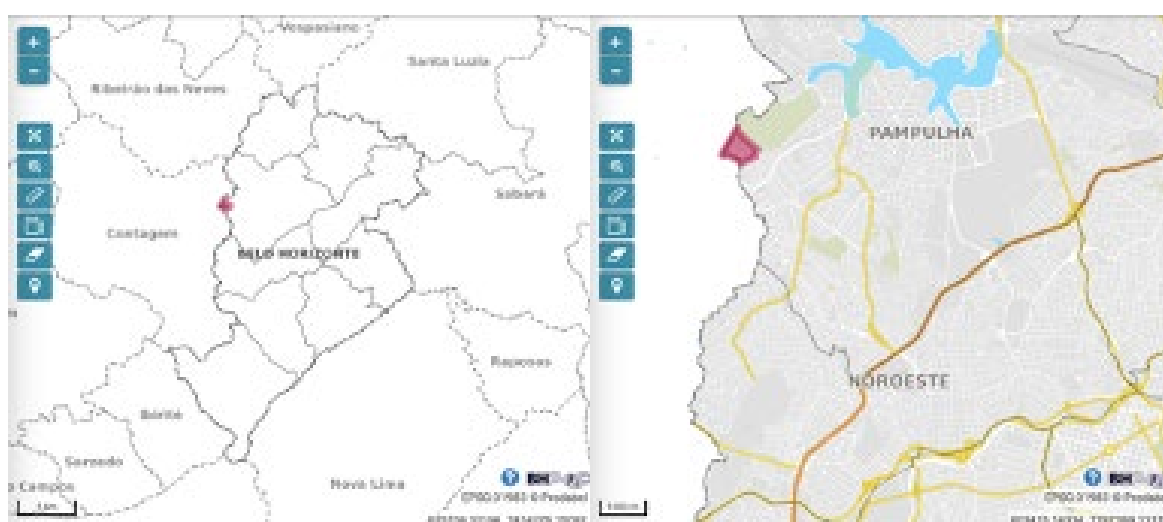
After the implementation of the intervention, surveys were carried out to evaluate the project, and compared with those carried out previously. In view of the positive results generated by the intervention, the Municipality of Belo Horizonte chose to maintain the new design after the end of the temporary intervention. Thus, in September 2019, permanent physical elements and new signage were installed, reinforcing the geometry. Some changes were also made to the original proposal, incorporating adjustments observed in the test period.



## Confisco

The Confisco neighborhood is a low-income community with indicators of social inequality and vulnerability located on the outskirts of Belo Horizonte, in the Pampulha region, on the border with the municipality of Contagem.

Figure 16 - Location of Confisco neighborhood.



Source: PBH (2022)

Because of its characteristics, the neighborhood has great dependence on public equipment and government support. Because of its characteristics, the neighborhood has great dependence on public equipment and government support. Thus, the Anne Frank municipal school, together with the health center that until early 2022 was located on the same block, played an essential role not only in the provision of basic services and food security, but also in the community organization of the population. Thus, the school was chosen for the intervention because it is a centrality, because it enables a pilot approach in relation to other schools, and because the data survey of the area showed high-speed, two-way traffic in its vicinity.

**Figure 17 - Location of Municipal School Anne Frank.**



Source: Trevisan (2021, p. 117)

The intervention was carried out in partnership with the Municipal Secretariat of Education, the Board of the Anne Frank Municipal School, the Education Management of the Superintendence of Urban Cleaning - SLU, the Regional Office Pampulha, the team from the Working Group - GT Pedala BH, the Association of Urban Cyclists of Belo Horizonte - BH em Ciclo, Movimento Nossa BH, and a representative from the Local Pathways Pathways Fellowship program, an initiative of the United Nations Sustainable Development Solutions Sustainable Development Solutions Network<sup>50</sup> - UN- SDSN, and from the School of Architecture of UFMG (Grupo Compasso) and residents association.

The debate about the intervention and the elaboration of its project were done in partnership with the school community, involving mainly elementary school children and students from the Youth and Adult Education.

**Figure 18 - Group work with the students at the Anne Frank Municipal School. Discussion of the project.**



Source: Trevisan (2021, p. 124)

**Figure 19 - Group work with youth and adult education students, discussion of the project.**



Source: Trevisan (2021, p. 126)

The gender perspective was also included, with a women's safety audit, carried out both on foot and by bicycle.

**Figure 20 - Paths traveled during the women's safety audit**



Source: Trevisan (2021, p. 129)

**Figure 21 - Group of women cycling around the school. Safety Audit.**

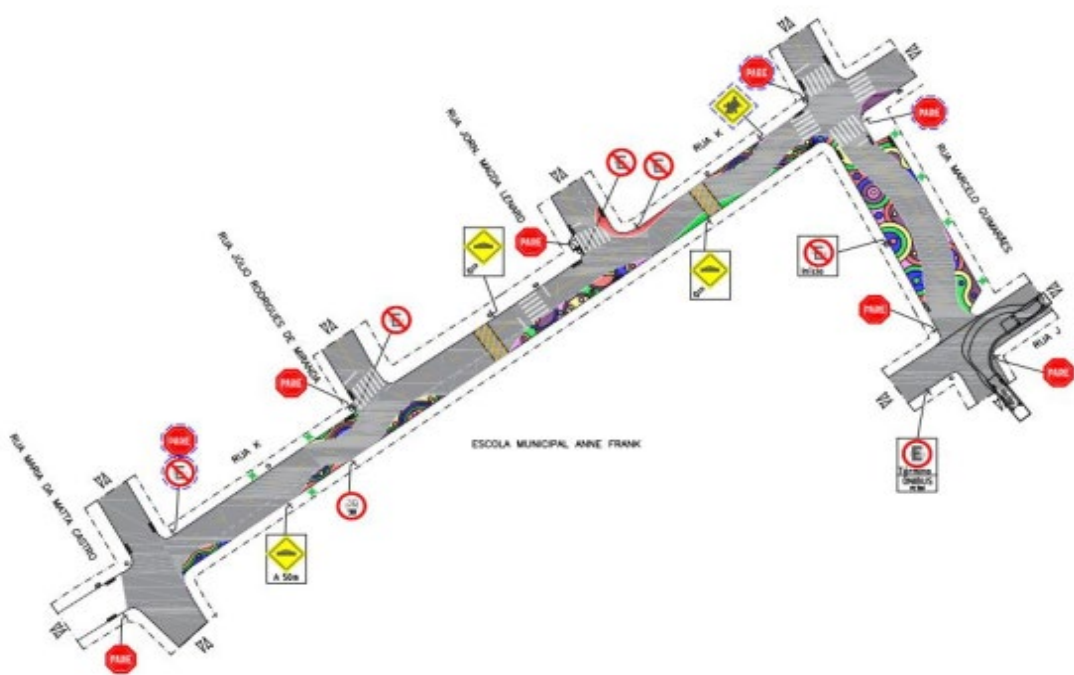


Source: Trevisan (2021, p. 131)



The implemented 30 km/h Zone relied, however, only on temporary equipment, such as paint on the asphalt and furniture made of tires, flowerpots, and PET bottles. There was, as in the Cachoeirinha neighborhood, a day of festivities for the implementation, with the holding of an “open street”. It is important to emphasize that the community got much more involved in the execution of the street than in the Cachoeirinha project, which created a sense of belonging that would be verified even two years later.

Figure 22 - Compatibilized Project. 30 km/h Zone at Confisco.



Source: Trevisan (2021, p. 135)

**Figure 23 - Deployment 30 km/h Zone at Confisco. Preparation of the tire pots.**



Source: Trevisan (2021, p. 142)

**Figure 24 - 30 km/h Zone at Confisco. Open Street. Show Devagar, devagarinho (Slow, slowly).**



Source: Trevisan (2021, p. 146)

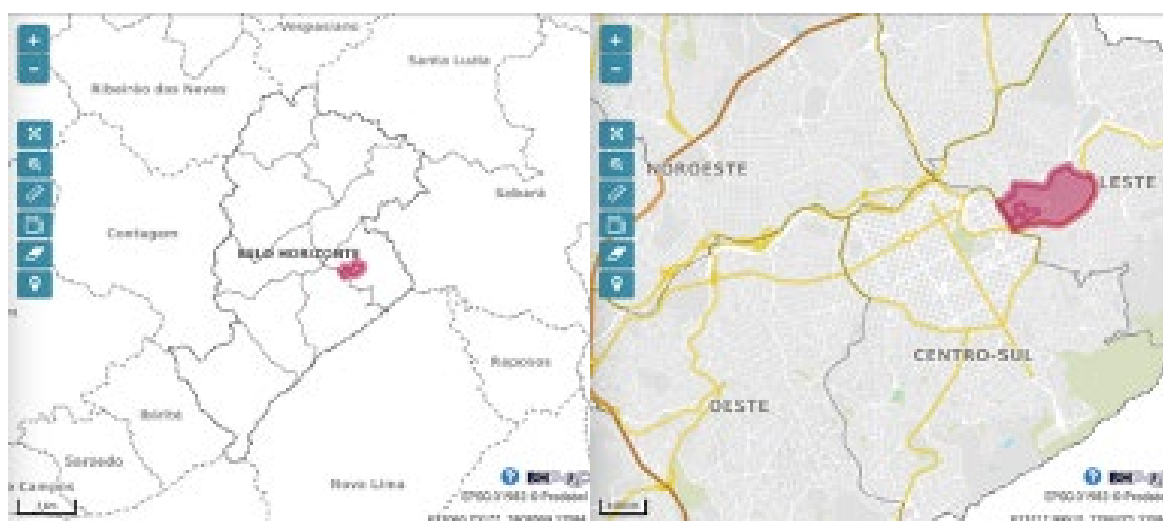


## Santa Tereza

Santa Tereza was the last neighborhood to receive an intervention, among those surveyed here. Taking place in 2021, still in the context of social isolation due to the pandemic emergency, several stages of the process - such as data collection and community articulation - were conducted online.

Santa Tereza, located in the central eastern region of the city, Figure 25, is an important neighborhood in the history of the Belo Horizonte, being part of its construction in the 1890s and comes from an irregular urban occupation. This led to an unequal integration of its population to the city, lacking conditions of mobility and accessibility. Currently, despite being adjacent to the central region of the city, the neighborhood has low internal coverage of public transport, but a great potential for integration into the public transport system of its immediate surroundings. This disarticulation causes the population to opt for motorized transportation, which impacts and pollutes the urban environment, constrains the use of active modes, contributes to GHG emission, and threatens the local cultural dynamics.

Figure 25 - Location of Santa Tereza neighborhood.



Source: PBH (2022)

On the other hand, it has great potential for reversing this scenario, since it is within a walkable distance to public transport options and services and has some use of bicycles. The project seeks to work with two schools in Santa Tereza to promote local actions capable of generating changes in the ways people use different means of transportation and public space in the neighborhood and at the same time contribute to mitigating the risks and impacts of COVID-19. At present, the Santa Tereza neighborhood has approximately 15 thousand residents and there is a large presence of restaurants and cultural centers in the neighborhood, known for its lively nightlife, great presence of cyclists and a very engaged community.

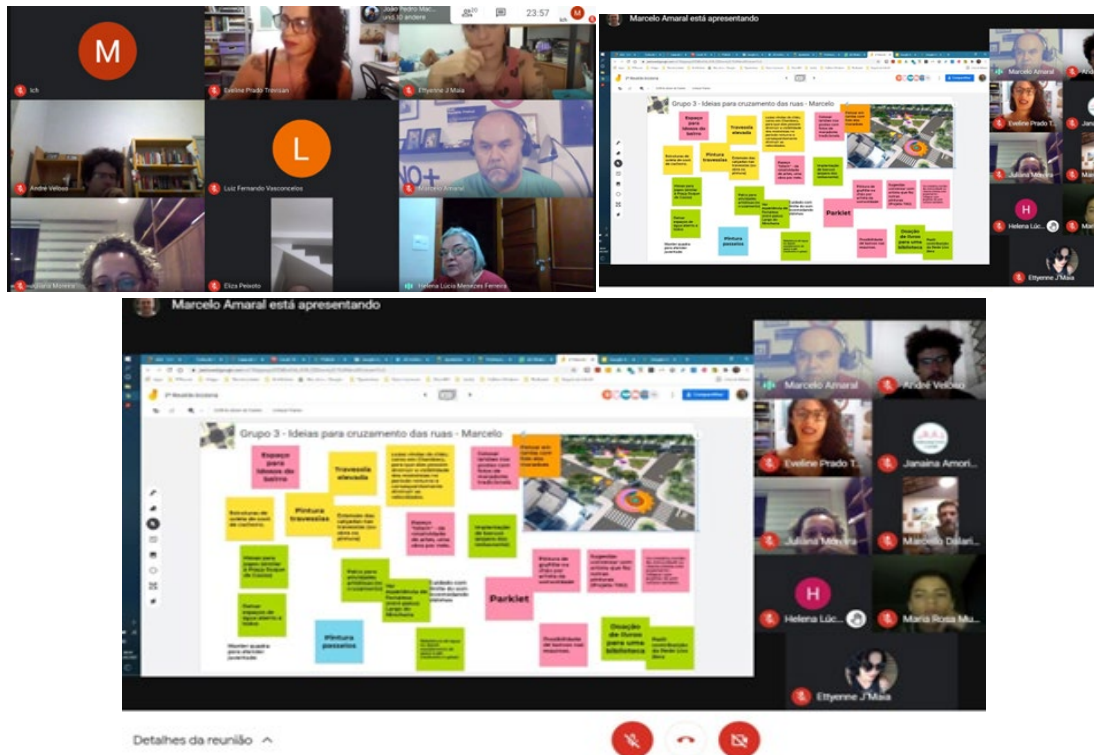
The intervention was preceded by meetings and articulations with the local community, and three virtual meeting were held, with the participation of dozens of interested people, such as the Santa Tereza Residents' Association, business owners from the area, people from Rede Lixo Zero (Zero Waste network of waste management), as well as people directly or indirectly interested in the project. Three online meetings were held, which presented the general proposal and discussed details of the proposed square renovation plan.

Figure 26 - Community meeting invitation - posted via e-mail and WhatsApp.



Source:Ecozona Santa Tereza Project – final report (2021, p.5)

Figure 27 - First, second and third community meetings.



Source: Ecozona Santa Tereza Project – final report (2021, p.5)

The execution of the project took place in the first half of May, contemplating two sets of interventions, the first part being related to bicycle infrastructure and the second part related to a “permanent open street” intervention, focused on incorporating road space to Joaquim Ferreira da Luz Square.

Implemented by BHTRANS with its own resources, the introduction of a bicycle lane of approximately 1.1km connected the existing cycling infrastructure on Avenida dos Andradas, one of the city’s most important Avenue, to the neighborhood through one of its main accesses. Figure 28 and Figure 29 indicate the proposed intervention and its actual results: in red, the existing bicycle lane and in blue the proposed interconnection to the neighborhood. The implemented bike line will take the cyclists safely to the Joaquim Ferreira da Luz Square, where the second intervention will be carried out. The physical intervention included:

- Safe cyclist crossing on the Andradas Avenue (red paint)
- Implementation of two unidirectional segregated bike lanes on the Paraisópolis Street
- Vertical and horizontal signs (bicycle pictograms) of bicycle for access to Joaquim Ferreira da Luz square

**Figure 28 - Proposed bike lane to connect the Santa Tereza Neighborhood - BEFORE/AFTER.**



Source: BHTrans/Octopus.

**Figure 29 - Streets in which the new cycling infrastructure will be installed - BEFORE/AFTER.**



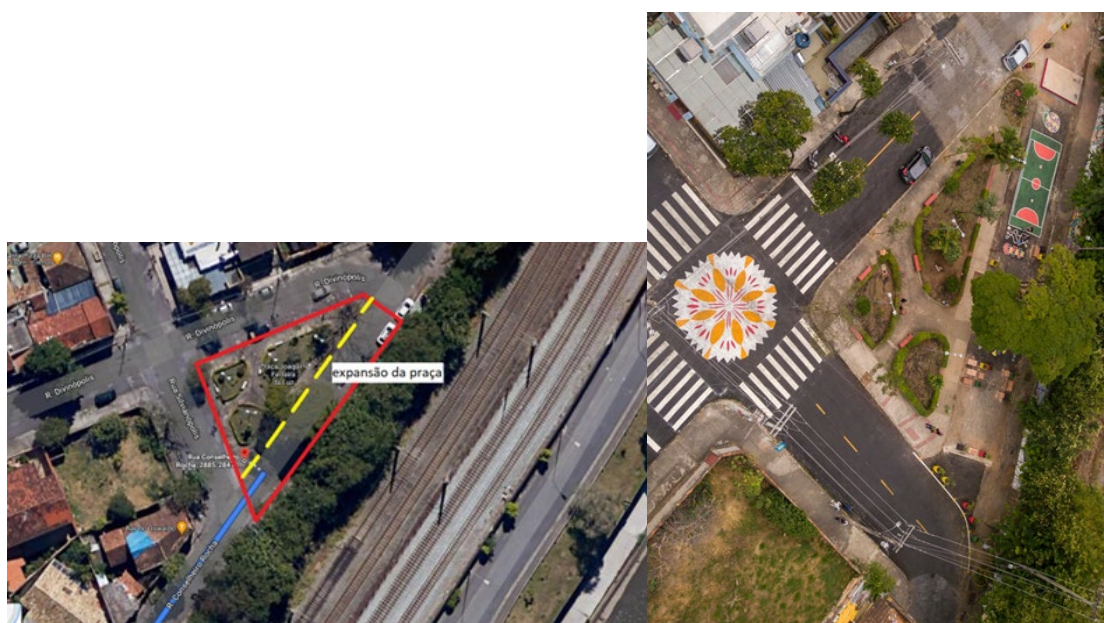
Source: BHTrans/Octopus.



The second part of the proposal consisted of intervening in the Joaquim Ferreira da Luz Square, ending point of the bike lane proposed. One side of the square was extended in order to turn the adjacent road into a permanent open street, where people can meet, interact and play in compliance with the COVID-19 restrictions. These actions converted the square into a lively public space allowing the people to keep the social distance, but at the same time support the numerous restaurants, cultural centers, and other businesses in the area. The physical intervention included:

- Rubber floor to be installed on the street (210m<sup>2</sup>)
- Urban furniture (benches, garbage cans, plants, etc.)
- Floor paint
- Landscaping

**Figure 30 - Proposed intervention in the Joaquim Ferreira da Luz Square - BEFORE/AFTER.**



Source: BHTrans/Octopus.

**Figure 31 - Street to be intervened in the Joaquim Ferreira da Luz Square - BEFORE/AFTER.**



Source: BHTrans/Octopus.

**Figure 32 - Implementation phases.**







Source: Octopus.

# RESULTS

## Cachoeirinha

The results of the research carried out in the Cachoeirinha neighborhood will be presented in the following items, divided according to the collection instruments.

### Observation sheet

The region where the intervention was carried out in the Cachoeirinha neighborhood has residential use as predominant. The existing building units are single-family houses and small buildings. The establishments basically consist of local commerce, with a neighborhood scale. In general, the private units are well maintained, except for some graffiti in the external areas of the buildings, as shown in Figure 33.

Figure 33 - Walls with the presence of graffiti on Simão Tamm Street.



Source: Octopus.



The block with the most commercial units is on Simão Tamm Street, between Conêgo Santana and Senhora da Paz streets, with restaurant, bakery, butcher, food store and beauty salon. The stretch of Simão Tamm Street between Senhora da Paz and Senhora da Conceição streets is bordered on one side by the back of the Old Fabric Factory, Figure 34, with a walled structure and no access. On the other side, there is a pharmacy company.

**Figure 34 - Simão Tamm Street between Senhora da Paz and Senhora da Conceição.**



Source: Octopus.

As shown in Figure 35, the area is also marked by the presence of three schools: Mariano de Abreu State School, Deputy Ilacir Pereira Lima State School, and Professor Eleonora Pieruccetti Municipal School. The first is located on the corner of Simão Tamm and Senhora da Paz streets, at the intervention site.

Figure 35 - School's location.



Source: Adapted from Google Maps.

Figure 36 - Students leaving school.







Source: Octopus.

The sidewalks on Simão Tamm Street are, in general, narrow, and impeded by street furniture, as shown in Figure 37. Sidewalks do not have tactile flooring, except for intersections, where access ramps are located. Also, in some places the pedestrian signs are inadequate and in need of maintenance, as well as concrete blocks and other signaling instruments, Figure 38 and Figure 39. Regarding the lighting, the vehicle scale one is satisfactory, with good lighting of the space occupied by cars. On the other hand, the lighting for pedestrians is unsatisfactory, with deficient points along the sidewalks.

**Figure 37 - Sidewalks on Simão Tamm Street.**



Source: Octopus.

**Figure 38 - Pedestrian signs on Simão Tamm Street.**



Source: registered by the authors.

**Figure 39 - Broken concrete blocks and other signaling instruments.**



Source: Octopus.



Although there are some stretches signaling prohibited parking or destening for loading and unloading in the block of Simão Tamm Street between Conêgo Santana and Senhora da Paz streets, it was observed that many drivers do not respect this. It was also observed that some of the concrete blocks installed to delimit the path of the cars were damaged, also shown in Figure 39.

After the intervention was carried out, Simão Tamm Street received signs of a road shared by motor vehicles and bicycles, as shown in Figure 40.

**Figure 40 - 30 km/h Zone signs at Cachoeirinha.**



Source: Octopus.

Currently, the street doesn't have many trees and there are no places with furniture for children in the intervention area. In the stretch of the intervention on Simão Tamm Street there are some bus stops, the stop between Senhora da Paz and Conde Santa Marinha streets with a cover and seat, installed when the intervention became permanent, Figure 41.

**Figure 41 - Bus stop on Simão Tamm Street, between Senhora da Paz and Conde Santa Marinha streets.**



Source: Octopus.

The times that were observed with a greater pedestrian traffic and more people using the bus stop were the entrance and exit of the schools, that is, in the morning, around 7 a.m., at lunch time, between 11 a.m. and 1 p.m., and at night, around 5 p.m. It is also noteworthy that, during lunch, employees of companies in the region were also observed.

Most of the employees identified at lunchtime are from a car rental company, which has its headquarters approximately 400 meters from the intervention. The company's building differs from the rest of the region which, as discussed above, is predominantly residential and local commerce, as shown in Figure 42.

