

The public space as tool to enhance urban informal settlements in Colombia

A case study in the Aguacatal neighborhood in Cali

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Laura Sofía Roldán Becerra:

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ABSTRACT

Like many Latin American cities, Cali is characterized for being a city with fragmented development, where there is a formally planned and structured central part, and in parallel, there are informal settlements on the city’s periphery. This urban growth is mainly based on socio-spatial segregation, with informal settlements far from the main urban corridor, first necessity services, collective facilities, and urban opportunities in general. In this context, public space becomes a crucial element in addressing these needs, as its proper configuration, connection, and equitable access can play a significant role in improving the quality of life and social integration of these populations.

This thesis aims to formulate design strategies addressing food security, water access, sanitation, waste collection, and improved accessibility within the informal settlements through a case study located in the Aguacatal neighborhood in Cali, Colombia. The proposal seeks to improve living conditions in informal settlements by strategically transforming the residual public areas into appropriately designed collective space solutions that meet unsatisfied basic needs. Finally, integrating these strategies holds the potential to create a strategic methodology that contributes to proposing appropriate and contextualized answers in other parts of the city with similar characteristics, establishing vital relations with the city’s long-term urban projects.

KEYWORDS

Public Space, Informal Settlements, Basic needs

INTRODUCTION

The imprint of violence and the accelerated process of industrialization that have framed the history of Colombia, as in many Latin American countries, have also left scars on the evolution and urban growth of their cities. This has resulted in disorderly and inequitable informal settlements, the majority of which are made up of rural residents who have moved to cities. Furthermore, this urban growth towards the periphery is supported by a socio-spatial segregation in which the informal settlements are regularly located far from the main urban corridor, collective facilities, basic services and in general from the opportunities offered by the city (Castillo-Valencia & Vivas, 2023).

One of the most affected cities by this type of urban development has been Cali in the Department of Valle del Cauca. Particularly, the composition of informal settlements in Cali is divided into two large zones: The first is located in the hillside zone on the western periphery, where the population is located in mountainous areas that make them vulnerable to events such as landslides. The second zone corresponds to the eastern periphery of the city and is located at the border of the Cauca River on a flat area of the city, prone to flooding due to the increase in the river bed. (López, 2022). All this has led organizations such as the Municipal Secretariat of Social Housing and Habitat to recognize Cali as a “city of invasions” (El País, 2013).

Government policies in Colombia acknowledge the urgency of addressing informal settlements, yet interventions remain limited to housing subsidies and basic infrastructure, overlooking the vital need for social habitat construction, particularly in the development of public spaces and the provision of basic services. In response, this thesis aims to formulate design strategies to tackle critical aspects such as food security, water access, sanitation, waste collection, and improved accessibility. Taking as a case study one of the informal settlements in northwestern Cali, specifically in the Aguacatal neighborhood, the project emphasizes the transformation of currently neglected public spaces, considered residual, into purposefully designed areas that can serve as integral components to address the multifaceted needs of the community. For these purposes, the thesis contextualizes its analysis at national and regional levels before delving into specific challenges faced by Cali, including urban planning deficiencies and integration issues with peripheral areas. The text further examines the socio-economic and environmental conditions of northwestern Cali and the Aguacatal neighborhood. Drawing on reference projects, the proposed strategies aim to enhance community quality of life and serve as a model to incentivize appropriate and contextualized projects in sectors with similar characteristics and integrate them with the future strategic projects of the city.

PROBLEM STATEMENT

Colombia is a country that has faced profound problems of violence and migration processes that have had a direct impact on the development and urbanization of its cities. This has led to unplanned and inequitable urban growth, closely tied to forced displacement resulting from internal armed conflict. According to UNHCR*, in September 2022 there were 8’336.061 displaced persons who migrated from the countryside to the cities (UNHCR, 2022). In this sense, faced with the need for housing, the victim population that arrives, displaced from the countryside, begins to concentrate in the peripheral areas of the city, seeking an alternative to habitability.

According to the Public Policy for the Integral Improvement of Habitat or “MiHábitat”, the informal settlements include precarious human settlements that concentrate households in urban or rural areas with irregular land tenure and are characterized by inadequate housing conditions. In addition, the inhabitants often face the challenge of limited or restricted access to urban mobility infrastructure, public services in the area, as well as basic and complementary facilities. (Municipal Council of Santiago de Cali, 2017). One of the cities most affected in its urban development by the internal armed conflict has been Cali in the Department of Valle del Cauca. According to the National Registry of Victims of December 01 2022, 192.816 victims had been identified as living in the city, placing Cali within the top five cities receiving victims of the armed conflict in the country (Ortiz & Franco, 2023).

From this context, in 2017 the MiHábitat Public Policy was adopted as a roadmap to improve the living conditions of the inhabitants of informal settlements. This policy is reinforced in 2020 by being included for the first time as a goal of the Cali District Development Plan, to achieve a more equitable and sustainable territory (Ortiz & Franco, 2023). However, despite these advances in public policy and the fact that the informal settlements are already registered by government institutions as areas in urgent need of intervention, the reality is that the programs and projects implemented continue to be very precarious. Particularly, interventions have been limited to housing subsidies, some paving and the installation of a few public service networks, leaving aside the need to invest in the social construction of the habitat through public spaces (Peláez & Franco, 2019).

Repairing this gap in territorial and collective terms is urgent, as the construction of habitat not only corrects urban imbalances, facilitates access to public services, and guarantees citizens’ rights but also enhances the quality of life for populations living in informal settlements by creating public spaces that promote community engagement and social cohesion. Under this backdrop, the question that guides this project arises:

UNHCR* United Nations High Commissioner for Refugees

How to transform the public space with the aim of meeting unsatisfied basic needs in order to contribute to the improvement of the quality of life in informal settlements?

OBJECTIVES

Scope

The scope of this research is to analyze how the transformation of public space can become a strategy that contributes to the improvement of the quality of life of the inhabitants of informal settlements, through an integral vision that takes into account the specific requirements of the community and generates a proposal that addresses unsatisfied basic needs and integrates them with the long-term vision of the city.

General objective

This thesis’s general objective is to develop strategies that could improve the supply of food and food security, the access to water and its sanitation, the waste collection system, and the accessibility through the transformation of public space that is currently considered residual in the informal settlements. To do so, the research focused on analyzing a case study in an informal neighborhood called Aguacatal in the Colombian city of Cali.

Specific objectives

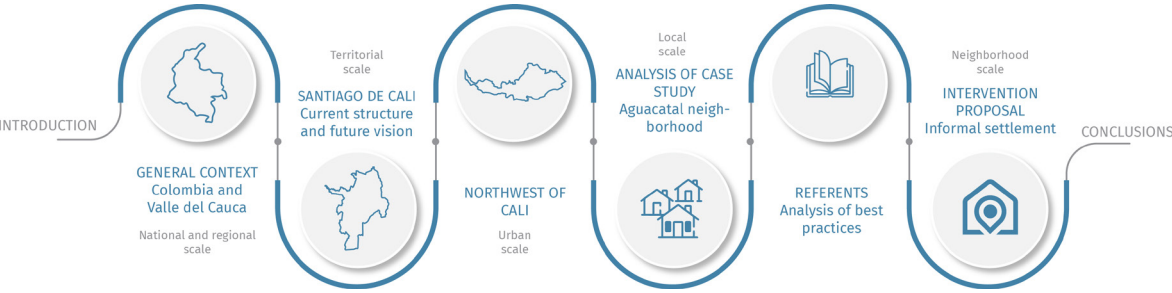
- 1. To analyze the territorial, political, social, and environmental structure of Cali.
- 2. To analyze the project vision proposed by the city of Cali.
- 3. To identify a possible intervention zone that connects the future strategic projects of the city and the informal settlements.
- 4. To identify the requirements of the community, prioritizing those of greatest need.
- 5. To define the strategies and tactics that will be applied in the areas identified for the creation and improvement of public space.
- 6. To propose a project at a micro-urban scale for the transformation of informal public space meeting some basic unsatisfied needs, that could be part of the city’s public space network and could serve as a model to be contextualized in areas with similar characteristics.

METHODOLOGY

This thesis will use a qualitative methodology, that as described in the book Architectural Research Methods by Linda N. Groat and David Wang (2013), “Qualitative research is multi-method in focus, involving an interpretive, naturalistic approach to its subject matter (...) Involves the studied use and collection of a variety of empirical materials.” pp. 218.

In parallel, a case study will be carried out together with a combined strategic intervention project in one of the informal hillside settlements located in the northwest of Cali in an area known as commune 1. In this context, the Aguacatal neighborhood will be chosen as the focus of the intervention. This approach integrates a theoretical and a practical component, complemented by data collection through a photographic report and visits to the area.

STRUCTURE



The thesis starts from a general perspective and then goes into the specific issues raised, working at scales from the national to the local level. It is structured into six chapters. The first chapter analyzes, in general terms the urban context, the geographical, historical and demographic conditions both at the national level in Colombia and at the regional level in Valle del Cauca. In the second chapter, a more detailed analysis of the current reality of the city of Santiago de Cali is carried out, exploring its urban planning and how it proposes strategic macro-projects to address different aspects of urban development. However, it highlights the lack of integration with the city's peripheral and informally developed areas.

The third chapter focuses on the northwest zone of the city, analyzing its socioeconomic and urban characteristics and detecting accessibility problems, the lack of adequate public spaces, poor river water quality, flooding and the location of informal settlements. These elements will become crucial for the selection of the project area. Following this premise, the fourth chapter moves into the analysis of a particular informal settlement in the Aguacatal neighborhood taken

as a case study. Here, the lack of basic and complementary services in the informal settlements is detailed, as well as the socioeconomic and environmental context of the area, providing a complete understanding of the situation in this specific context. Chapter five illustrates the analysis of some reference projects with similar characteristics that provide a deeper understanding of the processes, challenges, and practices associated with the resolution of problems in informal settlements.

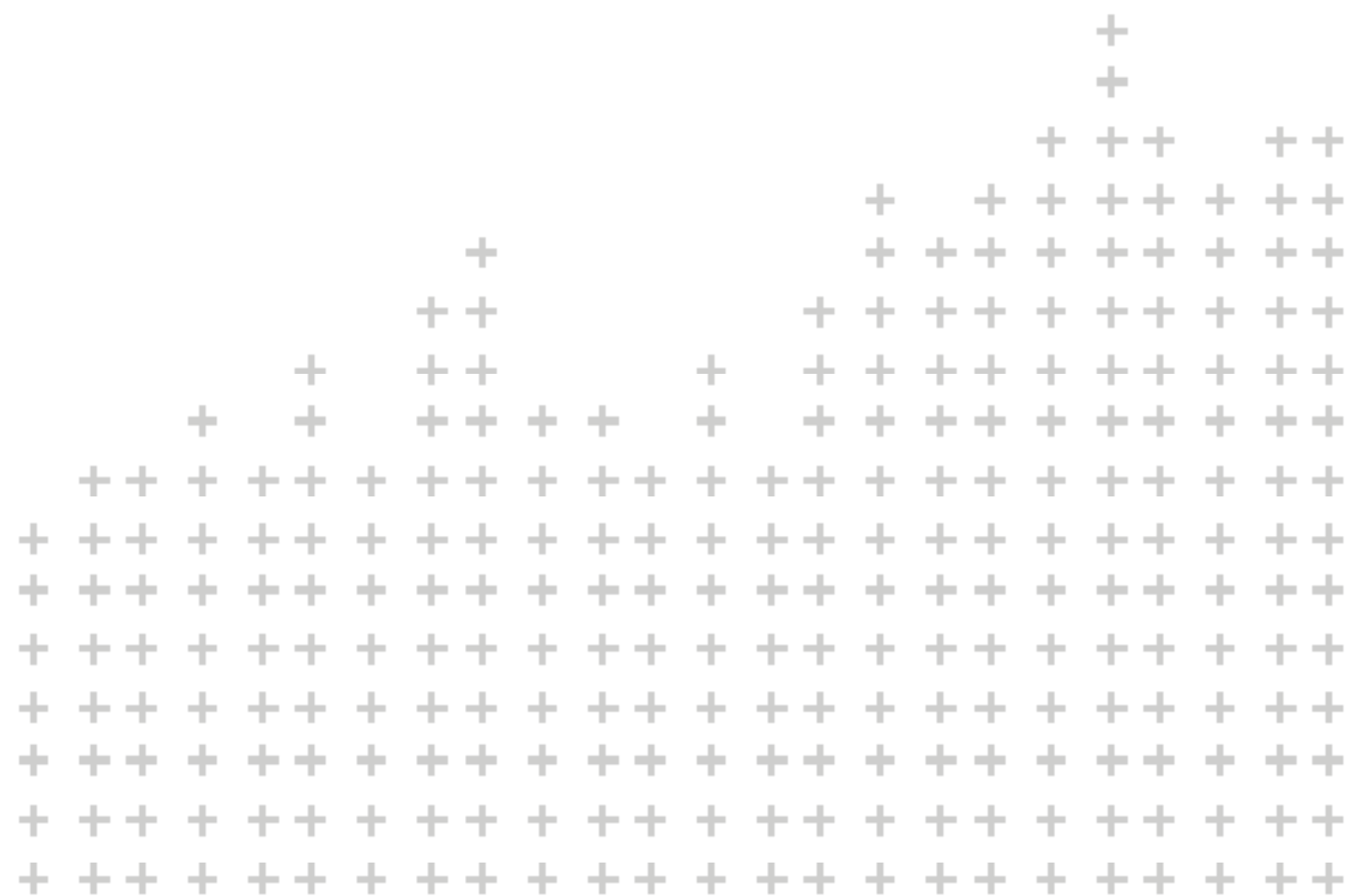
Finally, chapter 6 englobes the intervention proposal made for the existing public space through a series of strategies that contribute to improving the quality of life of the community in the Aguacatal neighborhood and that can be taken as a model applicable in other areas of the city with similar characteristics.

LIMITS OF THE RESEARCH

The research limits for this thesis are determined by several specific conditions associated with the geographic location and the actual social dynamics. These limits are broken down into the following points:

- Limited Access and Pedestrian Restrictions: given the pedestrian nature and limited access to the area where the case study is located, the ability of researchers to directly observe the social dynamics in the neighborhood is restricted. This prevents full immersion in the local environment, making first-hand data collection difficult.
- Insecurity in the neighborhood: The precarious state of the neighborhood presents an additional challenge. Unsafe conditions may hinder the physical presence of researchers in the area, making it difficult to conduct structured interviews or safely conduct direct observations.
- Potential Bias in Data Representation: Lack of direct access, limited information provided by geoportals, and reliance on limited sources could introduce biases in the representation of social dynamics in the neighborhood.

By recognizing and addressing these limitations in the research, the transparency and validity of the findings can be improved, as well as allowing for a more accurate interpretation of the results obtained.



GENERAL CONTEXT

Colombia and Valle del Cauca

Chapter 1

(1.1) Colombia

(1.1A) National context

Also known As Republic of Colombia • República de Colombia

Capital Bogotá.

Population (2023 est.) 53,717,000.

Official Language Spanish, 69 indigenous languages, 2 creole languages.

Total Area (Sq Km) 1,140,970.

Urban-Rural Population Urban (2018) 80.8% • Rural: (2018) 19.2%.

(The Information Architects of Encyclopaedia Britannica, n.d.).

Limits

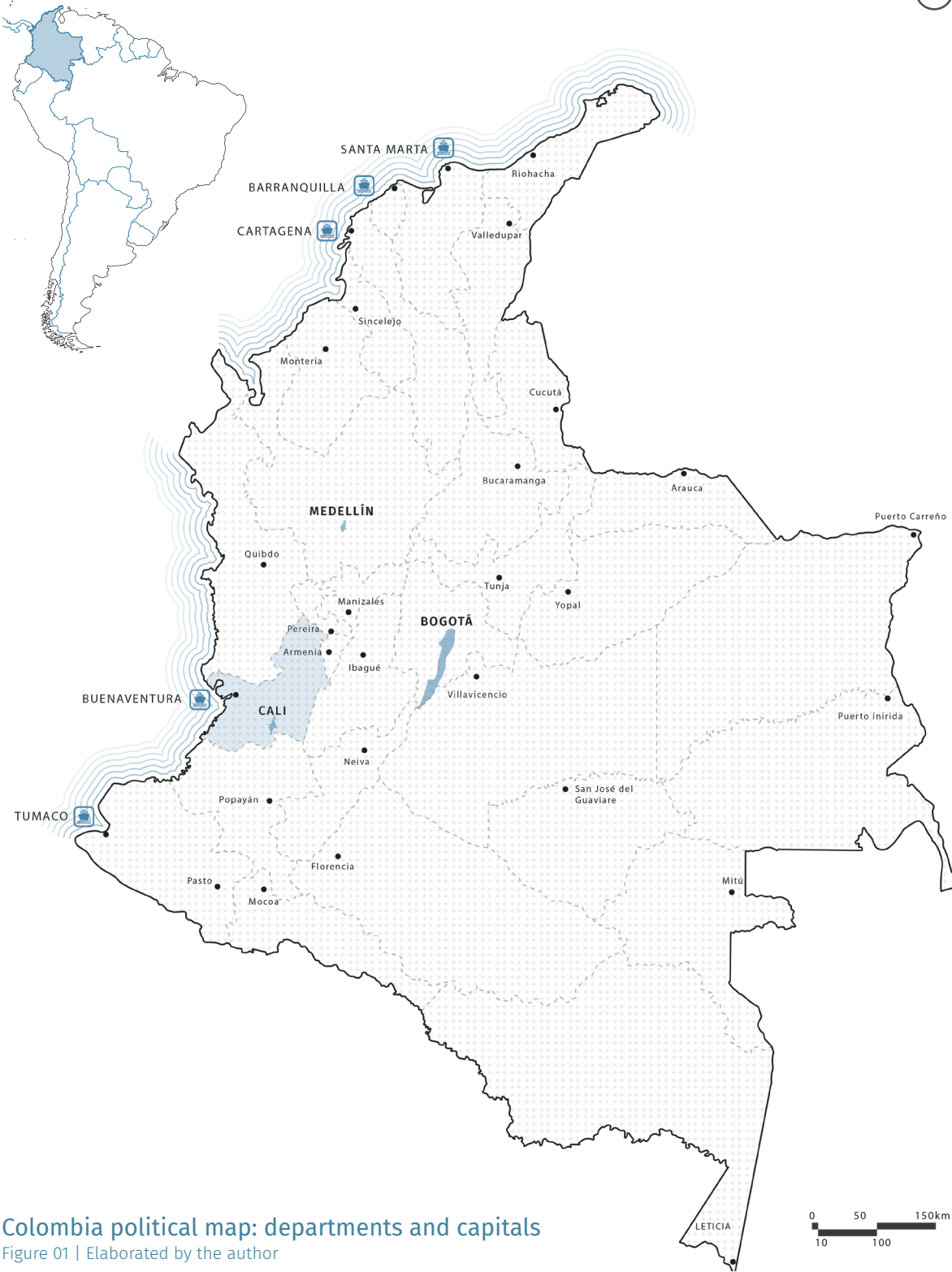
Colombia is a South American country bounded by two oceans and five countries.

- Limit to the NORTH: Panama (Northwest), the Atlantic Ocean and Venezuela (Northeast).
- Limit to the SOUTH: Peru and Ecuador (Southwest).
- Limit to the EAST: Brazil (Southeast).
- Limit to the WEST: Panama and the Pacific Ocean.

Is characterized by a diversity of landscapes, cultures and ethnic groups, reflecting its geographic, climatic and biological diversity, as well as its natural and historical heritage, which includes archaeological, colonial and modern sites. Some of its most fascinating places are the Andes, which cross the country from south to north, forming three branches with different altitudes and ecosystems; the Amazon rainforest, which covers 35% of the national territory and is home to a great biodiversity; the Caribbean Sea, which bathes the northern coast and offers coral reefs and natural parks; the Pacific Ocean, which borders the northern coast is characterized by its marine wealth and biodiversity; and the San Andrés Archipelago, which consists of three main islands and several cays and islets and has been declared a Biosphere Reserve by UNESCO. (Práctico, 2020).

Colombia is also famous for its production of coffee, flowers, emeralds and oil, which are some of its main exports and sources of income, is also recognized for its music, art and literature, which express its cultural identity and creativity.

South America: Colombia



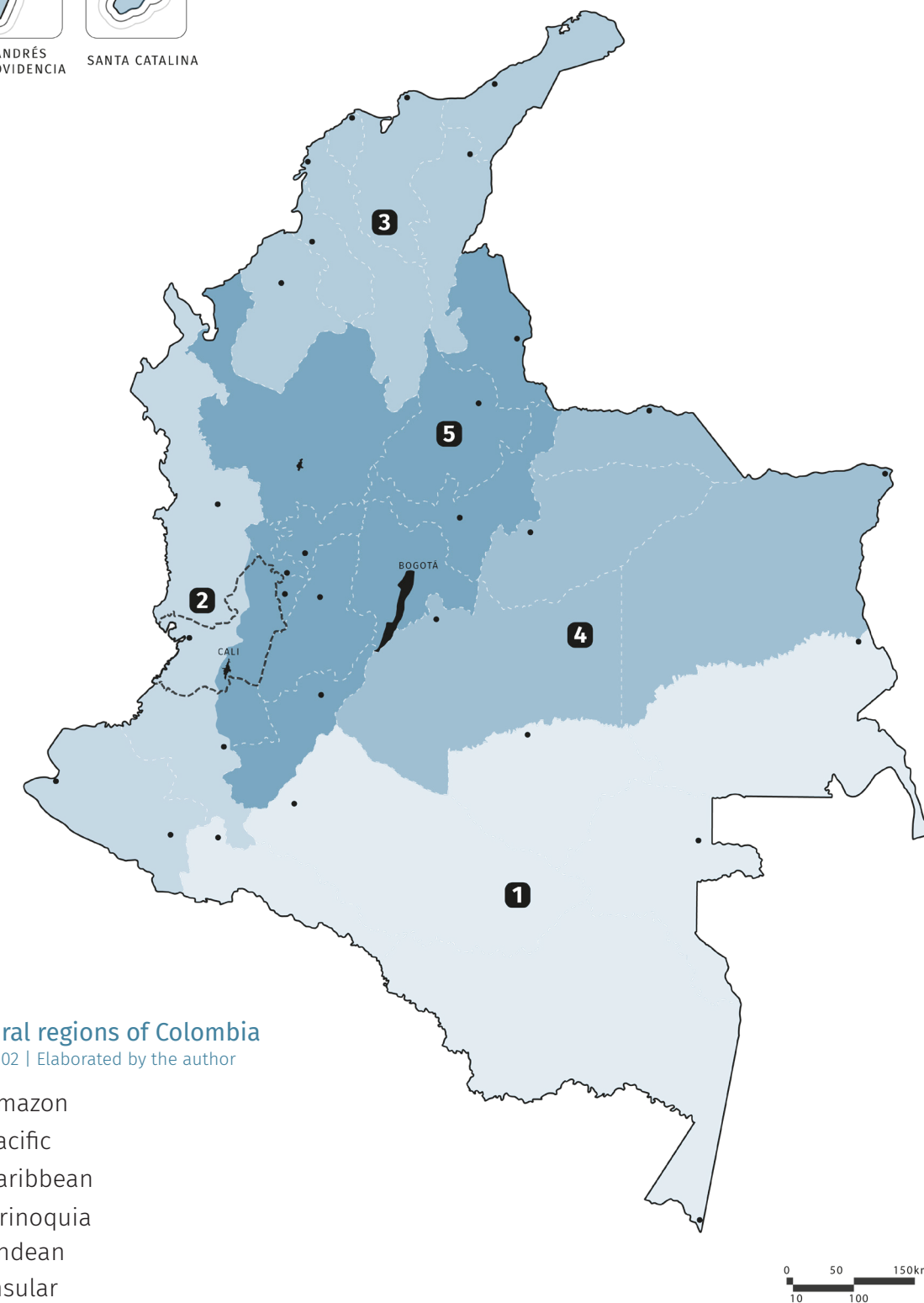
(1.1B) Natural regions

Geographical areas within a continent or nation known as “natural regions” are those whose environmental characteristics predominate.

- The Amazon region with a flat appearance in general, is covered, to a large extent, by jungle vegetation furrowed by large river currents.
- The Pacific region is largely made up of an extensive jungle plain, where humidity predominates.
- The Caribbean region comprises the northern part of the country. Its wide extension offers a very diverse physical aspect with noticeable variations in its relief and, as a consequence, in the climatic conditions.
- The Orinoquia includes the flat and undulating mountains. It is made up of extensive savannahs irrigated by tributaries of the Orinoco, where agricultural activity has intensified.
- **The Andean region** made up of the Western, Central and Eastern mountain ranges, presents a set of mountain valleys, plateaus and slopes, endowed with favorable conditions that facilitate the development of economic and cultural activities. This region concentrates most of the population and the highest socioeconomic level.
- The insular region is made up of the islands of San Andrés y Providencia and Santa Catalina. All this territory is located in the Caribbean Sea, northwest of the continental area. Its greatest development is observed by the sectors of commerce and tourism. (Portillo, 2022)

The Andean Region is located in the center of the country and has a wide range of thermal floors and the largest number of natural parks.

- It is the region with the largest number of habitants in Colombia: exactly 70% of the population.
- It has most of the economic activity: due to the water resources that it has, in addition to the lands that are so productive that they are used for agriculture. Other economic sectors come from the exploitation of oil and mining.
- It has three mountain ranges: within them we find a great wealth of natural geographical formations such as volcanoes, forests, moors, a great variety of water bodies (lakes, rivers, hot springs...), mining deposits, among others.
- Valle del Cauca department is located the Pacific region and mostly in the Andean region. (Portillo, 2022)



Natural regions of Colombia

Figure 02 | Elaborated by the author

- 1** Amazon
- 2** Pacific
- 3** Caribbean
- 4** Orinoquia
- 5** Andean
- 6** Insular

Legend

- Colombia perimeter
- - Valle del Cauca (Intervention sector)
- Capital cities

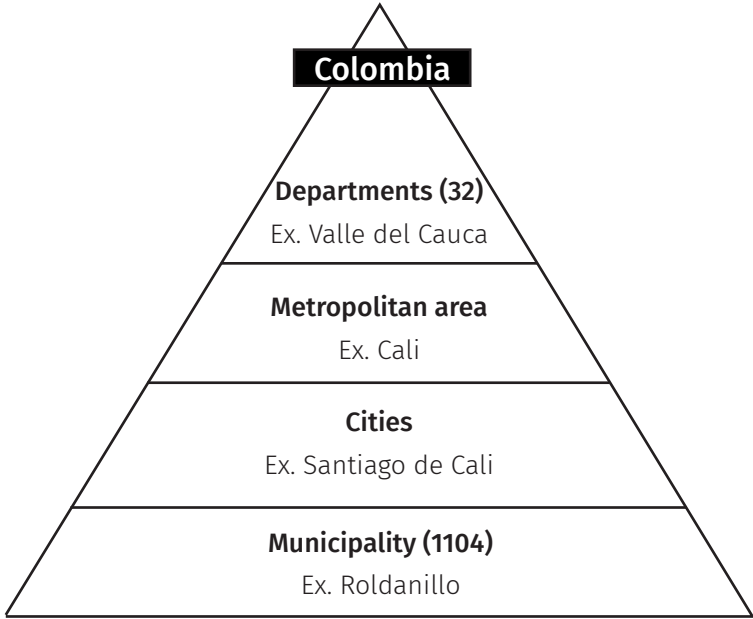
(1.1C) Territorial and political-administrative division

The Territorial and administrative division of Colombia country is the result of a historical process that has involved political, economic, social and cultural aspects.

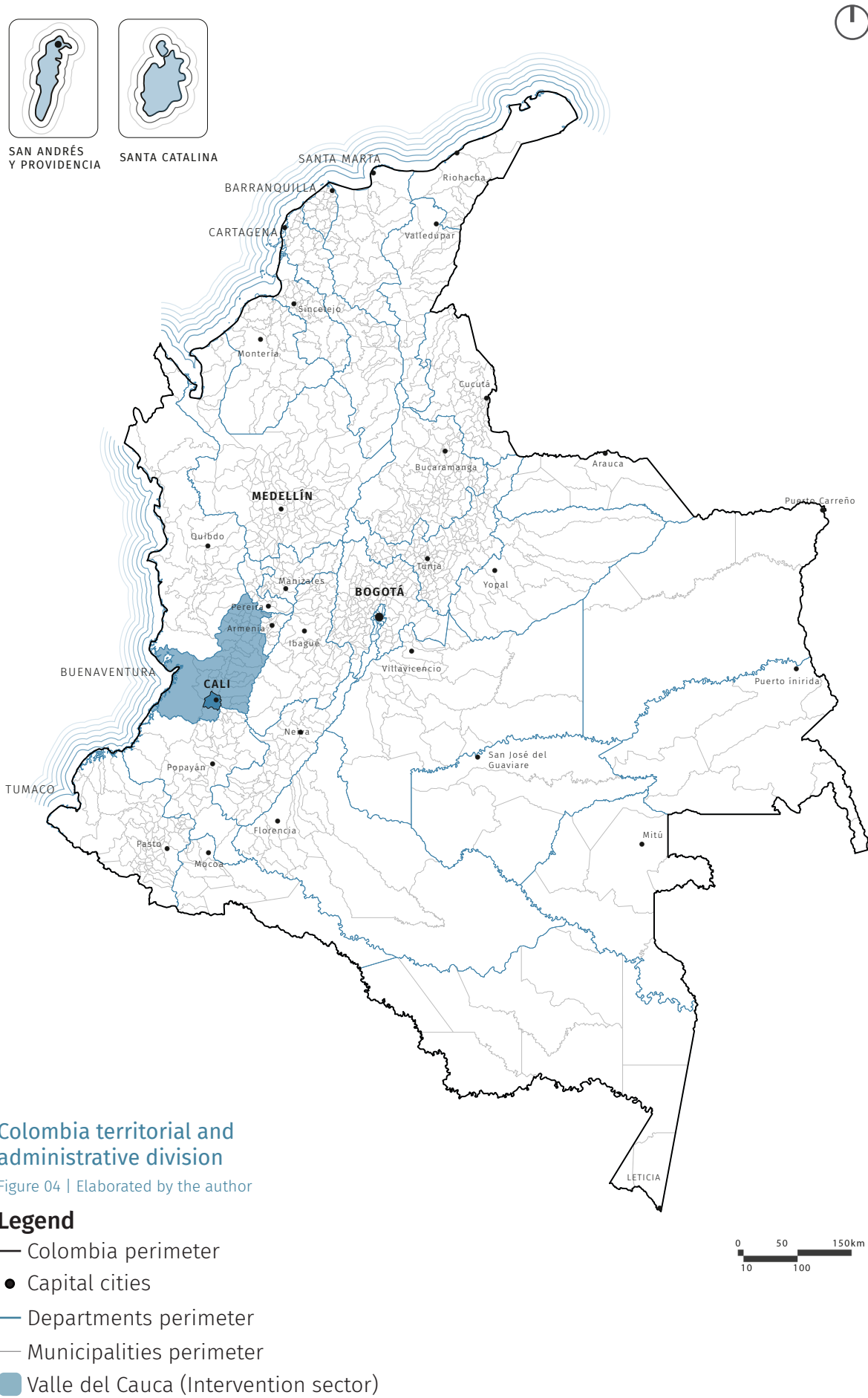
Currently, Colombia is divided into 32 departments and a capital district, which in turn are subdivided into municipalities, townships, villages and caseríos.

- The departments are first-order territorial entities, with administrative and financial autonomy, which are governed by their own constitution and elect their governors and departmental assemblies.
- Municipalities are second order territorial entities, with autonomy to manage their local affairs, which are governed by a municipal agreement and elect their mayors and municipal councils.
- The corregimientos, veredas and caseríos are internal divisions of the municipalities, which do not have legal status or administrative autonomy, but have local authorities such as corregidores, police inspectors and community action boards. Colombia’s territorial and administrative division seeks to guarantee the decentralization of power, citizen participation, regional development and the preservation of the country’s cultural diversity.

(Constitución Política de Colombia de 1991, 2011)



Territorial hierarchies in Colombia
Figure 03 | Elaborated by the author



Colombia territorial and administrative division
Figure 04 | Elaborated by the author

- Legend**
- Colombia perimeter
 - Capital cities
 - Departments perimeter
 - Municipalities perimeter
 - Valle del Cauca (Intervention sector)

(1.1D) Climate conditions

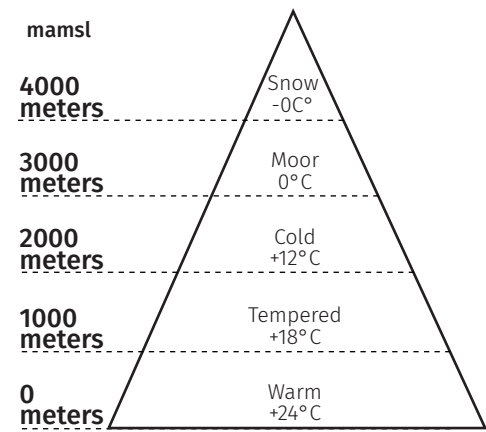
The Colombian territory is located in the intertropical zone of our planet. The climates of the different regions of the country vary due to the effect of the trade winds, humidity and the different thermal floors. Colombia does not have four seasons. The seasonal regime is bimodal and in almost all the territory there are two rainy seasons - from April to June and from August to November - and two summer periods.

Colombian climates can be classified in several ways, two of them are by their thermal floors and according to Caldas Lang.

Thermal floors | There are four thermal floors in Colombia: Paramo, cold, temperate and warm. Each thermal floor has a particular climate and a unique agricultural production.

- The warm thermal floor is characterized by high temperatures and low humidity, and is home to crops such as sugar cane, corn, cocoa, coconut, banana, cassava and rice.
- The temperate thermal floor has a medium temperature and medium humidity, and is optimal for growing coffee, pineapple and guadua.
- The cold thermal floor is characterized by low temperatures and medium humidity, and is home to crops such as eucalyptus, wheat and potatoes.
- The moor thermal floor is at very high altitudes and has very low temperatures and high humidity, and is home to species such as the frailejón and the condor.

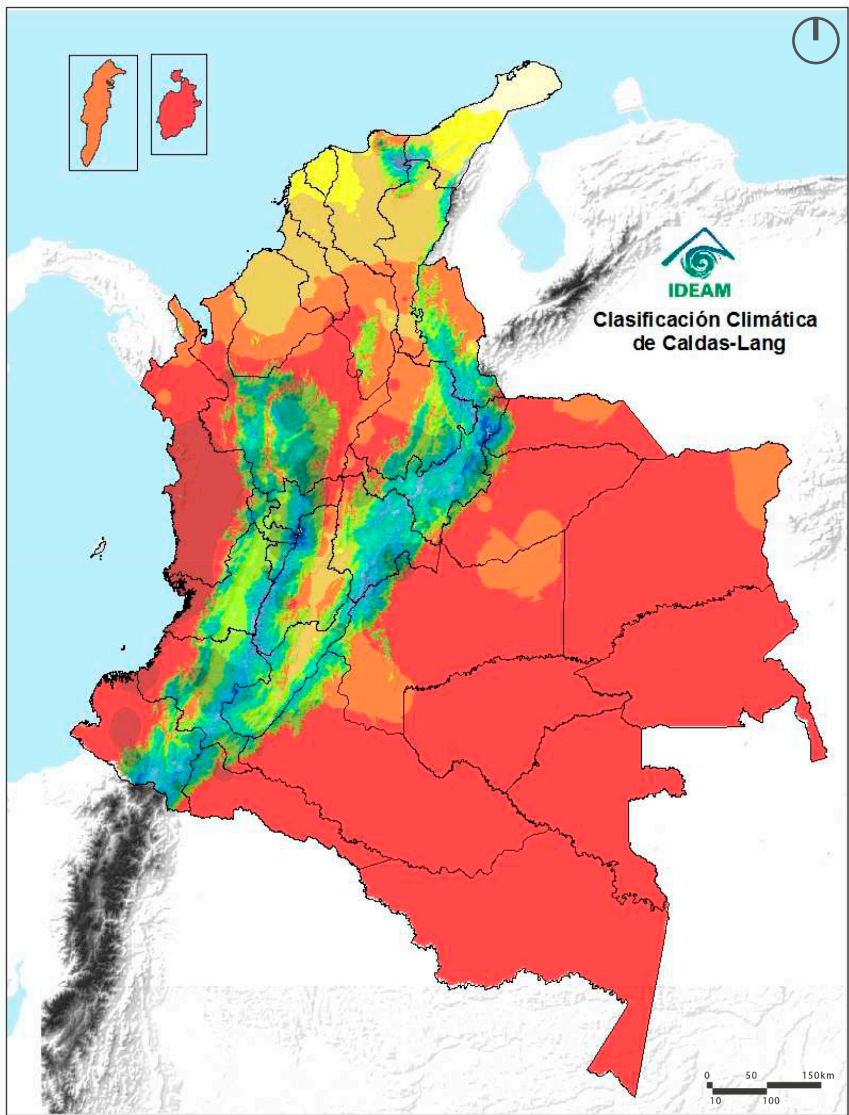
(Guevara, 2023)



Colombia's thermal floors
Figure 05 | Elaborated by the author

Caldas Lang | Colombia's climate according to Caldas Lang is divided into 25 climatic types. The classification is based on the interaction between temperature, altitude and humidity.