**Figure 42 - Localiza's head office building.**



Source: Estado de Minas (2022).

## Questionnaires

The questionnaire applied in Cachoeirinha was answered by 55 individuals on site, between 3 and 4 of June of 2022, Figure 43.

**Figure 43 - Application of the questionnaires in Cachoeirinha neighborhood.**



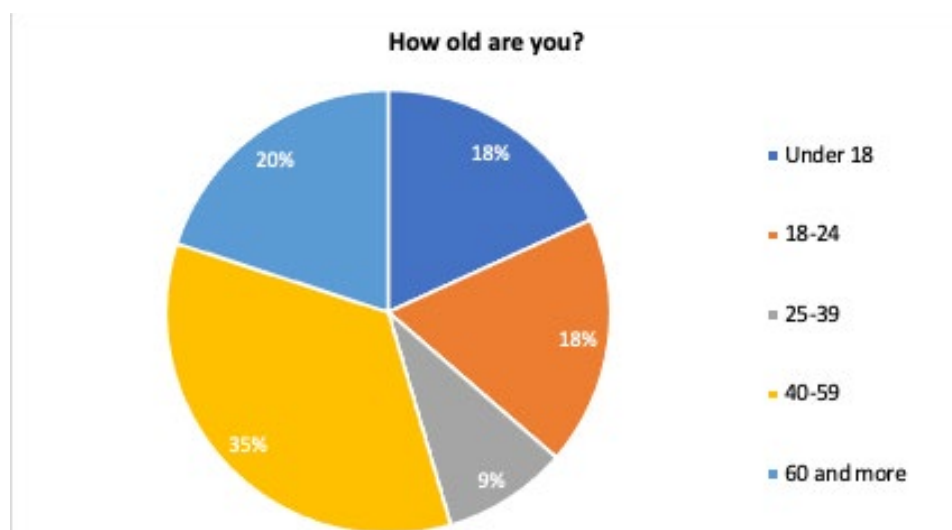




Source: Octopus.

To obtain the characterization of the profile of the respondents, they were asked about their age, gender, level of education, color, and occupation. Level of education and occupation were considered proxies to the level of income. In relation to age, it was informed ages between 15 and 76, with the biggest number of interviews with 15 years old, with four responses. To better understand the distribution of age between the interviews, Figure 44 was prepared. It shows that the age group with fewer respondents were 25 to 39 years old (9%), and the one with more respondents were 40 to 59 years old (35%), followed by 60 and more (20%), which indicates that older people are the main pedestrians on the site.

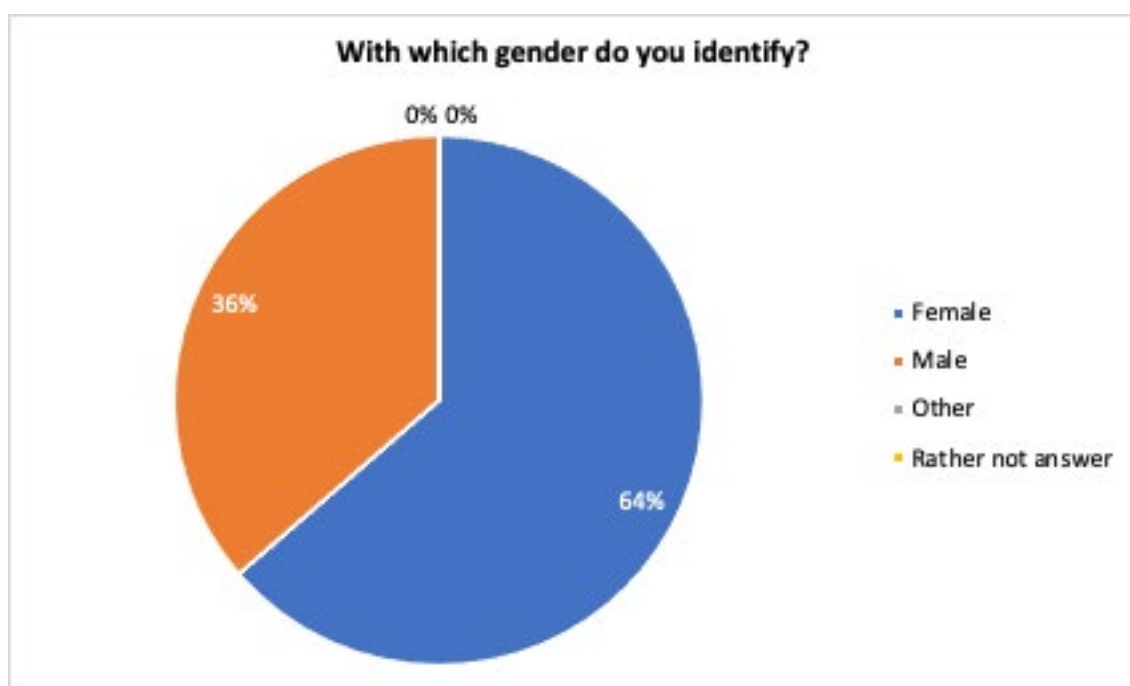
Figure 44 - Age distribution of respondents – Cachoeirinha.



Source: prepared by the authors

Regarding gender, most respondents identify themselves as female, with 64%. It is noteworthy that all respondents identified themselves as female or male, and the options Other and Rather not answer were not recorded.

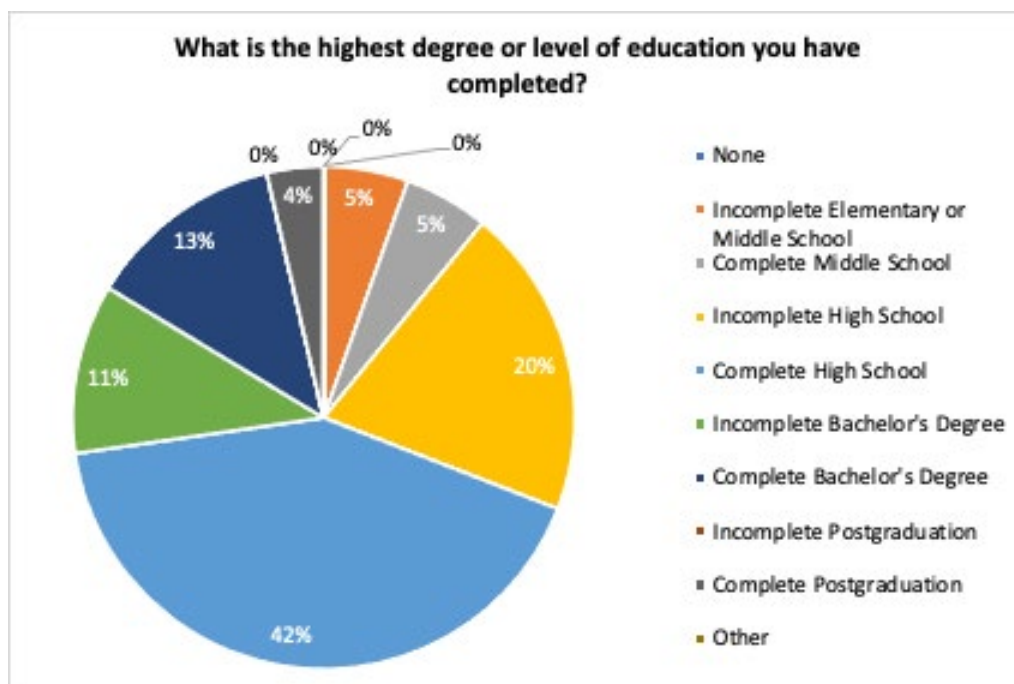
Figure 45 - Gender profile of respondents – Cachoeirinha.



Source: prepared by the authors

Regarding the educational profile, the research sample indicates a greater number (42%) of respondents with High School as the highest degree completed, followed by the ones with this degree incomplete (20%). The options with no answers were None, Incomplete Post Graduation, Other and Rather not answer. This educational profile indicates a middle and lower middle-class composition among the users of the site, as there are few respondents who have attended universities, a common prerequisite to access higher income jobs.

Figure 46 - Level of education profile of respondents – Cachoeirinha.

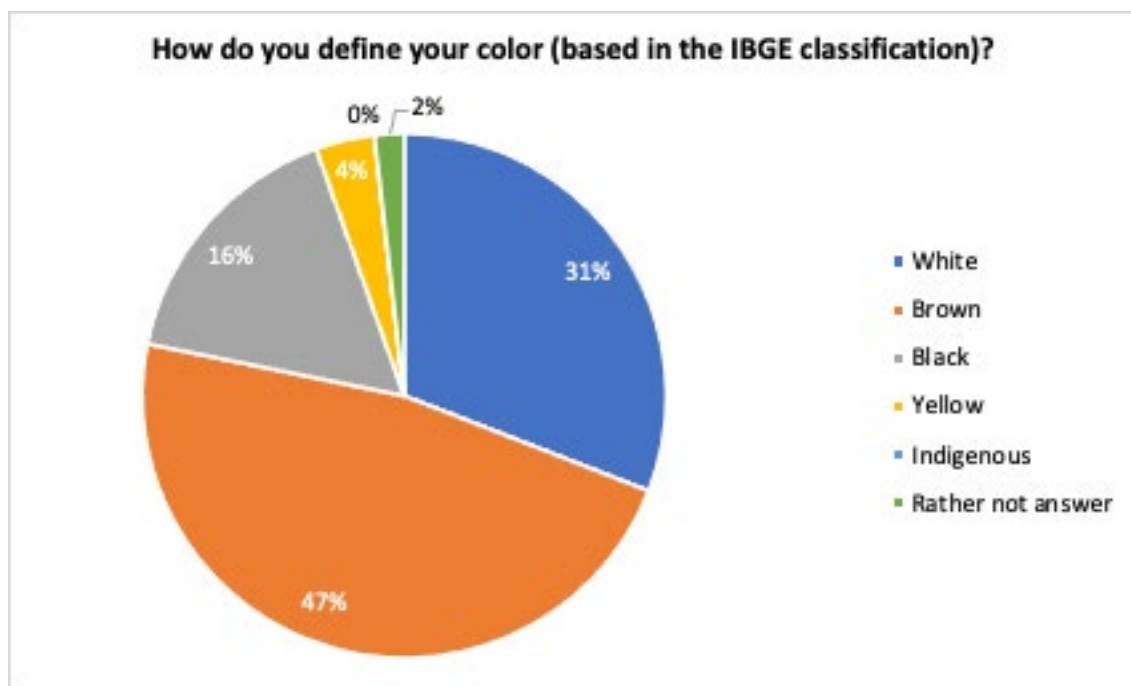


Source: prepared by the authors

Regarding the color, the classification of the Brazilian Institute of Geography and Statistics (IBGE) was used. The research sample indicates a greater number (63%) of people who declare themselves as “negro” (formally, in Brazil, the sum of those who consider themselves brown and black), followed by the ones who declare themselves as white (31%). This result stresses the middle and lower middle-class profile of the respondents.



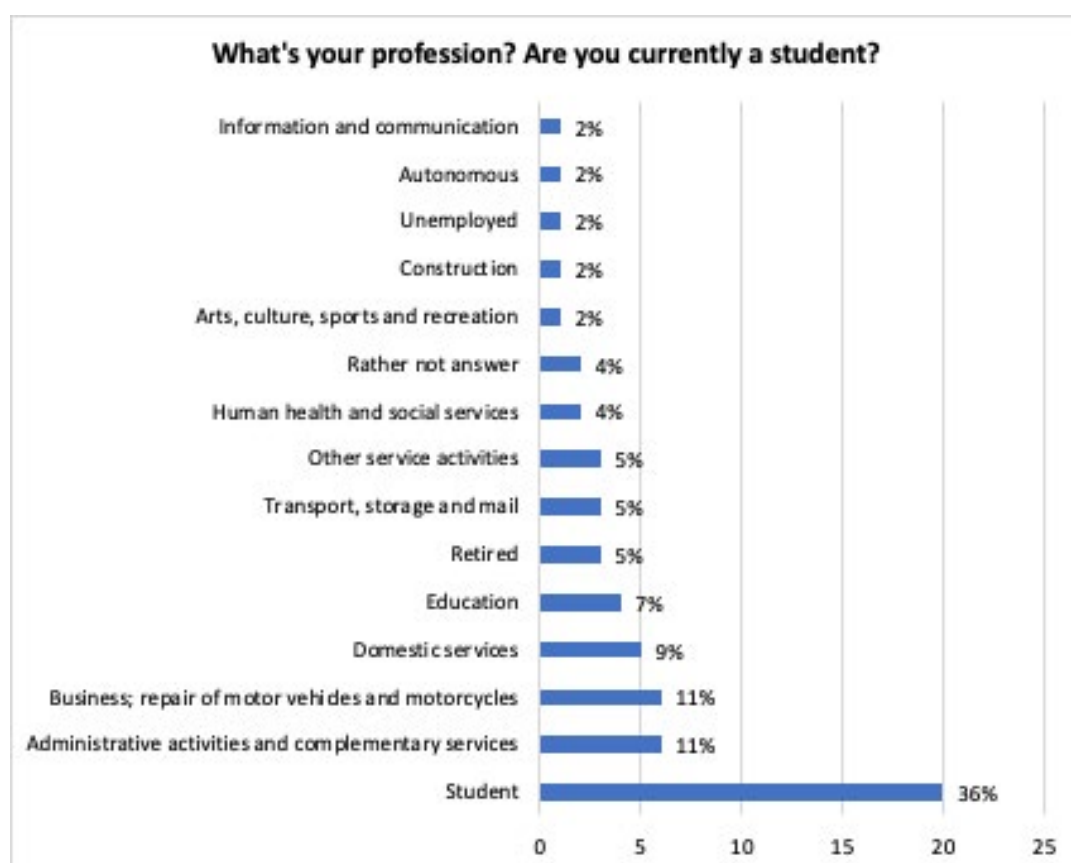
Figure 47- Color profile of respondents – Cachoeirinha.



Source: prepared by the authors

To analyze the information provided by respondents in relation to occupation, the responses were grouped according to the National Classification of Economic Activities (CNAE). Activities that did not fit into any specific category, or that were provided with very vague answers, were classified as other service activities. In addition to the activities included in the CNAE classification, were also considered: student, retired, unemployed and rather not answer. The graph showed in Figure 48 was prepared from these categories. 20 respondents identified themselves as students, representing 36% of the sample. This category was followed by two others, with 6 respondents each (11%), namely: administrative activities and complementary services and business; repair of motor vehicles and motorcycles. It is noteworthy that the greater number of students in the sample may be related to the proximity of the study area to schools. The occupational profile also demonstrates a lower middle-class type of profession for those who are pedestrians in the local.

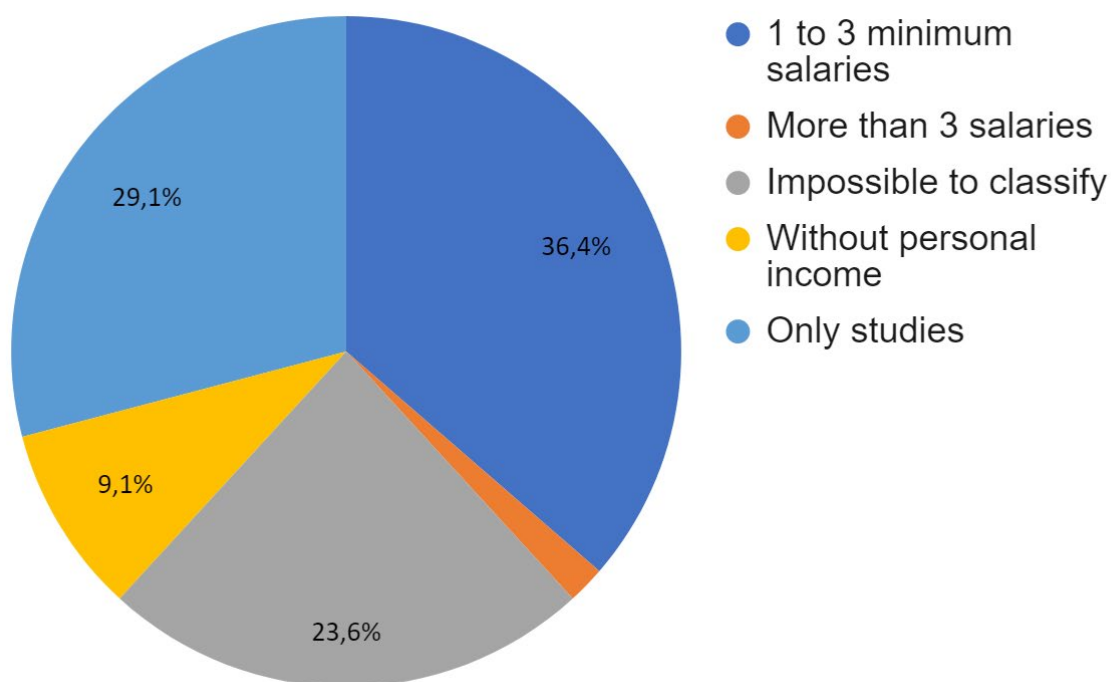
Figure 48- Occupational profile of respondents – Cachoeirinha.



Source: prepared by the authors

We created income categories based on the occupations of each interviewee. Each answer was classified into the following categories: one to three minimum salaries; three to ten minimum salaries; no income; only studies; and impossible to classify, this last one being attributed to people who answered that they are businessmen, self-employed, or professions that have a very wide salary range in Brazil, such as teachers. We did not classify any answers that corresponded to professions that correspond to people who earn more than 10 minimum wages, so we concentrated on indicating the professions that would be within the limit of 3 minimum salaries, since the per capita household income of up to 1/2 minimum wage or up to 3 minimum wages of total household income is the limit for registering the population in the Unified Registry of Social Programs of the Federal Government (CadÚnico) (IBGE, 2020).

Figure 49- Income level based on occupations – Cachoeirinha.

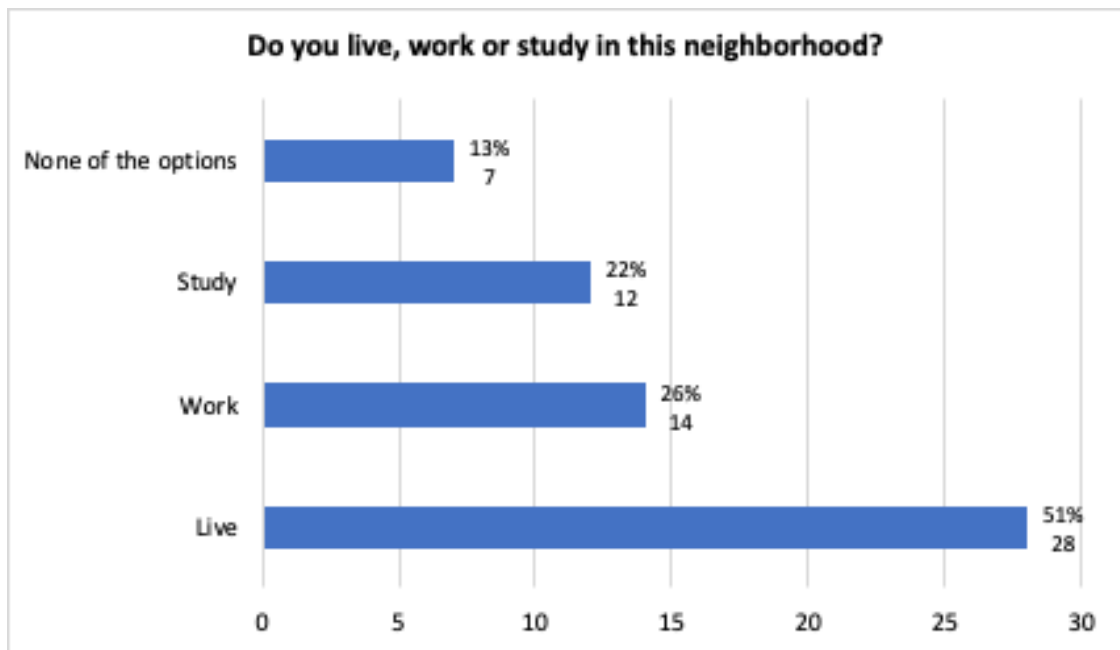


Source: prepared by the authors

According to Figure 49, 36.4% of the interviewed have professions considered low income (up to 3 minimum wages), 29.1% answered that they were only studying at the time of the questionnaire and 9.1% reported not having a profession with income. Among the answers there were no professions that are linked to higher salaries. 23.6% of the interviewed had professions that couldn't be classified, that is, those that do not have a specific income or that have a very wide salary range.

Regarding the relationship with the neighborhood, 28 respondents live in Cachoeirinha, representing 51% of the sample, followed by 14 that work and 12 that study in the neighborhood, representing 26% and 22%, respectively. It is noteworthy that the sum of the percentages is greater than 100%, since the respondents could inform more than one option.

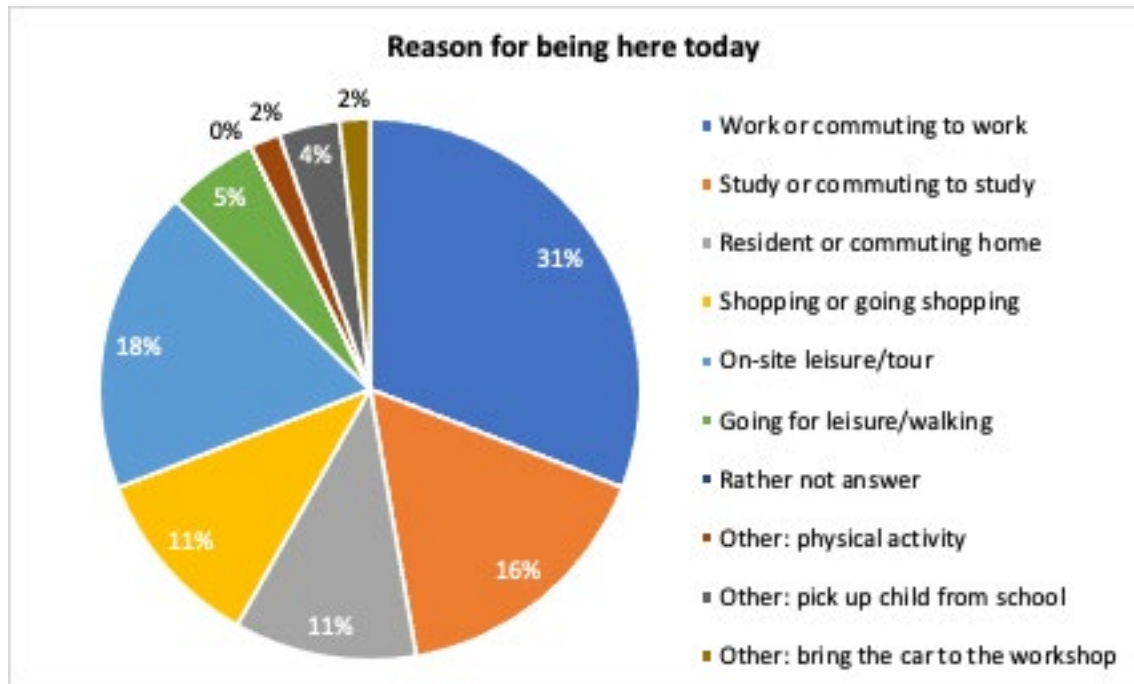
Figure 50- Relationship of respondents with the neighborhood – Cachoeirinha.