(CLIMA ANALISIS CLIMATICO - GALERÍA DE MAPAS - IDEAM, n.d.)



Climate classification by Caldas-Lang
Figure 06 | source: Subdirección Meteorológica. IDEAM.

- | | | |
|----------------------|----------------------|--------------------------------|
| Hot desert | Arid temperate | Very cold semi-humid |
| Hot arid | Temperate semiarid | Very cold humid |
| Hot semiarid | Temperate semi-humid | Very cold superhumid |
| Warm humid | Temperate humid | Extremely cold semi-humid |
| Warm superhumid | Temperate superhumid | Extremely cold semi-humid |
| Warm cold semi-humid | Cold arid | Extremely cold extremely humid |
| Warm semi-humid | Cold semi-humid | |
| Warm humid | Cold semi-humid | |
| Warm superhumid | Very cold semi-humid | |

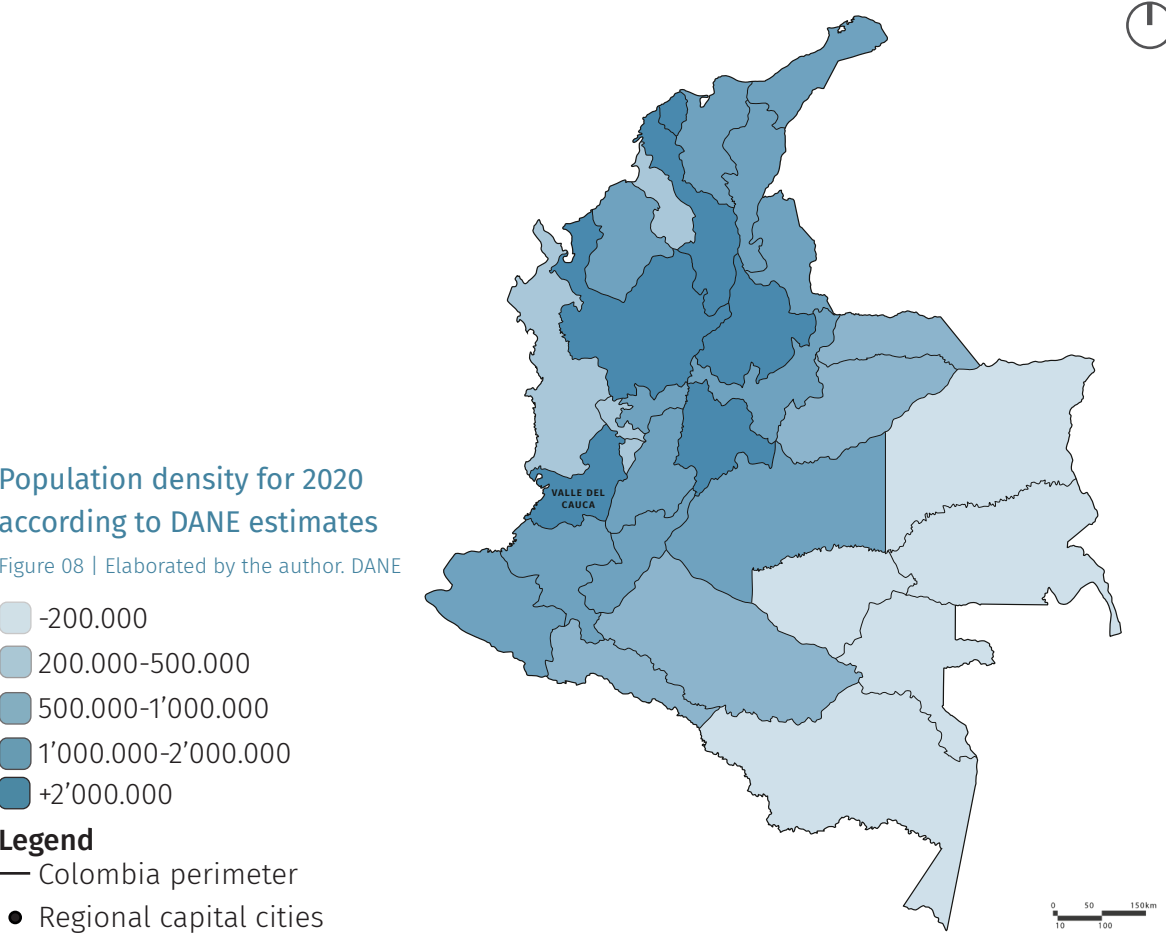
(1.1E) Population Density

Colombia is the second most populous country in Latin America and the 28th most populous in the world. Like many countries in the region, it has experienced rapid population growth, with a slight decline in recent decades. It is estimated that more than 7 million Colombians live outside the country for various reasons. However, thanks to economic improvements since the 2000s, living standards in urban centres have improved. (Colombia Population (2024) - Worldometer, n.d.)

Population	52'682.689
Density	45 inhab./km2
Growth rate	1.9%.
Birth rate	19.5
Mortality rate	6.1
Life expectancy	77 years
Males	75 years
Women	79 years
Fertility rate	1.78
Infant mortality rate	14.0

Population data table

Figure 07 | source: Worldometer



(1.1F) Socio Economic context: Monetary poverty

The monetary poverty index seeks to understand the proportion of people in households whose income does not allow them to cover the basic requirements of food, services, housing and education.

The National Administrative Department of Statistics (known as DANE) uses the Large Integrated Household Survey (GEIH) to calculate the total income received by the household and divides it by the total number of members of the household to understand the relative monetary income of each person.

Subsequently, it calculates the amount of money an individual needs to meet basic needs. For 2021, DANE established that the income each person needs to satisfy these needs is COP \$354,031- 82 € per month (this is the poverty line at a per capita level). For its part, the extreme poverty line is defined at a per capita income of COP \$161,099-37€.

The monetary poverty index for 2021 was 39.3% and the extreme poverty index was 12.2% of the total national population. (GIFMM Colombia, 2022).

Neighborhood in Cali in a situation of extreme poverty

Figure 09 | source: César Melgarejo. Tiempo, 2023



(1.1G) Socio Economic context: MPI

The Multidimensional Poverty Index (MPI) is a tool used by the national government to identify poverty levels based on dimensions and indicators. In Colombia, it was initially constructed by the DNP using the methodology of Alkire and Foster (2007). The main advantages of this methodology are that it provides an indicator of incidence, gap, and severity. (Colombia - Medición Pobreza Multidimensional - IPM 2014, 2022)

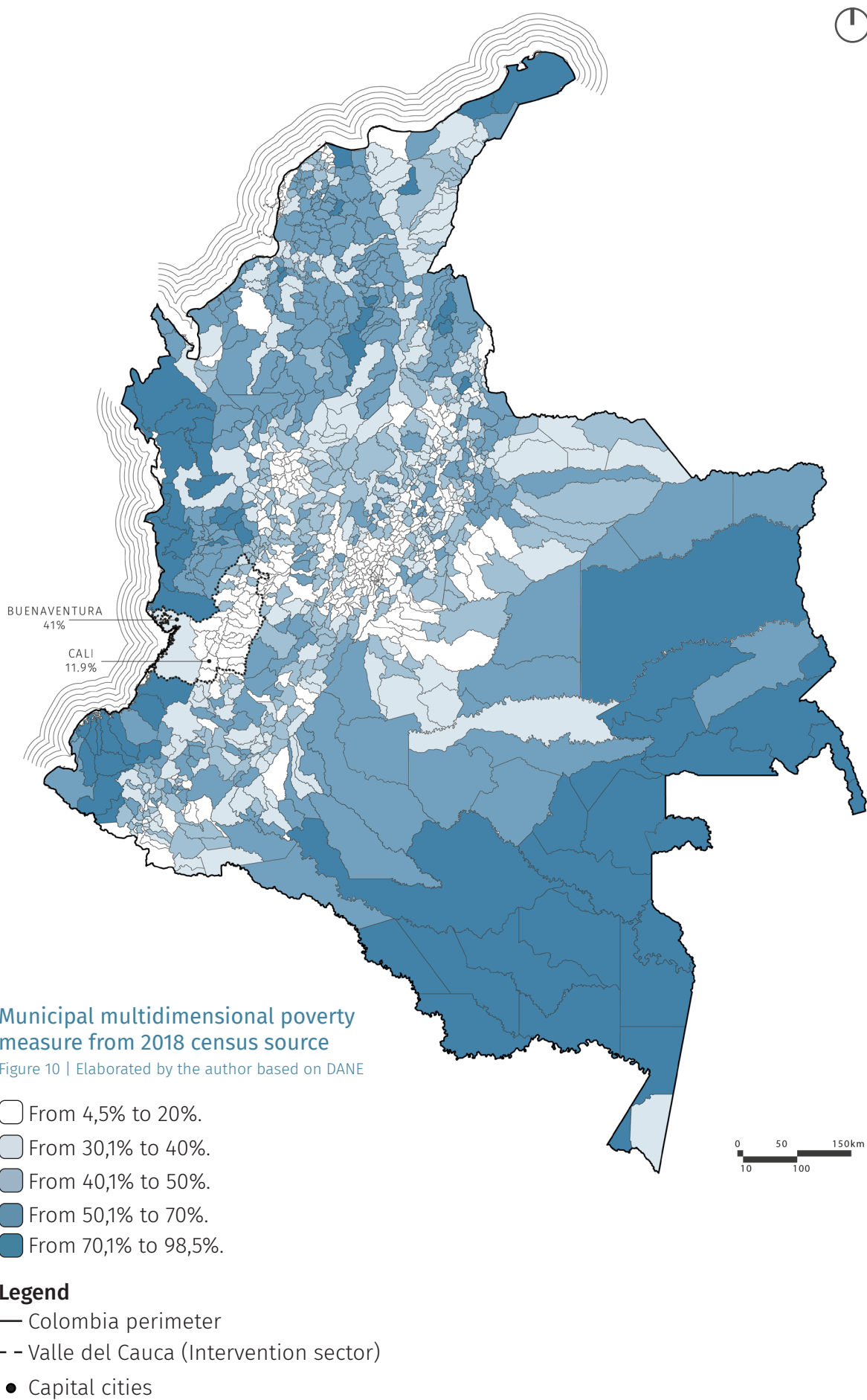
Recognising that poverty is more than just a lack of income, the government has improved its tools to identify individuals or households experiencing poverty, which is often associated with limited access to basic services such as education and health care, high infant mortality rates and reduced opportunities to engage with the wider community. For this purpose, the DNP has adapted a proposal to measure poverty across five dimensions: household, education conditions, childhood and youth conditions, labor, and health, as well as access to household utilities and living conditions. This approach enables public policymakers and governors to identify the necessary actions to overcome poverty in their respective territories with greater precision.

A minimum income per person is established to purchase a basket of food and non-food items that enable a satisfactory standard of living. Since poverty is measured by households (average of 4 persons), those below this minimum are considered poor households. This is known as the Poverty Line. (DEPARTAMENTO NACIONAL DE PLANEACIÓN Dirección de Desarrollo Social, 2016)

In Colombia, the highest levels of municipal multidimensional poverty are found predominantly in the Orinoco-Amazon and Pacific regions, and the lowest levels in municipalities located in the Central and Eastern regions of the country.

The municipal areas with the highest incidence rates of multidimensional poverty were Uribí (La Guajira) with 92.2%, Cumaribo (Vichada) with 91.4%, and Alto Baudó (Chocó) with 90.6%. Conversely, Sabaneta with 4.5%, Envigado with 4.9% in Antioquia, and Chía (Cundinamarca) with 6.7% had the lowest incidence of multidimensional poverty. (Medida De Pobreza Multidimensional Municipal De Fuente Censal 2018, n.d.)

DNP* Departamento Nacional de Planeación (National Planning Department)



(1.2) Valle del Cauca department
(1.2A) Regional context

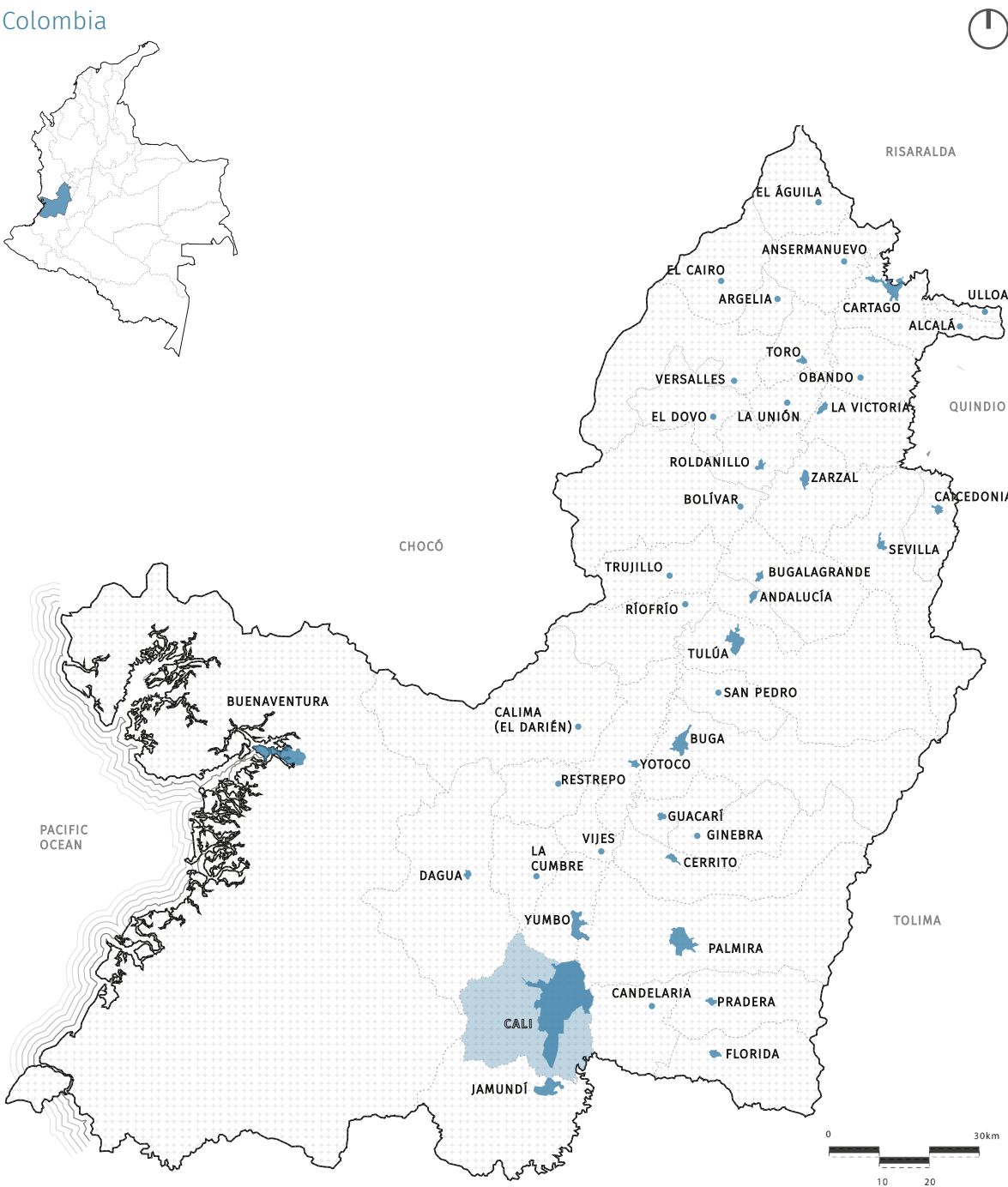
Ethnonym: Vallecaucano
Area: 22,140 km2
Population: 4,638,029 inhabitants
Density: 204.31 inhabitants/km2
Capital: Cali

Valle del Cauca is one of Colombia's 32 departments, created and registered in 1907 by citizen Ignacio Palau Valenzuela, a philanthropist and physician. His proposal was based on constitutional grounds, citing articles 5 and 45 of the 1886 National Constitution and addressing Popayán's misuse of resources in the province. (DANE 2023)

It is divided into 42 municipalities, 88 corregimientos and numerous hamlets and populated areas. The municipalities are grouped into 41 notarial districts, with a total of 69 notary's offices, one main registry district located in Cali and 7 sectional registry districts located in Buenaventura, Buga, Cartago, Palmira, Roldanillo, Sevilla and Tuluá; 2 judicial districts, Cali and Buga; the former includes the judicial districts of Cali, Palmira and Buenaventura; the latter includes the judicial districts of Buga, Cartago, Roldanillo, Tuluá and Sevilla. The department is part of the Valle del Cauca constituency.

It is located in the southwest of the country, in the Andean and Pacific regions. It has an area of 22,140 km2, which represents 1.9% of the national territory. It is bordered to the north by the departments of Chocó, Caldas and Quindío, to the east by the departments of Quindío and Tolima, to the south by the department of Cauca and to the west by the Pacific Ocean and the department of Chocó.

The department is well known for its sugar industry, which supplies the markets of Colombia and nearby countries. It is an important contributor to the national economy, according to 2005 statistics, in agriculture the valley contributes 5.37% of the national production. In fishery products, the Valle del Cauca region occupies the first place, contributing 36% of the country's total production. (Del Valle, n.d.).



Valle del Cauca: political and administrative map
Figure 11 | Elaborated by the author

- Legend**
- Santiago de Cali (Intervention sector)
 - Urban municipalities (42)
 - Valle Del Cauca perimeter
 - Municipalities division

(1.2B) Geography and topography



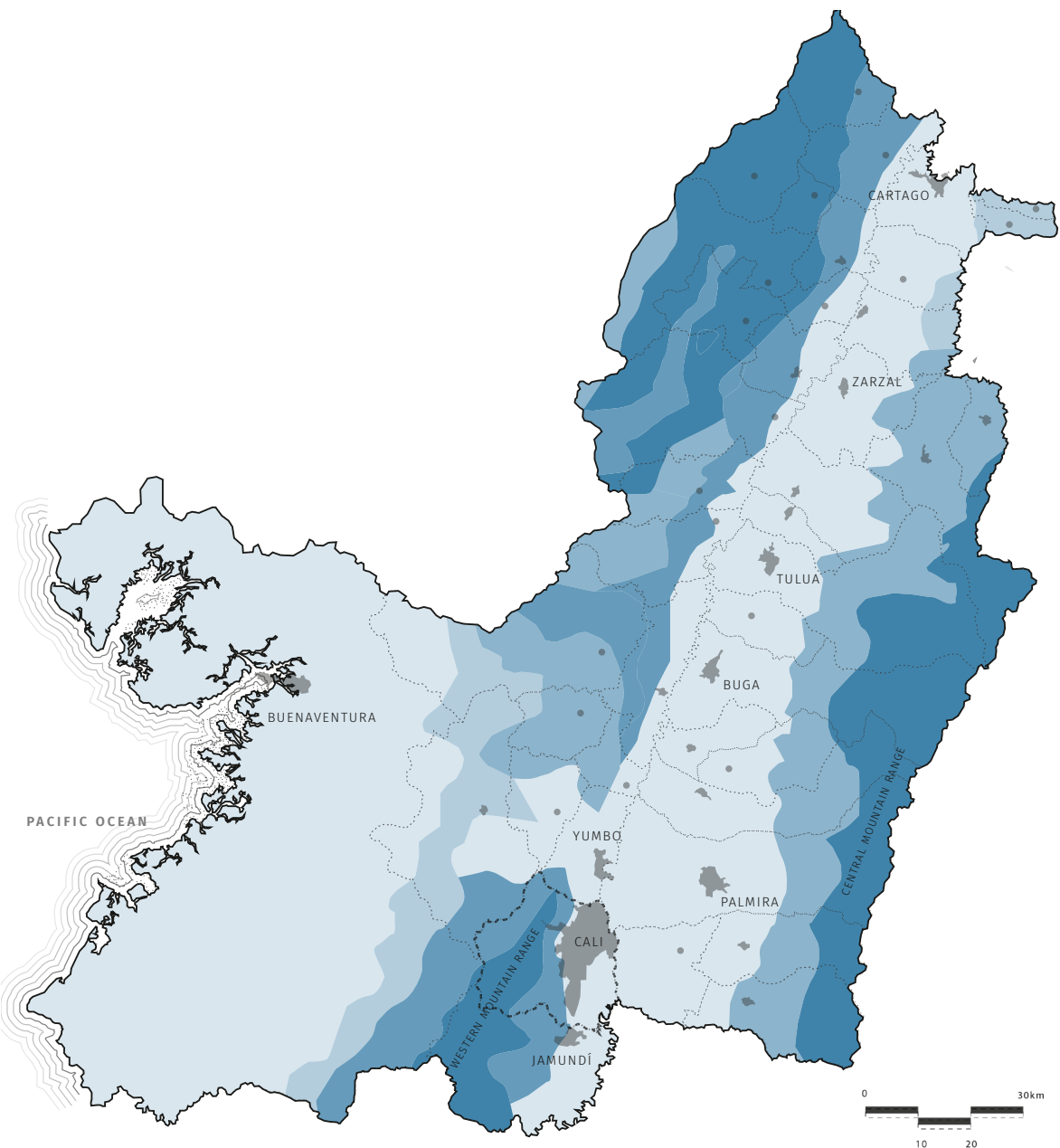
The Cauca River area covers the eastern slope of the Western Cordillera, the geographic valley of the Cauca River, and the western slope of the Central Cordillera, encompassing 1,073,886 hectares. The area is characterized by four major geographical features: the Pacific plain, the geographic valley of the Cauca River, and the Central and Western mountain ranges.

The Pacific plain features a coastal strip or alluvial platform, ranging from one to 50 meters in width, covered with mangroves and intersected by a network of estuaries, canals, and mouths that give rise to rivers flowing into the Pacific Ocean. Notable deltas are formed by some of these rivers, such as the San Juan, which has multiple mouths and islands.

The western mountain range runs southeast-north from the Naya hills to the Tatamá hill. It includes notable orographic features such as the Farallones de Cali, which reach heights of up to 4,200 meters. Other formations include the Los Paraguas mountain range and the Aguacatal, Buenos Aires, Calima, Garrapatos and Dapa ridges.

The Cauca River valley is a plain that originated from an inter-Andean tectonic depression. It is approximately 200 km long and 15 km wide on average, reaching up to 50 km at its widest point. The valley is composed of Quaternary alluvial deposits, which have deep soils and highly fertile surfaces.

The Central mountain range, similar to the Western mountain range, runs across the Department from south to north. It starts at Pico Iraca, which is 3,800 meters above sea level in the south, and ends at the headwaters of the Barragán river in the north, near the municipalities of Sevilla and Caicedonia. This mountain range serves as the border with the Department of Tolima and is higher than the Occidental. In addition to Parque Nacional Natural de Las Hermosas, Picos el Japón and Cerro de Pan de Azúcar at 3,900 meters above sea level are also noteworthy. (Martínez, 2019a)



Valle del Cauca Orography

Figure 12 | Elaborated by the author

Elevation

- 0 - 500 msl (24.7%)
- 500 - 1000 msl (6.0%)
- 1000 - 2000 msl (53.5%)
- 2000 - 3000 msl (12.1%)
- 3000 - 4000 msl (3.7%)

Legend map

- Cities
- Cali perimeter
- Valle del Cauca perimeter
- Municipalities division

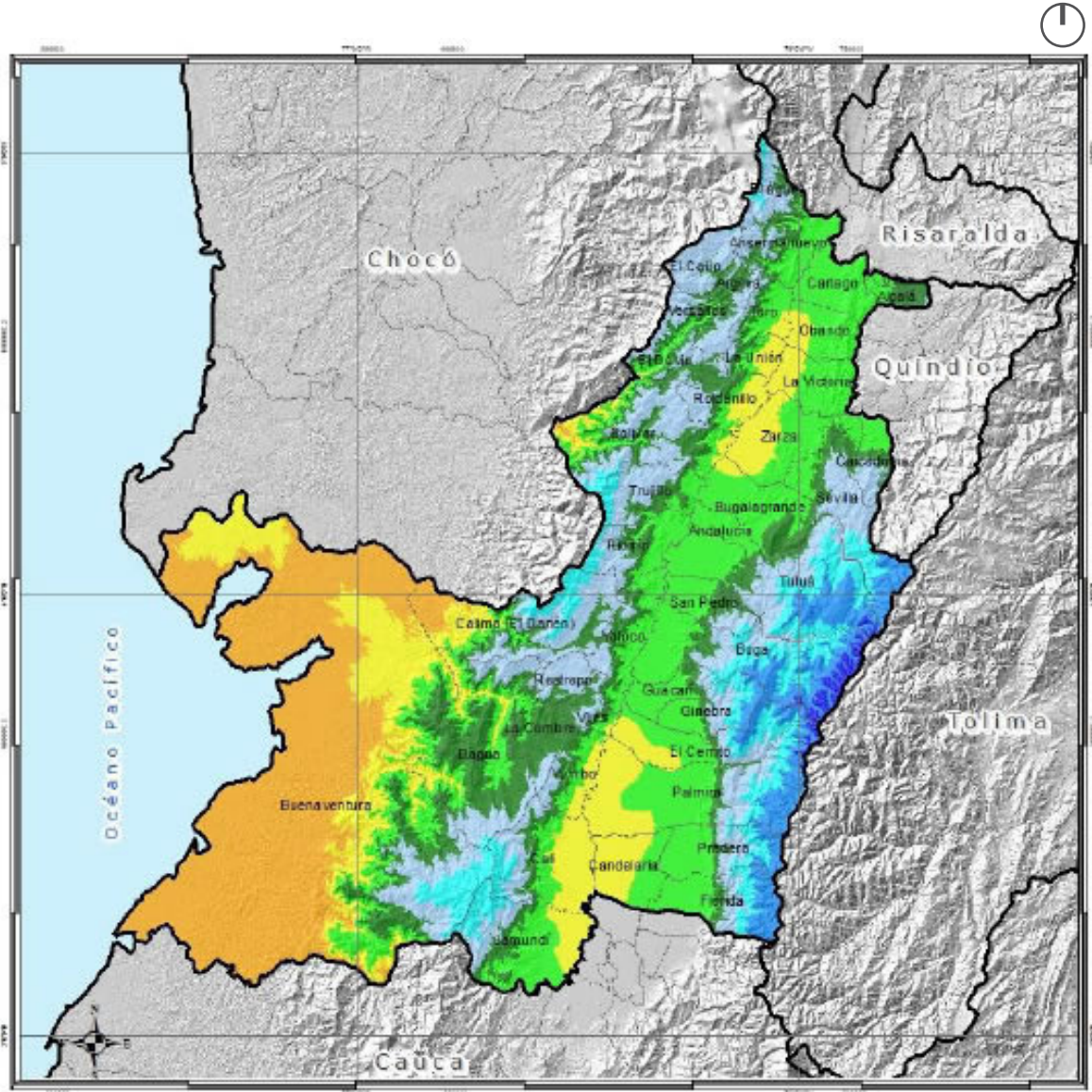
(1.2C) Climate conditions

The climatic attributes of the Valle del Cauca Department are predominantly dictated by its geographic coordinates and topographical features. Within the territorial expanse of the department, discernible variations in climatic conditions exist, notably between the Pacific slope and the Cauca River basin. The climatic profile prevailing in the majority of the geographical valley of the Cauca River spans from a warm semi-humid to temperate semi-humid classification. Towards the eastern terminus of the department, as well as in the central sector, encompassing the foothills of the western mountain range, there is a prevalence of cold and very cold climates.

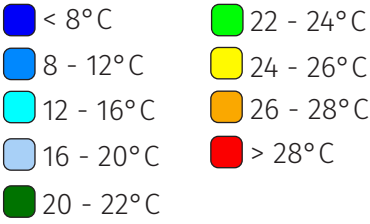
The thermal regime within the Valle del Cauca Department exhibits considerable variability. In the lower elevations of the geographical valley and the Pacific coastal strip, the mean annual temperatures range between 24 and 28°C, representing the highest values recorded within the department. As one ascends the mountain foothills, temperatures exhibit a linear decrease in correspondence with elevational gain.

Precipitation patterns within the Valle del Cauca region are contingent upon both geographical location and altitude.

- Pacific Plain: Situated between sea level and 1,000 meters above sea level, this region is characterized as one of elevated precipitation, experiencing an average annual rainfall ranging from 5,000 to 6,500 mm.
- Western Cordillera: Located at altitudes exceeding 3,000 meters above sea level within the Cauca river basin, this area registers a more temperate climate with precipitation levels ranging from 1,500 to 2,000 mm annually.
- Cauca River Valley: Positioned at an altitude of approximately 900 meters above sea level, this area witnesses reduced precipitation, measuring less than 1,500 mm per annum. The average temperature in this region oscillates around 25°C.
- Central Cordillera: Elevation surpassing 3,000 meters above sea level characterizes this region. Towards the higher elevations, the average temperature exhibits variations between 20°C and 6°C. (Martínez, 2019b)



Valle del Cauca: Average temperature
Figure 13 | source: Subdirección Meteorológica, IDEAM.



(1.2D) Land connections

The road infrastructure in the department of Valle del Cauca covers a total extension of 8,230.00 kilometers, of which 735.18 kilometers are under the responsibility of the national government. The road network in Valle del Cauca is divided into three categories:

- 1. Main road network: This set comprises trunk and transversal roads that articulate the main areas of production and consumption at the national level. The most important ones are Simón Bolívar Highway (National Route 25A) and Pan-American Highway (National Route 25).
- 2. Secondary and tertiary network: Beyond the primary highways, an extensive network of secondary and tertiary roads interconnects urban and rural areas across Valle del Cauca. These roads are indispensable for local mobility and the linkage between municipalities.
- 3. Urban roadways: Within the cities of Valle del Cauca, such as Cali, there exists a network of streets and avenues designed to enhance mobility within urban settings. These roads are utilized by private vehicles, public transit, and pedestrians. (Del Valle, n.d.-b)

Cali Metropolitan Area

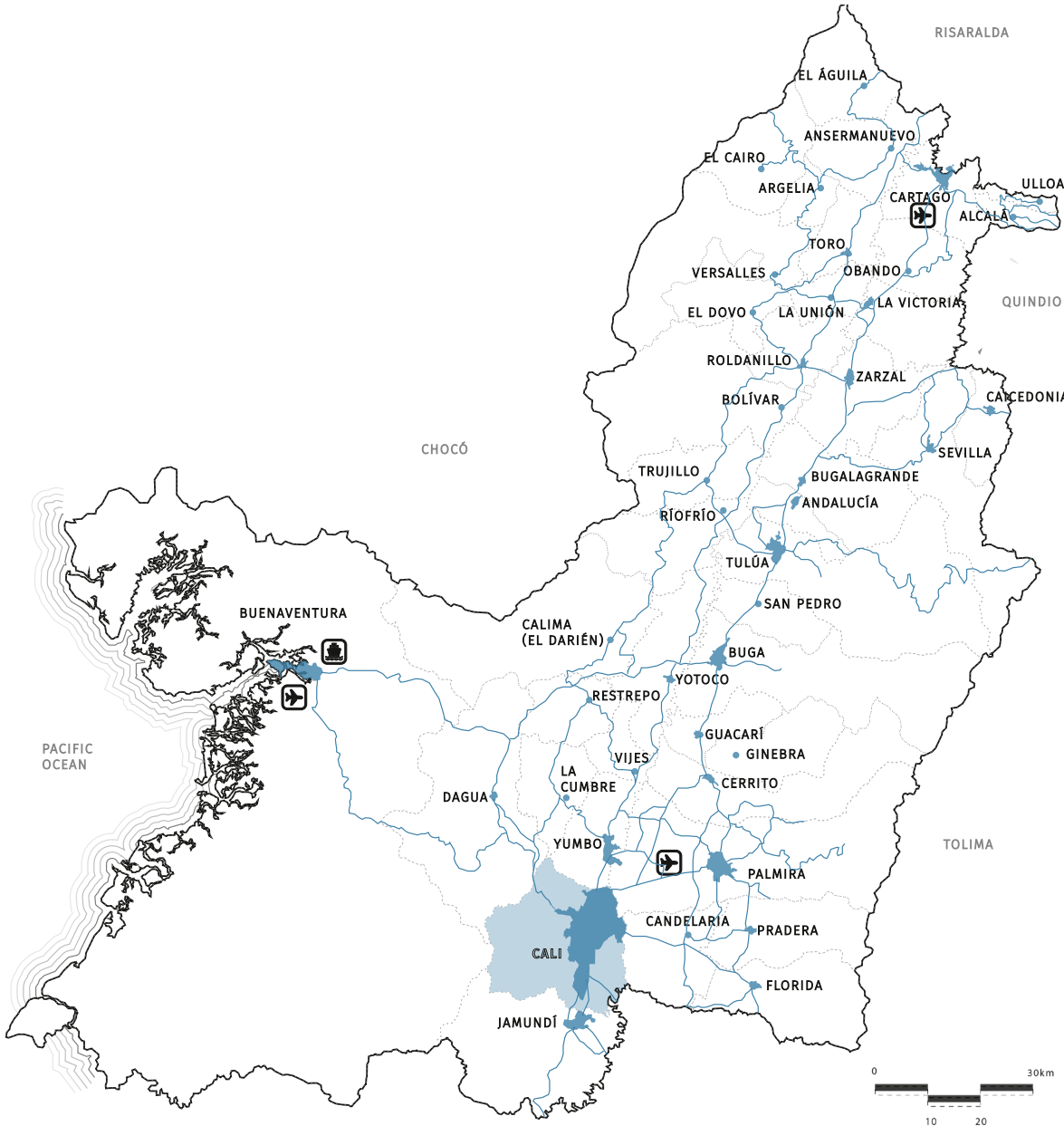
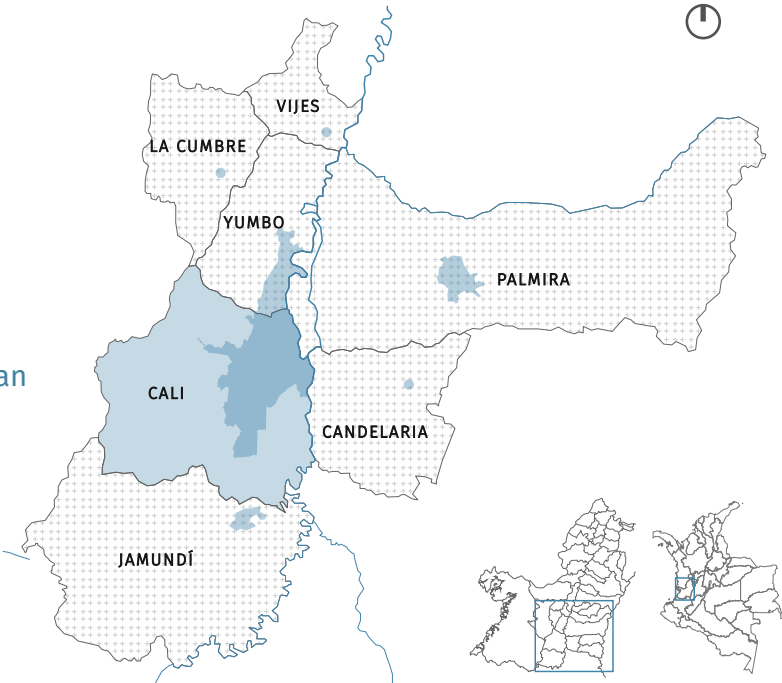
This region of the Metropolitan Area of Cali or Southwestern Colombia is home to some 2,935,972 inhabitants (Cali, Candelaria, Jamundí, Palmira and Yumbo). Although this area is not fully formalized. In this region of the Metropolitan Area you can find natural parks, gold mines, coal, oil, agriculture, the primary sector, industry, commerce and sugar cane. (COLOMBIA - Cali, n.d.)

Santiago de Cali: Metropolitan area

Figure 14 | Elaborated by the author

Legend map

- Urban areas of cities
- Santiago de Cali
- Municipalities

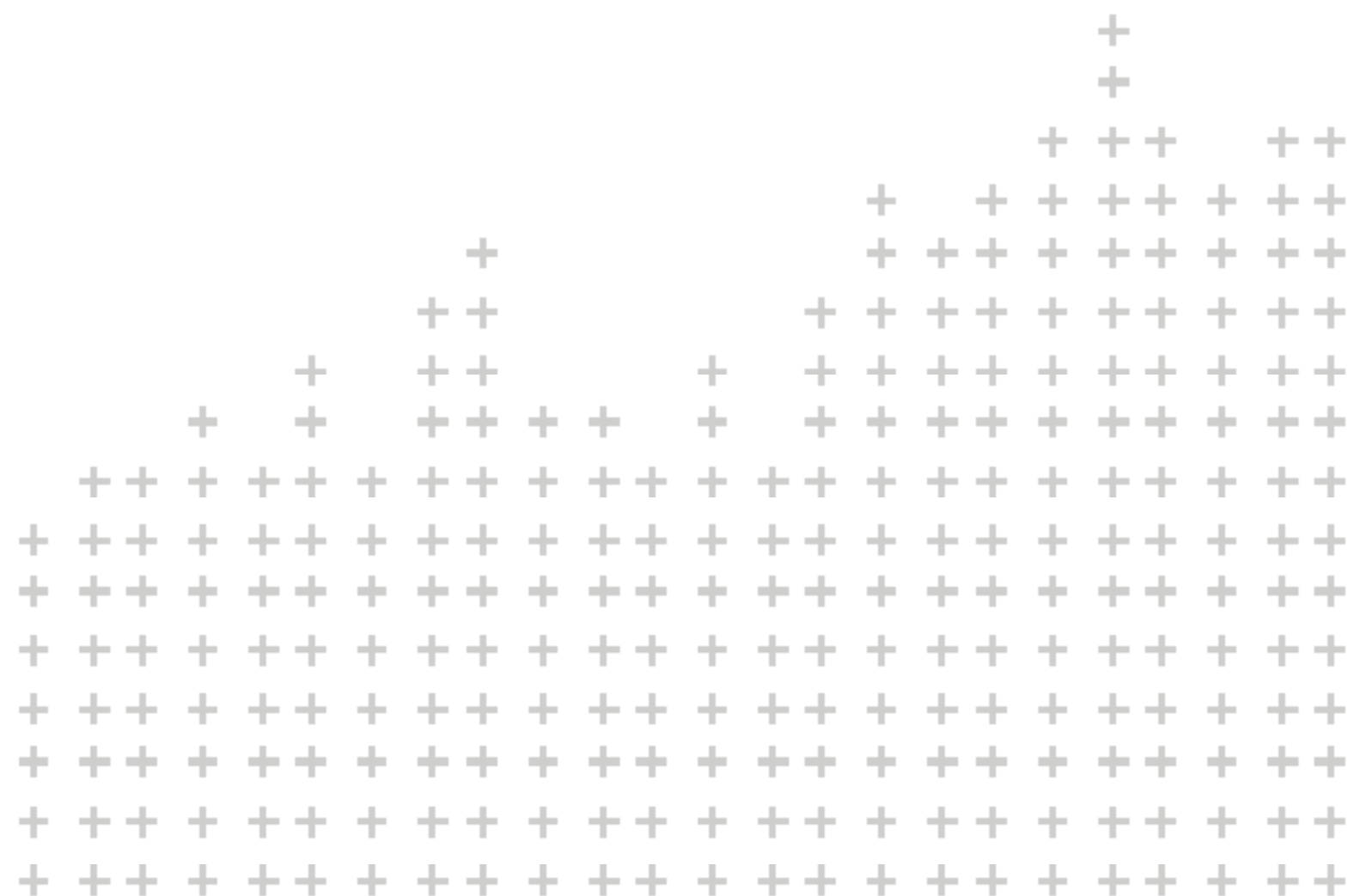


Valle del Cauca: Land connections

Figure 15 | Elaborated by the author

Legend map

- Main road network
- Urban areas of cities
- Santiago de Cali
- Valle del Cauca perimeter
- Municipalities division
- Main ports
- Airports



SANTIAGO DE CALI

Current structure and future vision

Chapter 2

(2.1) Santiago De Cali

(2.1A) City context

Capital of Valle del Cauca department

Population: 2,228 million inhabitants

Total area: 561.6 km2

Urban area: 119.7 km2

Located in the south of the department of Valle del Cauca, it is the capital city of the region and the third-largest city in Colombia in terms of population, with around 2,280 million inhabitants (DANE, 2022). It is also the third-largest economic center in the country. Founded by the Spanish conqueror Sebastián de Belalcázar in 1536, it is one of the oldest cities in Colombia and on the entire American continent. It currently maintains arquitectonic structures considered national monuments gathered at the center of the city. (Alcaldía de Santiago de Cali, 2023).

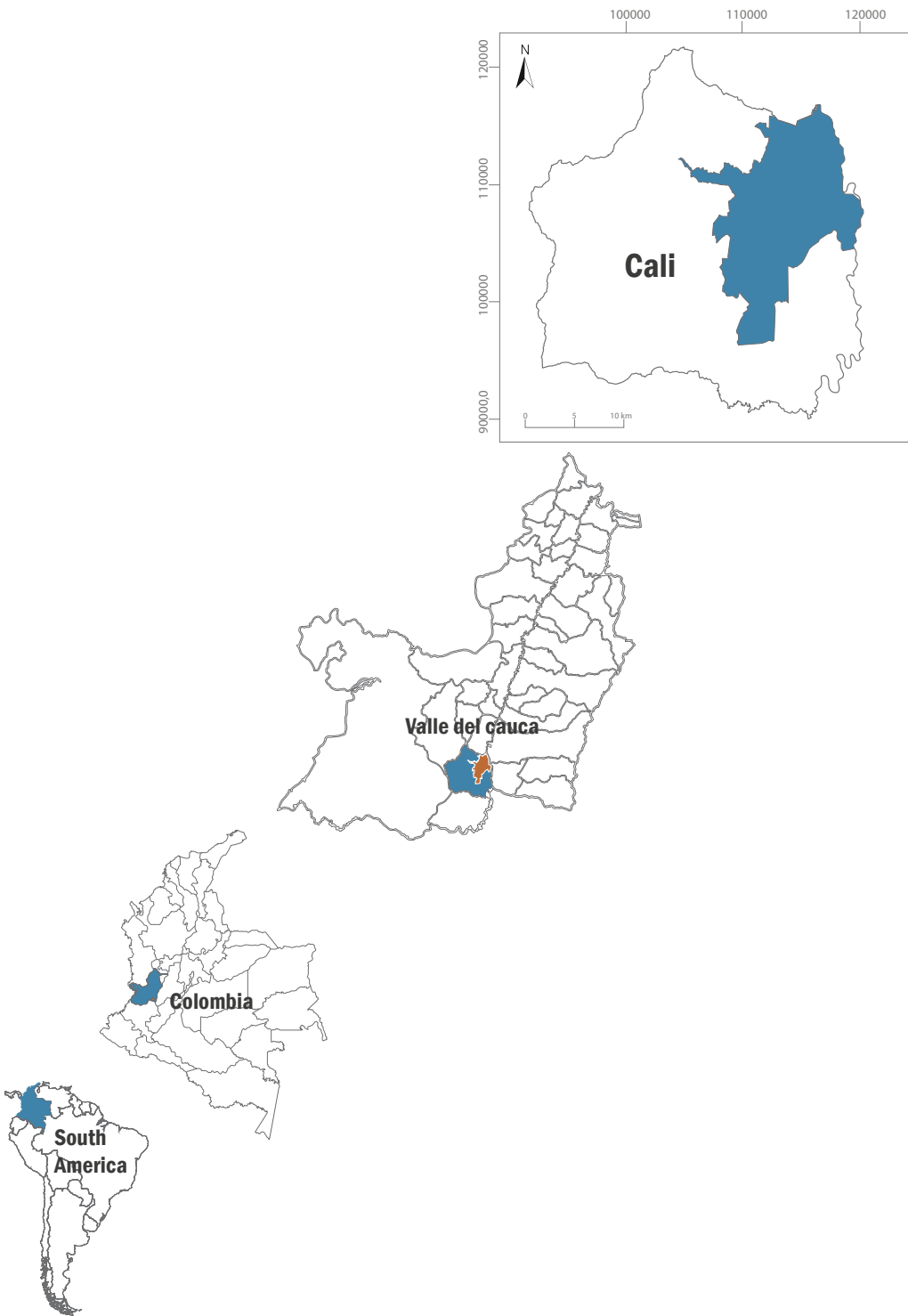
With a total area of 561.6 km2, 21.3% (119.7 km2) belongs to urban extension (CIAT, 2016). It has a privilege geographic position being closed to the Pacific Ocean, where the country’s main seaport is located (Buenaventura), helping to promote significant industrial and commercial growth in domestic and international markets.

It has an average climate of 24°C and seven rivers. Moreover, Cali has 64 protected areas and 61 urban wetlands, and it is known for having good examples of eco-neighborhoods in Colombia; one of them, San Antonio, was the first in Latin America to be recognized for the second time with the “Ecoquartier” seal from the French Ministry of Ecological Transition. Rainwater harvesting, composting, and family and community gardens are some of the eco-techniques that have been implemented to align with environmentally friendly goals. (Alcaldía de Santiago de Cali, 2023).



Santiago de Cali view

Figure 16 | source: shutterstock



Location of the city of Cali in the department of Valle Del Cauca, in Colombia and South America

Figure 17 | Elaborated by the author

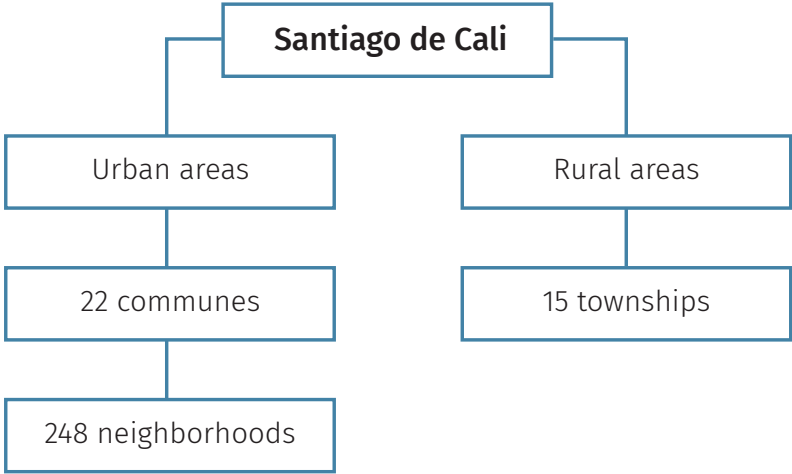
(2.1B) Territorial and political-administrative division

Cali is located in the department of Valle del Cauca in southwestern Colombia, on the eastern margin of the Western mountain range.

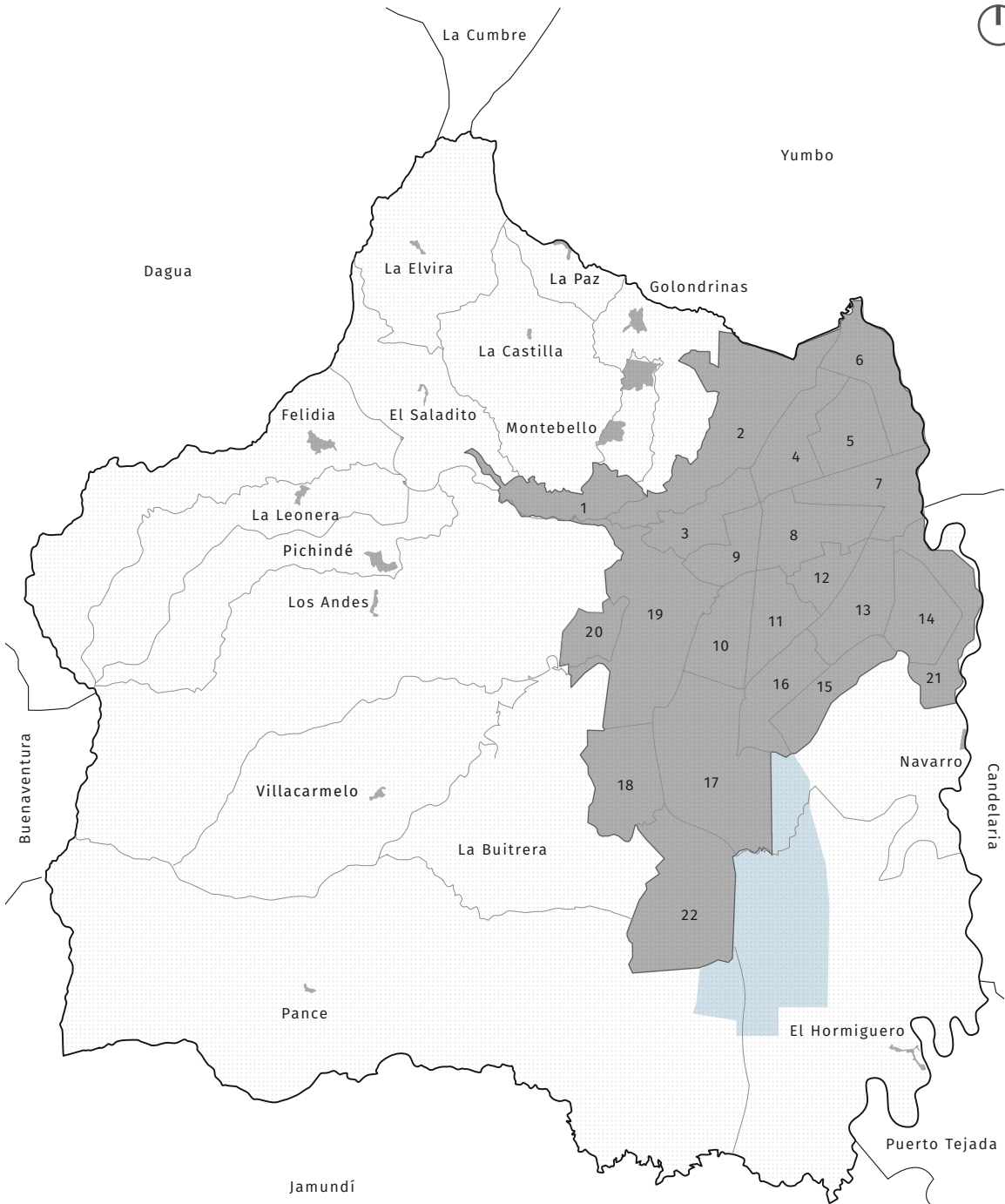
According to the Land Management Plan (POT-Agreement 373, 2014), the territory was delimited and classified as urban and rural areas. As it can be seen in the information obtained from the map (figure 19), the city’s urban area is divided into 22 communes, then further divided into neighborhoods and urbanizations. These communes are composed of 248 approved neighborhoods. From the other side, the rural area is divided into 15 townships (Alcaldía de Santiago de Cali, 2022)

- LIMITS:
- North: Municipality of Yumbo and La Cumbre
 - Northeast: Palmira
 - Northwest: Dagua
 - East: Candelaria
 - South: Jamundí
 - Southwest: the rural area of Buenaventura city

Cali is ruled by a democratic system based on Political Constitution of Colombia (1991), is governed by the Mayor’s Office and Municipal Council. (Alcaldía de Cali, 2014).



Scheme of Territorial and political division
Figure 18 | Elaborated by the author



Territorial and political division
Figure 19 | Elaborated by the author

Legend map

- Territorial political division
- Expansion areas
- Urban area (with communes)
- Rural area

(2.1C) Ecological structure

Cali’s ecological structure is concentrated in the rural area, at the west of the city (see annex 1). In the urban area, there are several corridors of this ecological structure associated with the city’s water sources, rivers, and streams; some of the most important are the shores of the Cali and Cauca rivers. Separately, within the urban area, at the eastern end of the city, is located the Marco Fidel Suarez air base, which is also integrated into the ecological structure.

According to Van Der Hammen & G. Andrade, (as referenced in Martinez, 2013),

The principal ecological structure refers to the collection of natural and semi-natural ecosystems that possess specific geographical locations, extents, connections, and health conditions. These characteristics ensure the preservation of biodiversity integrity and the provision of essential environmental services such as water, soil, biological resources, and climate regulation. This serves as a means to fulfill the basic needs of inhabitants and sustain life.

The principal ecological structure entails the management of vegetation cover, land, and water resources to ensure the conservation, including preservation and restoration, of biodiversity, biological resources, and environmental services. Implementing this structure necessitates a thorough examination of the areas to be included and the categorization based on Protected Area Systems.

In Colombia, the process of identifying the ecological structures in urban areas is the responsibility of the DAASU*. Since 2015–2016, there has been an alliance with the IAVH* to support in technical, administrative, and financial aspects and incorporate biodiversity and ecosystem services criteria into urban environmental planning. (MinAmbiente).

(2.1D) Institutions that support biodiversity in Cali

The recognition of natural, landscape and water wealth as a support for life in the city has required society to develop different actions to ensure its protection and recovery. In this sense, Cali created the declaration of Protective Forest Reserves, which consist of protected areas and the new ones to be declared with the different conservation strategies developed in the POT* such as ecoparks and environmental corridors (Law 388, 1997).

DAASU* Dirección de Asuntos Ambientales Sectorial y Urbana (Directorate for Sectoral and Urban Environmental Issues)
IAVH* Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (Alexander Von Humboldt Biological Resources Research Institute)
POT* Plan de Ordenamiento Territorial (Land Use Plan)

Each department is governed by the CVC*, which are in charge of the sustainable and rational use of renewable natural resources and the environment. It is also the highest authority in Valle del Cauca, which was formally created in 1954 with the initial intention of reducing the Cauca’s river disasters (floods, overflows, and agricultural damages).

Currently, in addition to generating and leading environmental policies and regulations, one of the CVC* primary objectives is to support and stimulate people and communities in the implementation of projects or activities aimed at the protection, conservation, and sustainable use of the environmental offer of regional ecosystems. CVC has implemented thermal and hydraulic capacity development projects in the region and is recognized as a regional development model in Latin America. (CVC, 2018).



The system in charge of protecting biodiversity within the department is the SIDAP* that works with social and community participation; as is mentioned in its official website (2023), regional and local meetings are established for dialogues and agreements to reach common benefit policies. It has a technical secretariat that is coordinated by the CVC. Its main objective is to articulate and plan in order to achieve an adequate ecosystem and sociocultural connectivity.

Specifically, the organization in charge of the areas to intervene is DAGMA*, which is the highest environmental authority within the urban perimeter of the Municipality of Santiago de Cali. It is structured by one head (the director), an environmental Management area, the UMATA* and Management Support Unit. Its multiple functions cover the duty of providing technical assistance focused on sustainable development in accordance with the law. (Alcaldía de Santiago de Cali, 2023).

Hierarchy of Institutions that support biodiversity in Cali

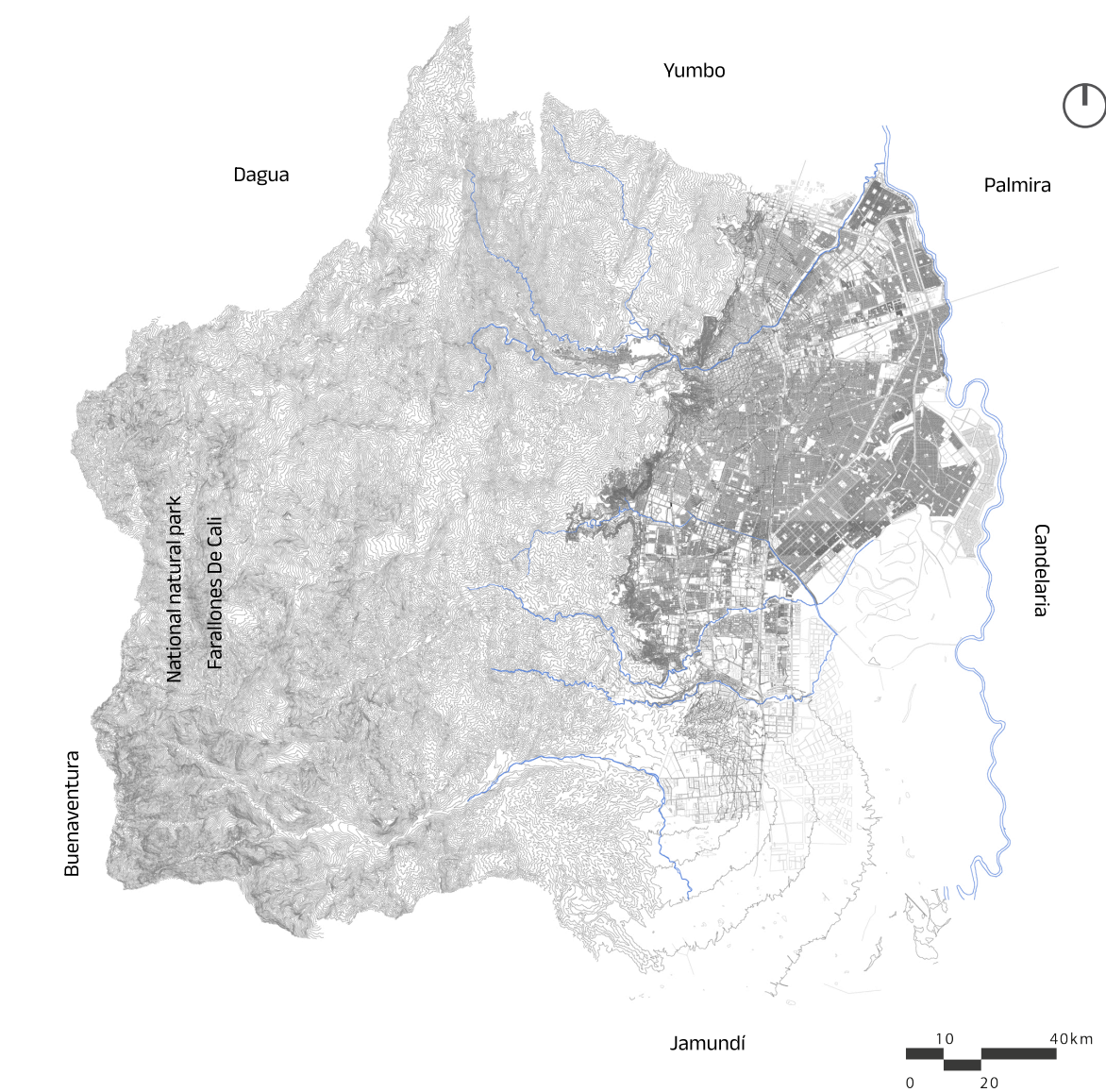
Figure 20 | Elaborated by the author

CVC* Corporación Autónoma Regional del Valle del Cauca (Western Integrated Mass)
SIDAP* Sistema Nacional de Áreas Protegidas (National System of Protected Areas)
DAGMA* Departamento Administrativo de Gestión del Medio Ambiente (Administrative Department of Environmental Management)
UMATA* Unidades Municipales de Asistencia Técnica Agropecuaria (Municipal Agricultural Technical Assistance Units)

(2.1E) Geography and Topography

Cali is located in the valley of the Cauca River, the second most important in Colombia, exactly at the eastern margin of the Western Mountain range. It Includes altitudes ranging from 916 masl in the geographic valley of the Cauca River to approximately 4,035 masl in the “Farallones de Cali” National Natural Park, which are part of the Western range of the Colombian Andes. (CIAT, 2016).

Several rivers descend from the Western range, passing through the municipal area of Cali, marking boundaries between the townships, and flowing into the Cauca River. Traveling along the Cauca River, 11 km after the mouth of the South Collector Canal, is the Puerto Mallarino water treatment plant, where 80% of the water consumed by the city is taken. Cali is crossed by seven rivers in total. (Alcaldía de Santiago de Cali, 2014).

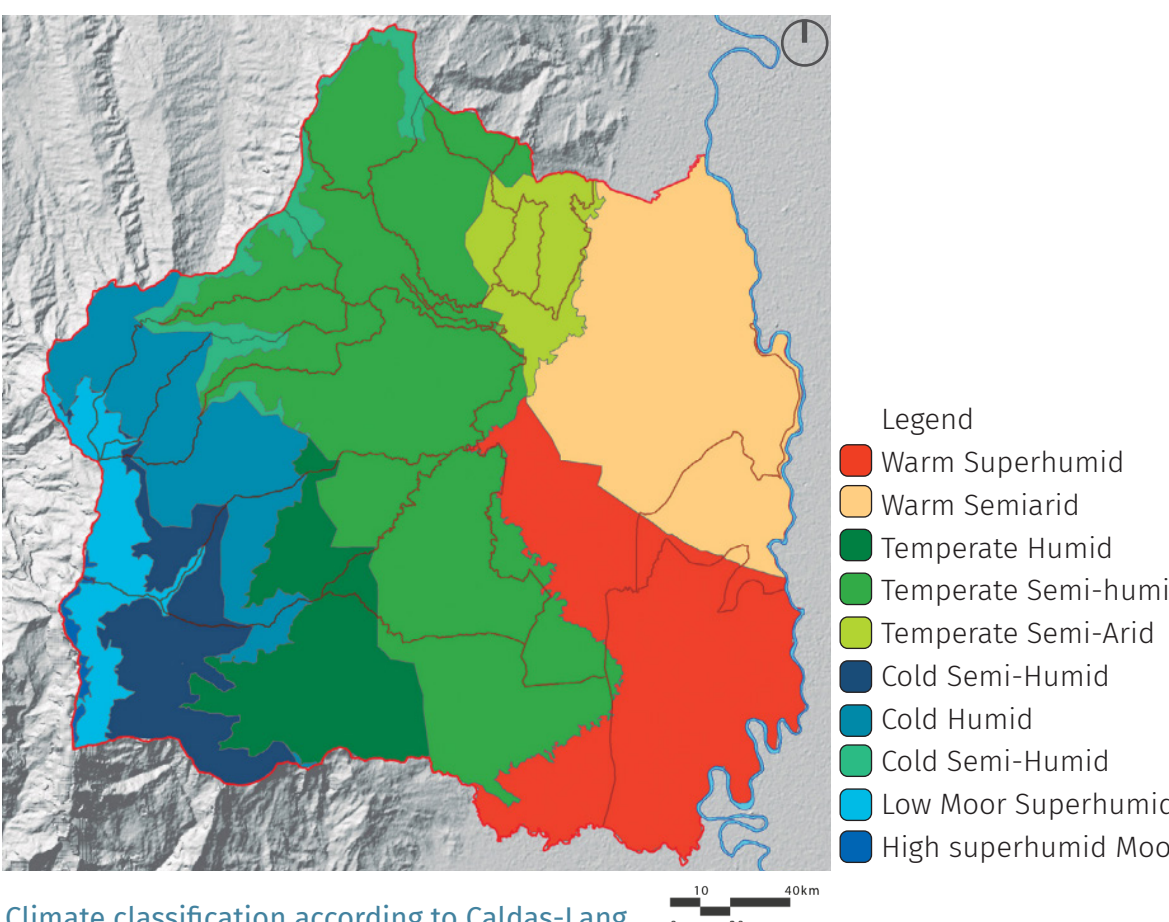


Topography of Cali
Figure 21 | Elaborated by the author

(2.1F) Climate conditions

Cali’s climate was analyzed using the Caldas-Lang classification as a reference. It must be taken into account that the classification established by Caldas was based only on temperature but focused on its altitudinal rather than latitudinal variation. On the contrary, Lang set the limits of his classification by considering a relationship between precipitation and temperature. The Caldas-Lang system revolutionized the field of classification by considering a relationship between precipitation and temperature, ultimately leading to a more accurate understanding of regional climate patterns. (International Center for Tropical Agriculture).

As illustrated in the climatic microzoning according to Caldas-Lang, 10 types of climates can be observed in the city (figure 22). The temperate semi-humid climate is the most widespread climatic microzone, accounting for 32.6% of the municipality. It is primarily found in moderate and low locations, with elevations ranging from 1,000 to 2,000 meters above sea level and average annual rainfall ranging from 1,200 to 2,200 mm (CIAT, 2016). In the urban area, the climate is mostly warm semi-arid in the north and warm semi-humid in the south. It also has a small part of temperate semi-arid in the north-western part of the Cali River.



Climate classification according to Caldas-Lang
Figure 22 | source: (CIAT, 2016)

(2.1G) Hydrography

Cali is enriched by the presence of seven rivers. These streams not only contribute to the city's scenic beauty but also play a significant role in shaping the city's development and its cultural and ecological diversity.

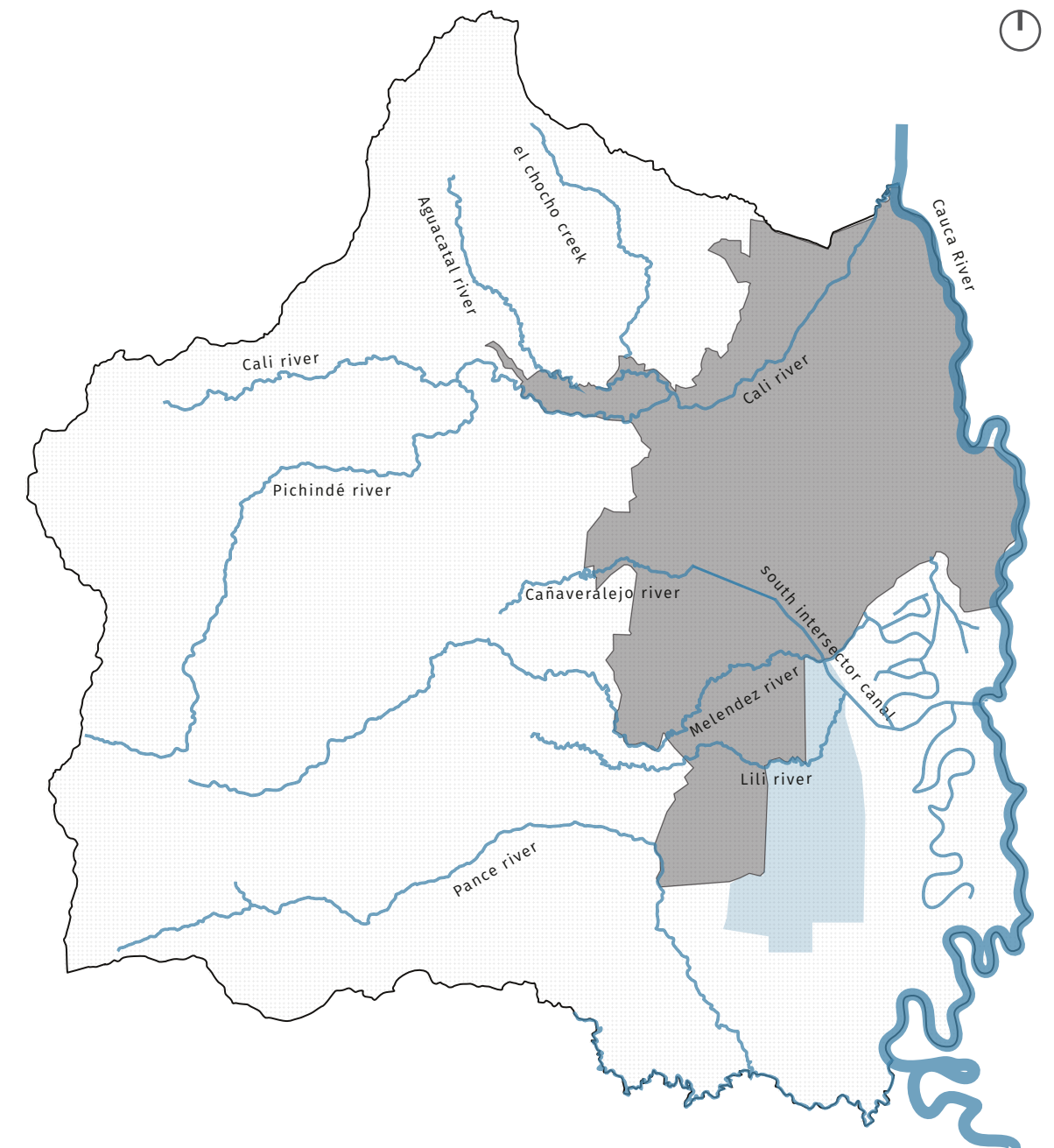
The Cali River is well-known among city residents for its name, length, and location. It is worth noting that it was the epicenter from which the growth of the city took place. This river starts on the west side, between the hills of Cristo Rey and Las Tres Cruces, and flows for over 50 kilometers until entering the Cauca River. Another is the Rio Cauca, which flows through the city to the east and serves 80% of its inhabitants. The Pance River, which drains into the Jamundi River, is a popular tourist and local destination.

Others are Cañaveralejo, Lili, Meléndez and Aguacatal which is born at the north side of the city exactly in La Elvira Township. (Alcaldía de Santiago de Cali, 2019).

Additionally, because of the biographical location of the city, climate, and topography, in Cali, approximately 282.7 ha are wetlands, and 70 ha of them are located in the urban area. (DAGMA, CVC)

The DAGMA* is in charge of monitoring the city's water resources, measuring its contamination level, and overall applying correct management procedures. The convergence of rivers and other water sources makes the region a natural powerhouse for crops such as sugar cane and animal reproduction.

DAGMA* Departamento Administrativo de Gestión del Medio Ambiente (Administrative Department of Environmental Management)



Hydrography of Cali

Figure 23 | Elaborated by the author

Legend map

- Rivers
- Expansion areas
- Urban area
- Rural area

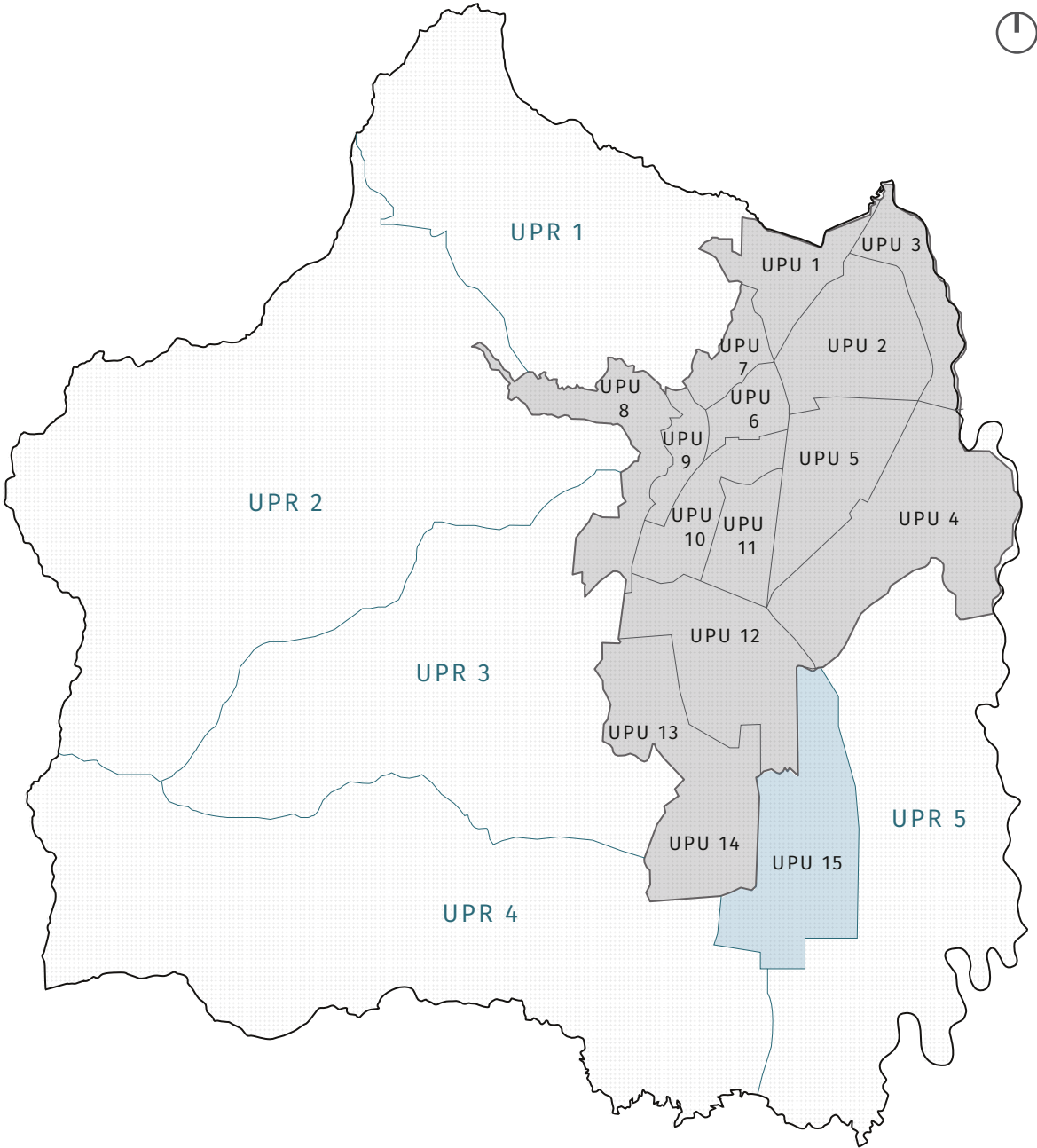
(2.1H) UPU and UPR

The POT, or Plan de Ordenamiento Territorial (Territorial Ordering Plan), as per Agreement 0373 of 2014, divided Cali into 15 neighborhood groups known as Unidades de Planificación Territorial/Urban Planning Units (UPU) and divided the rural area into 5 zones called Unidades de Planificación Rural/Rural Planning Units (UPR). (Alcaldía De Santiago De Cali , 2019).