Source: prepared by the authors

Regarding the reason for being in the area on the day of the research, the sample indicates a greater number of people (31%) with the reason work or commuting to work, followed by on-site leisure or tour (18%). Four respondents identify other reasons for being in the area, being: physical activity (1 respondent), picking up a child from school (2 respondents) and bringing the car to the workshop (1 respondent). It is important to note the low number of answers related to picking up the child from school, which may indicate that this activity is mainly carried out by drivers.

Figure 51- Respondent's reasons for being in the space- Cachoeirinha.

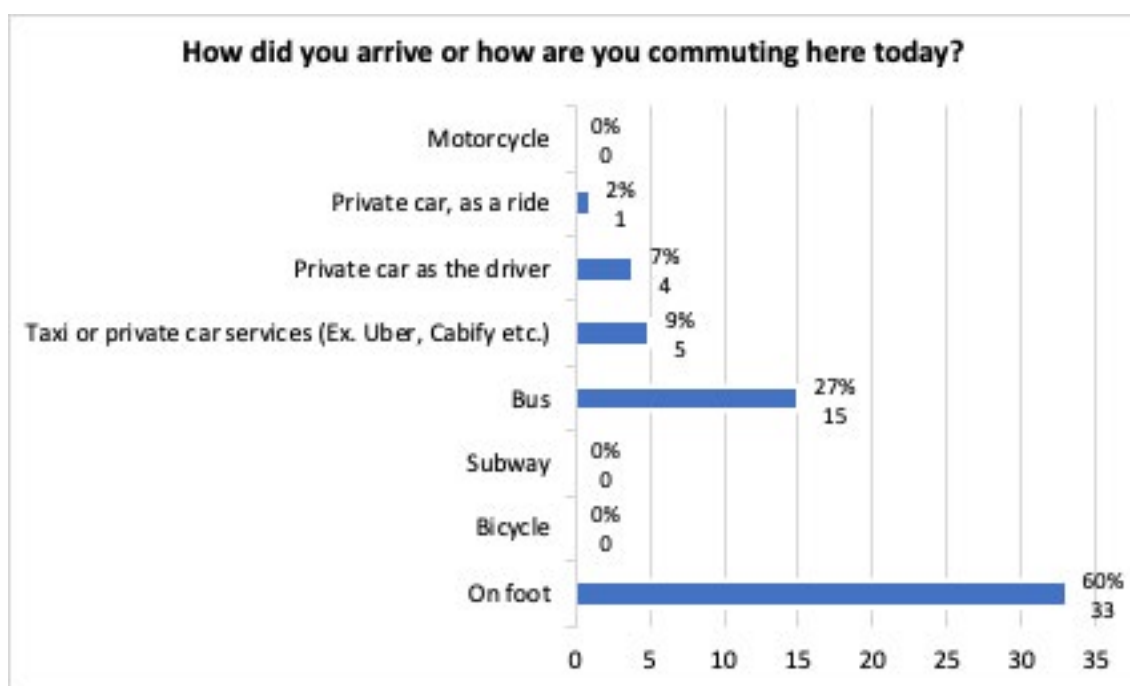


Source: prepared by the authors

The largest number of participants, 33, reached the area where the interview was being carried out on foot. The second largest number was of participants who arrived by bus, with 15 respondents. Such results are in accordance with the expected pattern, since people who were walking through the public space were interviewed, and not those who were driving. No one identified using a bicycle, subway, or motorcycle to get there.



Figure 52 - Transport used to reach the neighborhood- Cachoeirinha.

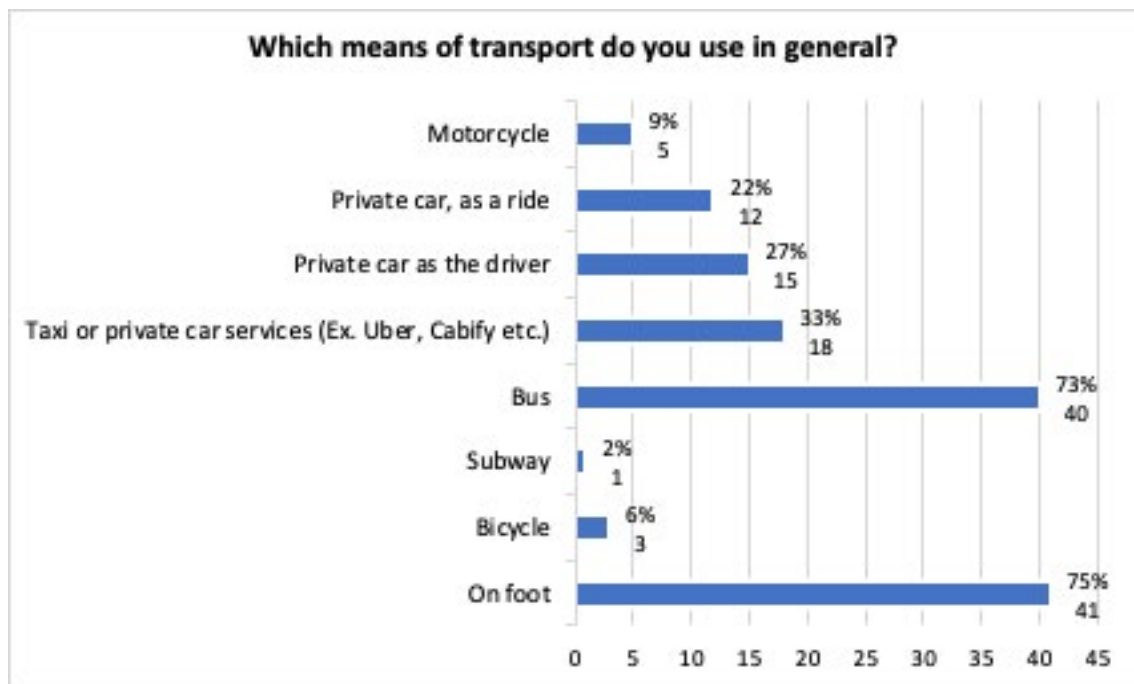


Source: prepared by the authors

The questions about parking and safety of cyclists did not obtain a considerable amount of response to be analyzed. In this way, they will not be analyzed.

Regarding the modes of transport usually used, walking was the most indicated, with 41 respondents, followed by bus, with 40 respondents. These values represent 75% and 73% of the sample. It is noteworthy that the sum of the values was greater than 100%, since the respondent could identify more than one option. Such results are in accordance with the expected pattern, as in the previous chart, since people who were walking through the public space were the ones interviewed.

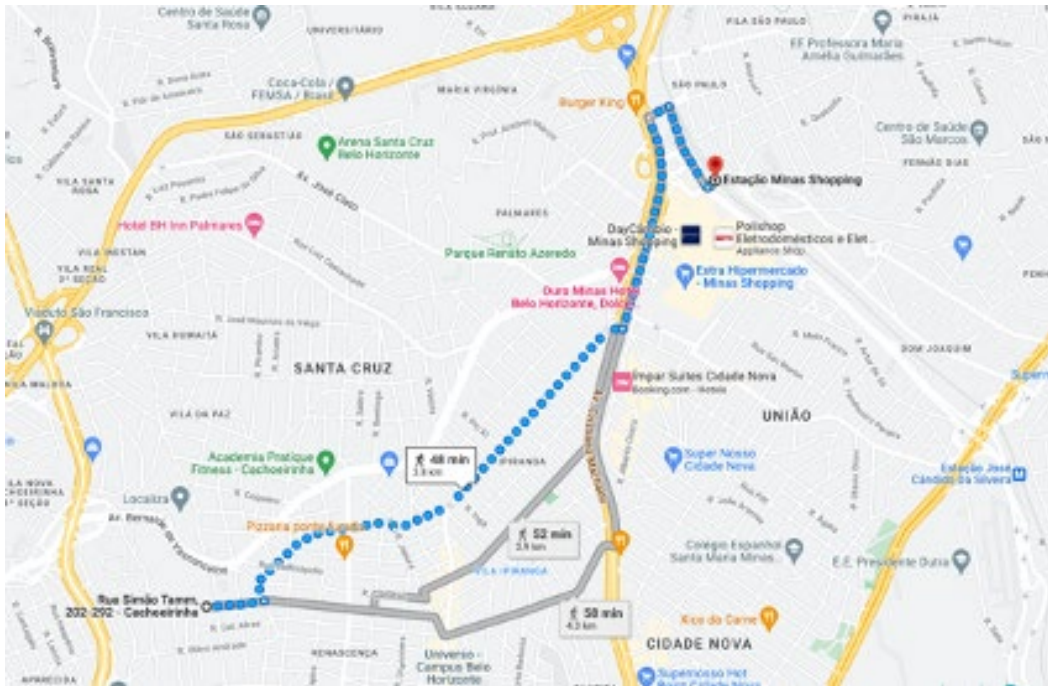
Figure 53 - Profile of commonly used means of transport- Cachoeirinha.



Source: prepared by the authors

It is noteworthy that the absence of responses identifying the metro as the mode of transport used to reach the area and its identification as a mean used in general only by one person may be related to the distance from the metro. The closest metro station to the research site is approximately 4 kilometers on foot from the location of the interviews, according to google maps, Figure 54. In addition, the subway infrastructure in Belo Horizonte is restricted, with only one line, which has 19 stations and runs for 28.1 kilometers.

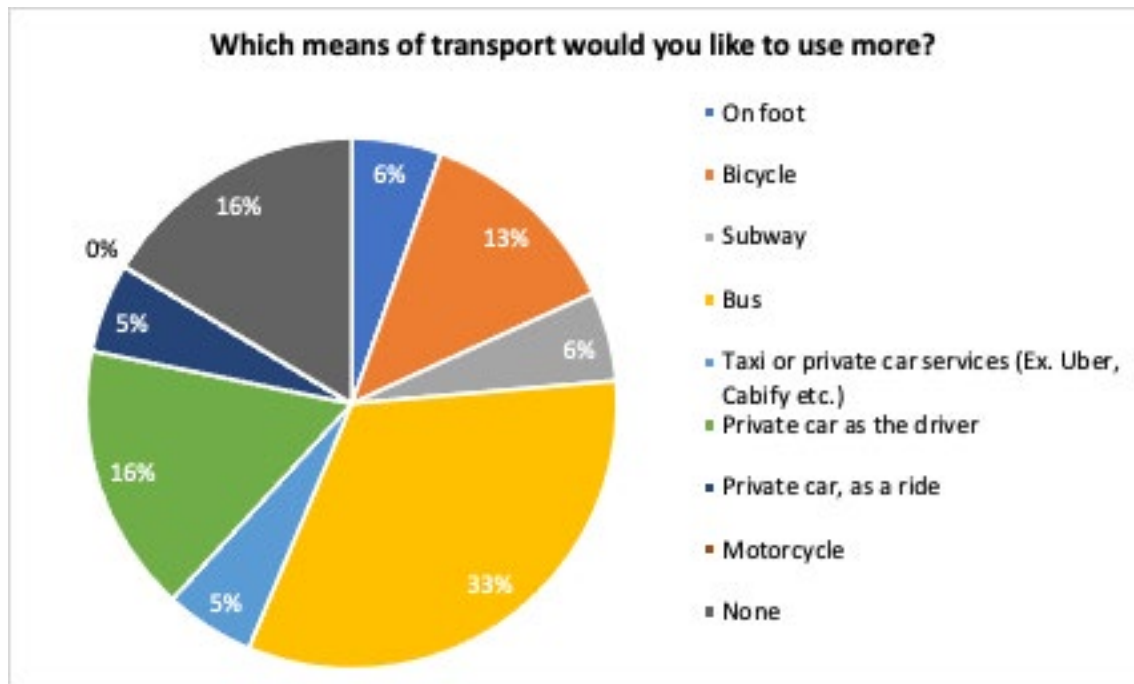
Figure 54 - Nearest metro station to Cachoeirinha.



Source: Google Maps

Regarding the means of transport that the respondents would like to use more, the mean that presented the most responses was the bus, with 33%, followed by the private car as a driver and by the respondents who do not have a mode that they would like to use more, both with 16%. It is worth noting that none of the respondents stated that they would like to use the motorcycle more, a result that contrasts with the great growth in the use of this mode of transport in recent years in the country.

Figure 55 - Desired means of transport- Cachoeirinha.



Source: prepared by the authors

Regarding the perception of safety in relation to car traffic in the study area, more than half of the respondents, 51%, said they felt safe, but with some difficulty crossing the street on foot. The second feeling most identified by respondents was totally safe when crossing the street on foot, followed by insecure when crossing, but didn't change his way. Only 2% of the respondents feel totally insecure about traffic in the location and avoid crossing the street at some point, and only 15% felt more insecure than secure, indicating the success of the intervention on pedestrian safety perception.



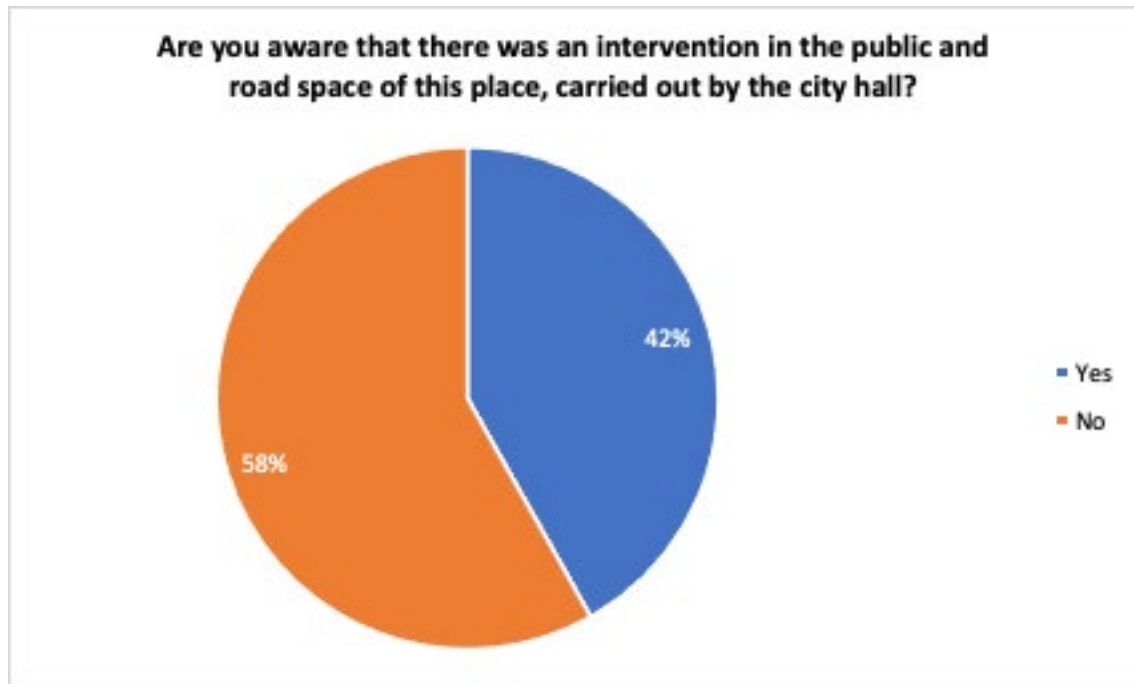
Figure 56 - Respondent's perception of security in relation to traffic- Cachoeirinha.



Source: prepared by the authors

To question the respondents about the measures implemented in the area, the knowledge about the intervention was first verified. Most people, 58%, were not aware of the intervention, while the other 42% said they were aware of it.

Figure 57- Knowledge of the intervention by the respondents- Cachoeirinha.

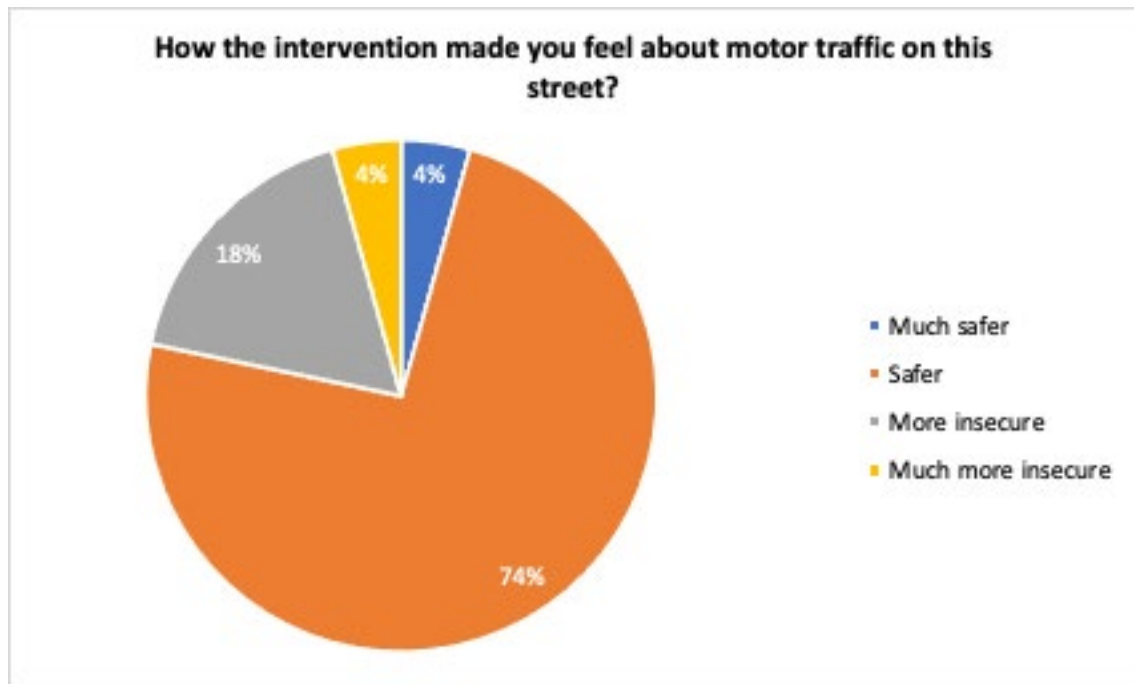


Source: prepared by the authors

The following questions were asked only to respondents who identified having knowledge of the intervention, which corresponds to 42% of the initial sample of 55, that is, 23 respondents. This was done since the following questions seek to assess the intervention and how it influenced traffic conditions and users' perceptions.

Regarding how the intervention made people feel about motorized traffic on the street, most of the sample said they felt safer, 74%, followed by those who felt more insecure, 18%. The amount of people who felt much safer and much more insecure was the same, with 4% of the sample.

Figure 58 - Effect of the intervention on the perception of safety- Cachoeirinha.

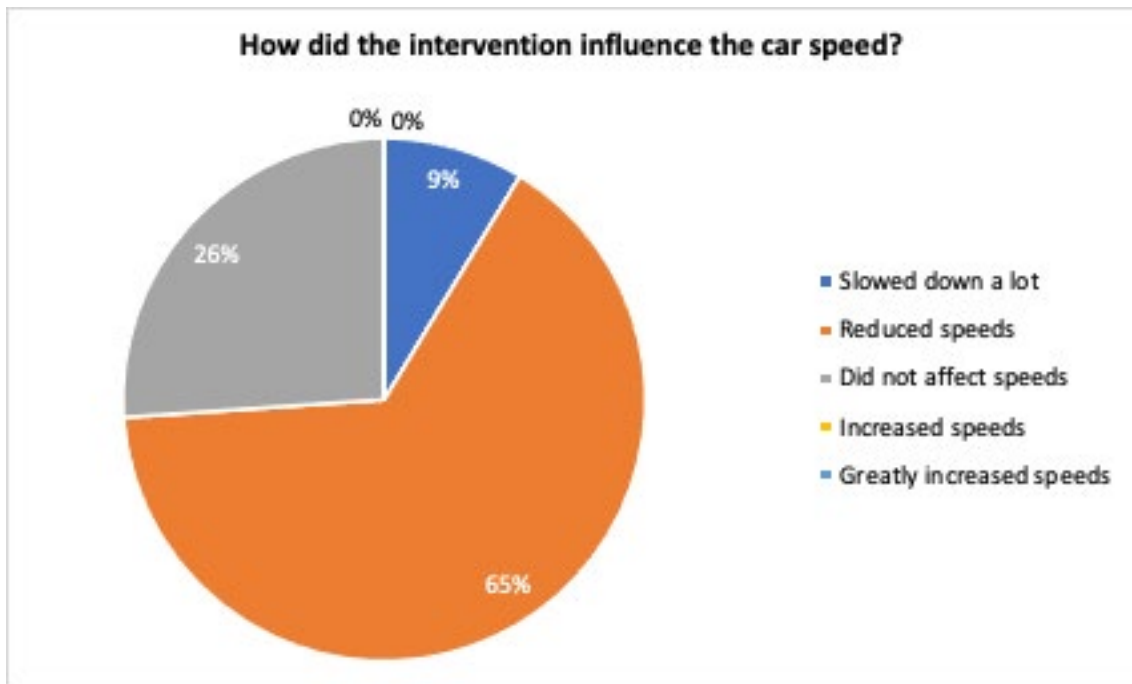


Source: prepared by the authors

Two questions were made for those participants that came by car, in order to understand how they evaluate the intervention and the parking after the intervention. However, these questions had only three responses, each rated as very satisfactory, satisfactory, or unsatisfactory. Thus, the results were not significant for the analysis.