These units serve as tools for inter-institutional coordination and citizen participation, facilitating the collaborative development of the territory at the local level. (Alcaldía De Santiago De Cali , 2019). The separation of the territory was based on grouping sets of neighborhoods sharing similar urban characteristics; therefore, this division proves valuable as it enables a more detailed analysis of areas and facilitates closer engagement with the community in each sector, becoming a key element in defining projects and programs along with aligning them with the specific needs and characteristics of the neighborhoods’ residents. (Alcaldía de Cali, 2014).

Functions:

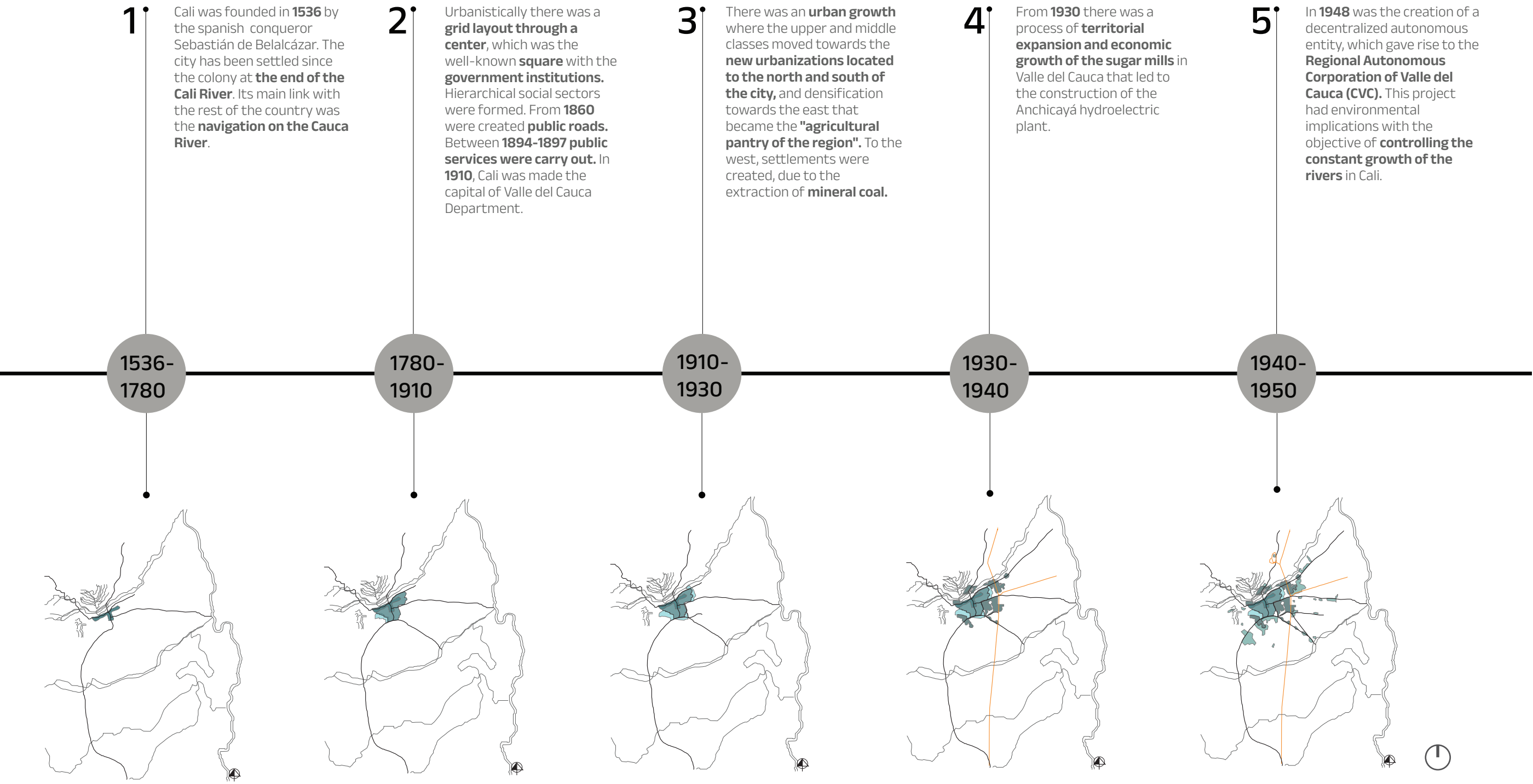
- Plan projects for specific areas.
- Decide on priorities for future local development.
- Plan investments for the land-use model in different zones.
- Determine and delineate corridors of zonal activity.
- Will be able to adjust volumetric norms.



UPU and UPR in Cali
Figure 24 | Elaborated by the author. Based on (Alcaldía de Cali, 2019)

- Legend map
- Expansion areas
 - Urban area
 - Rural area

(2.2) Historical process of urban and territorial development

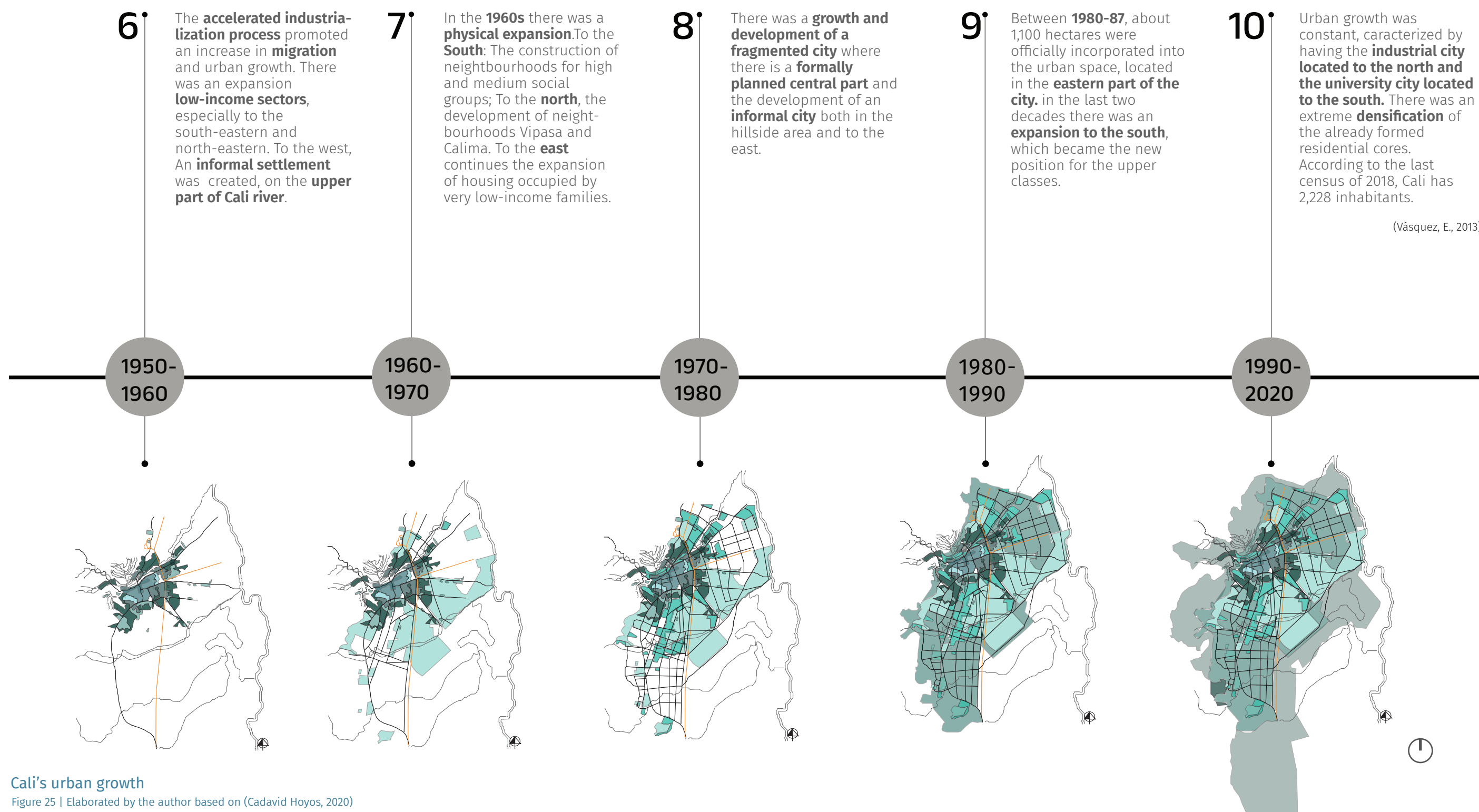


Cali's urban growth

Figure 25 | Elaborated by the author based on (Cadavid Hoyos, 2020)

The initial development of Cali was conceived as an urban center of modest dimensions, playing a crucial role as a connection point with the most relevant economic centers of Colombia through navigation along the Cauca River. Its strategic function as a commercial enclave and its proximity to productive valleys led to accelerated growth,

promoting its transformation into the capital of the department of Valle del Cauca. This process of urban evolution marked the beginning of Cali's multifaceted identity, where its initial growth as a strategic point of commerce was intertwined with the diversification of its functions towards departmental capital. This change in focus not only defined Cali's trajectory as an economic center but also influenced its social and cultural development.



Cali's urban growth

Figure 25 | Elaborated by the author based on (Cadavid Hoyos, 2020)

The rapid process of industrialization, together with the violence resulting from the internal armed conflict of the city in the 1950s and 1960s, generated that Cali was shaped by a complex interaction between the growth processes of a planned city and the development of informal areas. The urban structure of Cali reflects the duality between

the planned city, with its laid-out avenues and areas intended for different functions, and the informal areas that have emerged organically, responding to immediate housing and subsistence needs. This phenomenon has generated a complex network of contrasts where formality and informality, planning and spontaneity are interrelated.

(2.3) Socio economic structure
(2.3A) Socioeconomic stratification

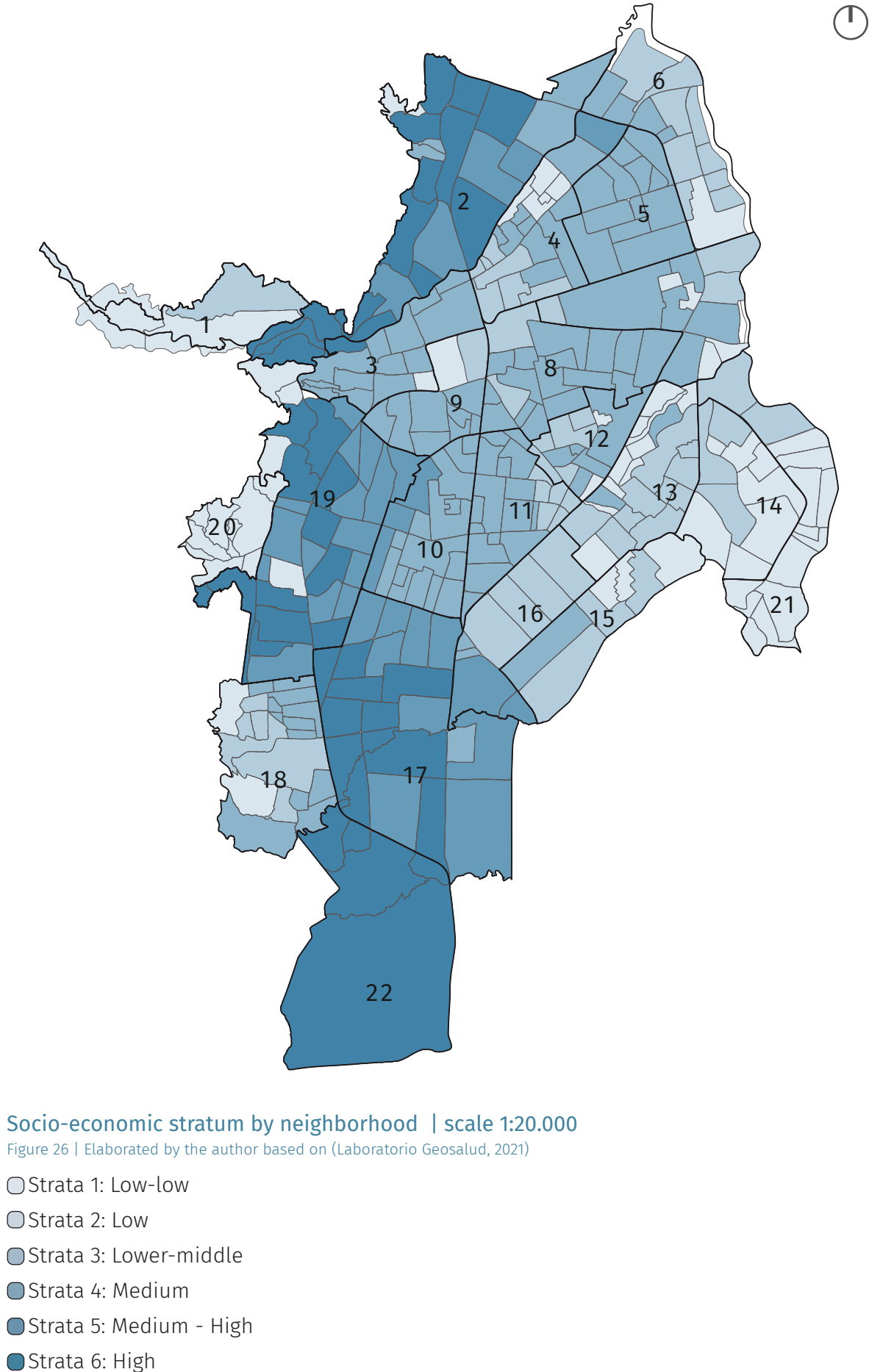
In the city of Cali, socio-economic segregation is evident in the severe contrast in the urban layout and quality of urbanization and buildings. In addition, the most vulnerable areas of the city can be clearly distinguished through the socio-economic stratification system applied in Colombia. (López, 2022)

Implemented since 1985, the stratification system, recognized by DANE* as a mechanism classifying the population into distinct strata based on similar social and economic characteristics, evaluates physical aspects of homes, their surroundings, and the urban or rural context. Unlike income-based criteria, the Colombian stratification considers factors such as street condition, construction materials, and accessibility to public transportation and services (Jimenez, n.d.).

The primary goal of this system was to redistribute income and guarantee fair access to essential services—water, electricity, and gas—for the entire population. Strata 1, 2, and 3 are associated with individuals who receive subsidies for residential public utilities. On the other hand, strata 5 and 6 represent higher socioeconomic levels, requiring residents to pay additional charges (contributions) on the value of domiciliary public utilities. Strata 4 neither benefits from subsidies nor incurs additional charges; residents in this stratum pay the exact value defined by the company as the cost of providing the service. (BBC News Mundo, 2022)

Figure 26 shows the distribution of strata in Cali by neighborhoods, showing two side areas with a higher presence of low strata, while the city center exhibits a more significant concentration of middle and high strata. When examining the communes according to the strata of their neighborhoods the homogeneity in the stratification of the communes in the eastern zone stands out, with a predominance of strata 1, 2 and 3. On the other hand, some communes in the western zone, especially in hillside areas, show significant diversity; for example, commune 2 encompasses all strata. Furthermore, it is interesting to note that in certain cases, neighbourhoods classified as Low-Low strata directly border neighbourhoods classified as high strata, creating physical and imaginary boundaries that have an impact on the urban and social dynamics of the city. (López, 2022) This is why the socio-economic stratum has also become a system to show the social, spatial and economic segregation of the country.

DANE* Departamento Administrativo Nacional de Estadística / National Administrative Department of Statistics.



(2.3B) SISBEN

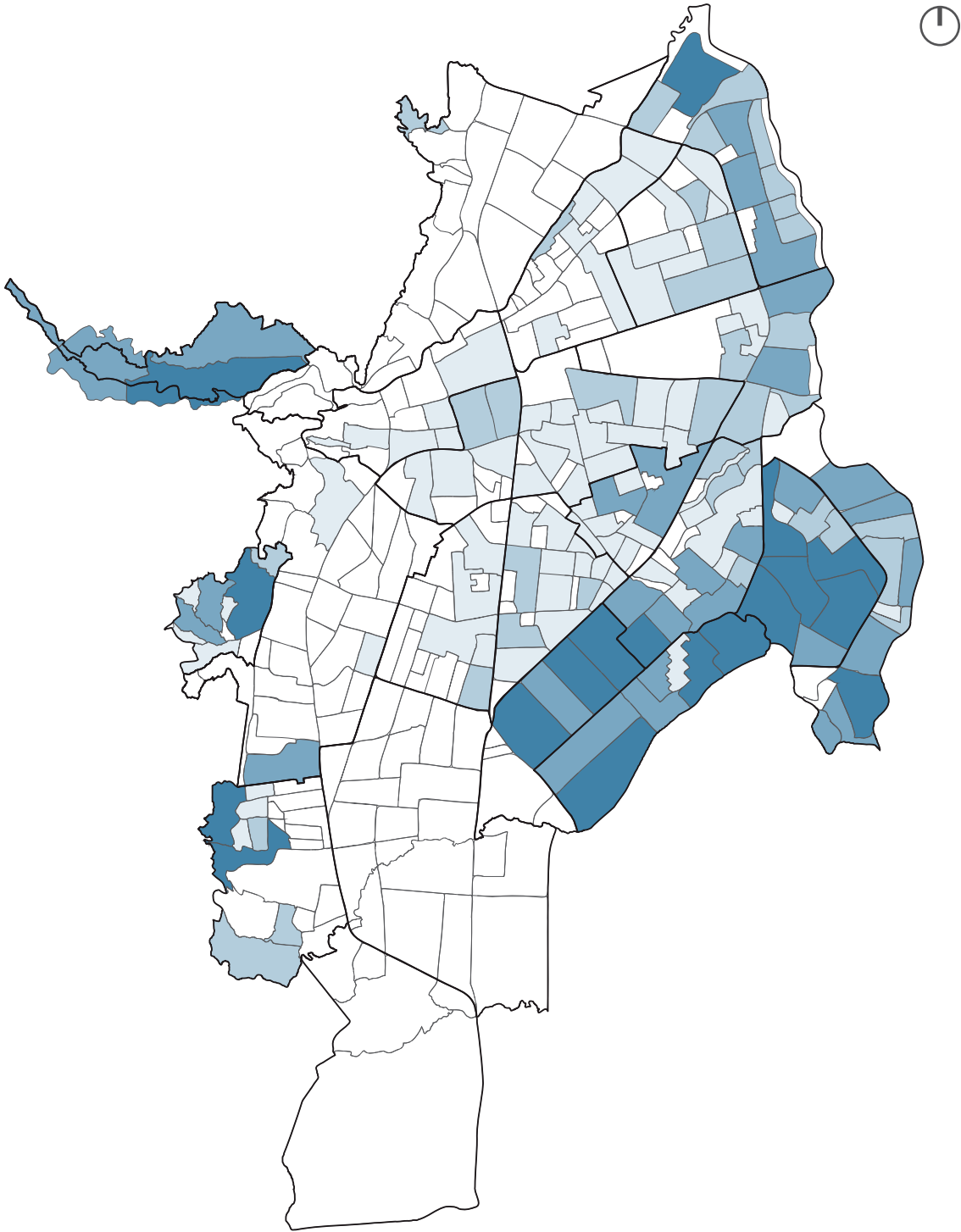
The SISBEN, an identification and categorization mechanism for potential beneficiaries of social programs, is a tool that employs a survey system to classify individuals or families based on their living conditions. The system utilizes a scoring framework ranging from 0 to 100, taking into account demographic, socioeconomic, and housing characteristics. Higher scores indicate more favorable living conditions and, consequently, a lower possibility of qualifying for state subsidies. (Peláez & Franco, 2019)

Location of the SISBEN population

As of June 2019, the updated SISBEN population in Cali covered 60.2% of the overall population. Out of the 1,340,759 individuals surveyed, 96.4% reside in urban areas, while 3.6% are in rural areas. These individuals constitute 442,440 households, predominantly located in the eastern sectors (communes 13, 14, 15, 16, and 21) and the hillsides of the city (Communes 1, 18, and 20), which represent areas characterized by a low socioeconomic stratum in the city.

15% of the total SISBEN-registered population is situated on the hillsides, while 50% resides in the eastern areas. Sisbenized people in Cali register a score of 42.3 points on average. (Caicedo & Castillo, 2021).

To summarize, this indicator reflects the living conditions in the city, evidencing a significant poverty problem. Through this system, it is revealed that more than half of the population requires government subsidies due to substandard living conditions to satisfy basic needs and guarantee their fundamental rights. As previously highlighted, areas such as the hillside area and eastern Cali concentrate the largest number of beneficiaries in SISBEN, indicating an urgent need for government support. However, this support should not be limited only to facilitating access to subsidies but should also focus on the implementation and execution of public policies aimed at improving aspects such as housing, basic services, equipments and public space.



SISBEN population by neighborhood | scale 1:20.000
Figure 27 | Elaborated by the author based on (Tipologías De Pobreza En Cali , n.d.)

- SISBEN population by neighborhood
- 1- 1600
 - 1601-4200
 - 4201-8500
 - 8501-16000
 - 16001-31606

(2.4) Urban system structure
(2.4A) POT / Plan de Ordenamiento Territorial

The POT*, guides how the municipality is physically developed. It seeks to achieve an harmonious balance between space planning, socioeconomic activities, and respect for the environment. In addition, it establishes rules, programs, and projects related to the use, adaptation, and transformation of physical space (Alcaldía De Santiago De Cali, 2018). The POT considers four main aspects: the vision (Art. 1), a regional agenda (Art.3), guidelines (Art. 5), and the MOT*, (Art. 4).

- Vision (Art. 1): Identifying and highlighting opportunities within the territory to encourage their development and utilization, with the goal of improving residents' quality of life.
- Regional Agenda (Art. 3): Collaboratively planning, managing, and overseeing urban processes in partnership with neighboring municipalities and nearby cities.
- Guidelines (Art. 5):

The guidelines for project proposal and implementation consist of three primary components:

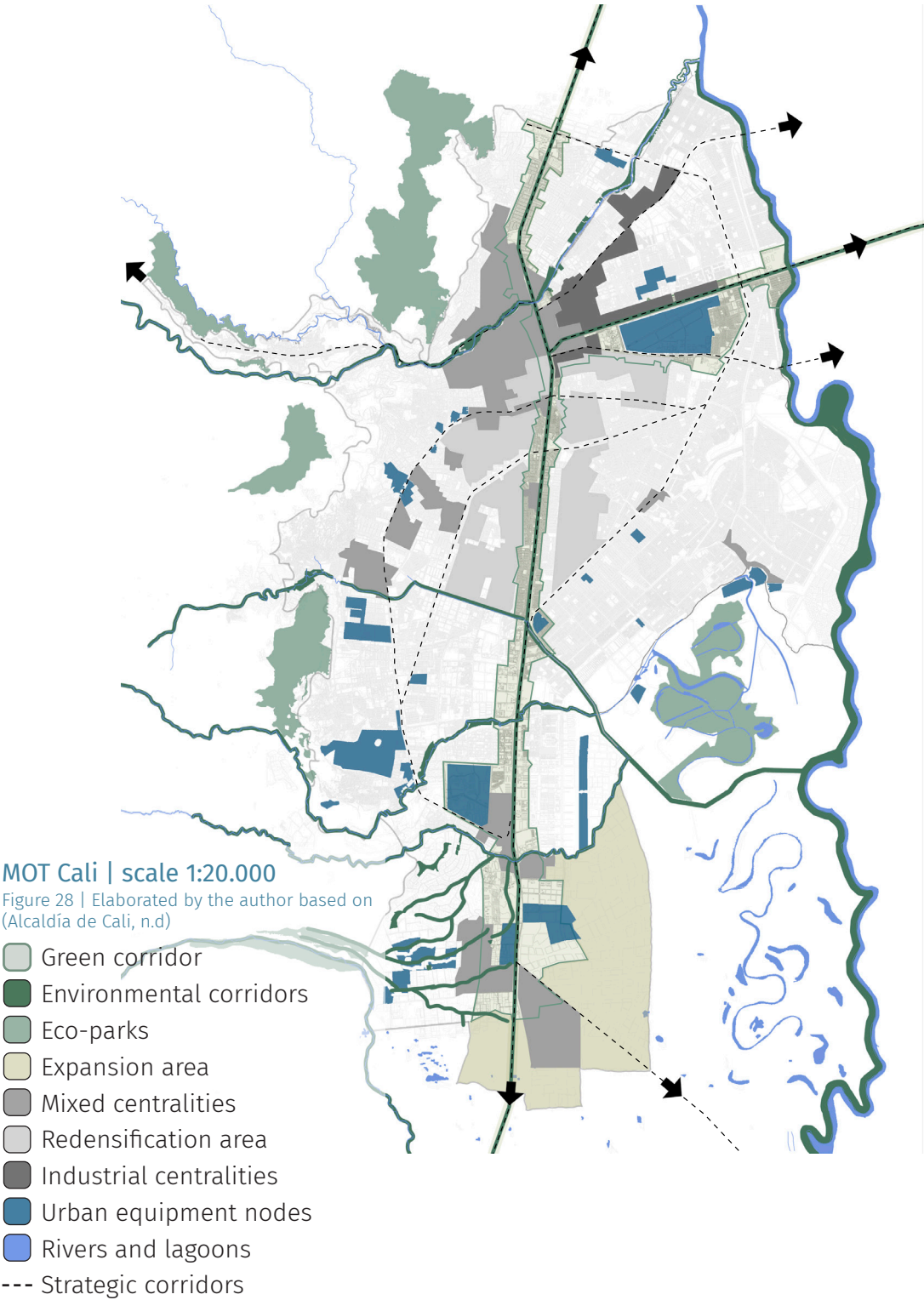
1. Environmental structure: Emphasizing the role of the environment as a cornerstone, promoting the protection and sustainable use of biodiversity.
2. Functional structure: Equitable Distribution and Connectivity prioritizing fair public service allocation, coordinating municipal borders, and promoting regional and global connectivity.
3. Socioeconomic and Urban Development: encouraging balanced urban growth, solidifying Cali's identity as a dynamic city providing diverse services including business, sports, culture, education, recreation, health, and tourism with access to a Pacific port. (Alcaldía de Cali,2014)

POT* Plan de Ordenamiento Territorial (Land Use Plan)
MOT* Modelo de Ordenamiento Territorial (Land Use Planning Model)

(2.4A) MOT / Modelo de Ordenamiento Territorial



The MOT* aims to put the POT* vision into action. It uses environmental factors to decide how land should be used and managed. The model is designed to be dense and polycentric with functional complementarity, connecting effectively with neighboring municipalities (Alcaldía de Cali,2014)

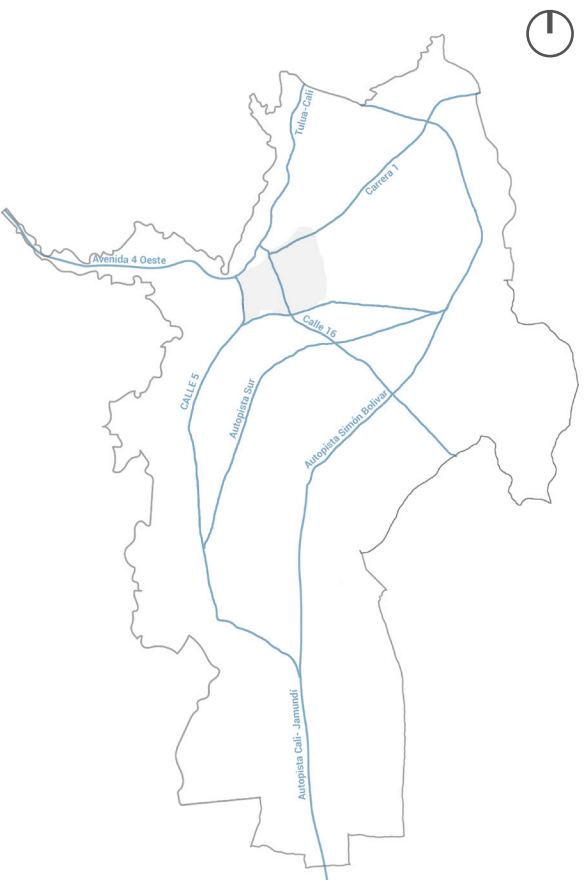


POT* Plan de Ordenamiento Territorial (Land Use Plan)
MOT* Modelo de Ordenamiento Territorial (Land Use Planning Model)

(2.4B) Mobility system

The following map (see figure 29) illustrates Cali's primary roads, revealing a network of main arteries like Calle 5 and the Simon Bolivar highway running from north to south. For east-west connectivity, Carrera 1 and Avenida 4 Oeste play crucial roles, with Avenida 4 Oeste being the only connection to Buenaventura (the port city).

In the (Annex 2) within the framework of POT* 2014, as per Agreement 037, delineates the road hierarchy in the city of Cali, encompassing existing roads and proposed future developments. The city's strategic plan for expanding the road network is primarily to the south, aiming to interconnect the entire area undergoing expansion in that direction. However, no major road-connection improvements are planned for Cali's western area.



Primary road system in Cali
Figure 29 | Elaborated by the author

Public transport system: MIO (Masivo Integrado de Occidente)

The MIO* is a bus rapid transit system serving Santiago de Cali, Colombia. The system runs articulated buses in specific lanes. The project was assigned to the Colombian company METROCALI and came into operation on March 1, 2009. The system includes 55 stations and 5 terminals, 39.6 km of trunk corridors (BUS ONLY Lane), and 424 km of pre-trunk corridors and feeders (Alcaldía de Santiago de Cali , 2019).

Within the context of the POT 2014, in accordance with Agreement 0373 (see Annex 3) illustrates the configuration of the MIO system in Cali, including the main stations that supply the entire city and the main, secondary, and tertiary bus lines. It is worth mentioning that in the northwest part of the city, there are only tertiary bus lines called Alimentadores.

POT* Plan de Ordenamiento Territorial (Land Use Plan)
MIO* Masivo Integrado de Occidente (Western Integrated Mass)

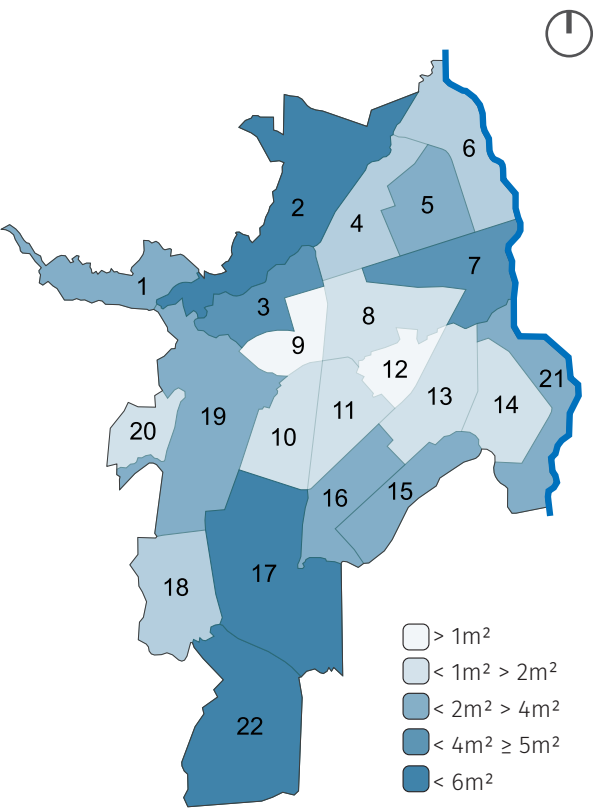
(2.4C) Public space system

The public space of the city of Cali is mainly composed of parks, green areas, squares and small squares. the city also proposes a series of new public spaces that are articulated with the existing ones, incorporating environmental corridors linked to the riverbanks. (see Annex 4).

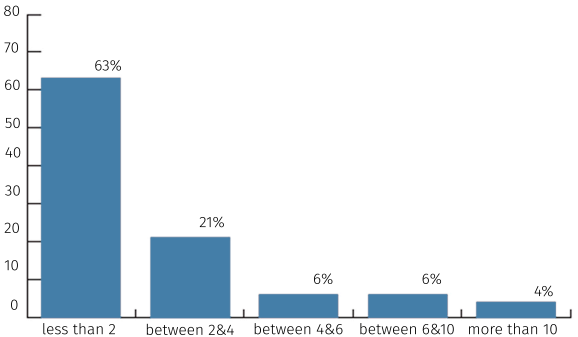
However, according to Mayorga, J. M. and Hernández, L. (2018), in their analysis of public space per inhabitant in Cali, it was determined that most of the city has less than 4 square meters of public space per inhabitant, especially in the center and north-east. In these areas, the supply of public space is limited and mainly on a neighborhood scale, which does not meet adequate needs according to population distribution.

In contrast, areas with medium-high and high indicators are found exclusively in the northern and southern ends of the city. In these areas, the amount of population does not correspond proportionally to the amount of land. The public spaces that contribute most to increasing coverage in these areas are close to some of the key elements of the main ecological structure, such as the Cali River to the north and the Meléndez to the south.

The graph (figure 31) demonstrates that 63% of the population can utilize public space of less than 2 square meters within a fifteen-minute radius from their residences, while only 10% have access to more than 6 square meters. Despite the extensive coverage of public space in certain geographic areas, the proportion of residents in these sectors is not as substantial. (Mayorga, J. M. and Hernández, L. 2018).