Regarding how the intervention influenced the speed of cars, most of the sample, 74%, identified a reduction, with 9% saying that there was a large reduction and 65% that there was a reduction. Another 26% stated that the intervention did not influence the speed of the cars. No participant identified an increase in speed resulting from the intervention. This result is a proxy of the perceived success of the intervention.

Figure 59 - Intervention effect on car speed- Cachoeirinha.

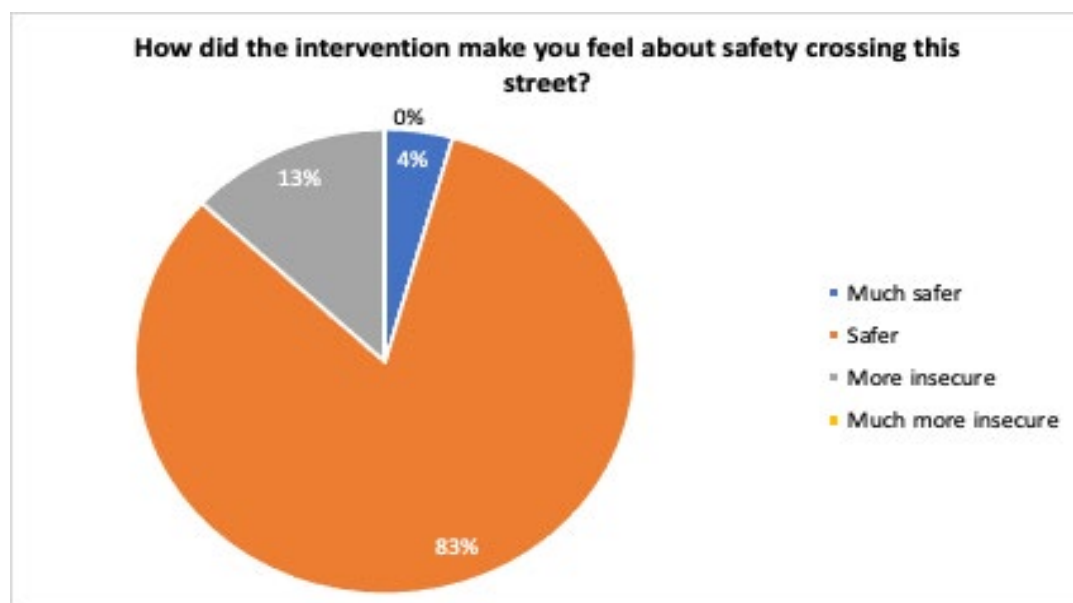


Source: prepared by the authors

The last question was about how the intervention affected the perception of safety when crossing the street. Most respondents, 83%, said they felt safer after the intervention, and 4% said they felt much safer. The second most identified perception was that the intervention generated greater insecurity when crossing the street, with 13% of respondents.



Figure 60 - Intervention effect on the perception of security when crossing the street- Cachoeirinha.



Source: prepared by the authors

In summary, the interview carried out in Cachoeirinha had the participation of an audience of different ages, composed predominantly of women, most of them with a level of education up to high school, black or brown. In addition, most of the interviewees have a housing relationship with the neighborhood. As previously mentioned, conducting the interview with people who were walking down the street, or waiting at the bus stop, may have influenced a high number of respondents who arrived at the space on foot or by bus, or who usually use these means. In any case, this profile was indeed the target of the intervention and is interesting to notice how pedestrians and bus passengers are predominantly female, brown, and black, above 40 years and lower middle class.

Regarding the intervention carried out, although only 42% of respondents were aware, the perception of safety in the region in relation to car traffic is good. When considering the respondents who are aware of the intervention, its positive effect was evidenced. Despite some negative responses, in general, the intervention made people using the space feel safer in relation to car traffic and when crossing the street, having reduced the speed of cars.

### Semi-structured interview

The semi-structured interview was conducted with Semia Semaan Abboud, president of the Pro-Cachoeirinha Community Association and vice-president of the Public Security Council. The interviewee is 63 years old and has lived in the Cachoeirinha neighborhood for 55 years. In 1993, she joined the Regional Transport and Traffic Commission, when it was founded, due to her dissatisfaction with the 8401-bus line in the neighborhood. Her leadership history in the neighborhood association began in 2007, when she was called to participate in the Protected Neighbors network. In 2012, Semia decided to found the Pro-Cachoeirinha Community Association, which is active to this day.

Regarding the intervention carried out in 2019, Sâmia was in favor and shares some of the perceptions identified with the observation form and the questionnaire. She stated that, before the intervention, the traffic situation was dangerous, mainly due to the presence of elderly people and children passing through the region, and with several accidents.

*“Because our neighborhood has a lot of elderly people, a lot... So, here it was very dangerous for them, and after that was done, it got a lot better. Like it or not, it got a lot better.”*

*“Yes, before the intervention, there were several accidents, but many, not a few.”*

Regarding children leaving schools, Sâmia stated that there was an improvement after the intervention.

*“It improved a lot, a lot more, it was not a little. But very.”*

Regarding prohibited parking and loading and unloading areas, Sâmia identified the same situation addressed in the observation form.

*“Between this pole and the other is prohibited, but they are there, they are there all day, all day. Then a truck comes, just like there’s a truck at the back, a lot of buses go by, sometimes they cover the hole.”*

According to the interviewee, some changes took place over time, improving the situation of the intervention, such as a new change in the curve radius for the cars.

*“The white belt, they put it on now, it’s been a while since they put it on, after I complained about it. Because there were a lot of accidents, the cars came and turned at once, and they climbed on top of it here (the sidewalk), you know?”*

Sâmia also addressed other points that she believes still need to be reviewed, such as the preference for vehicles coming from Simão Tamm Street, at the intersection with Senhora da Paz Street.

*“I said [...], in the past, Simão Tamm was the preferred one in the neighborhood, not today. This stop sign (Senhora da Paz Street) must be there (Simão Tamm Street), those cars that have to stop there. This one must go straight up, this one here, understand? That’s over there, that’s over here.”*

She also talked about needed maintenance and installation of crosswalks.

*“What is missing in the intervention, even, I have already asked, that I need to resurface this asphalt, this asphalt is all wrong. Another thing, it needs maintenance on those concrete blocks. There are some that are even ripped off, which for me are people who rip off. But there’s no need to be ripped off, okay?”*

Regarding the speed of cars, despite having identified a reduction, Sâmia believes that more measures are still needed to achieve the ideal situation.

*“Yes, there is a lot of space that needs to be reduced. Right here I think a spring break is needed, look here at the speeds that the cars come from there, did you tend? He knows? You must, here I had asked for the street to just go up, because here is a school, when you leave the traffic is dangerous...”*

### **Air quality meter**

On July 20, 2022, at 1:48 pm, the air quality monitoring device was installed. It was affixed to the Mariano de Abreu State School wall, as shown in Figure 61. The device remained in place for 24 hours, between 1h50 PM of 20th July 2022 and 1h50 PM of 21st July 2022 having remained collecting information during the time in loco, and being removed for data processing and analysis. It is worth noting that, as pointed out by Trevisan (2021), in Belo Horizonte there is a deficiency regarding the capture and dissemination of data related to air quality, and the possibility of carrying out such capture in areas of intervention of 30 km/h Zone projects contributes to demonstrate the results from these projects.

**Figure 61- Air quality monitoring device installed near the intervention site in the Cachoeirinha neighborhood.**



Source: registered by the authors.



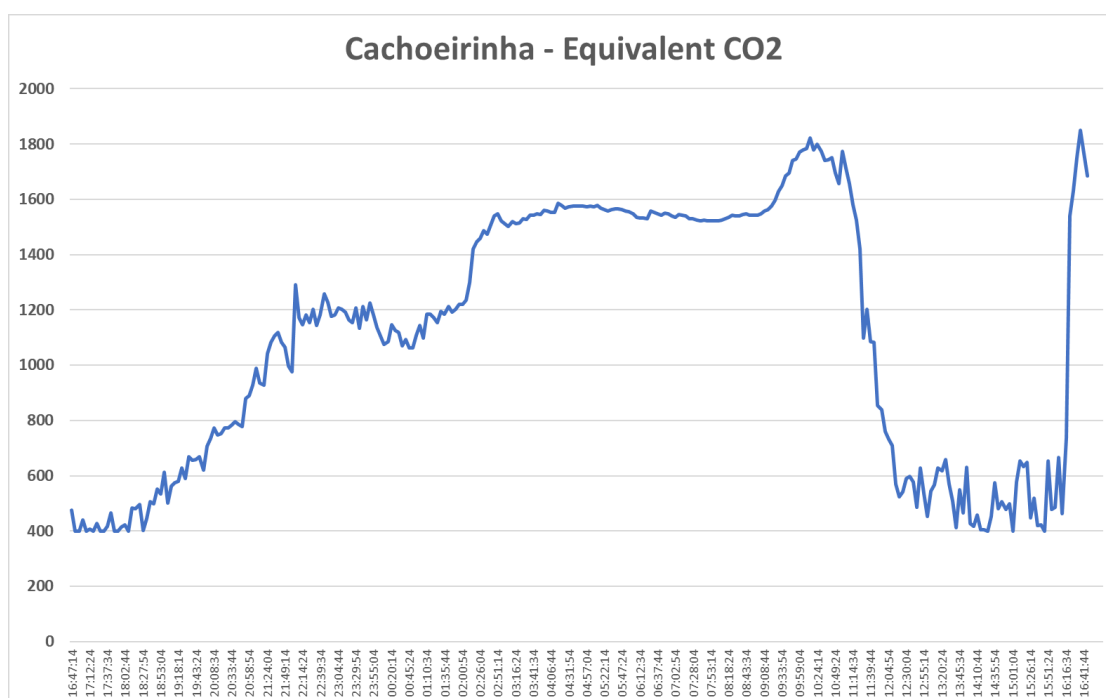
The measured results can be assessed online on the website <https://smartcitizen.me/kits/15499> following the referred time and date. Below, we present a table with the maximum, minimum and average values for seven variables. In addition, there is the median, which can be used as a proxy for the mean by eliminating outliers. Finally, the column on the right presents the values considered as reference for each of the variables measured. The measured variables were air temperature, air humidity, particulate matter concentration for particulate matter below 1 nanometer, 2.5 nanometers and 10 nanometers. Equivalent CO<sub>2</sub> gas concentration measured on parts per million and total volatile organic compounds on parts per billion.

**Table 1 - Air quality parameters - Cachoeirinha - July 2022.**

Cachoeirinha - 20th and 21st of July 2022					
Variable \ Value	Minimum Value	Maximum Value	Average Value	Median	Reference Value**
Air Temperature (°C)	15.47	54.49*	24.97	21.08	19.4
Air Humidity (%)	24.76	84.69	62.87	69.14	58.4
PM 1 (ug/m <sup>3</sup> )	3	36	10.64	11	na
PM 2.5 (ug/m <sup>3</sup> )	3	51	13.66	14	<35
PM 10 (ug/m <sup>3</sup> )	3	51	13.77	14	<150
Equivalent CO <sub>2</sub> (ppm)	400	1851	1,106.08	1171	<400
VOCs (ppb)	0	516	131.68	117	<250
* Outlier value due to sun or other heat source exposure					
** Belo Horizonte July air temperature and air humidity reference values sources: National Institute of Meteorology. PM 2.5 and PM10 - US Environmental Protection Agency. VOC - World Green Building Council. Equivalent CO <sub>2</sub> - European Environmental Agency					

Source: Smart Citizen Kit and authors, 2022

Figure 62 - Equivalent CO2 parts per million concentration - Cachoeirinha - July 2022.



Source: Smart Citizen Kit and authors, 2022

Based on the table and graph presented, it can be seen that the neighborhood's air quality indicators are good, with the exception of the volume of CO2 equivalent. When observed from the graph, it can be seen that the minimum sensor value for equivalent CO2 is 400 parts per million, indicating a measurement bias. However, even when this bias is discarded, the values are considered relatively high for an outdoor space. What can explain this value is the fact that the Cachoeirinha neighborhood is located at the convergence of two arterial avenues of the city - Antonio Carlos and Bernardo Vasconcelos avenues. Thus, even if changes in urban space have had an effect on car speeds and pedestrian safety, changes to improve air quality still require a more structural and comprehensive action in the territory of the municipality.

It is worth noting that no air quality monitoring was carried out in the Cachoeirinha neighborhood when the intervention was carried out, in 2019. Thus, the data obtained in the year 2022 could not be compared with previous data.

## **Confisco**

### **Observation sheet**

The region covered by the research in the Confisco neighborhood has a great diversity of urban uses that privilege non-motorized modes for the people living in the surrounding area. Besides the school itself, the streets in what has become a 30 km/h Zone have a market, a bakery, two grocery stores, a meat store, an evangelical church, a catholic church, a feed store, a clothing store, and a cleaning products store. Most of these commercial buildings have mixed use (residential and commercial). In this region is also integrated the Confisco Park, with a large open area for events and sports equipment. Therefore, it is possible to say that this region is a centrality of the neighborhood.

The streets surrounding the 30 km/h Zone are predominantly residential with low verticalization but smaller size. The school has a very low level of transparency and access, with high walls and few controlled accesses. The houses are also mostly walled and with little transparency.

About the condition of the public areas, in general, it is observed that the spaces for pedestrians are very narrow and force sometimes to walk through the car lane, there is no standardization of the sidewalk, which has obstacles that prevent good accessibility. Around the school, this condition is improved with a standardized sidewalk, which nonetheless continues to be narrow, with less than 2 meters wide.

The region of the 30 km/h Zone has good signs for pedestrians, cyclists, and cars, despite the fact that the paintings on the ground are already worn out. As for the urban furniture, we count three public garbage cans.

**Figure 63 - K street in Confisco.**



Source: prepared by the authors. June 2022

Regarding the people's behaviors and mobilities in the site, it was observed that it is a very active street, not only because of the presence of the municipal school, but also because of the diversity of businesses in close proximity to a residential area. In this way, mobility on foot is the most used to access these places, including the school, which during the children's entrance and exit times does not have a large movement of cars, but instead of families that come on foot and wait for the gate to open. In the same way we observe a large number of people carrying shopping bags, who do not use the car. We also observed the use of bicycles to access commerce and for leisure around the Confisco square.

However, as already mentioned, the infrastructure for mobility on foot does not allow a universal use of the sidewalks, causing people to use the car lanes to walk, especially the elderly who have more difficulty with obstacles, as observed at the site.

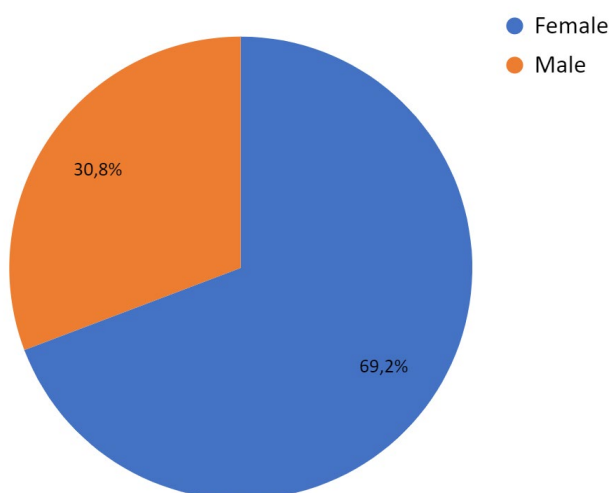


## Questionnaires

The questionnaire conducted in the Confisco neighborhood was mostly done at the busiest times, when students were entering and leaving the Anne Frank municipal school from 11am to 2pm on June 6, 10, 11, and 14. We interviewed not only students and parents at the school but also people who shopped there or waited for the bus, for example.

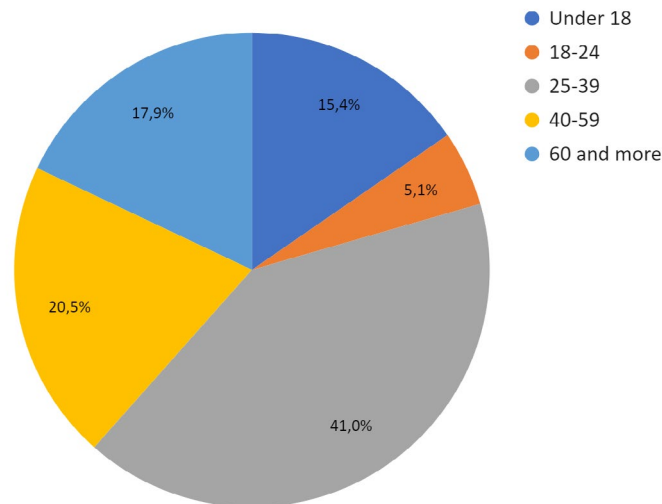
There were 42 answers in total, covering people of different ages, but mostly from the 25 to 39 (41%) and 40 to 59 (20.5%) age groups (Figure 65). This is a younger profile of respondents than of Cachoeirinha. Of the respondents, 69% identified themselves as female (Figure 64) - similar to the Cachoeirinha survey.

**Figure 64 - Gender profile of respondents – Confisco.**



Source: prepared by the authors

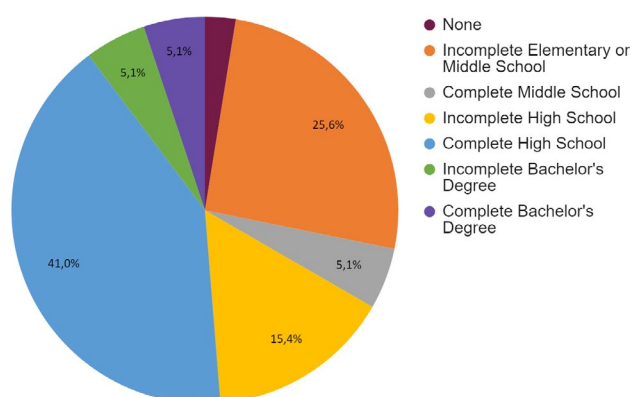
**Figure 65 - Age distribution of respondents – Confisco.**



Source: prepared by the authors

As for the educational profile, the great majority answered an education ranging from elementary school to high school (Figure 66). This is an educational profile lower than Cachoeirinha and indicates a lower level of income - of lower middle class and lower class - which is expected for this neighborhood.

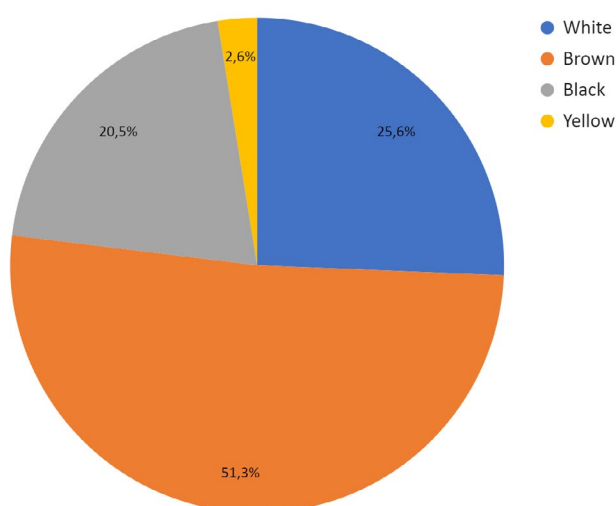
**Figure 66 - Level of education – Confisco.**



Source: prepared by the authors

As for the color classification according to the IBGE, 51% identified themselves as brown (Figure 67) and 20.5% as blacks, which compounds a majority of 71% of “negros” (brown and black population). The result, 8 percentual points higher than the Cachoeirinha survey, also stresses the lower-class income profile of the neighborhood.

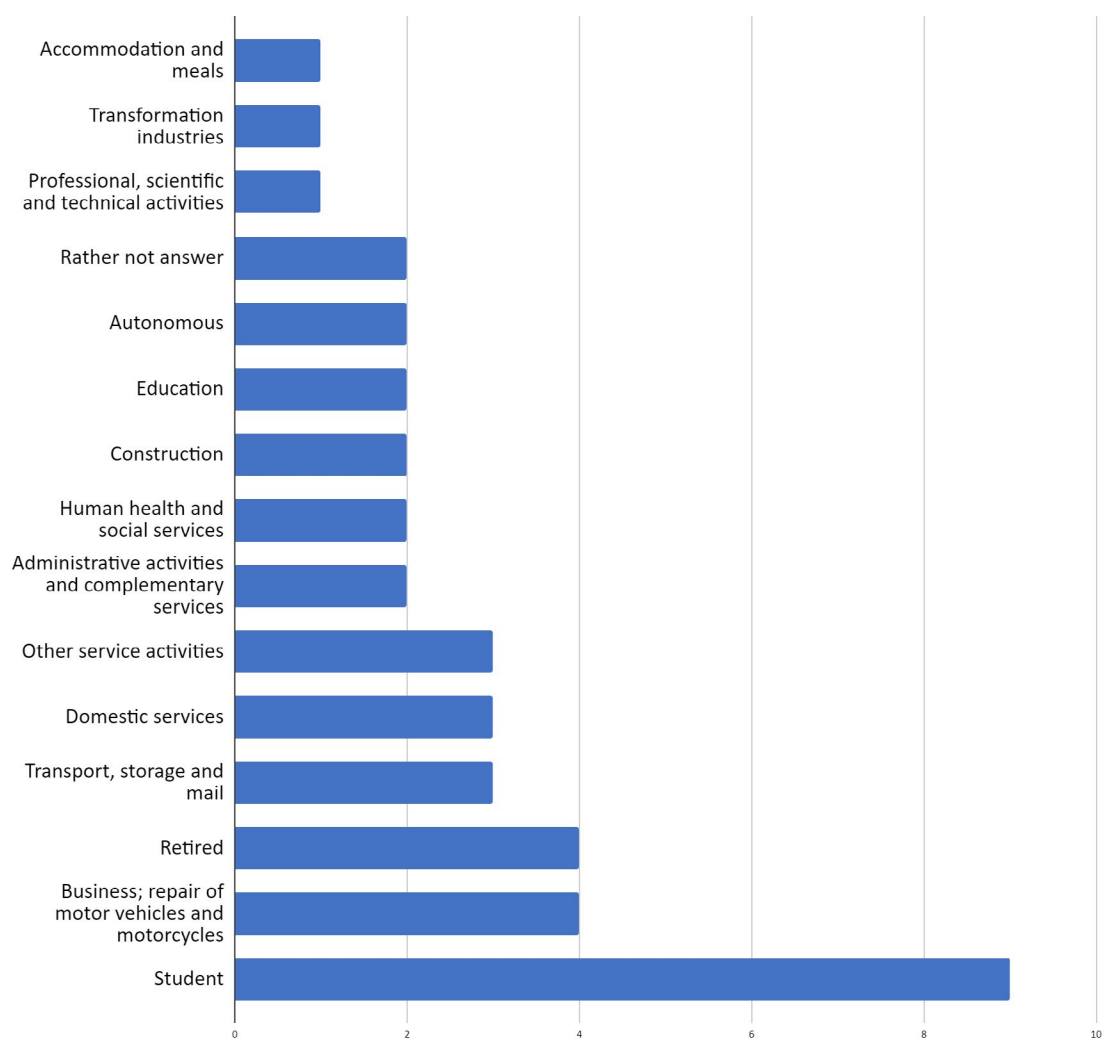
**Figure 67 - Color profile of respondents – Confisco.**



Source: prepared by the authors

In the Confisco neighborhood, 46.2% of the people have professions considered low income (up to 3 minimum wages), 5.1% reported not having a profession with income, and 17.9% answered that they are only studying at the time of the questionnaire. Among the answers there were no professions that are linked to higher salaries. As explained in the results of the Santa Tereza neighborhood, among the professions that cannot be classified are those that do not have a specific income or that have a very wide salary range (Figure 69).