Effective public space by communes per inhabitant
Figure 30 | source: (Alcaldía De Santiago De Cali , 2023)



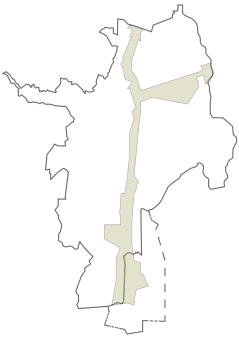
Distribution of population by range of coverage in Cali
Figure 31 | source: (Mayorga, J. M. and Hernández L, 2018)

(2.5) Future vision of the city and informal settlements

(2.5A) Future strategic projects

(A.1) The Green Corridor

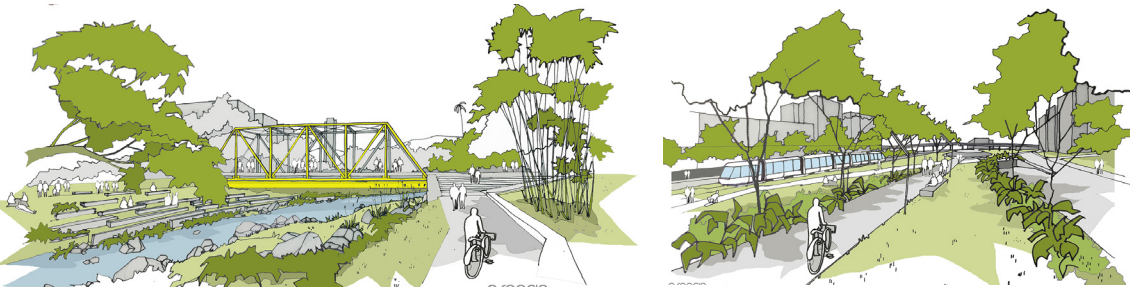
Architects: Espacio Colectivo , OPUS
Prize: First Place
Year Project: 2015



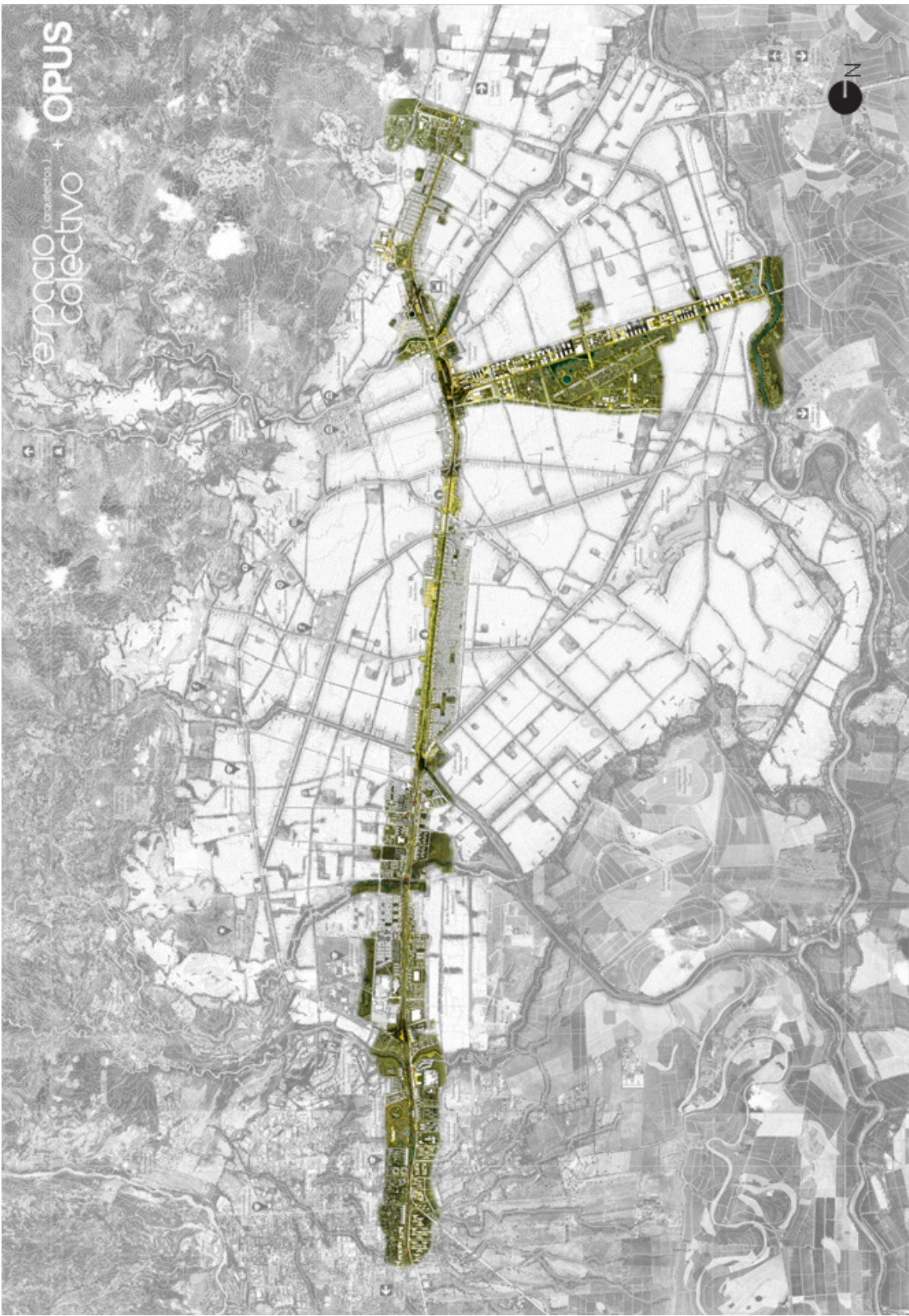
This project arose from a public competition held by the city of Cali to propose a renovation of the old railway line that crosses the city. The proposal of the firms Espacio Colectivo and OPUS, which won the first place, was utilizing the area of the former railway line for various objectives, including restoring an urban ecological network between the hills and the river, incorporating the city in social and spatial dimensions, ensuring balanced connectivity through an eco-friendly public transport corridor, and rejuvenating the city with well-thought-out projects that set in motion transformation processes starting from the central area.

The concept of the green corridor presents an opportunity to advance a city model committed to integrating urban, public space, landscape, and natural systems. The goal is to enhance the residents’ quality of life and reclaim the environmental and landscape values that have characterized Cali. This approach takes a holistic approach to addressing the interplay between the city, its natural surroundings, and mobility, with a focus on achieving sustainable development.

To this end, the project proposes intertwining environmental enhancements with social advancements, fostering spatial integration through strategic connections, and promoting balanced connectivity with a clean public transport corridor. Additionally, it seeks to breathe new life into the city by strategically developing hubs in the central area, catering to education, industry, innovation, commerce, services, and culture. (ESPACIO COLECTIVO+OPUS, 2016)



Green Corridor sketches
Figure 32 | source: (TER-Corredor Verde Cali — Opus, n.d.)



Green Corridor project plan | sc 1:20.000
Figure 33 | source: (TER-Corredor Verde Cali — Opus, n.d.)

(A.2) Environmental corridor of Cali River

Architects: ALCUADRADO Arquitectos + Habitar Colectivo
Environmental advisor: Maria Leonor Bayona Esguerra.
Landscape Advisor: Silvia Shiess.
Prize: First Place.
Year: 2018



The project was part of the National Public Competition for an initial design phase concerning the environmental, landscape, and urban design of the Cali River Urban Environmental Corridor, spanning from 25th Street to the mouth of the Cauca River. The initiative aims to improve the environment and oversee landscape management, fostering ecological connectivity and implementing strategies for conserving and sustainably using biodiversity in newly transformed landscapes. Tools for landscape management are employed to enhance ecological connectivity from the Farallones de Cali National Natural Park to the Cauca River. This involves specific solutions for local ecosystems, such as the warm, dry forest at the base of the alluvial forest.

At each museum station, a variety of activities are focused on the recovery of the Cauca Valley's endemic plants and animals. As essential components of an interactive educational approach, these activities include woods, wetlands, orchards, gardens, butterfly exhibits, apiaries, native species botanical displays, fruits, local crops, and the observation of birds, insects, and local animals (Álvarez, 2020).

To sum up, the initiative prioritizes ecological connection, landscape management, and environmental improvement. This program is an important step toward community involvement and sustainable urban development for a resilient city.

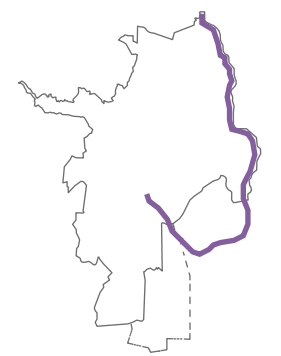


Environmental corridor of Cali River plan

Figure 34 | source: (Álvarez, 2020)

(A.3) Jarillon Plan of Cauca river

Thematic: Housing, Public space
Main responsible: Social Housing Secretariat of Cali.



The Project Jarillón Plan in Cali emerged in response to the effects of the 2010–2011 winter wave, impacting numerous families residing in the Jarillón and its adjacent areas. Through a meticulous census, 8,777 families were identified as beneficiaries of this extensive project, including both social and crucial infrastructure components. The primary objective is to ensure the relocation of these families while fully respecting their rights, thus significantly enhancing their quality of life and relocating them from areas of non mitigable risk. Concurrently, there is a concerted effort to strengthen the dike to prevent potential flooding of unprecedented scale. The beneficiaries are relocated to new social interest apartments built in various areas of Cali and nearby cities.

Likewise, the resettlement line is implemented through economic compensation by means of a subsidy. In this modality, beneficiaries have the option of accessing used housing following the technical criteria established by the project. Furthermore, this initiative encompasses other projects like the Cauca River linear park, the development of rural-inspired productive housing, and citizen education programmes on environmental conservation. Stretching across 26.1 km, the Cauca River Linear Park represents another central point of this large-scale project, aiming to empower the community in the preservation and utilization of its surroundings through the appropriation of public spaces and the establishment of natural areas. (Alcaldía de Santiago De Cali, 2022).



Cauca River Linear Park

Figure 35 | source: (Alcaldía de Santiago De Cali, 2022)



Rural productive housing

Figure 36 | source: (Alcaldía de Santiago De Cali, 2022)

(A.4) Aeropark Marco Fidel Suarez

Thematic: Public Space

Responsible: Administrative Department of Municipal Planning.
Co-responsible: DAGMA*, Secretariat of Infrastructure, Secretariat of Recreation and Sports.

Progress Description: Phase II of the Public Space Master Plan stipulated the inclusion of the evaluation of strategies and mechanisms for the management and financing of the Marco Fidel Suárez Airport.

Management model: with transfer of concessions, mixed investment and private real estate developments.

(IDESC- EXMU, 2018).

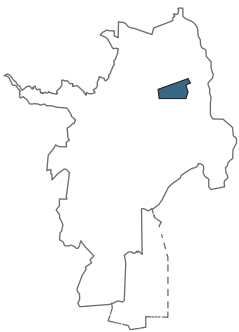
The POT* stipulates that the Aeropark must have at least 95 hectares dedicated to the enjoyment of the city’s pedestrians, where at least 90% must be green areas. (El País, 2023) it will serve as a vital ecological link, connecting the Green Corridor to the Cauca River, transforming the existing airbase into a large metropolitan park. This project was included in the green corridor competition, in which each participant submitted a proposal for the design of this urban park, as previously mentioned, at the end of the contest the winners were the firms ESPACIO COLECTIVO and OPUS.



Metropolitan park - Green corridor

Figure 37 | source: (Valencia, 2020)

POT* Plan de Ordenamiento Territorial (Land Use Plan)
DAGMA* Departamento Administrativo de Gestión del Medio Ambiente. (Administrative Department of Environmental Management)



(A.5) Urban renewal programs

The Urban renewal programs are:

- Partial plan El Hoyo and El Piloto
- Partial plan El Calvario (Ciudad Paraíso)
- Urban renewal project Lagunas El Pondaje and Charco Azul.

Thematic: Housing

Main responsible: Empresa Municipal de Renovación Urbana. Co-responsible: Social Housing Secretariat of Cali.

(IDESC- EXMU, 2018)

These projects aim to rejuvenate neglected city areas by constructing housing, public spaces, and commercial areas. The Partial Plan for El Hoyo and El Piloto proposes 5,482 residences along the Cali River, with 39,250 m2 of commercial spaces. Encompassing 23 hectares, the development anticipates creating 25,656 job opportunities. (Alianza Para La Renovación Urbana De Cali , 2020).

As a follow-up to the urban development initiative, the Partial Plan El Calvario (Ciudad Paraíso) transforms 23.81 hectares into a dynamic hub. It includes 28,164 m² of public space, potential housing for 5,951 units, and about 135,343 m² for commerce and services. Its objectives include revitalizing central areas, improving public spaces, optimizing transportation, creating jobs, and enhancing citizens’ quality of life. (Edru, 2023).

Finally, a significant challenge involves the construction of 2,000 free-of-charge homes for the beneficiaries around El Pondaje and Charco Azul lagoons, benefiting residents of the Incompletely Developed Human Settlements. The entire project covers a total area of 50,000 square meters, with 13,000 square meters designated as a protection zone (Alcaldía De Santiago De Cali, 2015).



Partial plan El Calvario (Ciudad Paraíso)

Figure 38 | source: (Edru, 2023)



Partial plan El Hoyo and El Piloto

Figure 39 | source: (Alianza Para La Renovación Urbana De Cali , 2020)



(A.6) Housing relocation project in areas of non-mitigable risk due to mass movements

Thematic: Housing

Main responsible: Social Housing and Habitat Secretariat of Cali

The goal of the initiative is to relocate houses in Communes 1, 2, 18, 19, and 20, as well as nearby rural areas identified as having a significant risk of mass movements based on current research and future updates. This relocation relies on the formulation of a comprehensive financial and implementation strategy. Likewise, the project aims to stabilize, restore, and protect the vacated areas in alignment with Article 444 of Agreement 0373 from 2014, specified in the POT.

The Secretariat of Social Housing and Habitat has successfully relocated 288 households from high-risk areas that could not be mitigated. These areas were identified through socio-demographic characterization carried out by the entity in 2013, prompted by the effects of the 2010–2011 La Niña phenomenon. The relocation is part of the Altos de Santa Elena Project and involves the allocation of new housing subsidies.

Progress:

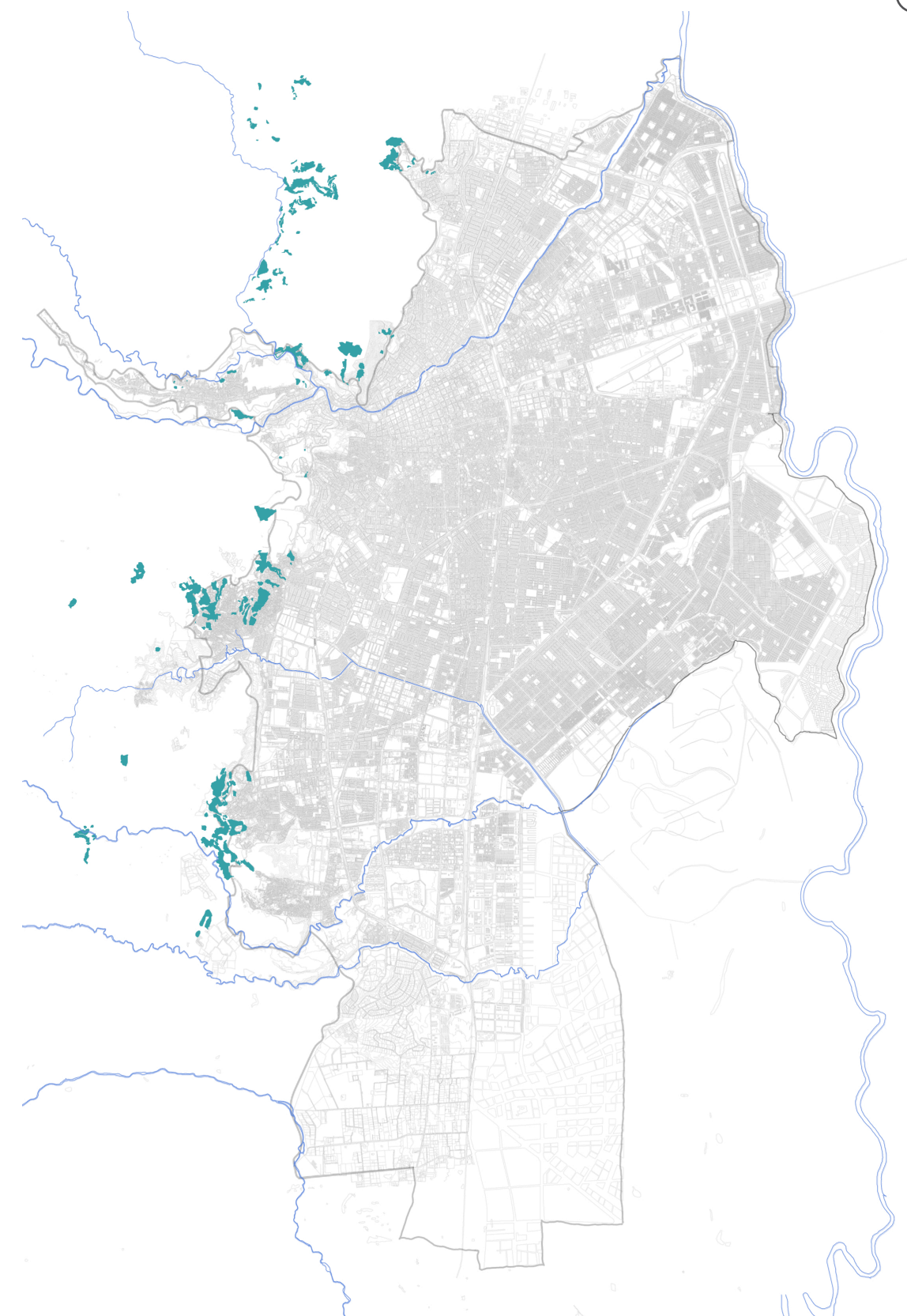
Commune 1 - 8 homes

Commune 18 - 233 households

Commune 20 - 47 households

Corregimiento la Buitrera - 2 homes

(Alcaldía De Santiago De Cali, 2019)



Housing relocation project in areas of non-mitigable risk due to mass movements | scale 1:20.000

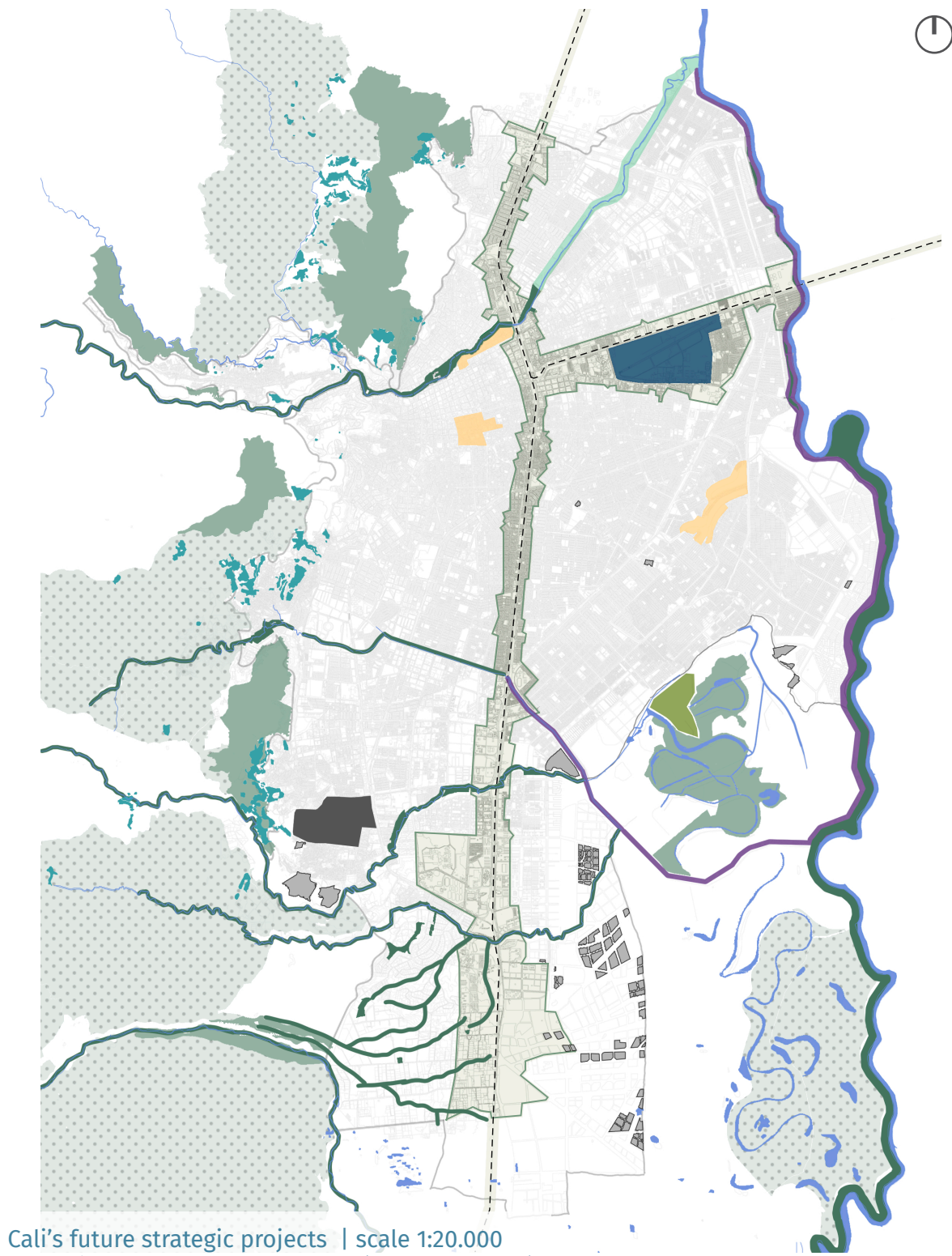
Figure 40 | Elaborated by the author based on (Alcaldía de Cali, 2014)

(2.6) Compilation of the city's future strategic projects

Figure 41 illustrates the locations of the previously strategic macro-projects, which are regarded as the most important proposals for public space, facilities, and housing. In parallel with these, the city of Cali has proposed further projects based on its vision for the city's future, such as Bataclán and Aguacatal Eco-parks, Pichincha Regional Park, Eco City Navarro, among others. All these strategic initiatives encapsulate the concept of a more interconnected city committed to the renaturalization of its primary corridors. A prominent axis of public spaces and collective facilities spans from north to south, exemplified by the green corridor and a network of environmental corridors along the city's riverbanks. These projects are intricately linked to urban renewal interventions targeting currently neglected areas.

These macroprojects are carefully designed to benefit every facet of the city, involving landscape, environmental considerations, and urban planning. Their fundamental goals include enhancing mobility systems, revitalizing public spaces, optimizing housing structures, and implementing cultural and educational facilities. By promoting an environment valued by its residents, the goal is to move the city toward a more balanced and organized composition.

The macroprojects seek to create a cohesive urban layout that not only addresses immediate needs but also contributes to the long-term sustainability and vibrancy of Cali. The inclusion of cultural and educational amenities serves as a booster for community engagement, fostering a sense of identity and pride among residents. These programs seek to develop a harmonious integration of infrastructure, environment, and community through careful urban planning, transforming Cali into a socially and culturally vibrant, economically viable city.



Cali's future strategic projects | scale 1:20.000

Figure 41 | Elaborated by the author based on (Alcaldía de Cali, 2014)

- Green corridor
- Environmental corridors
- Environmental corridor Cali River
- Relocation of houses at risk
- Plan Jarillon Cauca river
- Potential areas for protected zones
- Eco-parks
- Urban renewal program
- Eco City Navarro Macroproject
- Pichincha Regional Park
- Priority areas for social housing
- Aeropark Marco Fidel Suárez
- Area of interest
- Rivers and lagoons

(2.7) The informal settlements in Cali

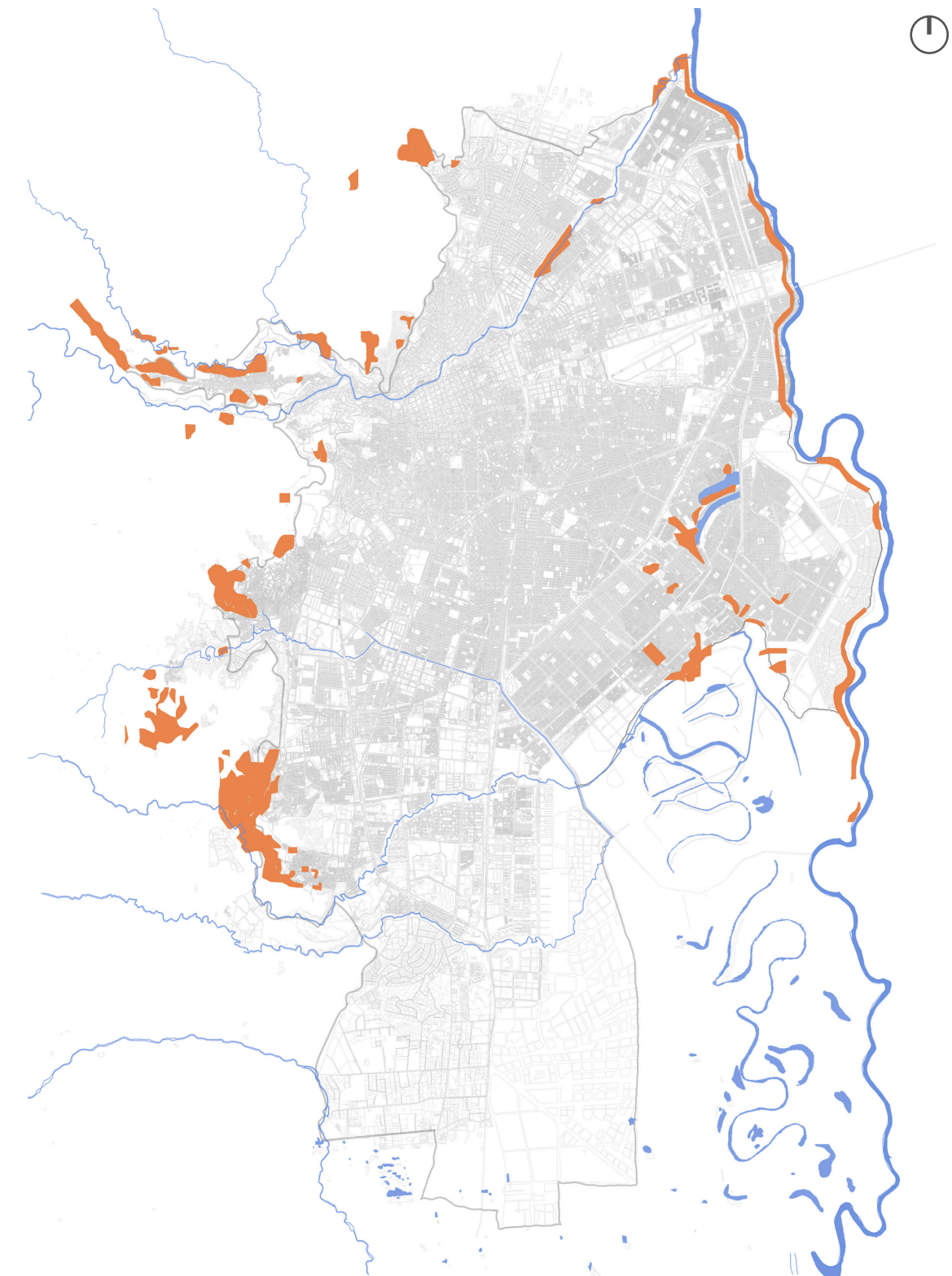
Over the last decade, there has been an ongoing rise in informal settlements. In sectors that have been consolidating for several decades, there is visible saturation in places with limited surface occupancy due to soil scarcity, while vertical expansion continues to increase without any safety parameters.

The majority of informal settlements have grown up on the hillsides in the eastern and western parts of the city (figure 42). Recent records from the Municipal Administration in 2017 reveal that approximately 40,000 families currently reside in these informal settlements. Moreover, in 2019, a total of 195 polygons representing informal settlements were identified, covering a combined area of 606.4 hectares. Within this expanse, 334.4 hectares are situated within the urban perimeter (Peláez & Franco, 2019).

The high presence of informal settlements in Cali is of great concern because the population living in these areas is particularly vulnerable compared to the rest of the city's population. Among the main problems associated with informal settlements are: higher levels of unprotected health system, deficiencies in education, lack of job opportunities, precarious housing conditions, irregular public services, high levels of multidimensional poverty, high population density and a state of permanent risk for families living on land prone to natural phenomena such as landslides or floods (Ortiz & Franco, 2023).

Another major problem with these settlements is their profound impact on ecosystems and the environmental wealth of the city, bearing in mind that most of the informal settlements are located in protected areas such as Los Farallones National Natural Park and the Cali River. To occupy these areas, people resort to actions such as deforestation, land movements without technical knowledge to prevent landslides and have even diverted or plugged water sources (Peláez & Franco, 2019). In addition to this, there is inadequate waste management and contamination of natural areas such as rivers, partly as a result of the lack of access to basic sanitation services and drinking water.

The persistent growth of informal settlements reflects the challenges of urban development. The visible saturation in limited surface areas due to soil scarcity, coupled with uncontrolled vertical expansion, points out the urgent need for strategic and safety-conscious urban planning and the implementation of policies, programs, and projects aimed at improving the quality of life of the population that constantly faces shortages of infrastructure and basic services.



Location of the Informal settlements in Cali | scale 1:20.000

Figure 42 | Elaborated by the author based on (Peláez & Franco, 2019)

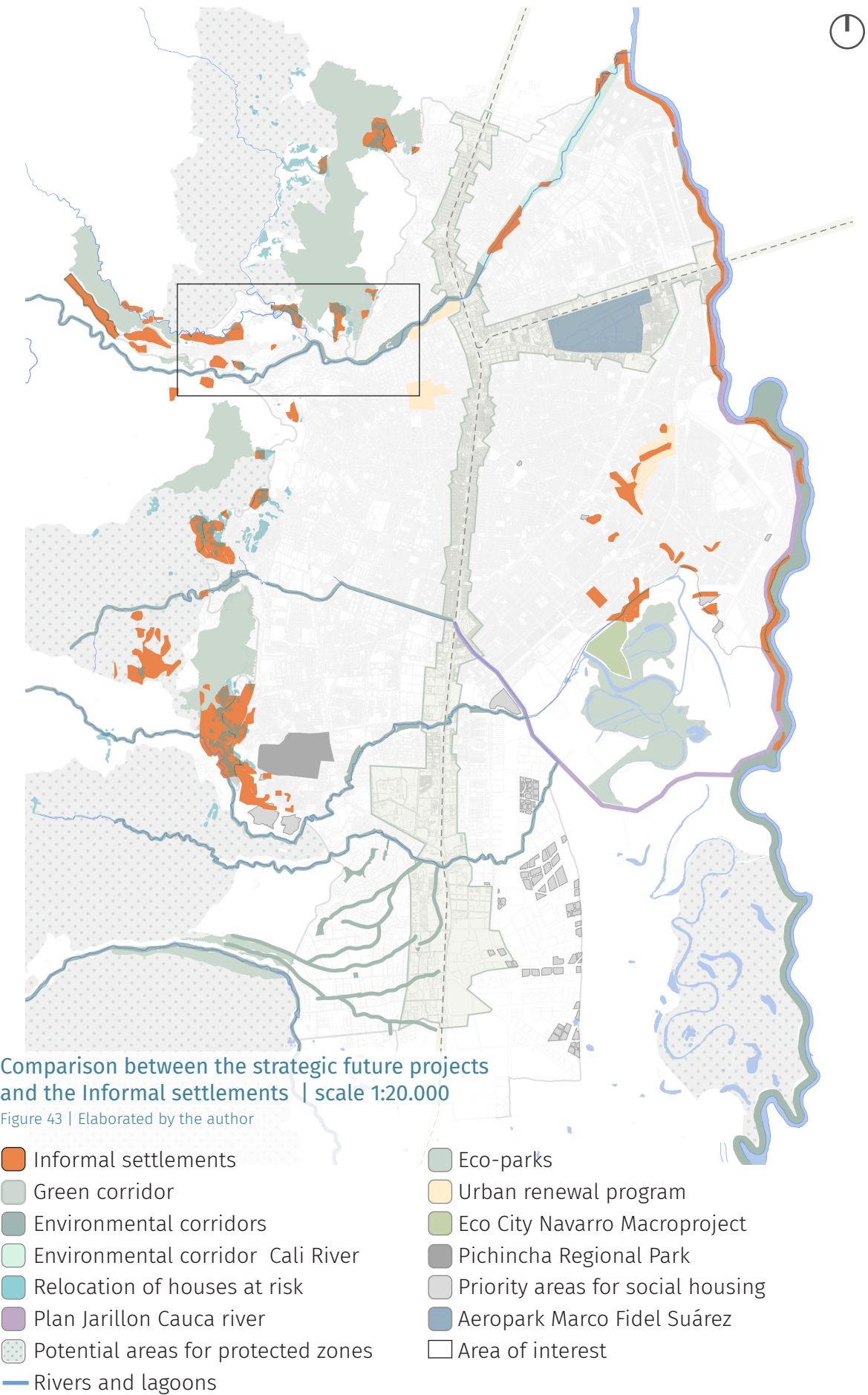
- Informal settlements
- Rivers and lagoons

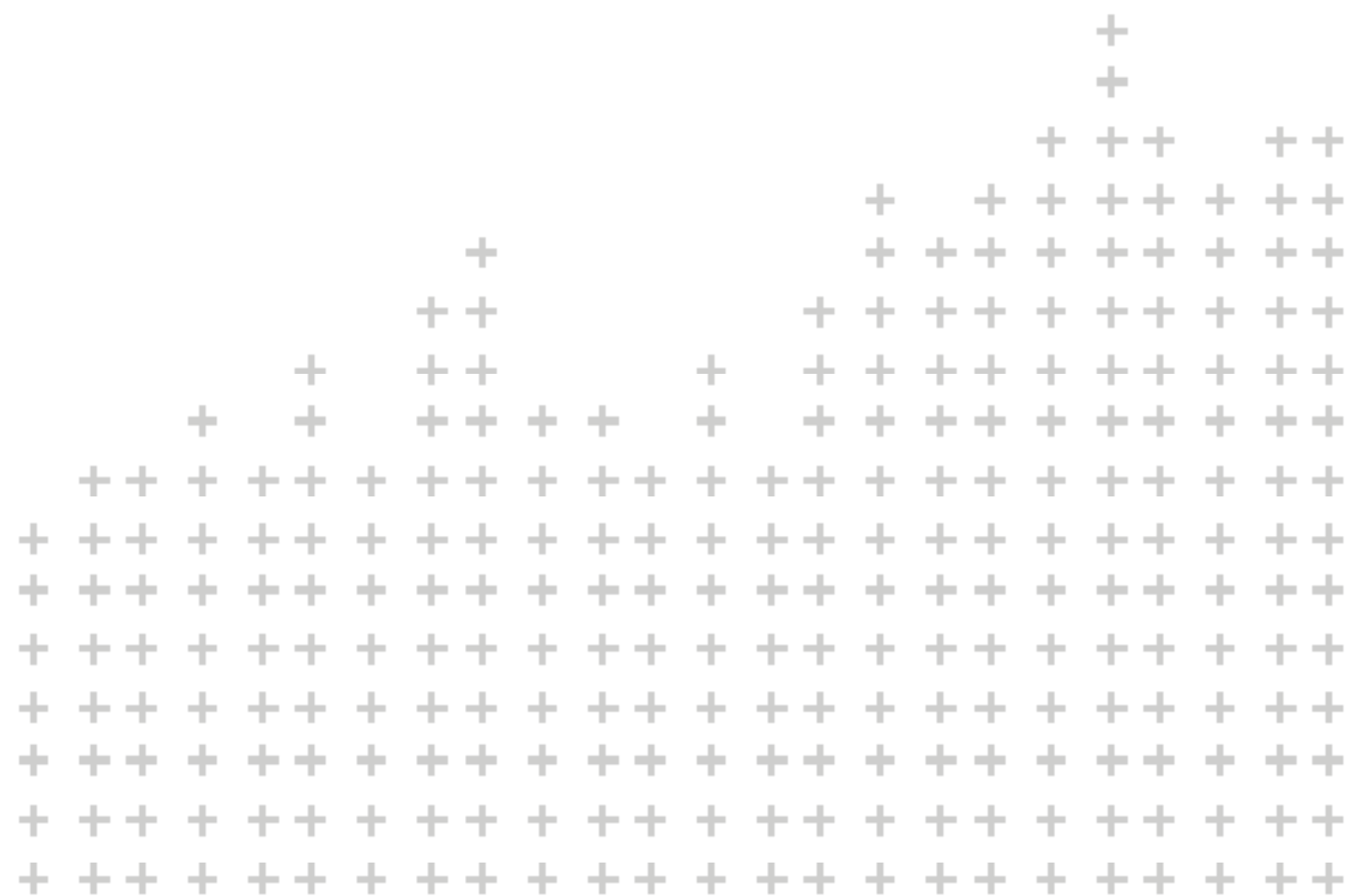
(2.8) Overlapping layers (strategic projects and informal settlements)

To understand how informal settlements are integrated into the city's future projects, the analysis was made by overlaying the informal settlements with the strategic future project plans, as shown in Figure 43. This map highlights the incorporation of some informal settlements into the city's strategic initiatives, particularly in the eastern region where urban renewal projects such as Lagunas El Pondaje, Charco Azul, and the Plan Jarillon of the Cauca River are situated. Notably, these projects share a common goal of addressing some of the issues faced by informal settlements, including the construction of new housing and the relocation of those threatened by potential flooding.