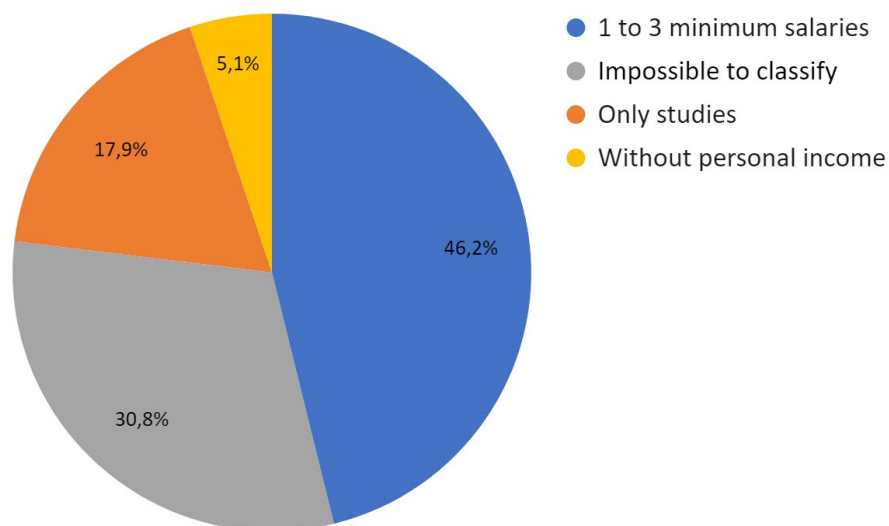
**Figure 68 - Occupational profile of respondents – Confisco.**



Source: prepared by the authors



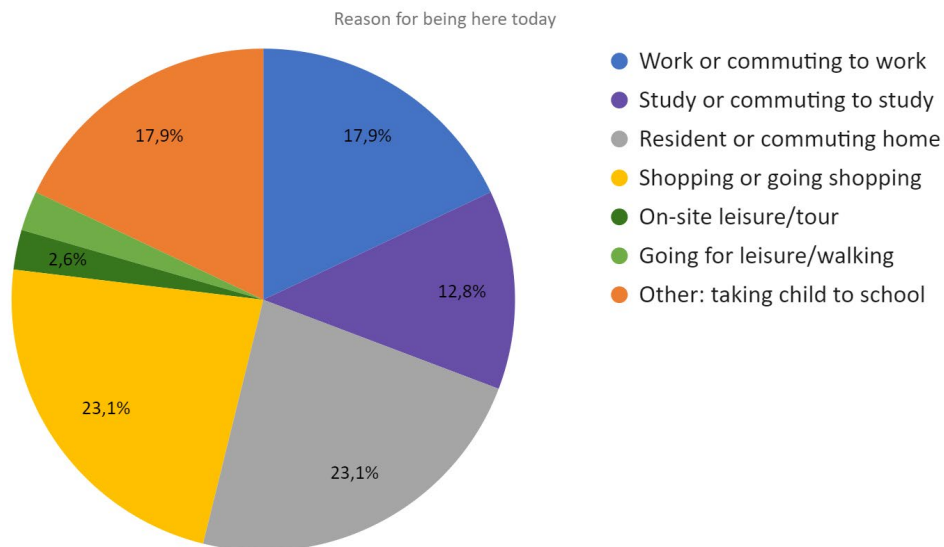
**Figure 69 - Income level based on occupations – Confisco.**



Source: prepared by the authors

Most respondents (61.2%) live in the neighborhood, 20.4% work locally and 12.2% study there, with 15.4% living and working in the confiscated neighborhood and 10.3% living and studying in the neighborhood. Among the reasons for being in that location are mainly related to school (40%) and shopping (23%) (Figure 70) which demonstrates the degree of centrality that Anne Frank Municipal School has.

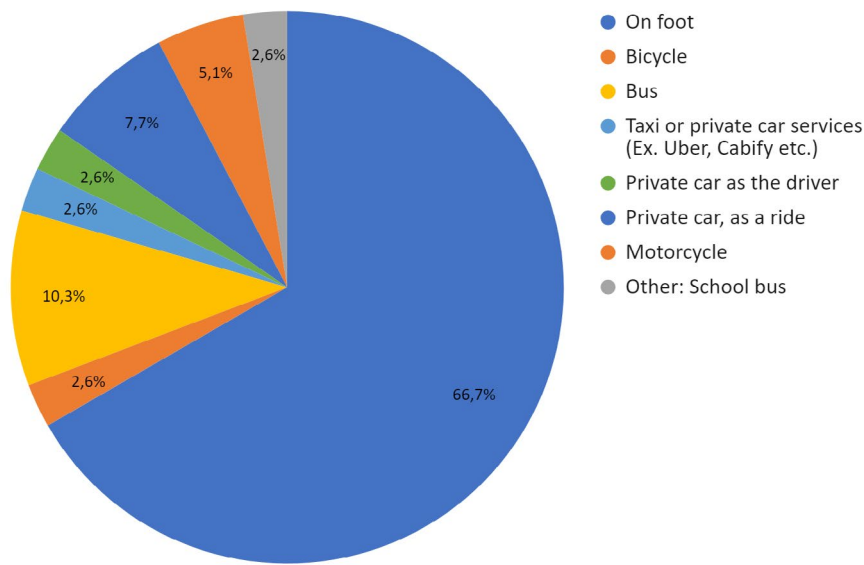
**Figure 70 - Respondent's reasons for being in the space – Confisco.**



Source: prepared by the authors

The most used modal for the task at that moment was walking (66.7%) followed by bus (10%) (Figure 71). It's worth noting that at least one respondent was using a bicycle and onlly 18% of the respondents utilized a private and motorized way of transport. This profile coincides with the one surveyed on Cachoeirinha and it is biased by the way of applying the questionnaire. But, even considering the bias, the modal profile shows the high usage of active and public modes of transport to access the local school and market.

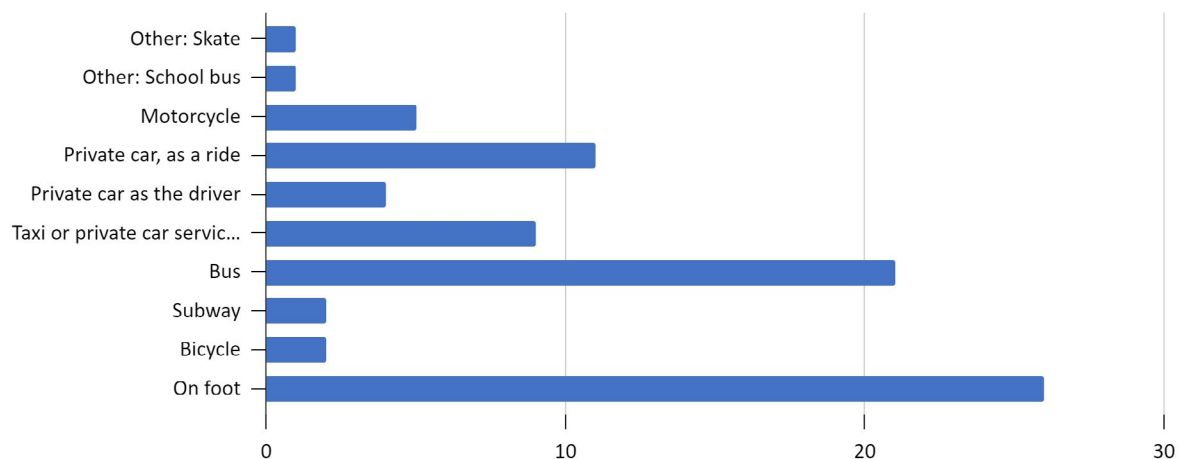
**Figure 71 - Transport used to reach the neighborhood – Confisco.**



Source: prepared by the authors

When asked about the most used means of transportation in general, walking was also the most cited, followed by the bus and the private car, as a ride (Figure 72), which is in accordance with the respondent social profile (brown or black women, above 25, lower class).

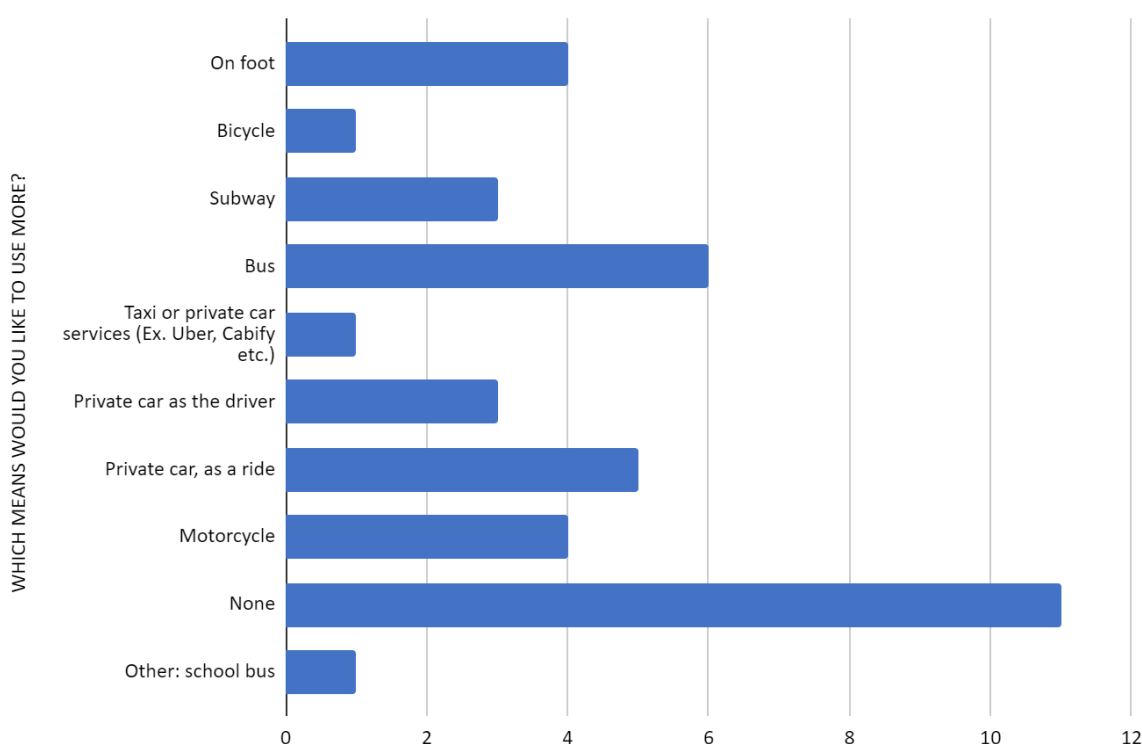
**Figure 72 - Profile of commonly used means of transport – Confisco.**



Source: prepared by the authors

It is possible to say that among the interviewees at that moment they performed a local mobility that is preferably done on foot and that there is no specific need for a type of mobility, since in the next question, which addresses the types of mobilities demanded, there was a great diversity of response (Figure 73).

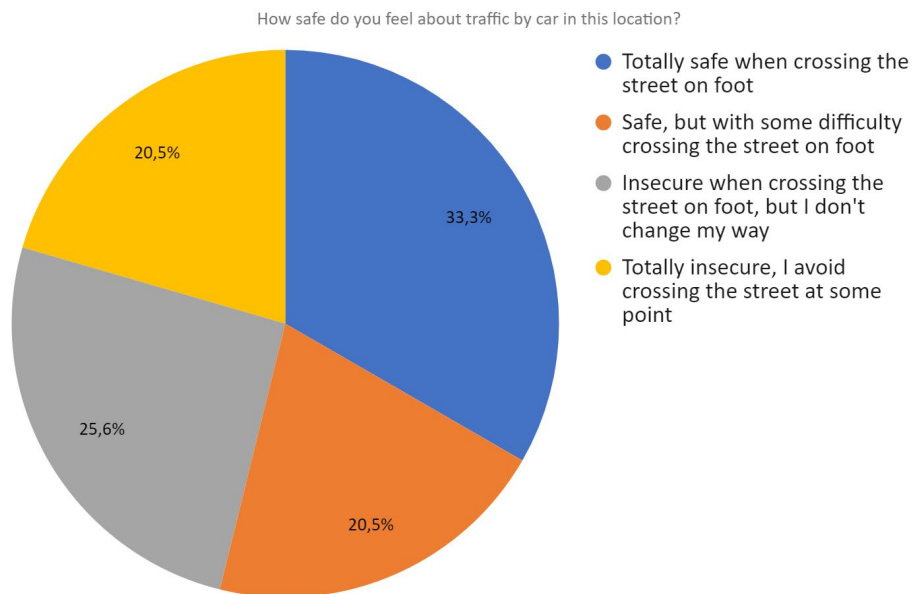
**Figure 73 - Desired means of transport – Confisco.**



Source: prepared by the authors

About conflicts with motorized traffic, it was asked a question focused on safety when crossing the street and if the respondent stopped crossing the street at any point, in this case the answers saying that they felt safe or very safe was slightly higher with 53% in total (Figure 74).

**Figure 74 - Respondent's perception of security in relation to traffic – Confisco.**



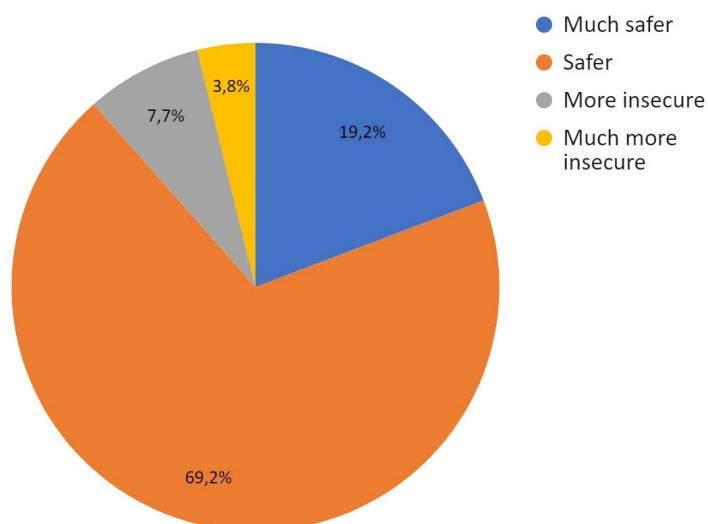
Source: prepared by the authors

Next, we addressed the temporary modification carried out in 2019, asking if the person passed through the place during the urban intervention, if the answer was yes, the next question would be about the improvement in the feeling of safety during the intervention.

In this case the answers were very positive, those who felt “safer” and “much safer” represented 88.4% in total (Figure 75).



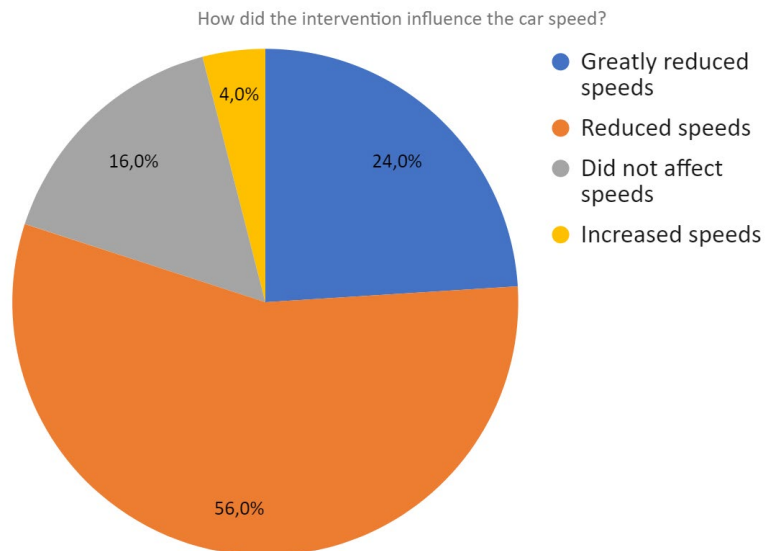
**Figure 75 - Effect of the intervention on the perception of safety – Confisco.**



Source: prepared by the authors

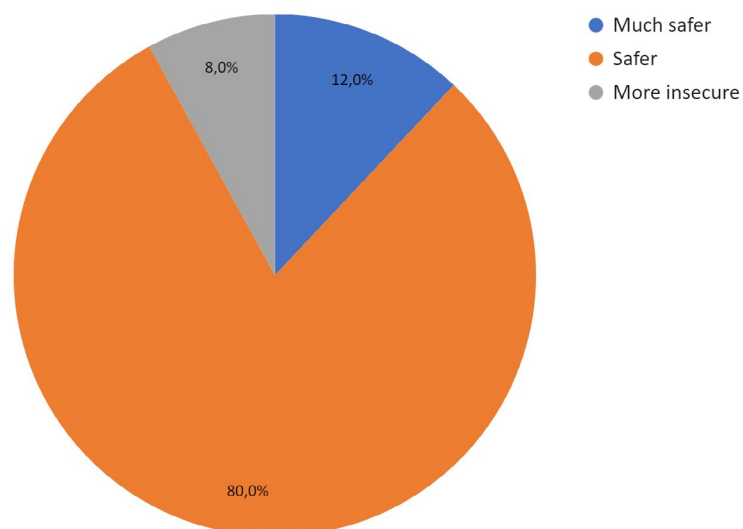
We also asked about the speed of cars after the intervention and again, the answers were mostly positive (Figure 76). 80% of the respondents also said that the intervention made crossing the crosswalk safer, 12% said it made it much safer, and 8% rated it as more unsafe (Figure 77).

**Figure 76 - Effect on speed of cars after the intervention – Confisco.**



Source: prepared by the authors

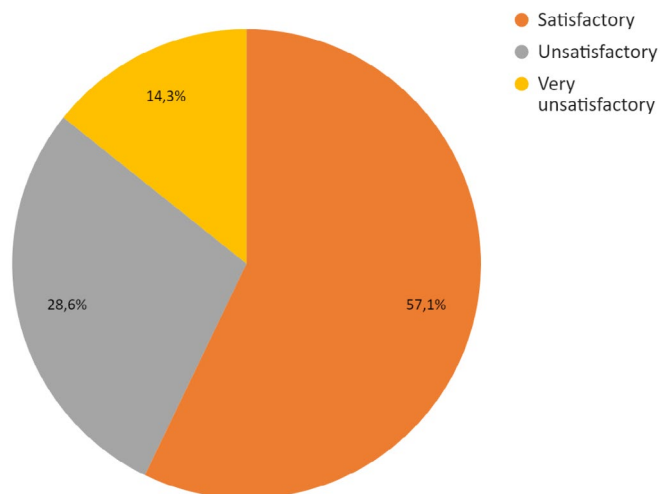
**Figure 77 - Safety when crossing the street during the intervention - Confisco.**



Source: prepared by the authors

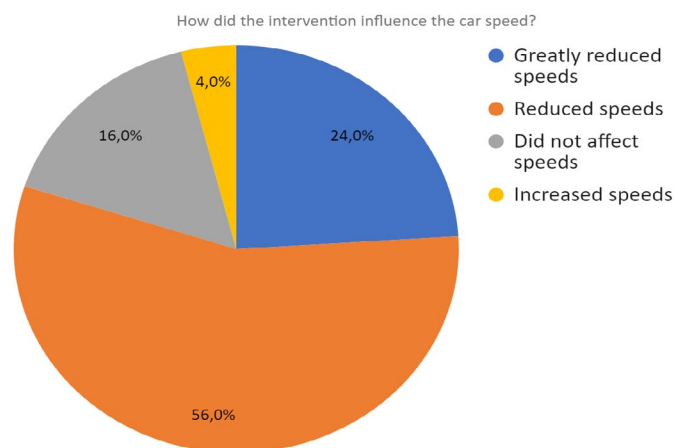
A total of 7 respondents answered that they attended the urban intervention by car and 4 rated it as satisfactory (57.1%), 2 rated it as unsatisfactory (28.6%) and 1 as very unsatisfactory (14.3%) for car use.

**Figure 78 - Satisfaction by car users during the intervention – Confisco.**



Source: prepared by the authors

**Figure 79 - Intervention effect on sense of speed of the cars – Confisco.**



Source: prepared by the authors

When asked if the intervention should return in a fixed way, 32.1% said the intervention should return and 53.6% said it should return with minor changes. We also left an open space for suggestions if the intervention should return (Table 2).

**Table 2 - Suggestions about the return of the intervention - Confisco**

<b>In your opinion, what aspects could be improved with a fixed intervention?</b>
More speed reduction elements.
Fixed sidewalk.
Make it safer for children leaving school.
The population was very disrespectful during the intervention, drilling the roadblocks, etc.
Reduce the speed to make it safer for the students
Draw more attention to pedestrian crosswalks
Potted plants were being torn down
There was a lack of enforcement
More places to park
Increase the parking lot by 45 degrees, remove the curb
More elements to reduce the speed of cars and buses

Source: prepared by the authors

### **Semi-structured interview**

The semi-structured interview was conducted with Conceição Pinheiro, vice director of the Anne Frank school, and with the director Mariana Carolina Carraro Chiodi.

Conceição Pinheiro has a long history with the school and the neighborhood. During the 28 years she has worked at the school, she tells us about a huge transformation in the neighborhood, such as the construction of the Confisco Park, through the participatory budget of the Belo Horizonte City Hall, where before it was an abandoned lot with a large amount of garbage, and today it has a preserved water spring and a leisure structure for the neighborhood. She also talks about the school not having the walls around it originally and the streets not being asphalted at the time.

Today the school not only provides elementary school education, but also kindergarten, and elementary and middle school education for youth and adults (EJA), at night.

About the social profile of the population, the vice-principal mentions that the neighborhood is surrounded by some low-income communities and that the school serves as a place of assistance for part of this population, even lending the space for the neighborhood to hold meetings and organize themselves politically. In addition, the school invites the community to discussions about security and public space, generating a community network that discusses issues in the territory.

Next we asked about safety in relation to the traffic around the school. She cites that traffic has increased in recent years but not enough to cause traffic jams, and that for her the presence of parked cars and narrowing lanes is a risk factor for children crossing the street.

Next, the director joins the interview talking more deeply about the project of implementing the 30 km/h Zone around the school. The project occurred through a dialogue between the school and BHTrans and was done in a participatory way with the school students, which helped with the involvement of the community in general. Even so, the director reports a conflict with the surrounding commerce during implementation, which lost parking spots with the reduction of road space.

The next point raised was about the permanence of the project in the urban space, since the plant pots and tires that were used for urban intervention were removed. About this case, the Director mentions that the maintenance of this furniture was partly under the responsibility of the school itself, through workshops of the integral education, which during certain periods of time, such as school vacations, rainy periods and also during the pandemic could not keep the maintenance, causing these objects and plants to degrade. At a certain moment, a group of residents warned that they were going to burn this furniture, which was degraded, and then BHTrans (local transit authority) opted to remove this part of the intervention.

About a possible transformation into a fixed intervention, modifying the sidewalks and the path of the cars, the director says that it would be a new process of participation with the community, which is starting to occupy the spaces again after a long period at home because of the pandemic.



Finally, students were asked about aspects of the temporary intervention, such as the expansion of the sidewalk. In this case it was said that the students, by participating in the painting of the intervention, used the new sidewalk, while people who didn't know the project didn't have this same appropriation.

### **Air quality meter**

On July 22, 2022 at 10am, the air quality monitoring device was installed. It was affixed to one of the outdoor pillars of the Anne Frank municipal school, as shown in Figure 80 and Figure 81. The device remained in place for 24 hours, between 10am of 22nd July, 20022 and 10am of 23rd July 2022, having remained collecting information during the time in loco, and being removed for data processing and analysis. It is worth noting that, as pointed out by Trevisan (2021), in Belo Horizonte there is a deficiency regarding the capture and dissemination of data related to air quality, and the possibility of carrying out such capture in areas of intervention of 30 km/h Zone projects contributes to demonstrate the results from these projects.

**Figure 80 - Air quality monitoring device installed near the intervention site in the Confisco Neighborhood.**



**Figure 81 - Air quality monitoring device installed near the intervention site in the Confisco neighborhood.**



Source: registered by the authors.

The measured results can be assessed online on the website <https://smartcitizen.me/kits/15499> following the referred time and date. Below, we present a table with the maximum, minimum and average values for seven variables. In addition, there is the median, which can be used as a proxy for the mean by eliminating outliers. Finally, the column on the right presents the values considered as reference for each of the variables measured. The measured variables were air temperature, air humidity, particulate matter concentration for particulate matter below 1 nanometer, 2.5 nanometers and 10 nanometers. Equivalent CO<sub>2</sub> gas concentration measured on parts per million and total volatile organic compounds on parts per billion.

**Table 3 - Air quality parameters - Confisco- July 2022.**

Confisco - 22nd and 23rd of July 2022					
Variable \ Value	Minimum Value	Maximum Value	Average Value	Median	Reference Value*
Air Temperature (°C)	13.76	25.5	19.34	18.84	19.4
Air Humidity (%)	50.29	87.51	68.54	67.48	58.4
PM 1 (ug/m <sup>3</sup> )	0	24	7.8	7	na
PM 2.5 (ug/m <sup>3</sup> )	0	32	9.93	10	<35
PM 10 (ug/m <sup>3</sup> )	0	35	10.06	10	<150
Equivalent Co2 (ppm)	400	1,791	1,181.62	1512	<400
VOCs (ppb)	0	439	149.97	179	<250
* Belo Horizonte july air temperature and air humidity reference values sources: National Institute of Meteorology. PM 2.5 and PM10 - US Environmental Protection Agency. VOC - World Green Building Council. Equivalent Co2 - European Environmental Agency					

Source: Smart Citizen Kit and authors, 2022

**Figure 82 - Equivalent CO2 parts per million concentration - Confisco - July 2022.**



Source: Smart Citizen Kit and authors, 2022

Based on the table and graph presented, it can be seen that the neighborhood's air quality indicators are good, with the exception of the volume of CO<sub>2</sub> equivalent. When observed from the graph, it can be seen that the minimum sensor value for equivalent CO<sub>2</sub> is 400 parts per million, indicating a measurement bias. However, even when this bias is discarded, the values are considered relatively high for an outdoor space.

To better understand whether there have been significant changes in air quality, the following are the values for the measurement taken in 2019, during the installation of the intervention in question:

**Table 4 - Air quality parameters - Confisco- September 2019.**

Confisco - between 9th and 26th September 2019					
Variable \ Value	Minimum Value	Maximum Value	Average Value	Median	Reference Value*
Air Temperature (°C)	14.55	56.55*	25.60	23.76	22.0
Air Humidity (%)	19.28	100*	57.56	59.16	55.3
PM 1 (ug/m <sup>3</sup> )	0	224	28.8	25	na
PM 2.5 (ug/m <sup>3</sup> )	0	337	37.2	33	<35
PM 10 (ug/m <sup>3</sup> )	0	322	37.6	33	<150
Equivalent Co <sub>2</sub> (ppm)	0	6,534	1,595.65	1651	<400
VOCs (ppb)	0	10405	708.13	291	<250
* Outlier value due to some source of sensor exposure					
** Belo Horizonte september air temperature and air humidity reference values sources: National Institute of Meteorology. PM 2.5 and PM10 - US Environmental Protection Agency. VOC - World Green Building Council. Equivalent Co <sub>2</sub> - European Environmental Agency					

Source: Smart Citizen Kit and authors, 2022

What can be seen from the comparison of the two tables is that the particulate matter values have dropped significantly. A not so sharp, but still relevant drop occurred in volatile organic compounds. The CO<sub>2</sub> equivalent concentration in the atmosphere, however, only varied marginally.

With only these elements it is not possible to say that the intervention was responsible for these changes. It is important to remember that the alteration of the space itself was undone as

recently as 2020. In this sense, it seems that the most explanatory hypotheses - although not conclusive - about this change in the data would be: (i) the effect of the social isolation of the pandemic for two years and (ii) the fact that September 2019 was a month of atypical drought in Belo Horizonte. Thus, the concentration of particulate matter, indicative of dust, was higher. But, the CO<sub>2</sub> concentration, reasonably more dispersed and more linked to a regional scale, remained reasonably the same.

## **Santa Tereza**

### **Observation sheet**

The region of the Joaquim Ferreira da Luz square has private units of low verticalization, being mostly houses of one or two floors, part of the houses have been converted into commercial properties and part remains residential. Right around the square are a painting studio and two bars. There is also an empty lot next to it. On the same block are two more bars and a mechanic's shop. The surrounding residences are low density and within 100 meters are two residential buildings of 3 floors each. One side of the plaza has a wall that separates the surface metro, on the other side, the limit are the streets that surround the plaza, and it is necessary to access it using the crosswalks.

**Figure 83 - Access to Joaquim Ferreira da Luz square in Santa Tereza.**



Source: Street view by google maps. January 2022



**Figure 84 - Santa Tereza's houses**



Source: prepared by the authors. July 2022

The restaurants are part of a gastronomic circuit of the Santa Tereza neighborhood that also attracts people from other regions and has its peak movement at night, especially on weekends. The degree of separation between public and private space is considerably low by city standards, all houses are fenced, but about half have a degree of transparency (metal railings), in the case of restaurants and bars, access is open. The types of land uses can be considered to encourage the circulation of people especially during the restaurants' peak hours. However, we do not see other commercial uses that encourage the circulation of the local population during the day, such as commercial buildings, markets, bakeries, educational institutions, and others. It is also necessary to emphasize that this space was part of a barrier area within the city, constituted by the subway line, and the Santa Tereza neighborhood, which can access the square on foot, is a region with low density residences, with a predominance of houses and some buildings of up to 4 stories.

The public area in and around the square has sidewalks with good width (2m) and without obstacles, the crosswalk, however, does not have a ramp for universal accessibility, there is also the presence of tactile flooring but only in two isolated points and without a continuity. The square now has a large number of benches, a garbage can, vases with plants. The equipment for children is a slide with a tunnel, a mini soccer field, and markings on the ground for children's games. As for the degree of conservation of the public space, it was observed that the

benches produced in the workshops have a degree of degradation due to the material used in its construction, and the expanded area of the square, which is lower, has an accumulation of dirt. The vegetation in the plaza was not shown to be treated frequently, and there were remnants of garbage during the camps. This garbage is due to the use of the square by waste pickers who open residential waste bags in the square. The place has night lighting for pedestrians and 30 km/h Zone signaling. The arborization allows leftovers in the square throughout the day.

**Figure 85 - Garbage in the Joaquim Ferreira da Luz square.**



Source: prepared by the authors. July 2022

**Figure 86 - Registration of a resident in the Joaquim Ferreira da Luz square.**



Source: Street view by google maps. January 2022

Concerning the people who frequent the square, during the day, we observed people who take their animals for a walk and some families who take children to use the equipment. During the night, restaurant employees also predominate, they use the benches in the square to take their work breaks, and some customers who go to the square after their meal or to smoke. Is important to stress that there is a relatively low attendance of people to the square.

### **Questionnaires**

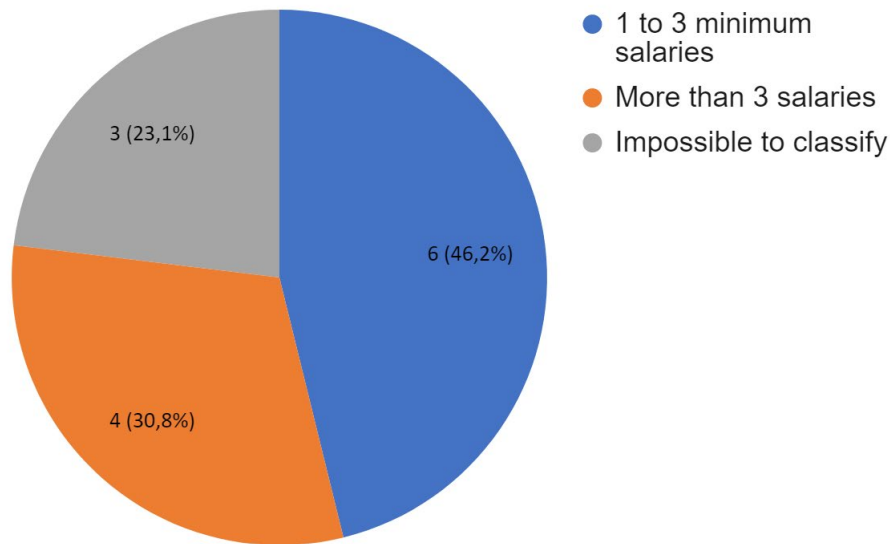
The application of the questionnaire at the Praça Joaquim Ferreira da Luz, in the Santa Tereza neighborhood, was done on June 25th at 6pm, July 1st at 2:30pm, 5pm and 7pm, July 2nd at 1pm, and July 3rd at 2:30pm. Concentrating on the weekends, which are the most frequent days for recreational activities, in relation to the bars and restaurants around and the presence of families using the playground equipment. A total of 13 responses were obtained, which are indicative of the low usage of the site.

The age of the respondents was between 24 and 35 years old, and one response was 53 years old. 61.5% identified themselves as male and 38.5% as female. 53.8% have completed high school, 30.8% incomplete higher education and 15.4% complete higher education as for color they defined themselves as 38.5% white, 30.8% brown, 23.1% black and 7.7% indigenous (one answer). Even with the low number of responses, it is possible to see a socio-economic profile of higher income compared to the other two locations surveyed.

Unlike the other neighborhoods analyzed, Santa Tereza tends to present a public with a social class with more resources than the Confisco and Cachoeirinha neighborhoods, as was presented in the introduction. This can be observed in the question about professions, where for the first-time people with a probable salary range higher than 3 minimum wages were presented, but all of them would be within the 10-salary range (Figure 87). Nevertheless, more people presented themselves with occupations that tend to be less remunerated (46.2%), they are mostly employees of the restaurants.



**Figure 87 - Income level based on occupations - Santa Tereza.**



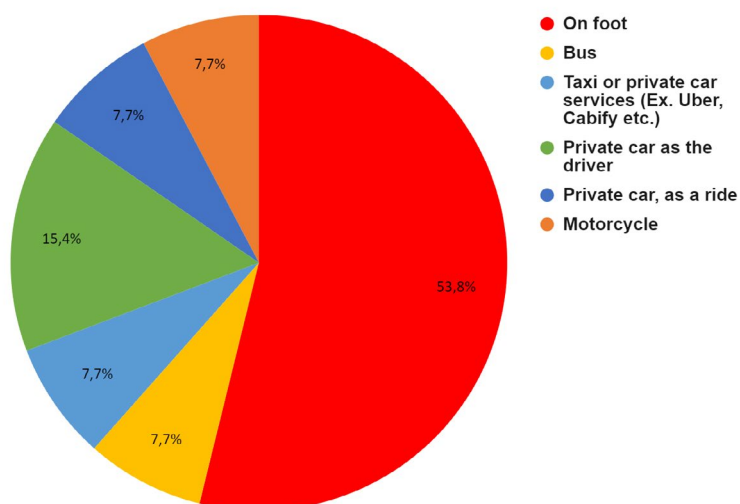
Source: prepared by the authors

The professions declared were the most diverse, but 4 answers were from workers related to local restaurants.

Among those interviewed, only 2 (15.4%) did not work or live in the neighborhood, the rest had some connection with the place surveyed. The two main reasons for using the square were work (38.5%) and leisure (30.8%), and 53.8% came on foot, motorized mobility, represented by car, motorcycle and cab totaled 38.5%, only one response used the bus.

It is important to note that no one mentioned the metro, even though the square is less than 500 meters from a station. Despite this, the bus was very frequently mentioned as the means used according to the question in Figure 88.

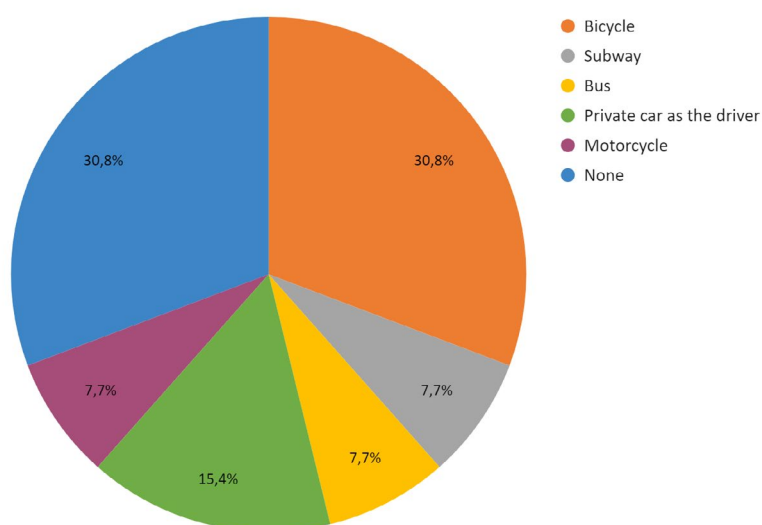
**Figure 88 - Means of transport used to access the square in Santa Tereza.**



Source: prepared by the authors

The most demanded type of transportation was the bicycle, present in 30.8% of the answers Figure 89.

**Figure 89 - Demanded modes of transportation in Joaquim Ferreira da Luz square, Santa Tereza.**

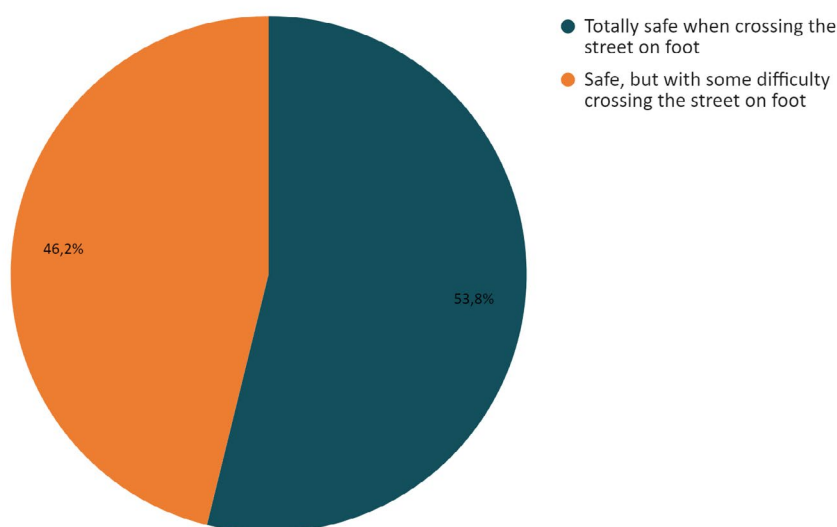


Source: prepared by the authors



Regarding the sense of safety in relation to car traffic around the square, respondents reported being safe or completely safe Figure 90. Already, the quality of the sidewalks is mostly placed as good (53%).

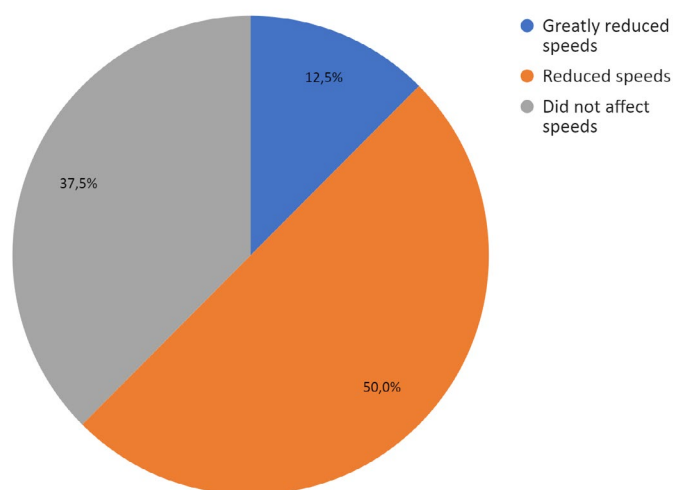
**Figure 90 - Sense of safety in relation to car traffic around the Joaquim Ferreira da Luz square in Santa Teresa.**



Source: prepared by the authors

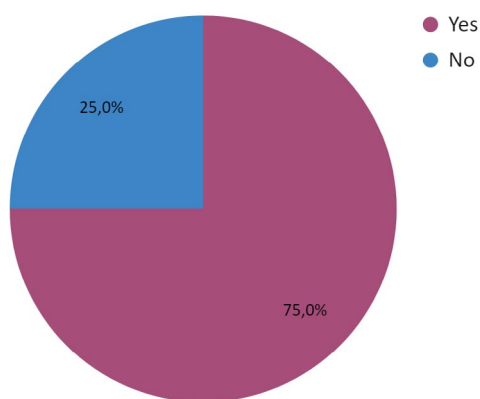
From the total of 13 respondents, 8 reported knowing the plaza before the expansion, of these, 5 reported that the speed of cars has reduced or greatly reduced (Figure 91). Of the total, 6 stated that the intervention changed the way they use the plaza (Figure 92). The respondents that say that the intervention does not change the way of using the square, are employees of the restaurants, they use mostly banks already present on the old square.

**Figure 91 - Sense of speed after the intervention around the Joaquim Ferreira da Luz square in Santa Tereza.**



Source: prepared by the authors

**Figure 92 - Has the intervention changed the way you use the square?**



Source: prepared by the authors

### **Semi-structured interview**

The semi-structured interview was conducted with Antonio Castelo Branco, a local resident who helped with the intervention in the Santa Tereza neighborhood and maintenance of the square.

One of the first important points mentioned was about the speed of cars. Despite the interruption of Conselheiro Rocha Street forcing the cars around the square, some drivers still make the first curve of the contour, which has low visibility, at a speed that he considers high, even so there were no reports of accidents. Even so, the reduction in speed was good compared to the old route that the cars used to travel.

As protection for the square, Antonio, with the help of other neighbors, made a barrier with wood stuck vertically in the ground, but in such a way that they can be removed by subway workers who use an access point to the line in the square. The barrier was important to avoid the invasion of cars and the parking on the plaza area.

Another important point was the report of a conflict between those who use the square and homeless people who have occupied the square for periods of time, using it for sleeping, with a tent, for personal cleaning and for clothes. Since the square is a place of low density and movement, in a context of increasing housing and economic crisis, the place became frequented by homeless people. The situation regarding the disputed use of the public space was understandably delicate. Thus, an effort was made by the residents to activate the Local Government Social Assistance structure, which tried to demote the homeless people from being there. But the place remained perennially inhabited until April 2022 and is still sporadically used as a place to sleep, as can be seen in the photos.

The use of the plaza for festivities, such as children's birthdays and Brazilian June festival, was also mentioned, as well as the use of the space mainly by families with children during the day, and bar customers at night. However, current usage is much lower than in the months following the inauguration of the square's remodeling when people from other neighborhoods came to get to know the new square.