It also reveals a lack of emphasis on the informal settlements in the western and northwestern parts of the city. In these areas, there is an absence of projects that offer solutions to the specific needs of Cali's informal settlements. The nearest strategic projects in this sector are the eco-parks named Bataclán and Aguacatal, renowned for their potential for ecological and public space projects. Despite their proximity, many informal settlements in the northwestern zone remain disconnected from these vital initiatives.

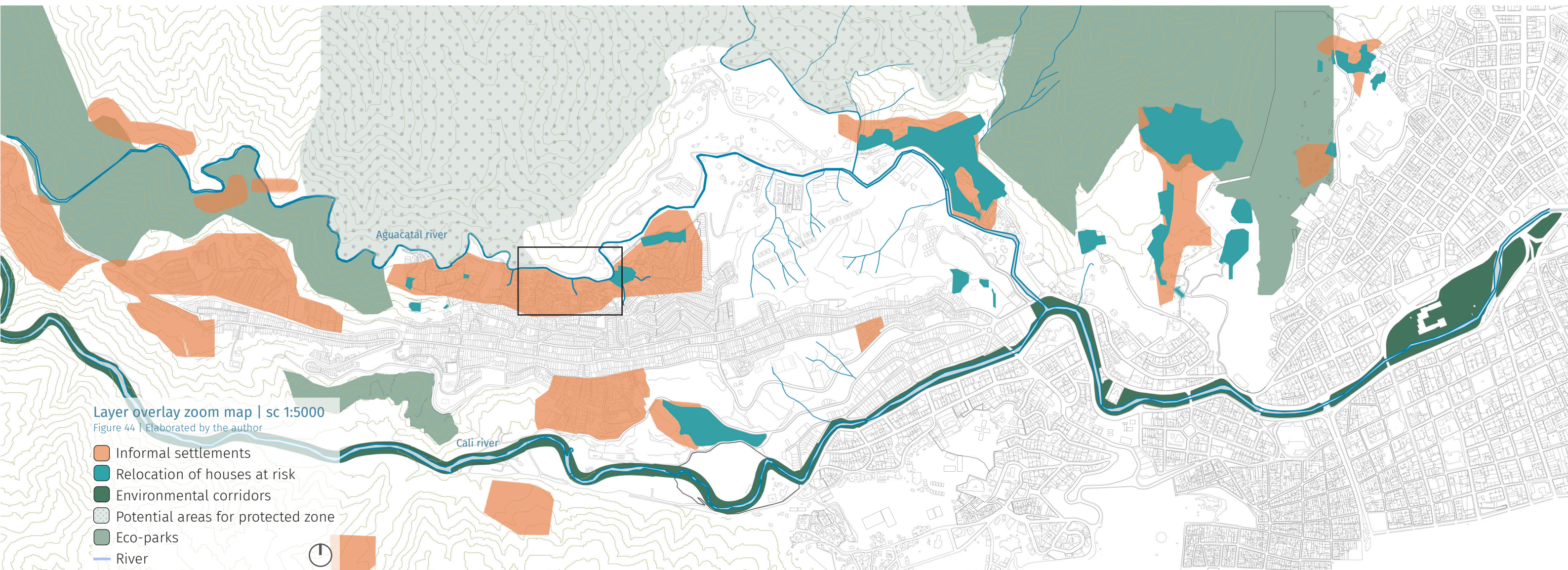
To bridge this gap, there is a crucial need to establish connections between informal settlements and nearby strategic plans, such as eco-parks. This linkage could serve as a conduit between the major projects, the Environmental Corridor of the Cali River and the Green Corridor, by implementing public spaces and urban renewal strategies. The proposed project aims to formulate a strategic model that could be replicated in other parts of the city with similar characteristics, aimed at improving the well-being of the population and connecting it with the main future projects of Cali.





NORTHWEST OF CALI

Chapter 3



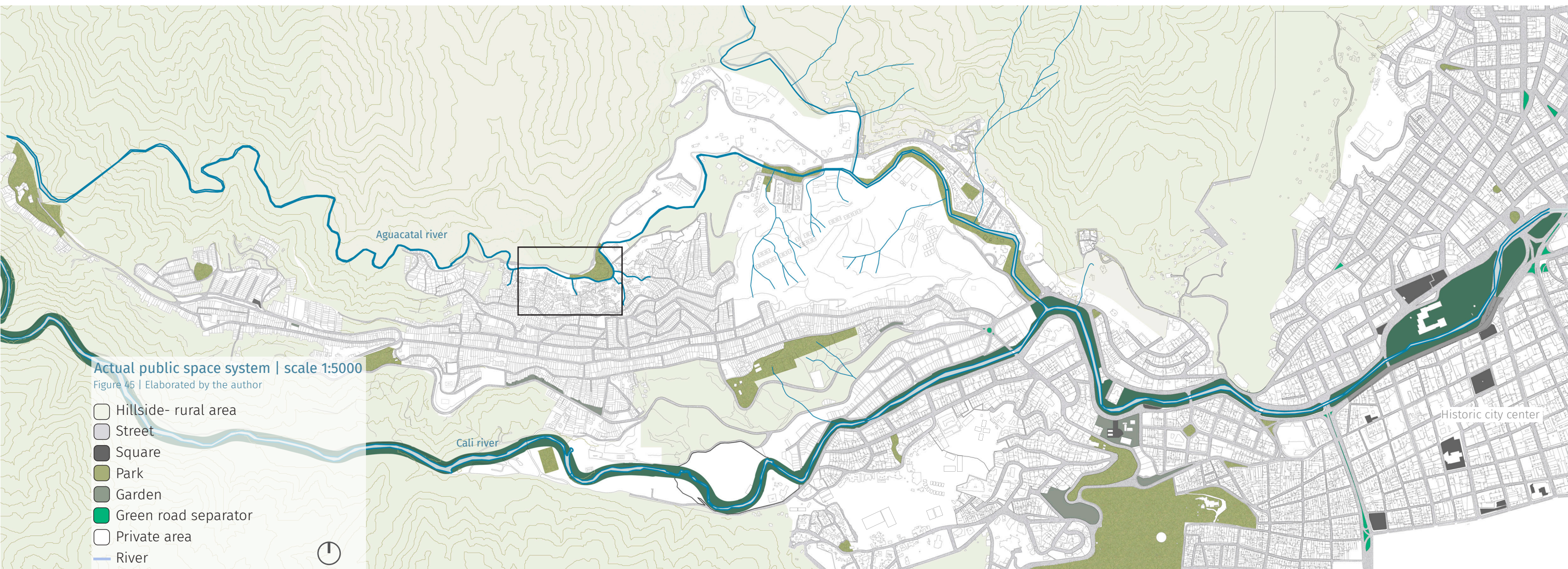
(3.1) Zoom of the overlapping in the area of interest

In the context of northwest Cali, informal settlements face substantial challenges due to the region's irregular topography. The mountainous orography imposes significant limitations on development options, complicating the provision of essential services such as road infrastructure and public transportation. In addition, the topography accentuates difficulties in accessing basic services such as water and sanitation, adversely affecting the quality of life of residents.

Future urban planning in Cali does not tend to consider integrally some hillside areas, both existing and in the process of growth. The lack of inclusion is manifested in the lack of public spaces, recreational facilities and green areas in these zones. This deficit not only has a direct impact on the quality of life, but also generates substantial implications for social cohesion and community development, a palpable phenomenon in the northwest of the city.

Although there are some planned future interventions in the area, such as the Ecoparks Bataclán and Aguacatal and the environmental corridor along the banks of the Cali River, unfortunately, there is no effective project connection between these proposals and the existing infrastructure. This lack of synchronization could limit the effectiveness and coherence of these initiatives, hindering their positive impact on the local community.

The integration of strategic city projects with informal settlements is essential to promote equitable, inclusive and sustainable urban development. Consequently, active citizen participation in the design and implementation of these initiatives is promoted, as well as the regularization of land tenure, an essential measure given the widespread lack of legal property titles in these settlements. Improving basic infrastructure, facilitating access to social services and promoting accessibility are key components in moving towards more equitable and sustainable urban development in northwest Cali.



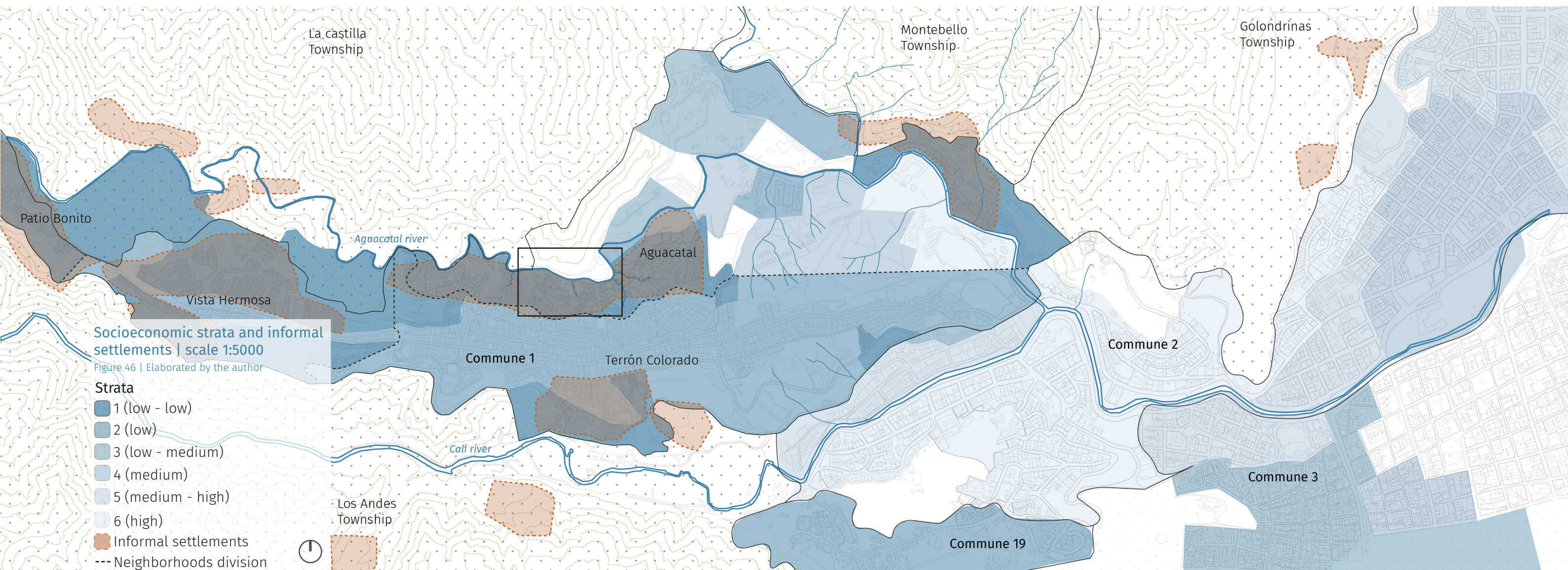
(3.2) Actual public space system

The actual public spaces in the city of Cali, especially in the northwestern part, reveals a clear urban challenge. The scarcity of public spaces and the suboptimal conditions of some of them indicate the need for a more comprehensive and equitable planning and development within the area to be intervened.

It can be seen that as the city extends towards the hillside area, there is less variety of public spaces, leaving only small or intermediate scale parks. Many of these parks are also in poor condition, lacking maintenance and adequate amenities for residents. The unequal distribution of public spaces within the community suggests the possibility of inequalities in access and enjoyment of these community resources. It is essential to address these imbalances in order to ensure the proper integrity to connect to the proposed future public space network and eventually connect at the city scale. In addition, active collaboration between the community and other relevant stakeholders could play

a key role in identifying priority areas for the development of new public spaces and the improvement of existing ones. Citizen participation can be fundamental in ensuring that public space proposals reflect the real needs of the community and contribute to the enrichment of the urban and social fabric in the northwestern part of Cali.

The limited presence of parks, squares and gardens in the northwestern area of Cali, compared to the central area and the historic center of the city, where there are more extensive parks and more important plazas, highlights the disparity in the distribution of public spaces. This contrast emphasizes the urgent need for an equitable approach to urban planning to ensure that all sectors of the city enjoy quality public spaces. The proper structuring of a neighborhood implies not only the existence of public spaces. It also implies their accessibility, diversity, and maintenance.



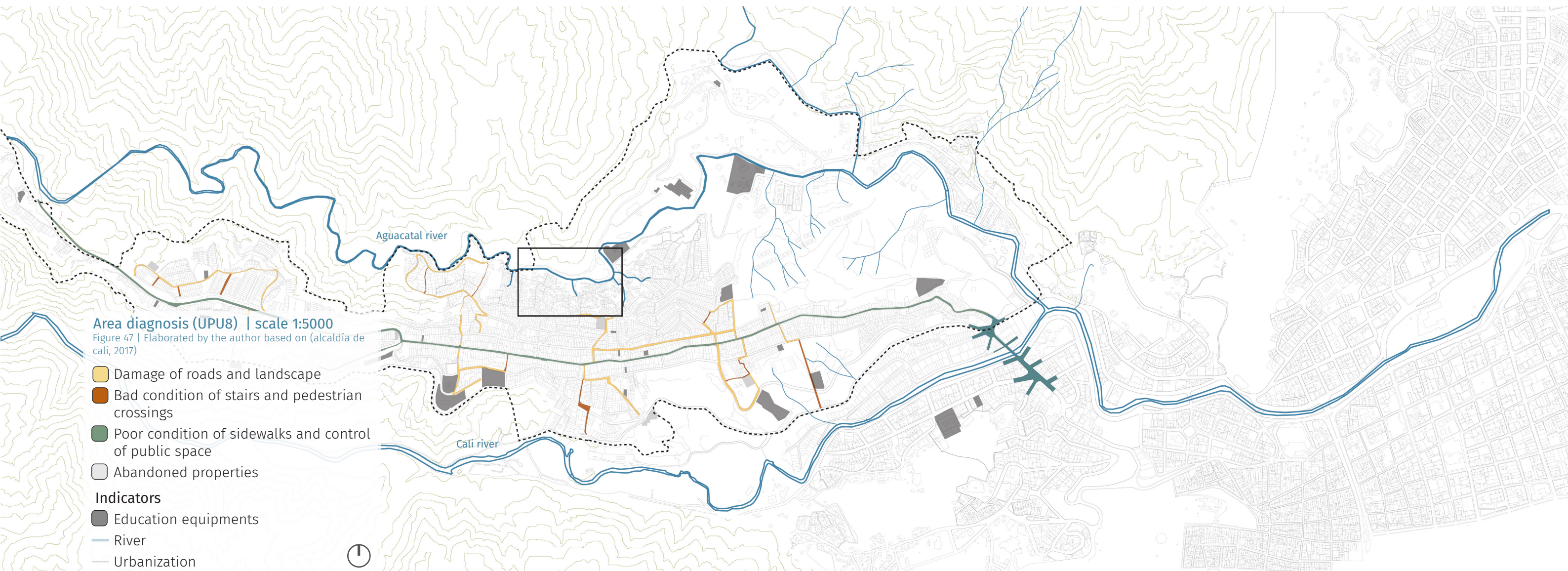
(3.3) Socioeconomic strata and informal settlements in the commune 1

Commune 1 of Santiago de Cali, also known as “Comuna Popular,” stands out as one of the 22 communes that make up the urban area of the city. Located in the northwest of Cali, its geographic boundaries connect it with Comuna 2 to the north, Comuna 3 to the east, Comuna 20 to the south and Comuna 4 to the west. This strategic location exposes it to diverse urban dynamics and particular challenges associated with its hillside context and close to two important rivers, the Cali and Aguacatal river.

In socioeconomic terms, the commune exhibits a varied range of realities, ranging from commercial and residential areas to the presence of informal settlements. In the case of the latter, the socioeconomic conditions of residents are likely to reflect lower levels of income and precarious employment. The scarcity of formal job opportunities can perpetuate a cycle of poverty, contributing to the economic challenges experienced by the inhabitants of these areas.

Informal settlements, currently referred to as informal human settlements of incomplete development, are a direct consequence of the population growth in Cali, exacerbated by various forms of migration that have led to a disproportionate and improvised occupation of urban land. This phenomenon manifests itself mainly in the hillsides of the municipality, where physical and environmental conditions, combined with human intervention, generate phenomena such as landslides, dumping and accumulation of solid waste.

These informal settlements are located on the Via al Mar, specifically in the protected zone of the Cali and Aguacatal rivers, on land characterized by excessive slopes. The houses, built with unstable materials, lack public services, have only one road connecting them to the city, have internal roads in poor condition, and lack basic social services.



(3.4) Urban diagnosis by UPU 8 | Analysis

The UPU* is a crucial tool in the context of the revision and adjustment of the POT* as it allows the generation of specific strategies for a given territory. In the case of the UPU8, a compilation of information is carried out at the local level, which is then used as a tool for urban planning.

During the process of revising and adjusting the POT*, a citizen participation strategy is implemented in UPU8. This strategy focuses on promoting the appropriation of the territory by its inhabitants. To achieve this, activities such as the recovery of the memory of the process of revision and adjustment of the POT* are carried out. In addition, social mapping workshops, field tours with the community and discussion and analysis sessions are organized in relation to the proposed projects and programs. These actions are designed to promote active community participation in decision-making and in shaping urban

development, thus facilitating a participatory planning approach that reflects local needs.

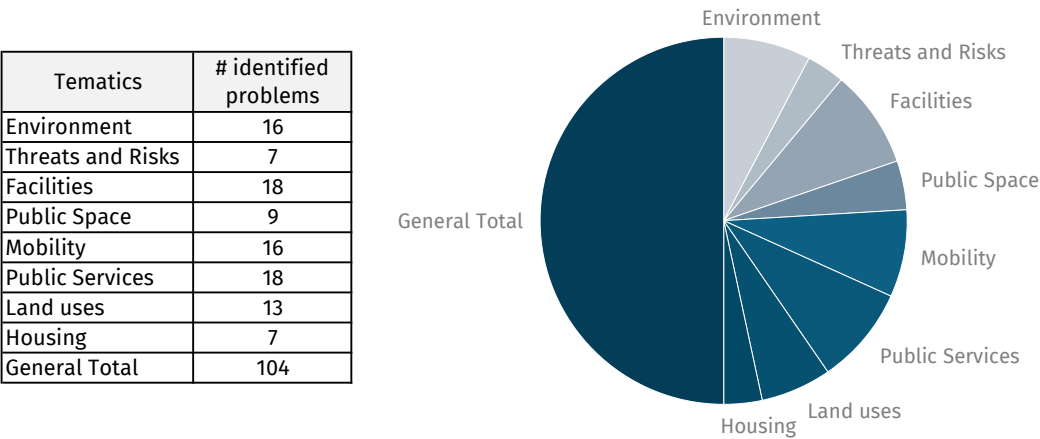
Through these processes, various cartographies are generated that highlight problems in the area, such as the deterioration of roads, accessibility limitations, especially in steep areas, and poor conditions of public space. These cartographic representations provide a detailed view of local issues, thus facilitating the identification of priority areas for intervention and giving an overview of what is happening within the commune.

In addition to participatory mapping, problem and solution matrices were used to gather information on the issues perceived by citizens, their causes, impacts and proposals for possible solutions during the period 2012-2016. Walks were conducted in the company of community leaders to recognize the territory and understand the conflicts present in the area.

(SUBDIRECCIÓN DE PLANIFICACIÓN DEL TERRITORIO, 2016)

UPU* Unidad de Planificación Urbana (Urban Planning Unit)
 POT* Plan de ordenamiento Territorial (Territorial Management Plan)

The information collected was organized according to thematic categories that included aspects such as environmental setting, threats and risks, facilities, public areas, mobility, public services, and land use patterns. The final result materialized in the Consolidated Matrix of the UPU 8 - Cerros Diagnosis, which revealed the following findings:



Territorial problems identified by UPU-8 citizens during the period 2012-2016

Figure 48 | Elaborated by the author based on (Subdirección de planificación del territorio, 2016)

Analyzing the information collected in the above matrix (see figure 48), it is clear that the main concerns of the inhabitants of UPU 8 - Cerros are focused on public services and facilities, both representing 17% of the requests. Problems were identified such as the poor condition of the aqueduct and sewerage networks, storm drainage failures and the lack of drinking water in Municipality. Mobility and the environment came in second with 15% of the requests, addressing issues such as the deterioration of road infrastructure, traffic congestion, lack of sidewalks and handrails, and the precarious condition of footbridges. Concerns about river pollution, lack of tree planting, mining activities and deterioration of environmental elements are also highlighted.

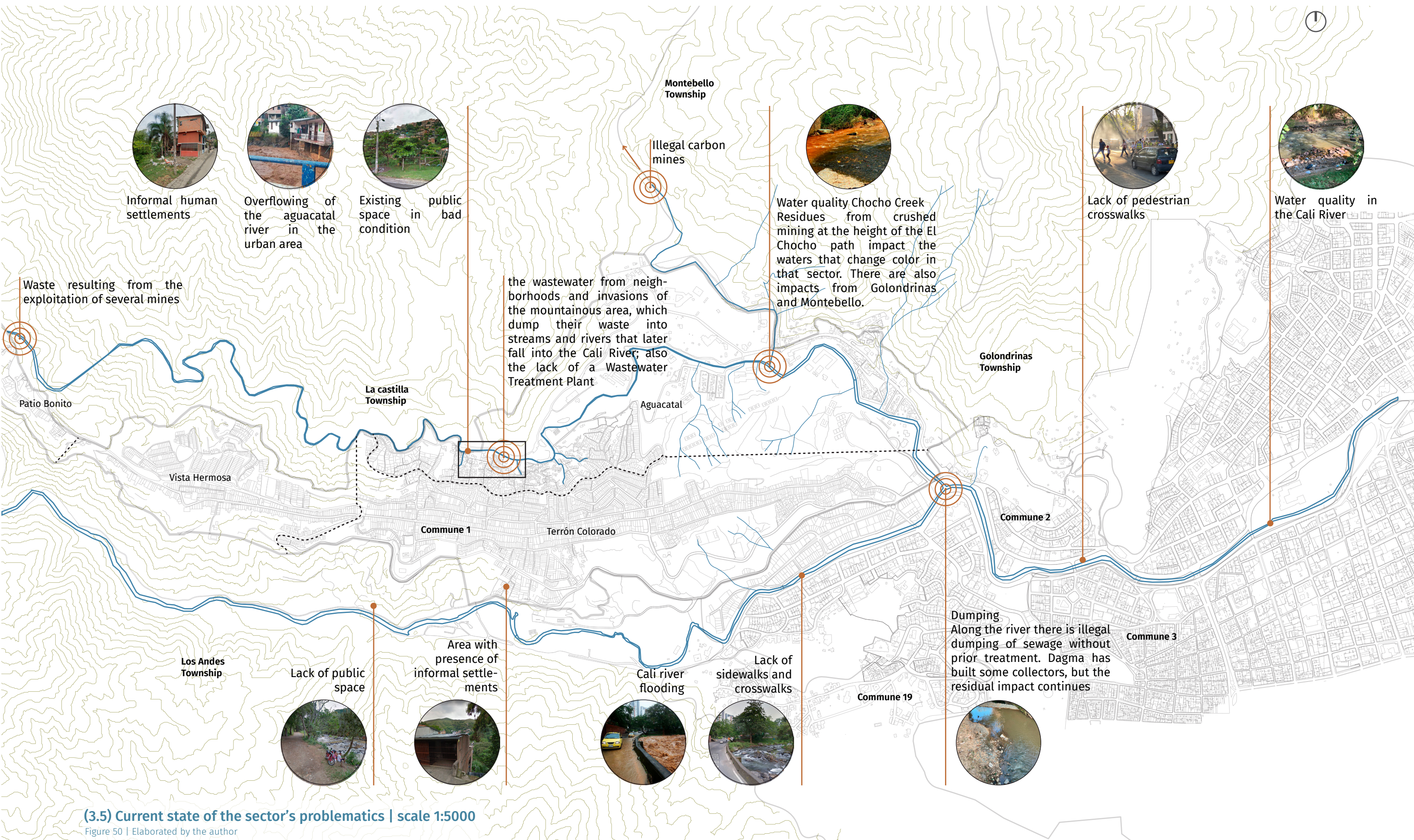
In third place, land uses represent 13% of the requests, identifying conflicts related to commercial activity and the interests of residents and merchants, as well as the proliferation of informal businesses and the adverse impacts of commerce. Next, public space represents 9% of the requests and addresses issues such as the deterioration of courts, green areas, and parks, the lack of areas for recreation, and the illegal occupation of public space by informal vendors. To a lesser extent, the presence of incompletely developed informal human settlements is indicated by housing, threats, and risks (each with 7%). This suggests a need for land development to construct VIS*. (SUBDIRECCIÓN DE PLANIFICACIÓN DEL TERRITORIO, 2016).

VIS* Vivienda de Interés Social (Social Interest Housing)

Formulation process and social mapping workshops of UPU 8

Figure 49 | source: document PROCESO DE PARTICIPACIÓN CIUDADANA PARA LA FORMULACIÓN DE LA UNIDAD DE PLANIFICACIÓN URBANA 8 – CERROS.pdf





(3.5) Current state of the sector's problematics | scale 1:5000

Figure 50 | Elaborated by the author

Current state of the sector's problematics

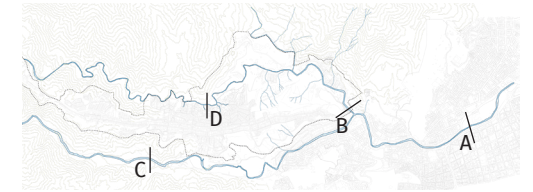
Starting from the historic center of the city, close to communes 2 and 3, it can be observed that this central and vital area has achieved a better connection with the urban planning of Cali. However, there are some issues, such as the presence of garbage in the river due to the high influx of people in this area. Although the infrastructure along the Cali River is good, there are identified areas where crosswalks are necessary to facilitate the flow of pedestrians.

At the confluence of the Cali and Aguacatal Rivers, there is a significant accumulation of chemical and organic waste. This is the beginning of a more significant pollution problem in the direction of the Cali River. The area has limited pedestrian access, with crosswalks being insufficient due to the prevalence of strata 5 and 6, which prioritize vehicular traffic. Informal human settlements have been detected in the upper areas of the Cali River, along with unattended public spaces and uncontrolled growth.

In reference to the Aguacatal River, the Chocho Creek is located, which connects directly to the river and extends into the mountainous zone. Due to various reasons, this stream experiences intense contamination for various reasons, making its waters a serious risk for domestic use, according to significant reports. At La Elvira, the Aguacatal River receives wastewater from pig facilities and sewage from several educational institutions and social clubs further downstream, in addition to waste generated by quarrying. The El Chocho creek also receives numerous wastes from quarries and coal mines along its course, as well as most of the wastewater in the Montebello and Golondrinas area.

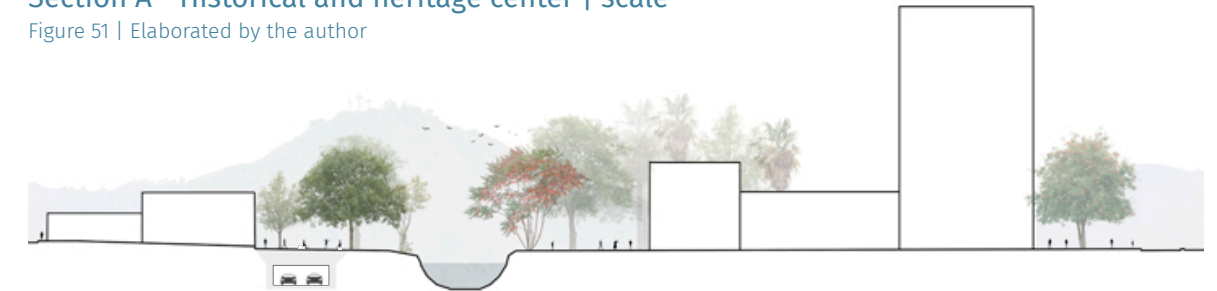
The Aguacatal neighborhood, located at a higher elevation, shows signs of unplanned growth and a lack of public facilities and spaces for the population. The presence of informal human settlements and the lack of essential services, as indicated in the UPU8 matrix, generate specific problems in these hillside encroachments. The absence of an aqueduct system and inadequate waste management facilities result in the latter flowing into the river.

Finally, there are parks in poor condition and a lack of continuity between planned urban development and unstructured housing growth. The lack of control over infrastructure and land ownership leads to housing that does not respect the river's protective strip. This situation poses a risk because, according to studies by the Mayor's Office of Santiago de Cali, the area is prone to flooding, which could have negative consequences for these homes.



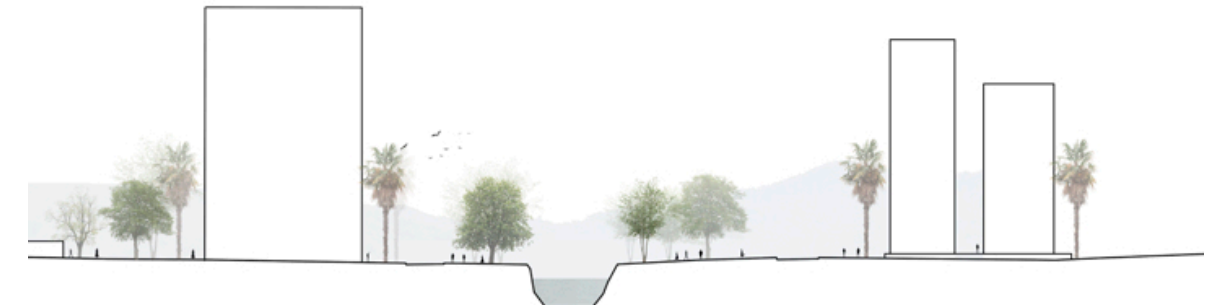
Section A - Historical and heritage center | scale

Figure 51 | Elaborated by the author



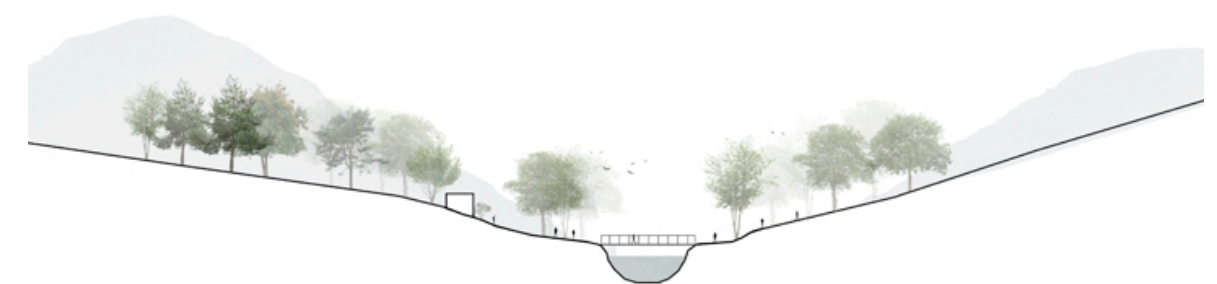
Section B - Aguacatal river lower part | scale 1:1000

Figure 52 | Elaborated by the author



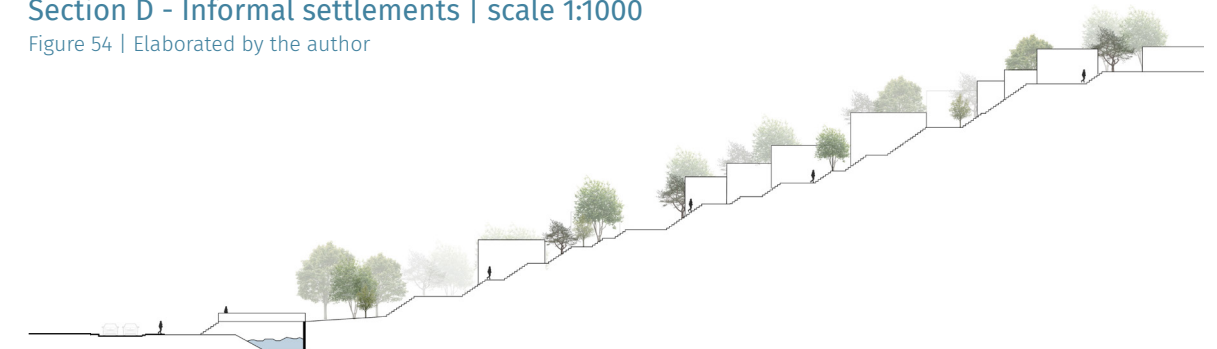
Section C - Ecological routes | scale 1:1000

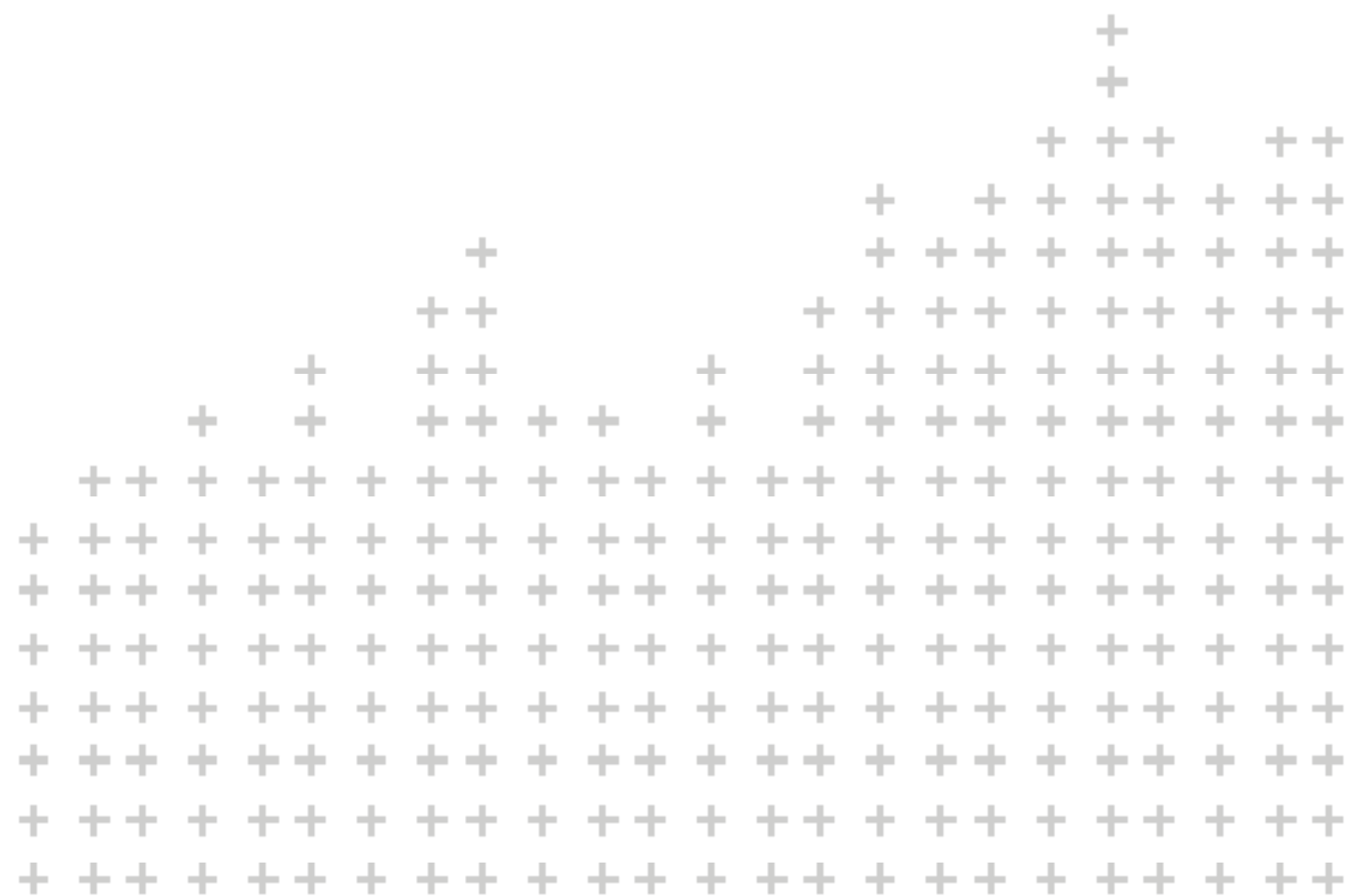
Figure 53 | Elaborated by the author



Section D - Informal settlements | scale 1:1000

Figure 54 | Elaborated by the author





ANALYSIS OF CASE STUDY

Aguacatal neighborhood

Chapter 4

(4.1) The Aguacatal neighborhood - Introduction

The Aguacatal neighborhood, situated in the northwestern region of the city and falling under the territorial-administrative jurisdiction of Commune 1, represents a distinct urban environment. It englobes four primary official neighborhoods: Terrón Colorado, Vista Hermosa, Aguacatal, and Patio Bonito.