## Air quality meter

On July 25, 2022, at 10:34 am, the air quality monitoring device was installed. It was affixed to the Antonio Castelo Branco Residence wall, as shown in Figure 93. The device remained in place for 24 hours, between 10h34 AM of 25th July 2022 and 10h34 AM of 26th July, 2022 having remained collecting information during the time in loco, and being removed for data processing and analysis.

**Figure 93 - Air quality monitoring device installed near the intervention site in the Santa Tereza neighborhood.**



Source: registered by the authors.

The measured results can be assessed online on the website <https://smartcitizen.me/kits/15499> following the referred time and date. Below, we present a table with the maximum, minimum

and average values for seven variables. In addition, there is the median, which can be used as a proxy for the mean by eliminating outliers. Finally, the column on the right presents the values considered as reference for each of the variables measured. The measured variables were air temperature, air humidity, particulate matter concentration for particulate matter below 1 nanometer, 2.5 nanometers and 10 nanometers. Equivalent CO<sub>2</sub> gas concentration measured on parts per million and total volatile organic compounds on parts per billion.

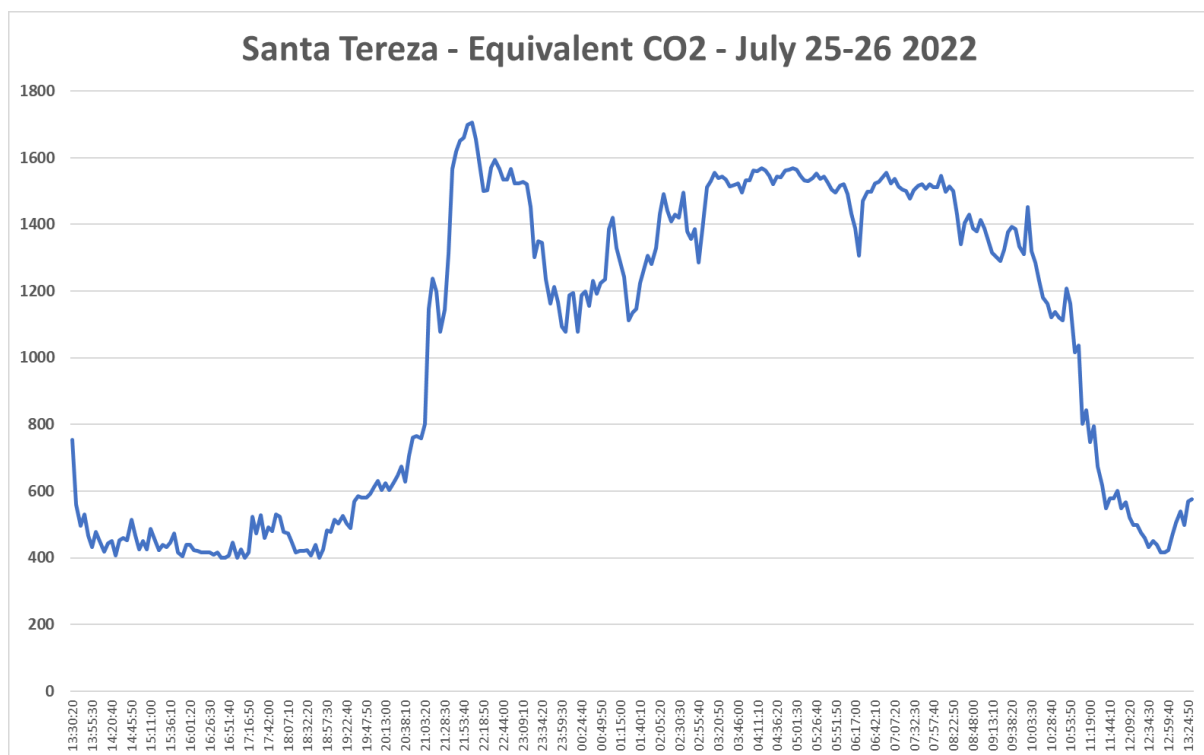
**Table 5 - Air quality parameters - Santa Tereza- July 2022.**

Santa Tereza - 25th and 26th of July 2022					
Variable \ Value	Minimum Value	Maximum Value	Average Value	Median	Reference Value*
Air Temperature (°C)	14.18	27.91	20.21	19.99	19.4
Air Humidity (%)	52.58	84.82	68.06	67.28	58.4
PM 1 (ug/m <sup>3</sup> )	0	18	5.78	5	na
PM 2.5 (ug/m <sup>3</sup> )	0	25	6.92	5	<35
PM 10 (ug/m <sup>3</sup> )	0	25	6.98	5	<150
Equivalent CO <sub>2</sub> (ppm)	400	1,705	1,031.46	1,191	<400
VOCs (ppb)	0	345	103.56	120	<250
* Belo Horizonte July air temperature and air humidity reference values sources: National Institute of Meteorology. PM 2.5 and PM10 - US Environmental Protection Agency. VOC - World Green Building Council. Equivalent CO <sub>2</sub> - European Environmental Agency					

Source: Smart Citizen Kit and authors, 2022



Figure 94 - Equivalent CO2 parts per million concentration - Santa Tereza - July 2022.



Source: Smart Citizen Kit and authors, 2022

Based on the table and graph presented, it can be seen that the neighbourhood's air quality indicators are good, with the exception of the volume of CO2 equivalent. When observed from the graph, it can be seen that the minimum sensor value for equivalent CO2 is 400 parts per million, indicating a measurement bias. However, even when this bias is discarded, the values are considered relatively high for an outdoor space.

When its compared to the results of 2021<sup>2</sup> regarding particulate matter in the air a significant reduction in the volume of particulate matter can be seen, and therefore an improvement in air quality. As already seen in the comparison performed in the Confisco neighborhood, there is a significant drop in particulate matter values, even though the average value cannot be compared. Without a more systematic and constant research, and more comprehensive in space, there is no way to say what caused this reduction. As already stated, one of the hypotheses

<sup>2</sup> Due to database access restrictions, only the maximum values for particulate matter were obtained for comparison,

put forward is the medium-term impact of the pandemic's social isolation. It can be inferred that the 30 km/h Zone has some influence on this decrease, although this is only an unproven hypothesis at this time. Further understanding of the dynamics of particulate matter in the urban atmosphere, in comparison with CO<sub>2</sub> concentration, is needed to understand the micro-local effects of the 30 km/h Zone. Without a government policy of constant air quality measurement, it is not possible to state with precision that there has been such an improvement.

**Table 6 - Air quality parameters - Santa Tereza- May 2021.**

LOCAL	DATE	Max. value		
		PM_1	PM_25	PM_10
		ug/m3	ug/m3	ug/m3
Praça Joaquim Ferreira da Luz	May/13/2021	72	126	151

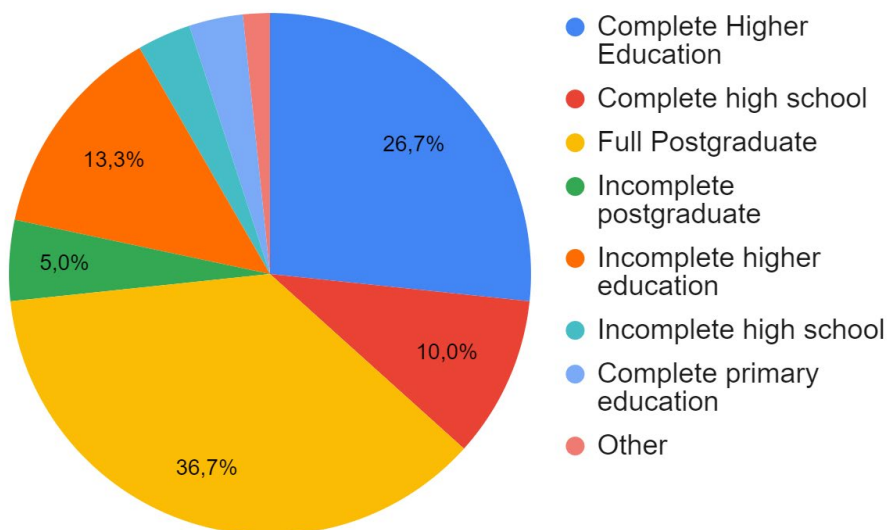
Source: prepared by the authors

## Cyclists of Santa Tereza

The questionnaire produced for the cyclists that use the streets demarcated as 30 km/h Zone and the bike lane implemented over the José Maria Torres Leal viaduct, was answered through an online form that was disclosed using the Nossa BH contact network. Inside the questionnaire it was possible to divide those people who use or used the viaduct and the 30 km/h Zone before or after the reforms. From a total of 60 responses, 40 people cited that they passed by before and after the intervention or only after the intervention, and 21 know about the implementation of the 30 km/h Zones within the Santa Tereza neighborhood.

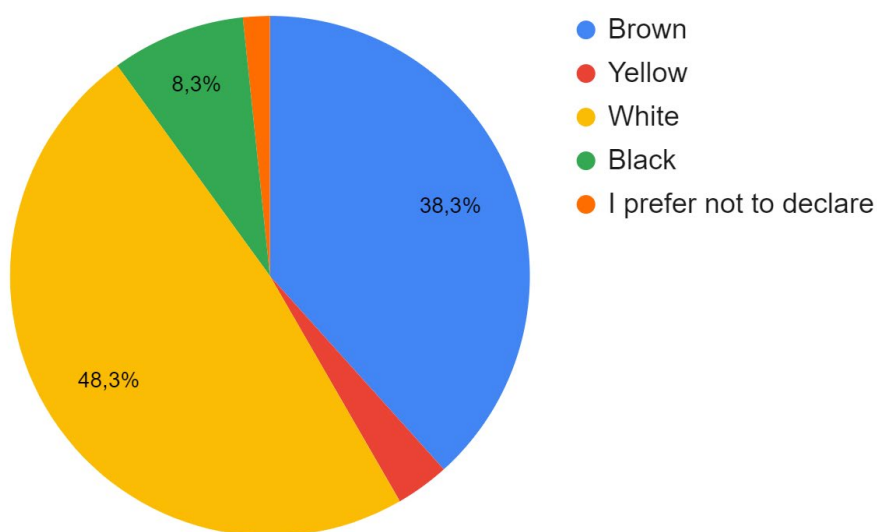
Regarding the social classification of the interviewees, 45% of the audience was defined as female, and 53.3% as male. Regarding the level of education, it was observed a higher presence of people with complete high school and college education, which may have a relationship with the distribution of the online questionnaire (Figure 95).

**Figure 95 - Level of education profile of respondents - Santa Tereza cyclists.**



Source: prepared by the authors

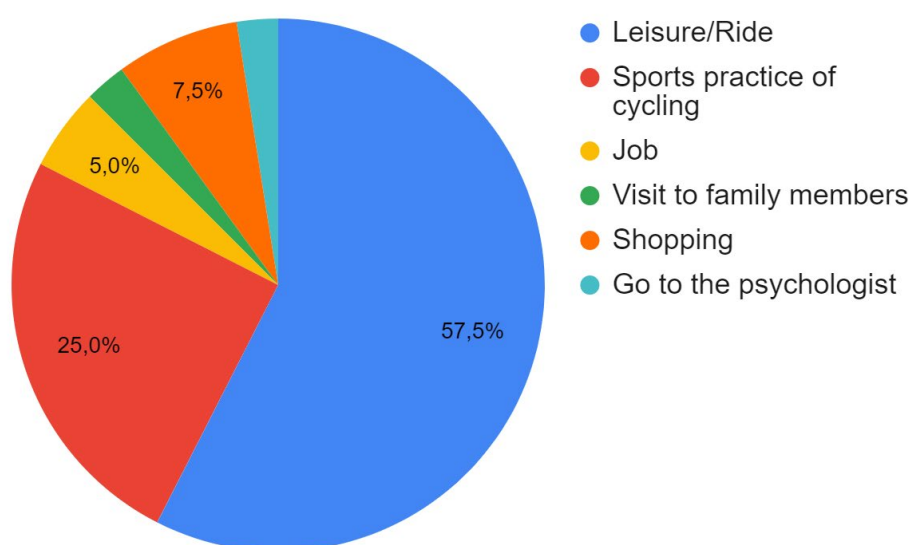
**Figure 96 - Color profile of respondents - Santa Tereza cyclists**



Source: prepared by the authors

The main reason for using the bicycle in the regions surveyed was for leisure purposes (57.5%) followed by sports practice (25%) (Figure 97). In addition, the majority of respondents indicated that they cycled only sporadically or on weekends (77.5%).

**Figure 97 - For what kind of displacement do you use the viaduct bike lane?**

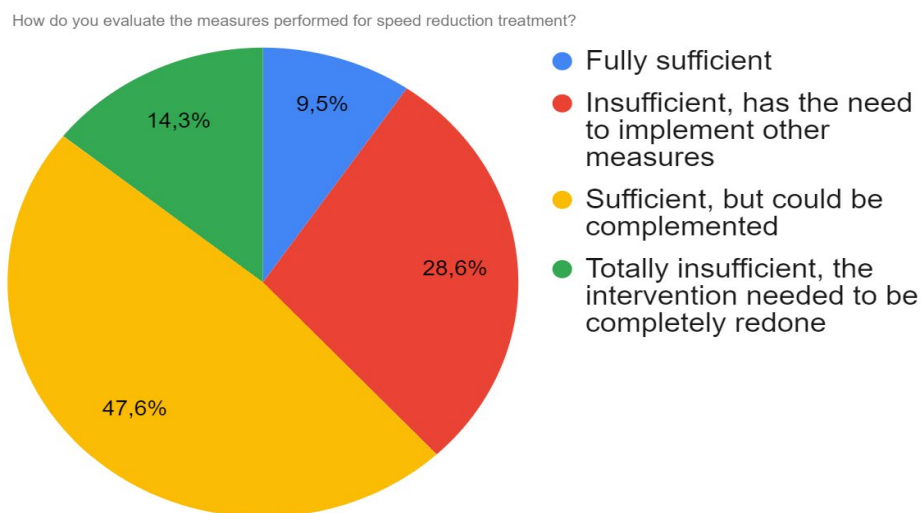


Source: prepared by the authors

When asked about the feeling of safety when using the José Maria Torres Leal viaduct bike lane, 60% defined it as safe, 10% as totally safe, and 30% as unsafe.

Regarding the feeling of safety for cycling in the 30 km/h Zone, the interviewees (21 in total) reported that the implementation did not influence the speed of cars (61.9%) and against 31% who believe that speeds were reduced in some way. Confirming this evaluation, 41.6% of the interviewees also stated that the implementation of the 30 km/h Zone is sufficient but still needs complementary measures, in this same evaluation 28.6 considered it insufficient and 14.3 considered it totally insufficient. Only 9.5% rated as totally sufficient (Figure 98).

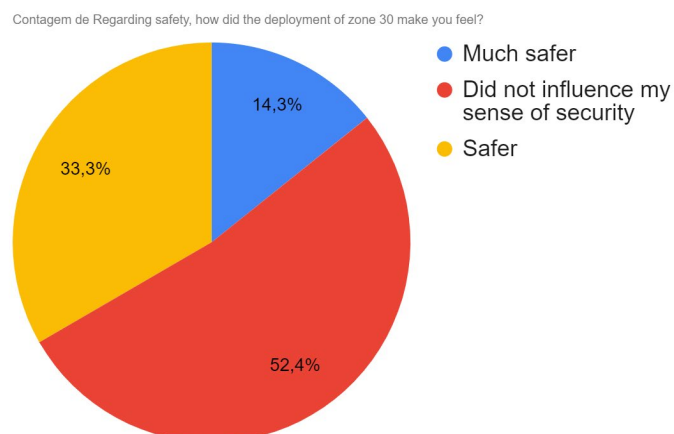
**Figure 98 - How do you evaluate the measures performed for speed reduction treatment?**



Source: prepared by the authors

When asked about the feeling of safety on these roads 80% defined it as safe or completely safe, but the feeling of safety was not influenced by the implementation of the 30 km/h Zone according to 52.4% of the responses. Those who cited that the implementation was positive for the feeling of safety were 14.3% in total (safer and totally safe) (Figure 99).

**Figure 99 - The influence of the implementation of 30 km/h Zones in Santa Tereza.**



Source: prepared by the authors



# COMPREHENSIVE ANALYSIS OF THE INTERVENTIONS

The urban interventions that have been addressed in this report present some similarities, both in terms of their successes and their limitations. It was widely observed that the physical changes in the road layout, with the simultaneous expansion of pedestrian space, have improved safety - and its perception - for pedestrians by objectively decreasing the speed of motor vehicles in the space. These changes - even if already undone, as is the case of Confisco - brought to the local citizens, mostly pedestrians, the perception of the need to treat the walkable space. It was also perceived that this treatment necessarily improves the quality of life and the urban environment.

Furthermore, the questionnaire applied in the three interventions brings evidence that the perception about the improvement of urban space is not correlated to the income profile. Indeed, both in the lower-class neighborhood (Confisco), as in the lower-middle class (Cachoeirinha) and in the upper-middle class neighborhood (Santa Tereza), the positive evaluation of the changes is significant. What the research brought up about the socio-economic profile of these populations is something that was already indicated by other focal research in Belo Horizonte: the fact that most of those who travel by foot and public transport are women, black and brown, with lower incomes and generally over 40 years old. Another pedestrian profile, a little more obvious, are students - children and young people - who go to school every day. In this sense, it is understood that the profile of the target audience of the 30 km/h Zones, EcoZones, low carbon and low speed policies is precisely the most vulnerable population and the one most affected by social, economic, and urban inequality in the country. Thus, the geographical prioritization of these policies must also follow socio-economic criteria, and the design of these interventions must consider the needs and vulnerabilities of this social profile.

Another striking aspect is that the effectiveness of urban changes and their maintenance is correlated with the degree of attraction/production of displacement that urban spaces have. Thus, the neighborhoods of Confisco and Cachoeirinha, for being centralities related to educational equipment and to economic activities (on a larger scale than the local one, in the case of Cachoeirinha), have their changes more perceived and used by the population. In the same way, the abandonment and degradation of the public space targeted by the intervention

is lessened. In the case of Santa Tereza, the square targeted by the intervention is in an area with low housing density. This context, added to the acute economic and housing crisis that the city and the country are going through, meant that the use of the space was disputed with the homeless population and waste pickers, which meant that the leisure purpose of the square could not be enjoyed.

Another evidence raised by this survey was the precariousness of the temporary changes in the implementation of 30 km/h Zones and EcoZones. In the three areas addressed, it can be seen that if there is fragility in the urban furniture elements used to alter the layout of the streets and for leisure, the effectiveness of the intervention is lower. Thus, in the case of Cachoeirinha, the change in the radius of curvature of the conversion of Nossa Senhora da Paz to Simão Tamm Street was not being respected when it was still made with concrete blocks in the middle of the asphalt. It only had a permanent effect when the curb extension was turned into a pavement. Similarly, the concrete blocks used at other points to reduce speed and prohibit parking are gradually being destroyed by accidents or ill-intended people. In the case of Confisco, the road design was altered by tires and large potted plants that, with the social isolation imposed by the covid-19 health emergency, were no longer maintained by the school community and had to be removed, completely disfiguring the intervention. Finally, in the case of Santa Tereza there are two elements to pay attention to: first, in the square, the furniture made with other construction material (as a cost reduction measure) did not manage to sustain itself and already needs to be replaced. In the case of the cycle route that connects the square to the viaduct bike lane, it is widely reported by cyclists using the route that the street paintings and signage are not effective in changing car behavior and making the road space safe. In fact, the street layout paints have simply not worked in any of the 30 km/h Zones implemented by the municipality and are soon worn out or replaced. These findings lead us to more robust policy recommendations, which are detailed below in the next topic.

# POLICY RECOMMENDATIONS

From the evidence gathered and the debate held here in this report, it can be seen that interventions such as 30 km/h Zones and eco-zones are very effective in reducing motor vehicle speeds and increasing pedestrian space and their sense of safety but are not yet effective as an element of systemic combat against the local effects and causes of climate change. Even if urban ambience and site temperature are improved, air quality and CO<sub>2</sub> equivalent concentration depend on more general factors involved at a wider geographical scale. But even for the issue of pedestrian space, it needs to be part of the urban landscape for wider acceptance. In other words, 30 km/h Zones and EcoZones need to be implemented in as many neighborhood centralities as possible and their implementation and maintenance should be treated by public authority in a manner as common as the process of resurfacing municipal roads.

Thus, in view of these elements and the history of urban interventions presented here, we present the following public policy recommendations:

- I. Incorporate the dynamics of solid waste treatment in the design of 30 km/h Zone, involving the community of workers with waste recycling;
- II. Develop a municipal eco-zone implementation plan, prioritizing local centralities, schools, and other displacement attractors/producers, as well as squares and other child-friendly places;
- III. Propose a geographical order of priority for implementation of EcoZone, considering social and economic vulnerability factors in the city's neighborhoods;
- IV. Incorporate the implementation of EcoZones and 30 km/h Zones as a heading in the budget cycle of the municipal public authority;
- V. Once incorporated into the municipal public policy agenda, it is recommended to discourage the use of temporary equipment and street painting, even if it is only a "tactical" element of acceptance;

- VI. Associate the reduction of regulated speed in 30 km/h Zones with traffic calming measures, such as permanent physical changes of lane narrowing, sidewalk addition and sinuosity, aiming at an effective reduction of speed;
- VII. Develop and incorporate into the implementation plan community strategies with local actors and the various public authorities, elaborate the final EcoZone project in a participative manner;
- VIII. Involve the community in the physical construction of the EcoZone;
- IX. Give wide publicity to the process of setting up the EcoZone and 30 km/h Zone, in particular its effects on the urban environment;
- X. Develop strategies for monitoring and maintaining the eco-zone spaces, including by involving the recyclable and organic material collectors, as a mechanism to guarantee its original purpose. Elaborate a Eco-zone Sustainability Plan;

# REFERENCES

Agência Metropolitana da RMBH. **Diagnóstico do plano metropolitano de transporte coletivo** (Diagnosis of the metropolitan plan for public transportation). 2022.

Bryman, A. (2012) **Social Research Methods**. Nova York: Oxford University Press Inc.