This commune is distinguished by the presence of multiple contrasts, as strata 6 (high class) is located right across the street from strata 1 and 2 (lower classes). This creates unseen borders that reflect social and economic inequality. Added to this is the lack of urban facilities and public spaces for the most disadvantaged areas, while other areas do have all of these amenities.

This area initially accommodated a significant portion of the population displaced by the armed conflict in Colombia, leading to an informal composition in its early stages. Despite the development of sectors dedicated to high-income housing, the majority of Commune 1 originated from settlements that were initially informal and later integrated into the urban context, notably evident in areas like Terron Colorado.

Furthermore, the presence of informal settlements persists in the current scenario, with approximately 15 dispersed throughout the entire commune. Some of these settlements face the threat of mass movement, leading to the establishment in the POT* that relocation is necessary. However, certain settlements endure in the sector, and government interventions have been minimal, failing to ensure the fulfillment of basic rights such as equitable access to essential services and the provision of public spaces for community integration.



Formal and informal contrast

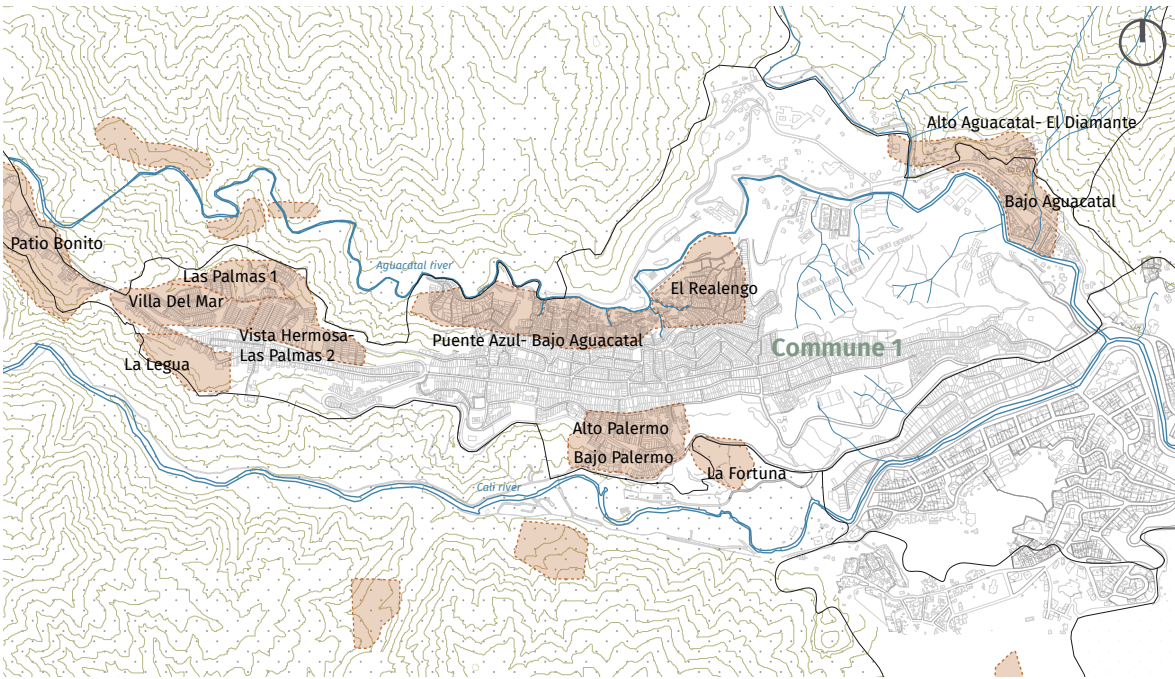
Figure 55 | source: (Skytrip, 2022)

POT* Plan de Ordenamiento Territorial (Land Use Plan)



Puente Azul - Bajo Aguacatal informal settlement

Figure 56 | Elaborated by the author



Informal settlements in Aguacatal neighborhood

Figure 57 | Elaborated by the author based on (Peláez & Franco, 2019)

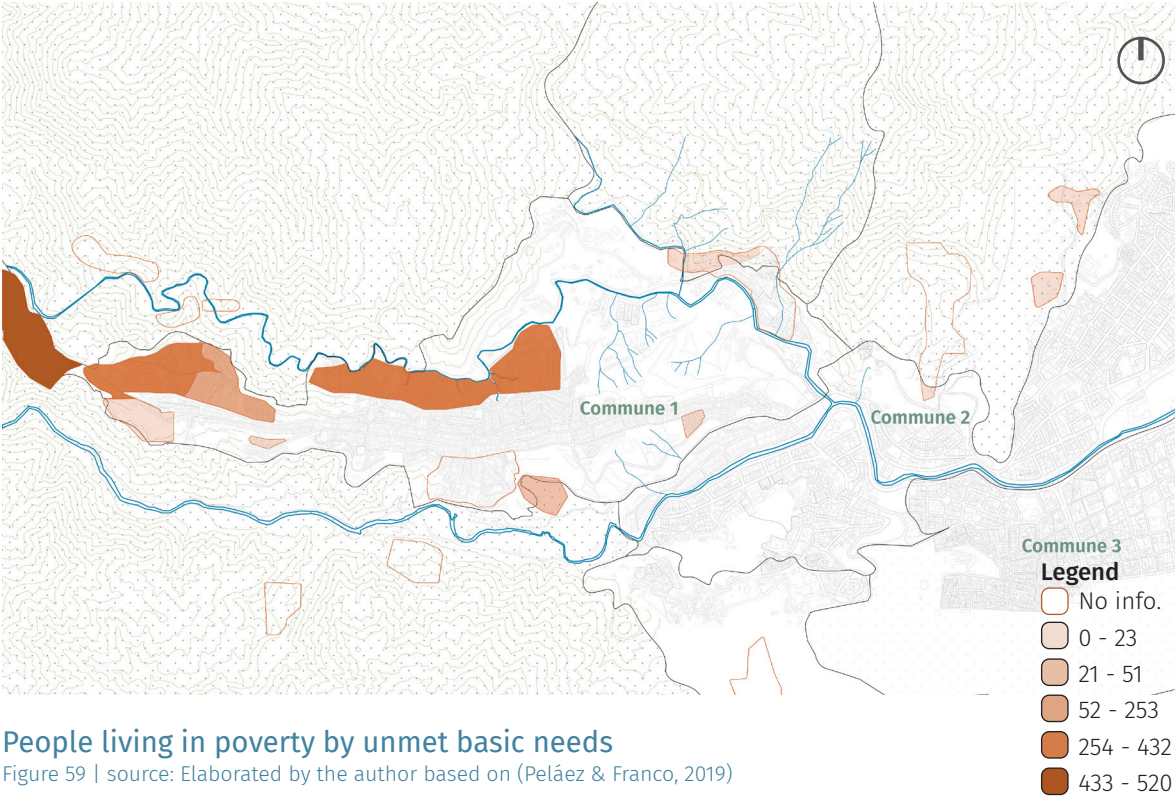
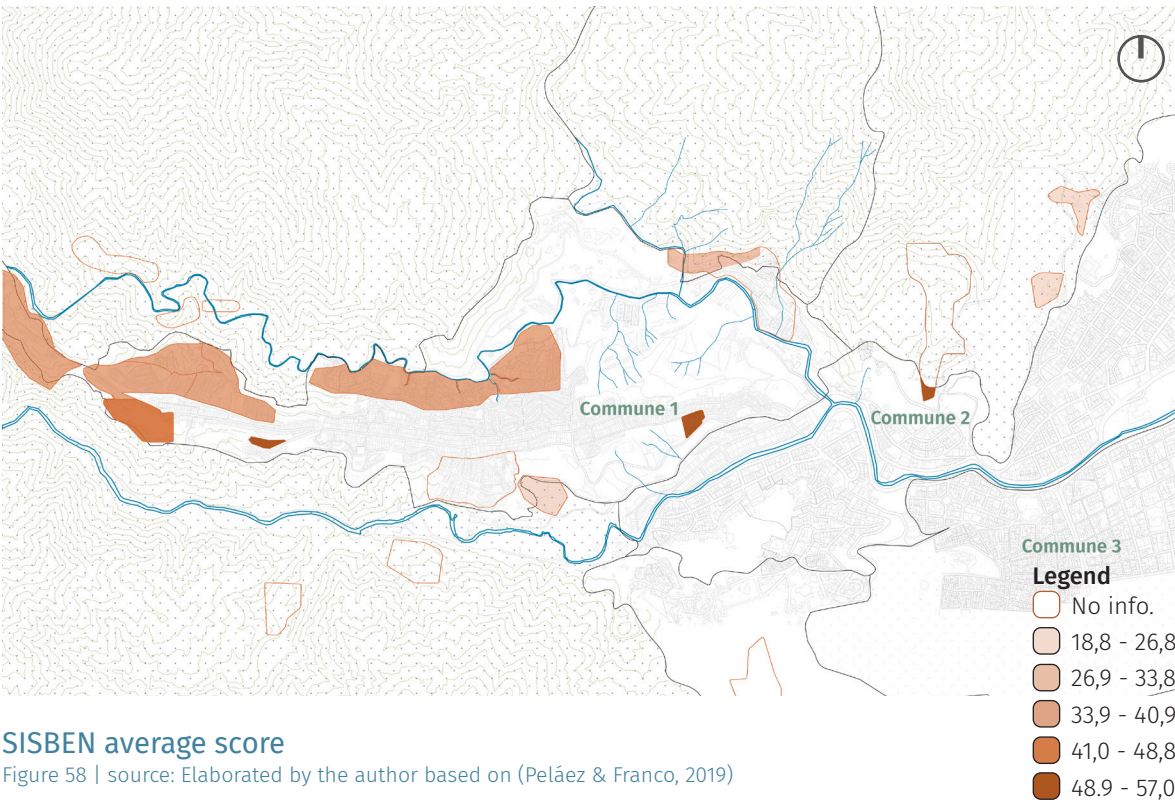
(4.2) Socioeconomic context Commune 1 and the Aguacatal neighborhood

Commune 1, situated on the western hills of Cali, is traversed longitudinally by the Vía al Mar (road to the Port of Buenaventura). It is characterized by having natural features (watersheds) and households with heterogeneous socioeconomic strata (high, medium, and low). (Peláez & Franco, 2019). The formation of this commune originated with the purpose of establishing a communication and access route to the municipality of Buenaventura. Furthermore, this area has been the recipient of a large number of displaced populations due to the armed conflict in Colombia, especially people from the Departments of Chocó, Cauca and Nariño. It borders to the south with commune 19 and the district of Los Andes; to the north with the townships of El Saladito, La Castilla, Montebello and Golondrinas; to the northeast with commune 2, and to the west with the township of El Saladito. This commune covers 3.2% of the total area of the municipality, equivalent to 384.2 hectares. (Observatorio de seguridad , 2019)

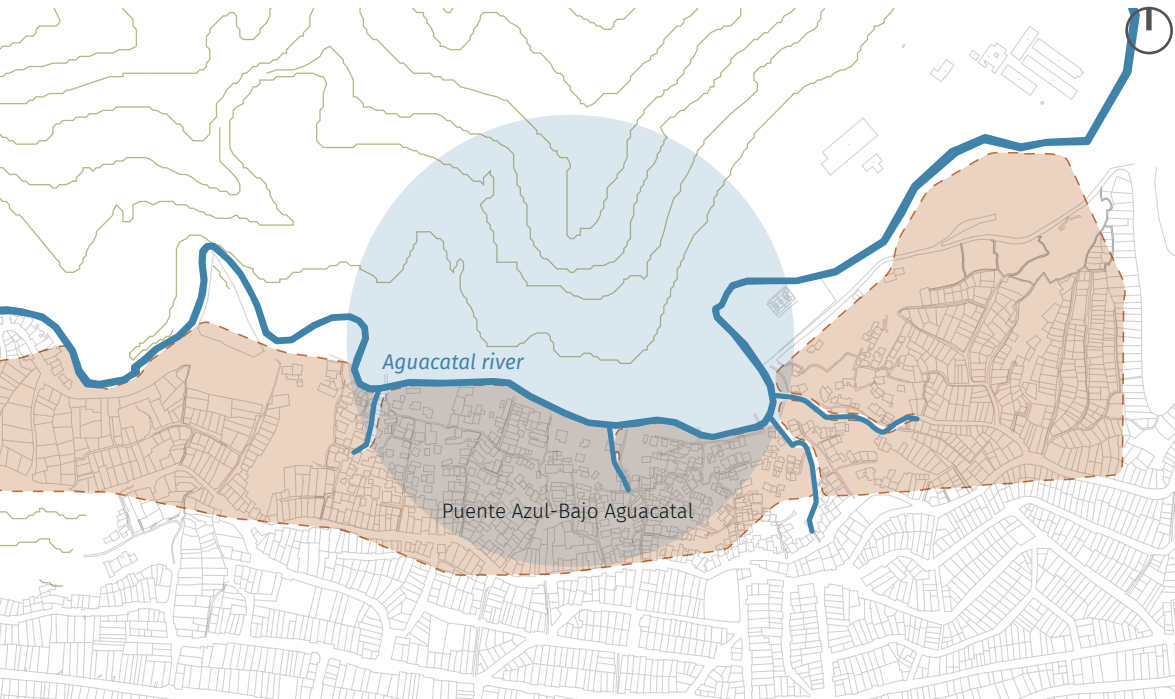
In accordance to the 2018 Population and Housing Census (CNPV*), 44,214 individuals live in the commune, with almost all (99.7%) registered in the SISBEN. The commune’s informal settlement population is 12.0% (5,311 people), with the majority concentrated in Patio Bonito (1,346 people), Las Palmas I (1,109 people), and Puente Azul-Bajo Aguacatal (990 people). The informal settlements within this area extend to 93.1 hectares, exhibiting a growth dynamic that occurs in two distinct patterns. Firstly, there is a linear expansion in the lower regions of the commune. Secondly, there is a tendency to occupy larger expanses extending towards the neighboring areas along the Aguacatal and Cali rivers. This proliferation has led to detrimental effects on these river basins, including deforestation and pollution emanating from the settlements and their inadequate wastewater management. These issues are exacerbated by the insufficient sanitation services in these areas. Furthermore, between 2007 and 2016, informal settlements experienced an annual growth rate of 3.3%. (Peláez & Franco, 2019)

As can be seen in figure 58, the majority of settlements have a SISBEN* average score of 33.9 to 40.9, a low amount considering that this system measures from 1 to 100, where 100 indicates the most favorable living conditions and 1 the least favorable. This is also evidenced in figure 59, which shows the people in poverty due to unmet basic needs, and the data is concerning. For instance, in Puente Azul-Bajo Aguacatal, there are on average between 254 and 432 people in this condition, and in Patio Bonito, there are between 433 and 520 people.

* CNPV: Censo Nacional de Población y Vivienda / National Population and Housing Census
* SISBEN: Sistema de Identificación de Potenciales Beneficiarios de Programas Sociales / Identification System of Potential Beneficiaries of Social Programs



(4.3) Study area: Informal settlement Puente Azul - Bajo Aguacatal



Study area: informal settlement Puente Azul- Bajo Aguacatal / Area of influence

Figure 60 | Elaborated by the author based on (DANE, 2018)

The Puente Azul-Bajo Aguacatal informal settlement is used as a case study. This settlement was selected because it has great potential since it is close to the edge of the river, to a public space with soccer fields, and to the city’s public transportation network. However, there are no good pedestrian connections that link the highest areas of the settlement to these amenities.

Likewise, this settlement presents problems with sanitation, water quality, and a lack of public spaces, among other factors mentioned above that show the great urgency of intervening in this sector. These deficiencies contribute to a substandard living environment for residents, exacerbating health risks and diminishing the overall quality of life. The study will concentrate on a specific sector within the Puente Azul-Bajo Aguacatal informal settlement due to the shared challenges faced in the area. However, the ultimate goal is to develop this sector as a guide for addressing common issues in the rest of the informal settlement. The following socio-demographic information is obtained from the DANE* Geoportal (2018), in which the data of the studied area is obtained with an area of influence of 222 meters, as shown in figure 60.

*DANE: Departamento Administrativo Nacional de Estadística / National Administrative Department of Statistics.

In the area of influence, a total of 1,986 people are registered, of which 951 are men and 1,035 are women. The majority of the population is young, since most people are between the ages of 20 and 29. There is also a large number of people aged 10 to 19 years and 30 to 39 years old (see figure 61). However, it can also be seen that the majority of people have a level of education that only reaches preschool (pre-kindergarten and primary school), resulting in inherent disadvantages across labor, economic, and social dimensions (figure 62). Furthermore, the area comprises a total of 922 households, with a predominant presence in stratum 1 (figure 63). The majority of these residences are designated for residential purposes.

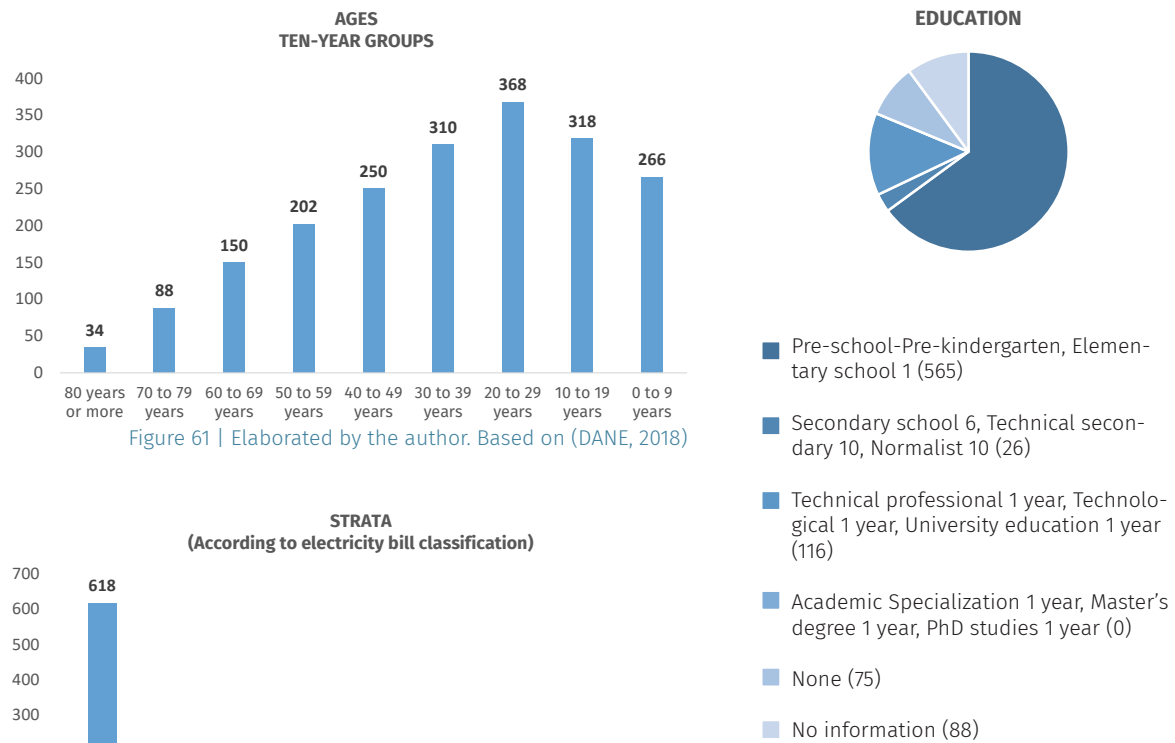
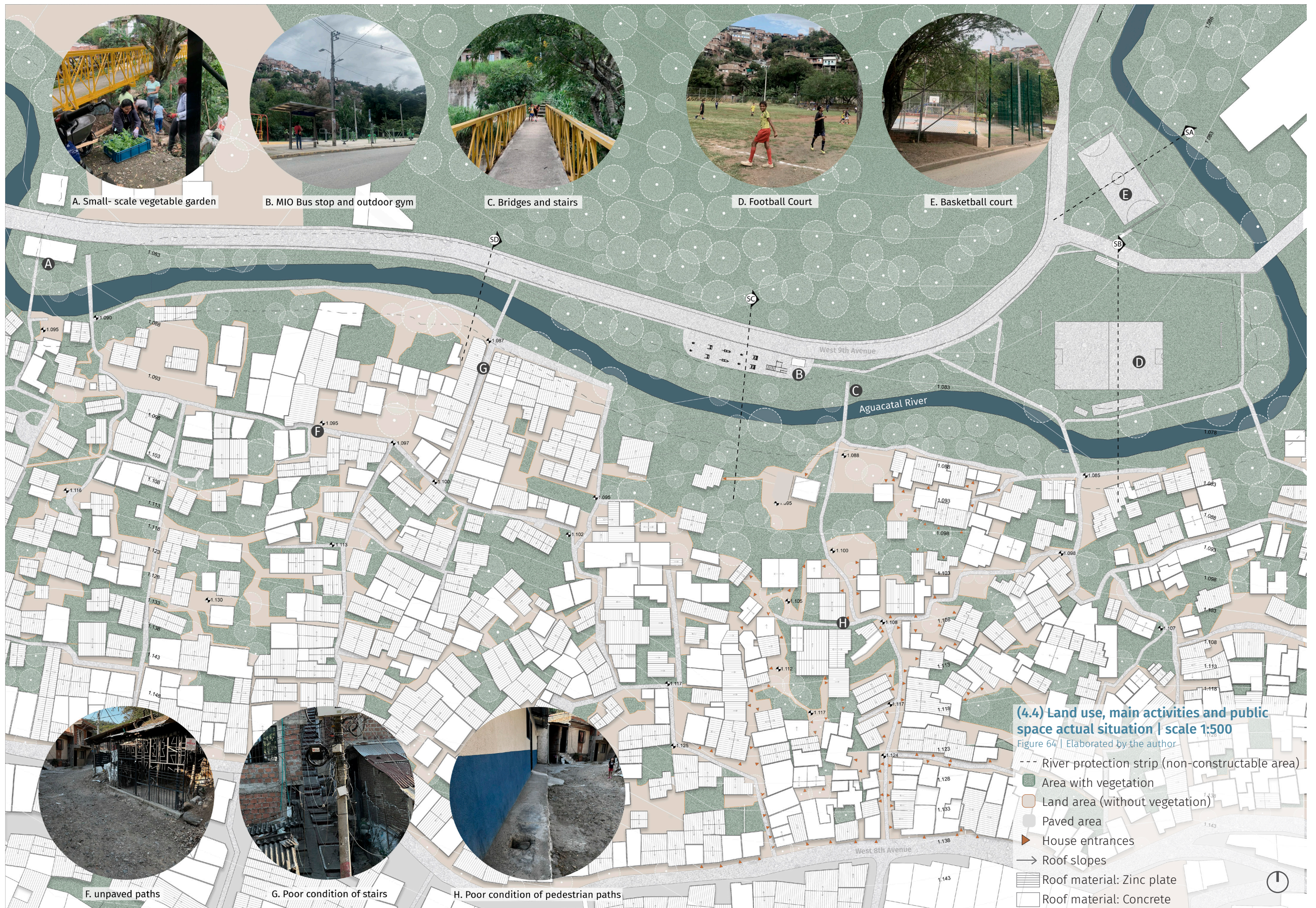


Figure 62 | Elaborated by the author. Based on (DANE, 2018)

Figure 63 | Elaborated by the author. Based on (DANE, 2018)

To determine the conditions of the Puente Azul-Bajo Aguacatal settlement, a photographic report and visits to the area were carried out (figure 64). The documentation helped to point out specific locations that highlight the current state of land use, the condition of the public spaces, and the community activities within the area. Evident in the analysis is the pressing issue of deteriorated and incomplete pedestrian paths and the general lack of street and football court maintenance. However, valuable community activities have been identified, including the presence of a small-scale community vegetable garden and the use of soccer fields by young people. Additionally, the settlement benefits from a nearby station of the MIO public transportation system.

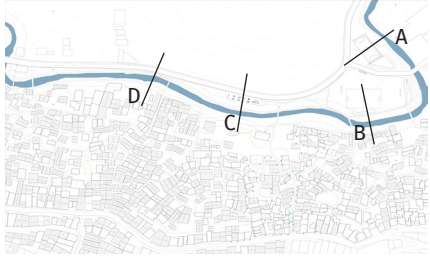


(4.5) Photographic Report | Puente Azul-Bajo Aguacatal

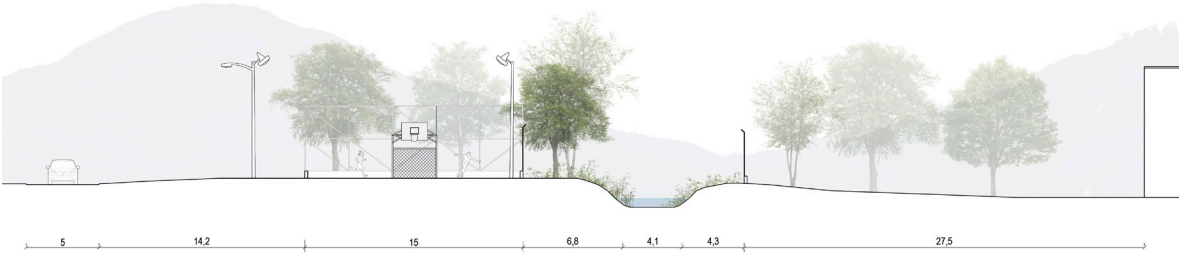
Figure 65 | All images were elaborated by the author



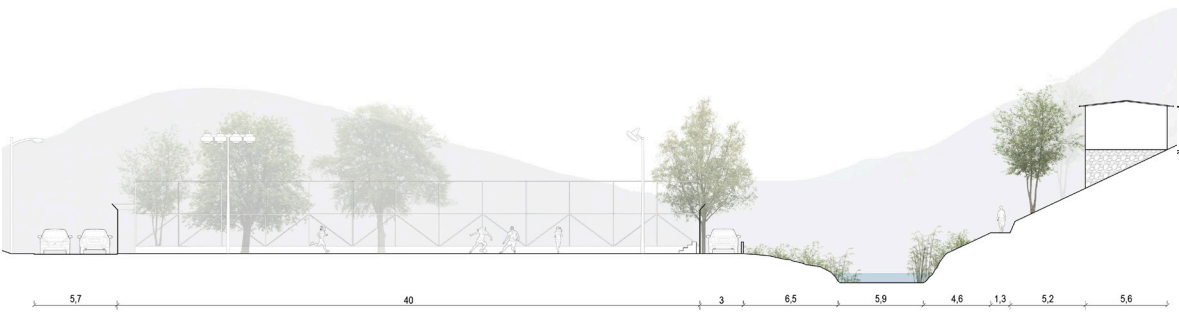
(4.6) Sections actual situation | scale 1:200
 Figure 66 | All sections were elaborated by the author



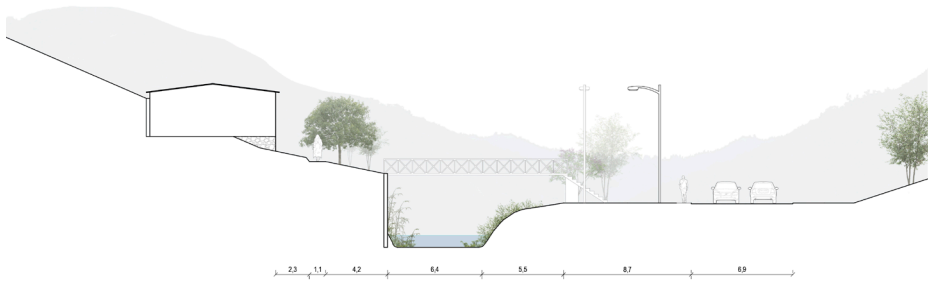
Section A | scale 1:200



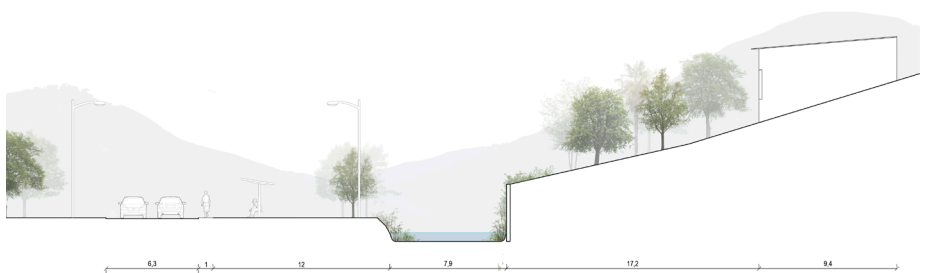
Section B | scale 1:200



Section C | scale 1:200



Section D | scale 1:200



(4.7) Regulations for public space with border typology

The border park is defined as a public space that is located on a geographic boundary, is part of the main ecological structure and has elements of urban furniture, connecting elements and recreational elements (see figure 68). The border is a geographic limit that separates the city from some element of the main or complementary ecological structure, such as mountains, buffer strips, environmental corridors, and canals, mainly. Because of their environmental nature, conservation takes precedence over any other use.

Intervention zone with an indicative flood protection strip

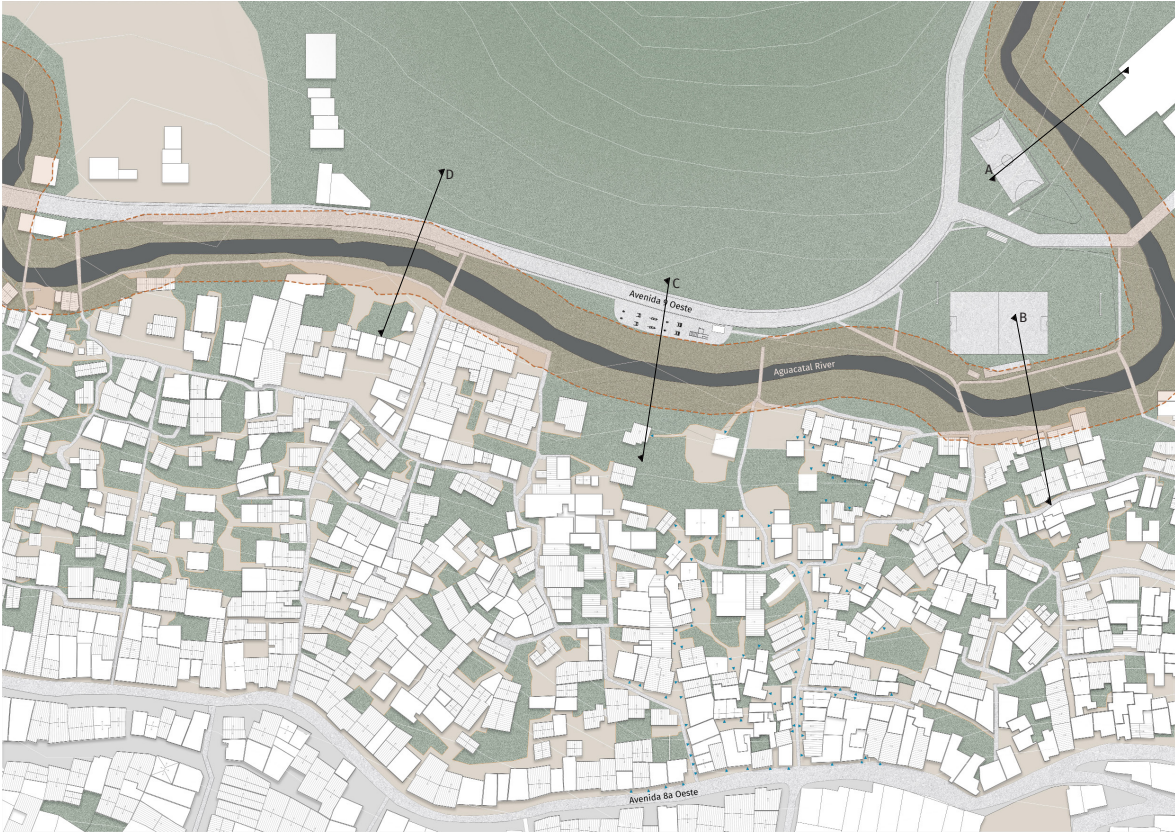


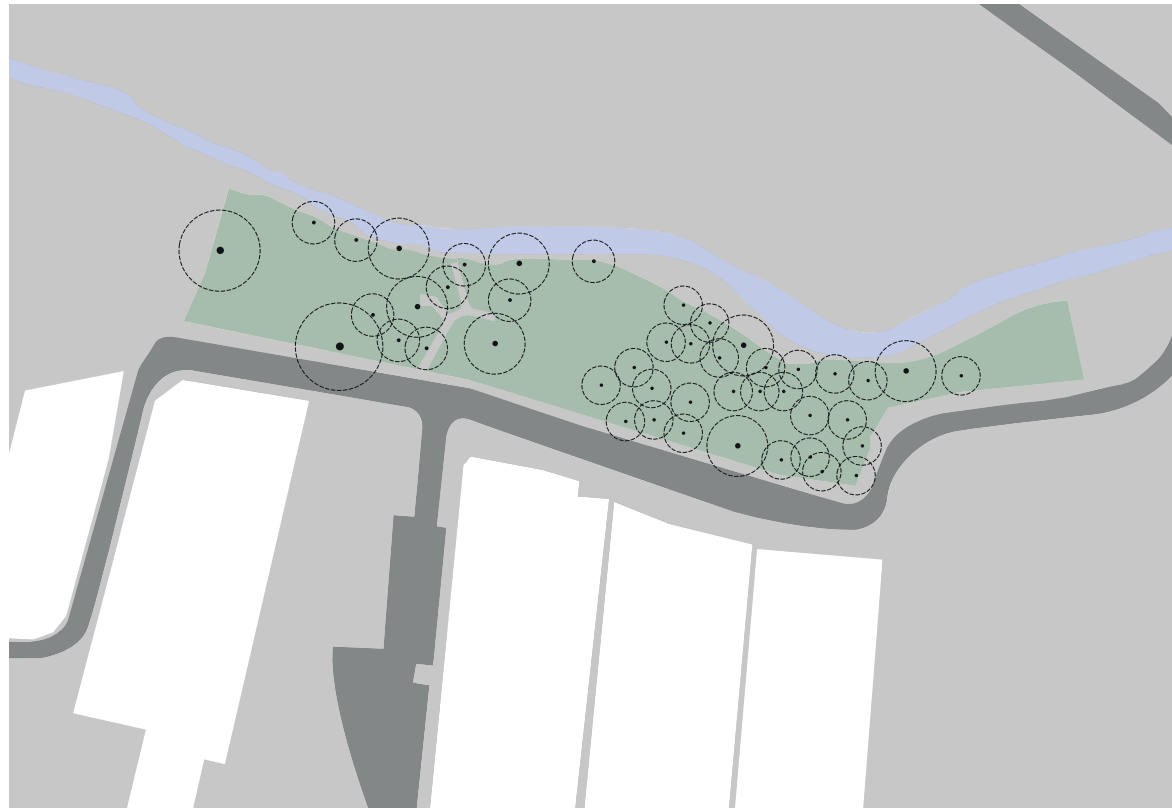
Figure 67 | Elaborated by the author

Protection strip from the river (10m)

- Paths and walkways are allowed in the buffer strips, as long as they are paved, in brick or other material that guarantees the permeability of the soil and is approved by the competent environmental authority.