Boni, V.; Quaresma, S. J. (2005) Aprendendo a entrevistar: como fazer entrevistas em Ciências Sociais. **Em Tese**, v. 2, n. 1, p. 68-80. <https://doi.org/10.5007/%25x>

Duarte, J. (2005) Entrevista em profundidade. In: Duarte, J.; Barros, A. (ed.). **Métodos e técnicas de pesquisa em comunicação**. São Paulo: Editora Atlas S. A. cap. 4, p. 62-83.

Estado de Minas (2022) **MPMG multa Localiza em R\$ 5 milhões por tarifa de 12%**. Available at: [https://www.em.com.br/app/noticia/economia/2022/05/25/internas\\_economia,1368980/mpmg-multa-localiza-em-r-5-milhoes-por-tarifa-de-12.shtml](https://www.em.com.br/app/noticia/economia/2022/05/25/internas_economia,1368980/mpmg-multa-localiza-em-r-5-milhoes-por-tarifa-de-12.shtml). Access in: July 20, 2022.

IBGE (2020) **Síntese de indicadores sociais**: uma análise das condições de vida da população brasileira: 2020 / IBGE, Coordenação de População e Indicadores Sociais. Rio de Janeiro

ITDP Brasil (2016) **Reduzir a velocidade para preservar vidas**. Available at: <https://itdpbrasil.org/reduzir-a-velocidade-para-preservar-vidas/>. Access in: July 19, 2022.

Litman, T.; Steele, R. (2017) **Land use impacts on transport**. Canada: Victoria Transport Policy Institute.

MOVIMENTO NOSSA BH (2021) **Mapa das Desigualdades da RMBH** (RMBH inequality map). Available at <https://nossabh.org.br/uploads/2021/06/Mapa-das-desigualdades-da-RMBH-2021.pdf>

MOVIMENTO NOSSA BH (2021). **Ecozona Santa Tereza Project Final Report**: Execution and accountability.



Prefeitura de Belo Horizonte (2022) BHMap. Available at: [https://bhmap.pbh.gov.br/v2/mapa/idebhgeo#zoom=2&lat=7799410.42731&lon=609897.46282&baselayer=base&layers=municipio\\_rmbh%2Cregional](https://bhmap.pbh.gov.br/v2/mapa/idebhgeo#zoom=2&lat=7799410.42731&lon=609897.46282&baselayer=base&layers=municipio_rmbh%2Cregional). Access in: July 19, 2022.

TREVISAN, Eveline Prado (2021) **Ruas de estar: mobilidade e apropriação urbana**. Tese (Doutorado em Arquitetura e Urbanismo), Universidade Federal de Minas Gerais, Belo Horizonte.

Urban Pathways (2022) **The Urban Pathways Implementation Tracker is tracking the Projects Progress**. Available at: <http://www.urban-pathways.org/belo-horizonte1.html>. Access in: July 19, 2022. Implementation report Santa Tereza.

WRI Brasil (2014) **Zonas 30: reduzindo a velocidade para salvar vidas**. Available at: <https://wricidades.org/conteudo/zonas-30-reduzindo-velocidade-para-salvar-vidas>. Access in: July 19, 2022.

# ANNEX I - CACHOEIRINHA'S QUESTIONNAIRE

**How old are you?**

---

**With which gender do you identify?**

- ☐ Female
- ☐ Male
- ☐ Other
- ☐ Rather not answer

**What is the highest degree or level of education you have completed?**

- ☐ None
- ☐ Incomplete Elementary or Middle School
- ☐ Complete Middle School
- ☐ Incomplete High School
- ☐ Complete High School
- ☐ Incomplete Bachelor's Degree
- ☐ Complete Bachelor's Degree
- ☐ Incomplete Post Graduation
- ☐ Complete Post Graduation
- ☐ Other
- ☐ Rather not answer

**How do you define your color (based on the IBGE classifications)?**

- ☐ White
- ☐ Brown
- ☐ Black
- ☐ Yellow
- ☐ Indigenous
- ☐ Rather not answer

**What's your profession? Are you a student currently?**

---

**Do you live, work or study in this neighborhood?**

- ☐ Live
- ☐ Work
- ☐ Study
- ☐ None of the options

**Reason for being here today:**

- ☐ Work or commuting to work
- ☐ Study or commuting to study
- ☐ Resident or commuting home
- ☐ Shopping or going shopping
- ☐ On-site leisure/tour
- ☐ Going for leisure/walking
- ☐ Rather not answer
- ☐ Other

**How did you arrive or how are you commuting here today?**

- ☐ On foot
- ☐ Bicycle
- ☐ Subway
- ☐ Bus
- ☐ Taxi or private car services (Ex. Uber, Cabify etc.)
- ☐ Private car as the driver
- ☐ Private car, as a ride
- ☐ Motorcycle

**If you came by car, what do you think of the parking lots:**

- ☐ Very good
- ☐ Good
- ☐ Bad
- ☐ Too bad

**If you came by bicycle, how do you rate the safety to get here:**

- ☐ Totally safe
- ☐ Safe
- ☐ Insecure
- ☐ Totally insecure

**Which means of transport do you use in general?**

- ☐ On foot
- ☐ Bicycle
- ☐ Subway
- ☐ Bus
- ☐ Taxi or private car services (Ex. Uber, Cabify etc.)
- ☐ Private car as the driver
- ☐ Private car, as a ride
- ☐ Motorcycle
- ☐ Other

**Which means would you like to use more?**

- ☐ On foot
- ☐ Bicycle
- ☐ Subway
- ☐ Bus
- ☐ Taxi or private car services (Ex. Uber, Cabify etc.)
- ☐ Private car as the driver
- ☐ Private car, as a ride

- ☐ Motorcycle
- ☐ Other
- ☐ None

**How safe do you feel about traffic by car in this location?**

- ☐ Totally safe when crossing the street on foot
- ☐ Safe, but with some difficulty crossing the street on foot
- ☐ Insecure when crossing the street on foot, but I don't change my way
- ☐ Totally insecure, I avoid crossing the street at some point

**Are you aware that there was an intervention in the public and road space of this place, carried out by the city hall?**

- ☐ Yes
- ☐ No

**How did the intervention make you feel about motor traffic on this street?**

- ☐ Much safer
- ☐ Safer
- ☐ More insecure
- ☐ Much more insecure

**If you have come by car: how do you evaluate the intervention?**

- ☐ Very satisfactory
- ☐ Satisfactory
- ☐ Unsatisfactory
- ☐ Very unsatisfactory



**If you are coming by car: how do you evaluate the car parks after the intervention?**

- ☐ Very satisfactory
- ☐ Satisfactory
- ☐ Unsatisfactory
- ☐ Very unsatisfactory

**How did the intervention influence the speed of cars?**

- ☐ Greatly reduced speeds
- ☐ Reduced speeds
- ☐ Did not affect speeds
- ☐ Increased speeds
- ☐ Greatly increased speeds

**How did the intervention make you feel about safety crossing this street?**

- ☐ Much safer
- ☐ Safer
- ☐ More insecure
- ☐ Much more insecure

# ANNEX II - CONFISCO'S QUESTIONNAIRE

**How old are you?**

---

**With which gender do you identify?**

- ☐ Female
- ☐ Male
- ☐ Other
- ☐ Rather not answer

**What is the highest degree or level of education you have completed?**

- ☐ None
- ☐ Incomplete Elementary or Middle School
- ☐ Complete Middle School
- ☐ Incomplete High School
- ☐ Complete High School
- ☐ Incomplete Bachelor's Degree
- ☐ Complete Bachelor's Degree
- ☐ Incomplete Post Graduation
- ☐ Complete Post Graduation
- ☐ Other
- ☐ Rather not answer

**How do you define your color (based on the IBGE classifications)?**

- ☐ White
- ☐ Brown
- ☐ Black
- ☐ Yellow
- ☐ Indigenous
- ☐ Rather not answer

**What's your profession? Are you a student currently?**

---

**Do you live, work or study in this neighborhood?**

- ☐ Live
- ☐ Work
- ☐ Study
- ☐ None of the options

**Reason for being here today**

- ☐ Work or commuting to work
- ☐ Study or commuting to study
- ☐ Resident or commuting home
- ☐ Shopping or going shopping
- ☐ On-site leisure/tour
- ☐ Going for leisure/walking
- ☐ Rather not answer
- ☐ Other

**How did you arrive or how are you commuting here today?**

- ☐ On foot
- ☐ Bicycle
- ☐ Subway
- ☐ Bus
- ☐ Taxi or private car services (Ex. Uber, Cabify etc.)
- ☐ Private car as the driver
- ☐ Private car, as a ride
- ☐ Motorcycle

**If you came by car, what do you think of the parking lots:**

- ☐ Very good
- ☐ Good
- ☐ Bad
- ☐ Too bad

**If you came by bicycle, how do you rate the safety to get here:**

- ☐ Totally safe
- ☐ Safe
- ☐ Insecure
- ☐ Totally insecure

**Which means of transport do you use in general?**

- ☐ On foot
- ☐ Bicycle
- ☐ Subway
- ☐ Bus
- ☐ Taxi or private car services (Ex. Uber, Cabify etc.)
- ☐ Private car as the driver
- ☐ Private car, as a ride
- ☐ Motorcycle
- ☐ Other

**Which means would you like to use more?**

- ☐ On foot
- ☐ Bicycle
- ☐ Subway
- ☐ Bus
- ☐ Taxi or private car services (Ex. Uber, Cabify etc.)
- ☐ Private car as the driver
- ☐ Private car, as a ride

- ☐ Motorcycle
- ☐ Other
- ☐ None

**How safe do you feel about traffic by car in this location?**

- ☐ Totally safe when crossing the street on foot
- ☐ Safe, but with some difficulty crossing the street on foot
- ☐ Insecure when crossing the street on foot, but I don't change my way
- ☐ Totally insecure, I avoid crossing the street at some point

**What do you think of the sidewalks at this location?**

- ☐ Great, I have no problems walking through them
- ☐ Good, I have no difficulty walking through them
- ☐ Bad, I have some difficulty walking through them
- ☐ Terrible, I have a hard time walking on the sidewalk

**Are you aware that there was an intervention in the public and road space of this place, carried out by the city hall?**

- ☐ Yes
- ☐ No

**Did you make use of this temporary intervention? That is, did you ever frequent this space?**

- ☐ Yes
- ☐ No

**How did the intervention make you feel about motor traffic around the school?**

- ☐ Much safer
- ☐ Safer
- ☐ More insecure
- ☐ Much more insecure

**If you frequented the area by car, how did you rate the changes?**

- ☐ Very satisfactory
- ☐ Satisfactory
- ☐ Unsatisfactory
- ☐ Very unsatisfactory

**If you frequented the area by car, how did you rate the issue of parking?**

- ☐ Very satisfactory
- ☐ Satisfactory
- ☐ Unsatisfactory
- ☐ Very unsatisfactory

**How did the intervention influence the speed of cars?**

- ☐ Greatly reduced speeds
- ☐ Reduced speeds
- ☐ Did not affect speeds
- ☐ Increased speeds
- ☐ Greatly increased speeds

**How did the intervention make you feel about safety crossing this street?**

- ☐ Much safer
- ☐ Safer
- ☐ More insecure
- ☐ Much more insecure

**Overall, how would you evaluate the temporary intervention?**

- ☐ Positive
- ☐ Neutral
- ☐ Negative



**Would you like the intervention:**

- ☐ To come back
- ☐ To come back, but with small changes
- ☐ I don't care if it comes back or not
- ☐ To be completely reworked
- ☐ I'm against carrying out similar interventions

**In your opinion, which aspects can be improved with a fixed intervention?**

---

# ANNEX III - SANTA TEREZA'S QUESTIONNAIRE

**How old are you?**

---

**With which gender do you identify?**

- ☐ Female
- ☐ Male
- ☐ Other
- ☐ Rather not answer

**What is the highest degree or level of education you have completed?**

- ☐ None
- ☐ Incomplete Elementary or Middle School
- ☐ Complete Middle School
- ☐ Incomplete High School
- ☐ Complete High School
- ☐ Incomplete Bachelor's Degree
- ☐ Complete Bachelor's Degree
- ☐ Incomplete Post Graduation
- ☐ Complete Post Graduation
- ☐ Other
- ☐ Rather not answer

**How do you define your color (based on the IBGE classifications)?**

- ☐ White
- ☐ Brown
- ☐ Black
- ☐ Yellow
- ☐ Indigenous
- ☐ Rather not answer

**What's your profession? Are you a student currently?**

---

**Do you live, work or study in this neighborhood?**

- ☐ Live
- ☐ Work
- ☐ Study
- ☐ None of the options

**Reason for being here today**

- ☐ Work or commuting to work
- ☐ Study or commuting to study
- ☐ Resident or commuting home
- ☐ Shopping or going shopping
- ☐ On-site leisure/tour
- ☐ Going for leisure/walking
- ☐ Rather not answer
- ☐ Other

**How did you arrive or how are you commuting here today?**

- ☐ On foot
- ☐ Bicycle
- ☐ Subway
- ☐ Bus
- ☐ Taxi or private car services (Ex. Uber, Cabify etc.)
- ☐ Private car as the driver
- ☐ Private car, as a ride
- ☐ Motorcycle

**If you came by car, what do you think of the parking lots:**

- ☐ Very good
- ☐ Good
- ☐ Bad
- ☐ Too bad

**If you came by bicycle, how do you rate the safety to get here?**

- ☐ Totally safe
- ☐ Safe
- ☐ Insecure
- ☐ Totally insecure

**Which means of transport do you use in general?**

- ☐ On foot
- ☐ Bicycle
- ☐ Subway
- ☐ Bus
- ☐ Taxi or private car services (Ex. Uber, Cabify etc.)
- ☐ Private car as the driver
- ☐ Private car, as a ride
- ☐ Motorcycle
- ☐ Other

**Which means would you like to use more?**

- ☐ On foot
- ☐ Bicycle
- ☐ Subway
- ☐ Bus
- ☐ Taxi or private car services (Ex. Uber, Cabify etc.)
- ☐ Private car as the driver
- ☐ Private car, as a ride

- Motorcycle
- Other
- None

**How safe do you feel about traffic by car in this location?**

- Totally safe when crossing the street on foot
- Safe, but with some difficulty crossing the street on foot
- Insecure when crossing the street on foot, but I don't change my way
- Totally insecure, I avoid crossing the street at some point

**When do you use the square?**

- Every day
- Only weekdays, during the day
- Only weekdays, at night
- Only on weekends, during the day
- Only on weekends, at night
- I only use it sporadically
- It's the first time I come

**How do you use the square currently?**

- Walk with the dog
- For the child to play (slide, hopscotch)
- Play soccer
- Uses the old square benches
- Uses the banks installed in the intervention
- I'm just passing through

**What do you think of the sidewalks at this location?**

- Great, I have no problems walking through them
- Good, I have no difficulty walking through them
- Bad, I have some difficulty walking through them
- Terrible, I have a hard time walking on the sidewalk

**Are you aware of the reformulation of this location and did you know the square before the intervention?**

- ☐ Yes
- ☐ No

**If you have come by car, how do you evaluate the intervention?**

- ☐ Very satisfactory
- ☐ Satisfactory
- ☐ Neither satisfactory nor unsatisfactory
- ☐ Unsatisfactory
- ☐ Very unsatisfactory

**If you have come by car, how do you evaluate the car parking after the intervention?**

- ☐ Very satisfactory
- ☐ Satisfactory
- ☐ Neither satisfactory nor unsatisfactory
- ☐ Unsatisfactory
- ☐ Very unsatisfactory

**Did the change in the path of cars and the construction of the square influence the speed of cars?**

- ☐ Greatly reduced speeds
- ☐ Reduced speeds
- ☐ Did not affect speeds
- ☐ Increased speeds
- ☐ Greatly increased speeds
- ☐ Don't know

**Did you use the square before the intervention?**

- ☐ Yes
- ☐ No



**Has the intervention changed the way you use the square?**

- ☐ Yes
- ☐ No

**After carrying out the intervention, did you stop using the square for a period? Why?**

- ☐ Yes, due to the presence of homeless people
- ☐ Yes, due to lack of lighting
- ☐ Yes, due to the degradation of the furniture
- ☐ Yes, due to lack of time or change of routine
- ☐ Yes, because the people who used to go with me stopped going
- ☐ Yes, by the distance from home
- ☐ Yes, because I moved
- ☐ Yes, because I changed jobs
- ☐ Yes, because I changed schools
- ☐ Yes, because of the pandemic
- ☐ No, I continued using the square normally
- ☐ No, I continued using the square, but in more restricted areas

**Are you by bicycle or came by bike?**

- ☐ Yes
- ☐ No

# ANNEX III - SANTA TEREZA'S QUESTIONNAIRE (CYCLISTS)

## Who is answering this questionnaire?

- ☐ Cyclist who entered by QR Code or link
- ☐ Interviewer

## Place

- ☐ Top of the viaduct
- ☐ Lower part of the viaduct
- ☐ Crossing or area outside the viaduct - Santa Tereza
- ☐ Crossing or area outside the viaduct - Santa Efigênia

## Day and time

---

## How old are you?

---

## With which gender do you identify?

- ☐ Female
- ☐ Male
- ☐ Other
- ☐ Rather not answer

## What is the highest degree or level of education you have completed?

- ☐ None
- ☐ Incomplete Elementary or Middle School
- ☐ Complete Middle School
- ☐ Incomplete High School
- ☐ Complete High School
- ☐ Incomplete Bachelor's Degree

- Complete Bachelor's Degree
- Incomplete Post Graduation
- Complete Post Graduation
- Other
- Rather not answer

**How do you define your color (based on the IBGE classifications)?**

- White
- Brown
- Black
- Yellow
- Indigenous
- Rather not answer

**What's your profession? Are you a student currently?**

---

**Which means of transport do you use in general?**

- ☐ On foot
- ☐ Bicycle
- ☐ Subway
- ☐ Bus
- ☐ Taxi or private car services (Ex. Uber, Cabify etc.)
- ☐ Private car as the driver
- ☐ Private car, as a ride
- ☐ Motorcycle
- ☐ Other

**Which means would you like to use more?**

- ☐ On foot
- ☐ Bicycle
- ☐ Subway
- ☐ Bus
- ☐ Taxi or private car services (Ex. Uber, Cabify etc.)
- ☐ Private car as the driver
- ☐ Private car, as a ride
- ☐ Motorcycle
- ☐ Other
- ☐ None

**Do you know about the implementation of a bike lane on José Maria Torres Leal viaduct?**



- ☐ Yes
- ☐ No

**Did you ride by bicycle on José Maria Torres Leal viaduct before and after the bike lane implementation?**

- ☐ Yes
- ☐ No, only after implementing
- ☐ No, only before the implementation
- ☐ I never passed the viaduct

**For what kind of displacement do you use the viaduct bike lane for?**

- ☐ Work
- ☐ Study
- ☐ Shopping
- ☐ Leisure/walk
- ☐ Cycling sport practice
- ☐ To take a child to school

**When do you usually use the viaduct bike lane?**

- ☐ Every day
- ☐ Only weekdays, during the day
- ☐ Only weekdays, at night
- ☐ Only on weekends, during the day
- ☐ Only on weekends, at night
- ☐ I only use it sporadically
- ☐ It's the first time I use

**How safe do you feel cycling in this location (José Maria Torres Leal viaduct)?**

- ☐ Totally safe
- ☐ Safe
- ☐ Unsafe
- ☐ Totally unsafe

**Regarding safety, how did implementing the bike lane make you feel?**

- ☐ Much safer
- ☐ Safer
- ☐ Didn't influence my sense of security
- ☐ Insecure
- ☐ Much insecure

**Do you know about the implementation of speed reduction treatment in stretches of Paraisópolis, Dores do Indaiá and Conselheiro Rocha streets, with the receipt of signaling indicating 30km/h Zone and sharing the road between cars and bicycles?**

- ☐ Yes
- ☐ No

**How do you evaluate the measures carried out for speed reduction treatment?**

- ☐ Totally sufficient
- ☐ Sufficient, but it could be supplemented
- ☐ Insufficient, there is a need to implement other measures
- ☐ Totally insufficient, the intervention needed to be completely redone

**How did the 30km/h Zone implementation influence the speed of cars?**

- ☐ Greatly reduced speeds
- ☐ Reduced speeds
- ☐ Did not affect speeds
- ☐ Increased speeds
- ☐ Greatly increased speeds
- ☐ Don't know

**When do you usually use these streets?**

- ☐ Every day
- ☐ Only weekdays, during the day
- ☐ Only weekdays, at night
- ☐ Only on weekends, during the day
- ☐ Only on weekends, at night
- ☐ I only use it sporadically



**How safe do you feel cycling through this location?**

- ☐ Totally safe
- ☐ Safe
- ☐ Unsafe
- ☐ Totally unsafe

**Regarding safety, how has the 30km/h Zone implantation made you feel?**

- ☐ Much safer
- ☐ Safer
- ☐ Didn't influence my sense of security
- ☐ Insecure
- ☐ Much insecure

# ANNEX V - SEMI-STRUCTURED INTERVIEW

1. What is your name?
2. How old are you?
3. Do you live in this neighborhood? For how long? Have you always lived in the same house, or have you moved within the neighborhood?
4. Do you work in this neighborhood? For how long?
5. In case you work, where do you live and how do you get to work?
6. How do you see the neighborhood today? Is it a good place to be? Has it gotten better or worse in recent years?
7. What is your opinion about the city and neighborhood traffic? How does traffic affect your daily life?
8. What is your opinion about the city and neighborhood sidewalks?
9. Are you afraid of traffic in the city or in the neighborhood? Have you ever had an accident or felt threatened in any way? What about when walking?
10. Are you aware that there was an intervention in the road space, carried out by the city hall?
11. Did you already know this space before the intervention? Do you think it changed the flow of people? In what way? Has it affected your perception of security?
12. What improvements do you believe the intervention brought?
13. What problems do you believe the intervention brought?
14. In your opinion, what changes could be made to make the intervention better?
15. How did the intervention affect you personally?

**16. (CONFISCO) How do you evaluate the implementation of the intervention and the situation after it was dismantled?**

**17. (CONFISCO) Would you like the intervention to be repackaged?**



# Urban Pathways



**Wuppertal  
Institut**

**UNHABITAT**  
FOR A BETTER URBAN FUTURE

**UN**   
environment  
programme



More information about the  
Urban Pathways project can be found at:

**[WWW.URBAN-PATHWAYS.ORG](http://WWW.URBAN-PATHWAYS.ORG)**