- The space or “pocket” between the outer limit of the buffer strip and the road can be used for active or passive areas, for recreation or play. (See figure 69)

(Manual De Adecuación De Espacio Público Efectivo, MAEPE, De Cali, 2018)



Type of park - Border (Parque La Tercera Edad - Santiago de Cali)

Figure 68 | source: (MAEPE, 2018)



Platforms and trails in a buffer strip

Figure 69 | source: (MAEPE, 2018)

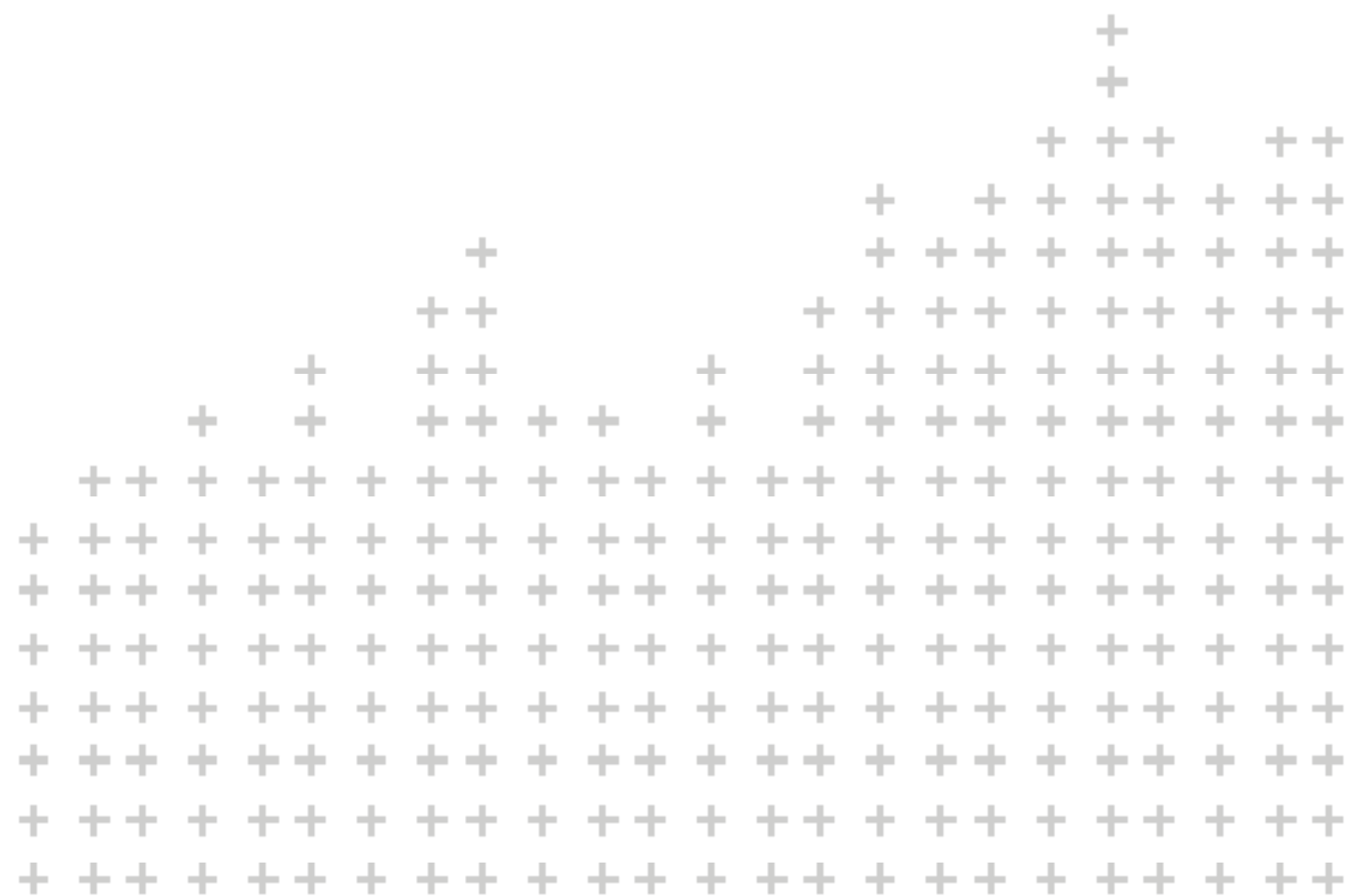
(4.8) Chapter 4 conclusions

As could be seen in the previous analysis, the Aguacatal neighborhood, situated within Commune 1, exhibits significant social and economic disparities, as highlighted by contrasting strata levels, indicating social inequality. Moreover, the informal settlements in the area confront major challenges, notably a lack of urban facilities and public spaces. Despite these challenges, government interventions have been minimal, resulting in the failure to address the basic needs of residents and ensure equitable access to essential services and community integration.

These informal settlements, which accommodate a substantial portion of the population, grapple with issues such as inadequate infrastructure, environmental degradation, and poverty. Given the observed growth patterns, there is a pressing need for comprehensive urban planning strategies to address expansion and its associated impacts. Additionally, the low SISBEN scores and high prevalence of poverty emphasize the urgent necessity for targeted interventions aimed at improving living conditions and addressing basic needs within these communities.

From the analysis of the Puente Azul-Bajo Aguacatal informal settlement, the following findings could be obtained: Despite its strategic location near a river, sports facilities, and the city's transportation network, the informal settlement faces challenges such as inadequate maintenance of public facilities and green areas, insufficient pedestrian connections, and issues with sanitation, water quality, and public spaces. It's remarkable how the stairs developed out of the necessity for a transversal connection in order to ascend the hill; however, because of the unplanned and rapid expansion of informal settlements, the majority of them are deteriorated and lack the necessary railings and measurements. It is also noteworthy that the community residents have gathered to make a small area for cultivation, and the football court, although it lacks maintenance, is frequently used by the inhabitants of the sector, especially children and young people.

Despite this, the latent problem of the lack of quality, integration, and meeting spaces for the community in the hillside area is readily apparent. Given that the area primarily consists of stratum 1 housing, there are numerous deficiencies concerning amenities and opportunities for communal gatherings. This situation reveals the urgent need for interventions that prioritize the creation of quality public spaces to foster social interaction and community activities while also supporting the actual ones established in the sector.



REFERENCES

Analysis of best practices

Chapter 5



Finished proposal by KNOW

Figure 70 | source: KNOW

(5.1) Knowledge in Action for Urban Equality: Community Practices for Food Security in San Juan de Lurigancho - Lima, Perú

Architects: KNOW

Date of realization: 01-03-2020

KNOW STUDIO memory discusses how the sanitary emergency and associated lockdown measures have worsened the living conditions of the poorest families, highlighting economic, social, and urban inequalities. In response, communities in peripheral neighborhoods organized Ollas Comunes (community kitchens) to address food crises. The text proposes collaborative efforts between academia and civil society to design spaces supporting community practices for food security and inclusive infrastructure management. The interventions are part of a comprehensive hillside occupation project that connects local care spaces, such as Ollas Comunes, into a network including urban agriculture, canteens, supply centers, day care centers, and spaces for the elderly. The aim is to promote self-sufficiency through citizen management, overcoming spatial and social fragmentation. The project emphasizes innovation in materials and construction systems for replicability and scalability, utilizing locally available resources and labor. (KNOW, n.d.)

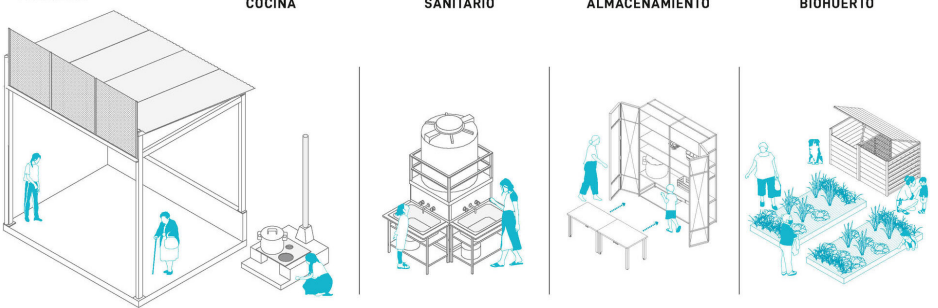
The intervention is part of a project with a multi-scale and integral approach: at a local scale, it addresses the improvement of the spatial qualities of the common pots and, at a neighborhood scale, it articulates the care spaces in networks that include urban agriculture, food preparation and consumption, commercialization, waste management and other care activities such as day care centers and spaces for the elderly. In this way, proposals are made that expand and articulate the social and environmental dimensions of collective care.

PROBLEMÁTICA

- Suelo de tierra. Polvo
- Techo para protección de condiciones climáticas
- Cocinas a leña = problema de humo
- Cocina con soportes rudimentarios
- Acceso al agua para preparación y limpieza
- Falta de implementos de cocina
- Espacio de almacenamiento
- Falta de espacio de preparación
- Sistema para aguas residuales (y su aprovechamiento)
- Productos para fin alimenticio y productivo

PROPUESTA

MÓDULOS DE IMPLEMENTACIÓN PROGRESIVA

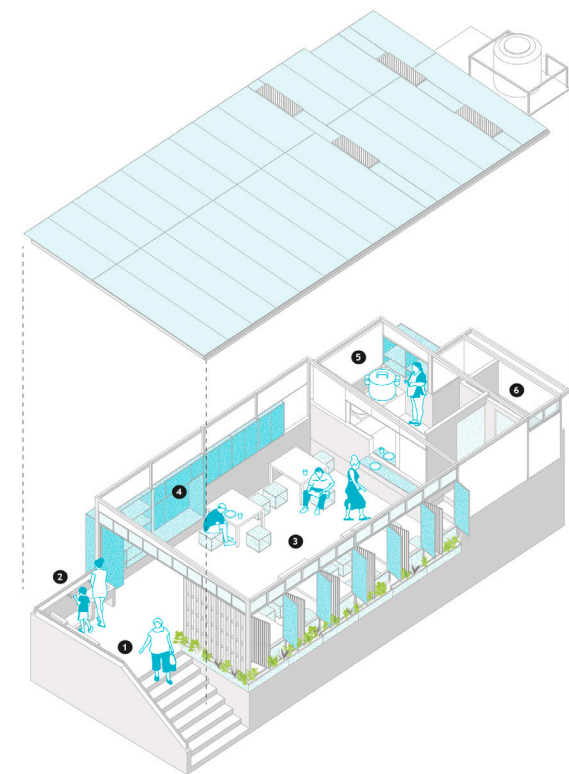


KNOW proposal

Figure 71 | source: KNOW

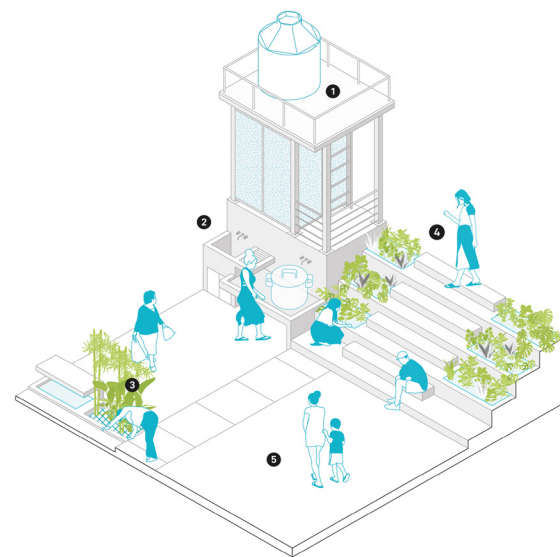
Two pilot projects were carried out in the district of San Juan de Lurigancho (A.F. 13 de Julio and A.F. Santa Rosita). The work areas were identified due to the lack of infrastructure for the development of common cooking pots, a situation that is repeated in other peripheral neighborhoods in Lima.

In the particular case of the A.F. 13 de Julio, which had its facilities in operation, priority was given to the sanitary module. Its location demanded the consolidation of the public space adjacent to the entrance of the facilities. The architectural proposal combined the need for simple maintenance and the resistance of the furniture (concrete) with more efficient options in terms of implementation time and space (using a metal structure and an OSB/drywall enclosure that, compared to brick, allowed for a larger roofed area), achieving a better functioning of community activities and facilitating the modularity and replicability of the intervention.. (KNOW, 2020)



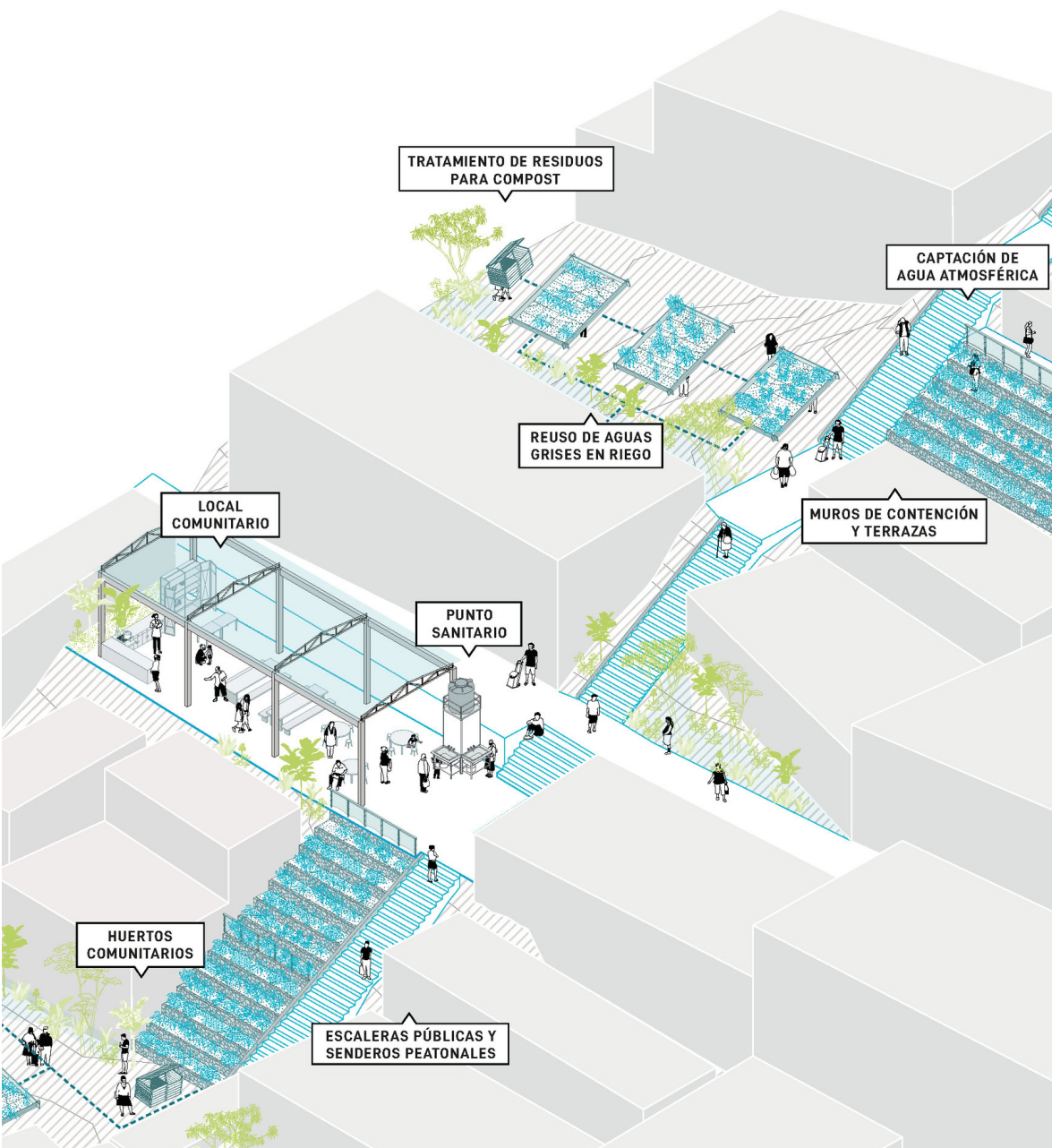
Community center axonometry in 13 de Julio
Figure 72 | source: KNOW

The second intervention took place at A.F. Santa Rosita, situated in the middle-lower part of the hillside. In contrast to the previous case, the Olla Común operated in an undeveloped communal space, providing an opportunity to implement a community facility integrating four modules (kitchen, bathroom, storage, and Biohuerto). Active participation from both leaders and residents was observed, and its location was accessible to other neighborhoods, suggesting the potential for the infrastructure to serve a larger number of people. (KNOW, 2020)



Sanitation module axonometry in S.Rosita
Figure 73 | source: KNOW

The project seeks to expand the conventional boundaries of architecture and suggests adopting a perspective in which citizens and their needs are the drivers of their environments and communities. At the same time, it seeks to establish symbolic and political landmarks that highlight places and territories where co-production and habitat construction processes can and should contribute. Under a democratic vision of design, it seeks to expand the tangible and intangible paradigms from which to operate, urging joint action to strengthen networking and mitigate the significant inequalities in the city. (Vivas, 2023).



Project axonometry by KNOW
Figure 74 | source: KNOW

(5.2) Staircases and Time - Ambato, Ecuador

Architects: Rama Estudio

Area: 1098 m²

Date of realization: 2020

Description by the project team. “The project is located in Ambato-Ecuador. Its geographical condition allowed the interconnection of some neighborhoods with the city center by stairs. This essential condition in past times was invaded by the use of vehicles and the creation of new roads to facilitate the circulation of automobiles canceling the pedestrian space. This area was abandoned, the neighborhoods near the stairway faced complex social problems and became dangerous places.” (Silva, 2023).

The project seeks to increase neighborhood appreciation of the hillside, promote alternative forms of pedestrian travel, boost economic activity, revitalize the green hillside into a productive space, and stimulate local tourism. Overall, the initiative aims to reduce dependence on vehicles, which would result in a reduction of pollution from the combustion of fossil fuels in the city. The proposal consists of connecting the 13 pre-existing stairways on the hillside, which link the upper part of the city to the center. This approach streamlines and optimizes travel, as public transport routes, which normally take up to 25 minutes, could be shortened to a 3-5 minute interval. (Silva, 2023).



Finished proposal by Rama Studio

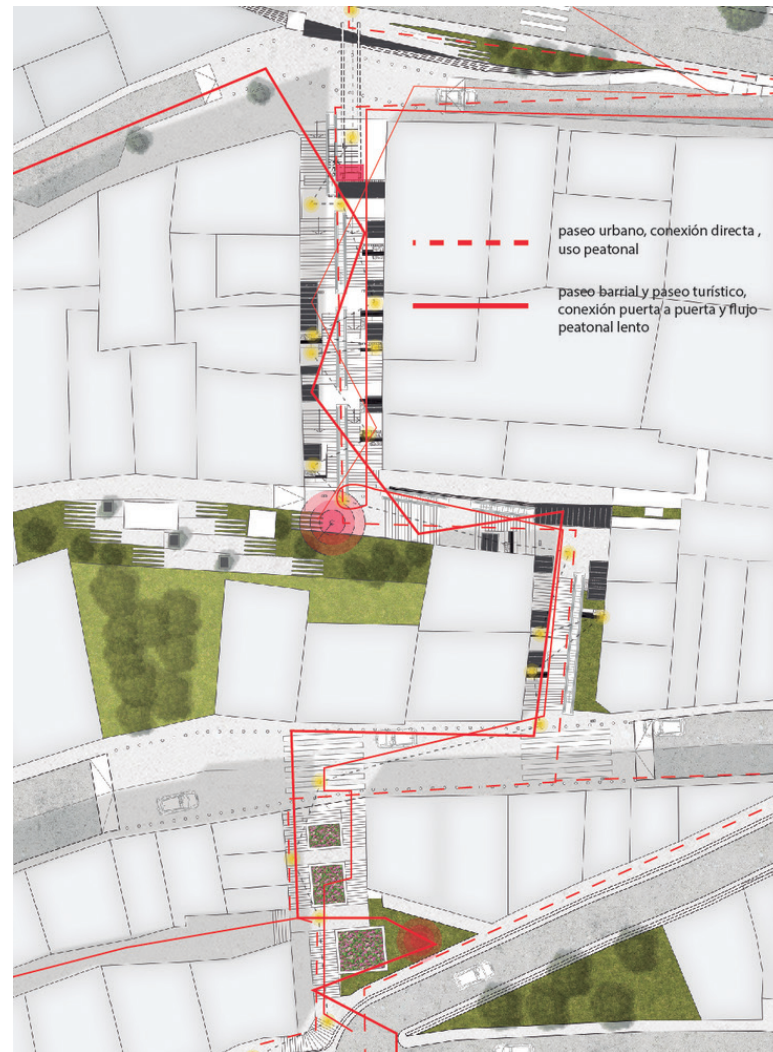
Figure 75 | source: Nación films, Rama estudio



Axonometry of the project

Figure 76 | source: Nación films, Rama estudio

The project establishes a linear flow that reduces the time required to travel long distances, thanks to the implementation of escalators that facilitate pedestrian movement along long distances. The proposal has formulated strategies that could be replicated in subsequent phases, including stakeholder integration, active participation of residents, continuity of use, and implementation of pedestrian mobility systems. (Silva, 2023).



Path diagram

Figure 77 | source: Nación films, Rama estudio

This two-and-a-half-year project is collaborative and involves various local stakeholders, such as private, municipal, community and academic entities. Residents are an integral part of the process by participating in the analysis, diagnosis, identification of problems and search for solutions. The initiative is materialized through the joint design of the residents, with the assistance of the technical team. The Municipality financially supports the proposal, while private enterprise collaborates in its execution to reduce the investment. The academy contributes with the analysis and diagnosis of the intervention

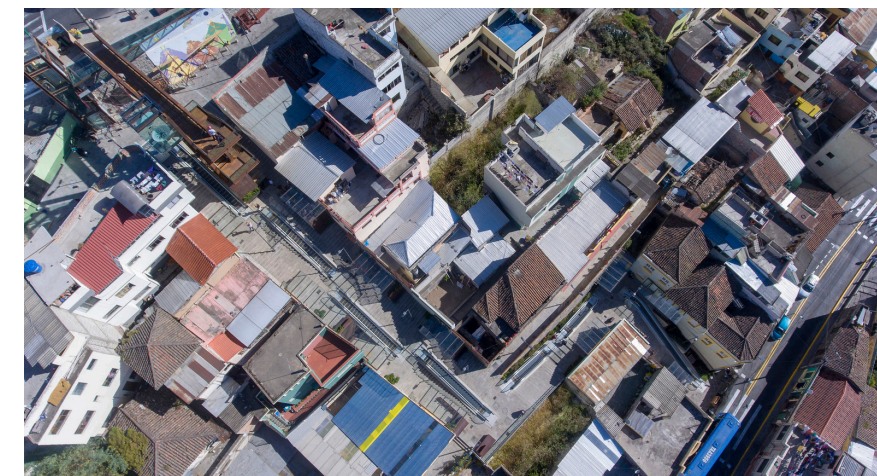
The proposal functions as a new transportation alternative for the city. This will increase the number of users of the stairs by tripling their monthly use, which will stop the use of private cars and public transportation that emit CO2. In addition, the revitalization of the site consists of a reforestation of the hill in order to contain and prevent land displacement.



Pedestrian accessibility

Figure 78 | source: Nación films, Rama estudio

The project is focused on the following lines of action: providing a new conception of the hillside neighborhood, promoting vertical connection and mobility, rescuing disused spaces, promoting day-to-day life and cultural activities, improving community integration, increasing green spaces, strengthening local tourism, giving priority to pedestrians, and boosting the economy. With these axes a global logic that allows us to address the problems from an integral point of view. (REHABILITACIÓN DE LAS ESCALINATAS DE LA CASTILLO PASEO PELILEO - Archivo BAQ, n.d.)



Project top view

Figure 79 | source: Nación films, Rama estudio



Finished proposal by 1U1V

Figure 80 | source: Ce Wang

(5.3) Dahei New Village / One University One Village Community Center - Kunming, China

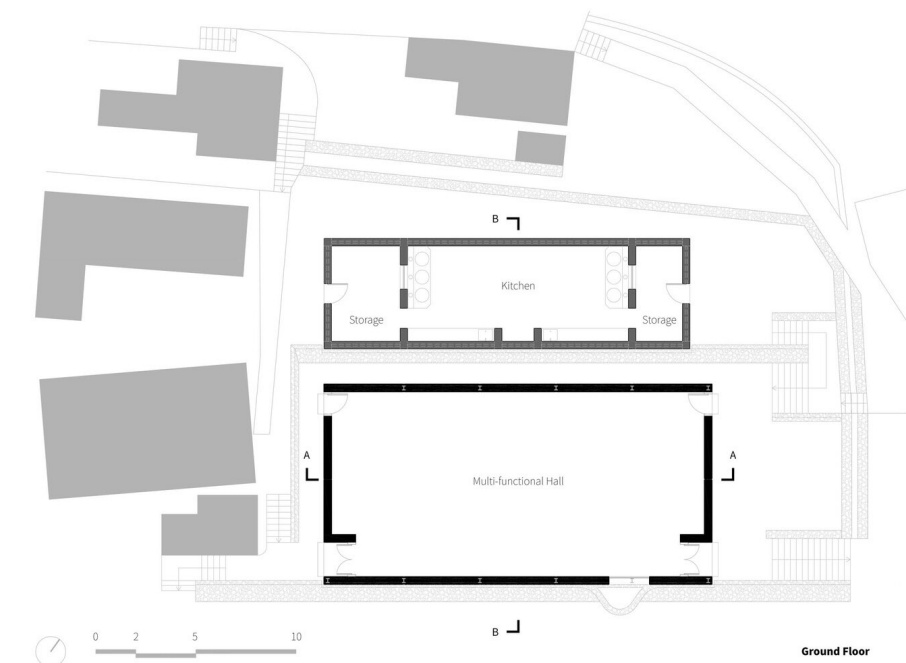
Architects: One University One Village

Area: 345 m²

Date of realization: 2021

The Gongfang, also known as the community hall, is used locally as a versatile space for various activities such as wedding celebrations, funerals and festivals. However, the old structure of the hall had safety issues due to its advanced age. The 1U1V team negotiated with the municipal authorities to undertake a reconstruction using innovative technology based on anti-seismic soil compaction. The goal is to provide village residents with a renovated space that is safe, comfortable, functional and also aesthetically pleasing.

The newly constructed community hall is located in the same area as the previous hall and consists of outdoor areas, a main hall and a kitchen. Its layout and circulation corridors have been designed with the local residents' way of life and the original community hall structure in mind. The walls of the building have been compacted using soil extracted from the site. To improve its seismic resistance, the soil has been appropriately mixed with sand and gravel, following the granulometric analysis of the soil. No chemical additives, such as cement or other stabilizers, have been incorporated into the wall, which facilitates the recycling of the materials or their return to nature. (Chen, 2022)



Community center ground floor

Figure 81 | source: Ce Wang

In order to meet the project's criteria for daylighting, durability and aesthetic appeal, a bamboo roof truss structure was chosen. The combination of raw earth and bamboo, both of which have a low carbon footprint and lower energy consumption, along with passive design approaches such as daylighting, ventilation and the presence of a thermal mass wall, ensure a minimal environmental load throughout the building's life cycle. The construction of the building was carried out in collaboration between 1U1V's all-female construction team and local residents. The strategy employed, known as "high science and low technology", is based on the principle of using "local materials, local technology and local labor". (Chen, 2022)



Image of people using the space

Figure 82 | source: Ce Wang

In addition, the project highlights the relevance of participatory architecture by involving local inhabitants in the construction process, allowing them to have a voice and contribute to the creation of a space that fits their specific needs. This approach not only promotes community ownership and ownership of the building, but also underscores the importance of thoroughly understanding the particularities of a place. By identifying and addressing the specific needs of the local population, the project aims to provide a facility that significantly improves the quality of life and facilitates the daily activities of those who live there.



Interior of the community center

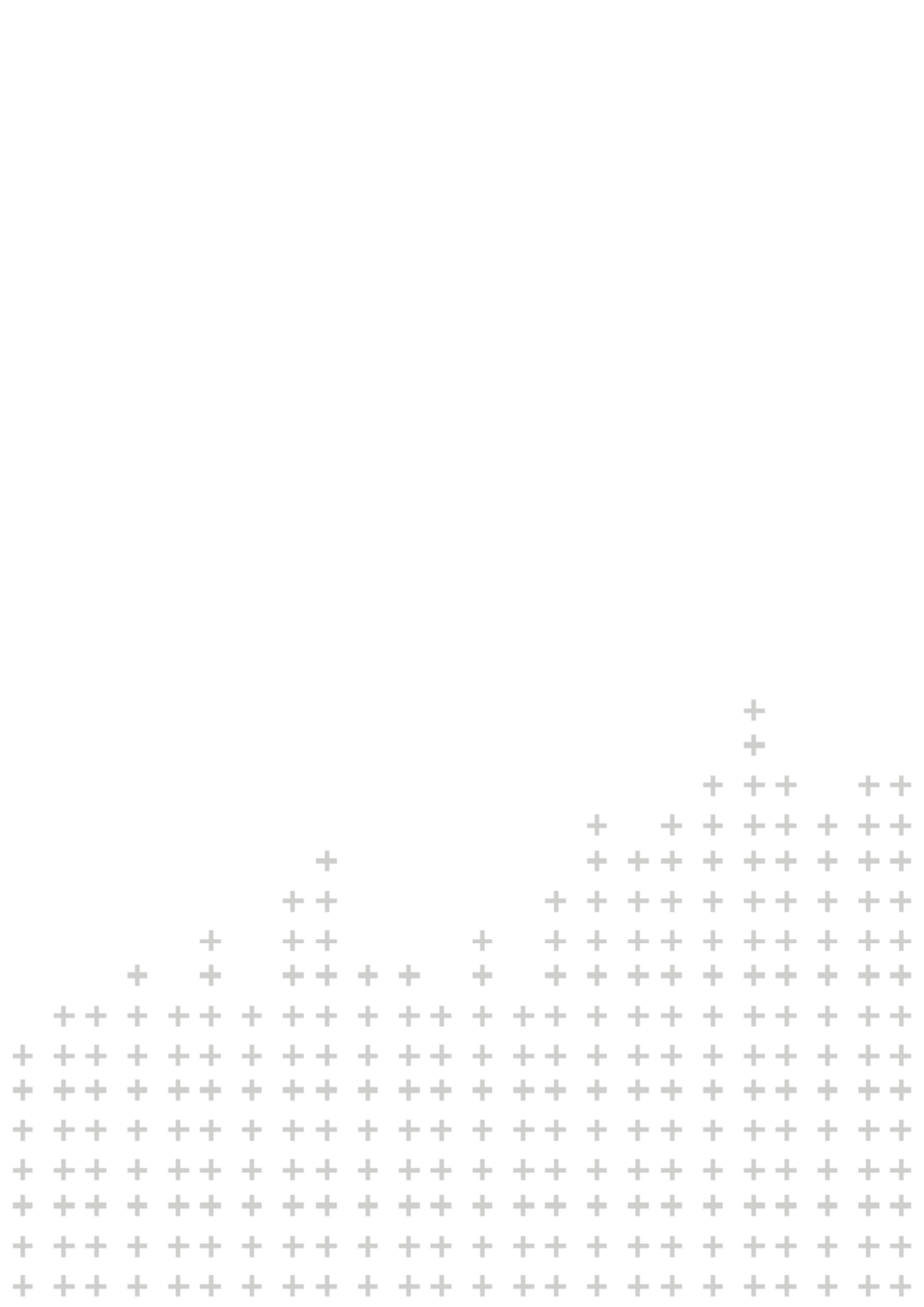
Figure 83 | source: Ce Wang

(5.4) Referents conclusions

In the first case, located in **Peru**, the project, through a participatory methodology and effective collaboration with key actors, manages to consolidate the creation of a Care Network that addresses issues such as food security. However, it goes further by striving to overcome other multidimensional barriers present in the peripheral area of the city, where resources are scarce. The difficulty of obtaining and preparing food is recognized as a significant challenge. Given this knowledge, Spaces that serve as centers for community practices are implemented, responding not only to the need for food supply, but also to the lack of adequate infrastructure in the area. This project is particularly noteworthy for its focus on the needs of a precarious sector located on a hillside, which implements strategies that meet the needs of the community.

The second reference, located in **Ecuador**, shows a condition of hillside neighborhoods where accessibility improvement is proposed through the incorporation of escalators. Initially, this area was mainly destined to vehicular traffic, limiting pedestrian space and being abandoned, which generated concern among residents due to its dangerousness. What stands out about this project is its focus on revaluing pedestrian mobility, a factor that not only boosts the economy, but also revitalizes the hillside and boosts tourism. At some intersections, spaces have been conceived for daily use, generating urban landmarks within the neighborhood. This project is taken into consideration because it proposes strategies that allow for improved accessibility, and in turn, generates community integration nodes at some strategic points along the route in a sloping context.

Finally, the third referent, which is located in **China**, analyzes the social conditions within the neighborhood to be worked on and identifies frequently used places that present precarious conditions. One of these spaces is selected, proposing the renovation of the old community center. In this renovation process, priority is given to the implementation of circulation spaces and the correct distribution of space, taking into account the lifestyle of the villagers and the original layout of the old building. The use of local materials is chosen to carry out the project, integrating them in a sustainable way into the structure, and thus contributing to the identity and eco-efficiency of the environment. This approach not only seeks to improve the physical conditions of the space, but also to enhance the cultural and community connection through a design that responds to the needs and history of the place. This project is considered because it highlights the importance of knowing the context and needs of the inhabitants to create a facility such as the community hall, where people interact and citizen participation is encouraged.



INTERVENTION PROPOSAL

Informal settlement

Chapter 6

(6.1) Basic and complementary services in the public space

The design proposals are presented at scales of 1: 500, 1: 200, and 1: 100. The 1:500 scale incorporates strategies and identifies potential areas for public space interventions. Subsequently, a specific section of the area is selected, and a more detailed examination is conducted at scales of 1:200 and 1:100. This detailed assessment serves as a reference for implementation across the entire area.

It should be noted that the strategies implemented arise from the synergy between the sociodemographic analysis of the area, the diagnosis of problems identified by the city of Cali in UPU 8, and the analysis of the physical conditions and unmet basic needs of the informal settlement Puente Azul-Bajo Aguacatal.

To this end, a detailed analysis of the basic and complementary services potentially offered in public spaces was undertaken. The aim was to develop various design strategies that align with the specific requirements of the community in the sector (see figure 84) and contribute to the improvement of living conditions by addressing the current inadequacies in meeting these essential needs.

Among the requirements of basic services of first necessity are: supply of food security; clean water and sanitation, waste collection system, and accessibility in hillside areas. Within the complementary services are taken into account the community life and the spaces for community equipment.

For each of the identified requirements, one or more strategies were proposed, followed by the addition of tactics to facilitate their development. Subsequently, a subset of these strategies advanced to a more detailed design level (scales 1:200 and 1:100), where a concrete design model is presented. Meanwhile, some strategies remain at the level of proposal outlined at a scale of 1:500.

All these strategies are framed in the sustainable development goals (SDGs), principally number 6: clean water and sanitation, number 11: sustainable cities and communities, and the goal 12: responsible consumption and production.



source: United Nations SDG's

Table of requirements, strategies and tactics for informal settlement

Figure 84 | Elaborated by the author

	Requirement	Strategy	Tactics
Basic services of first necessity	Supplying food security	Community vegetable garden	-Locate a space with continuous sun exposure and good orientation. -Flower pots that adapt to the size of the area. -Have access to a suitable substrate and fertilizer depending on the type of vegetables that are going to be planted.
		Cooking module with wood-burning oven with pipe	- Locate a strategic point that allows the location of a community wood stove. - Implementation of a pipe to properly expel smoke.
	Clean water and sanitation	Rainwater collection for irrigation of non-food plants and cleaning	-Catchment or collection. - Storage. - Supply or distribution.
		Water point module for food washing and preparation	- Water tank. - Dismountable structure for easy transport. - Wrapping panels with doors to facilitate the change of parts and protection of the water tank.
		Drainage system	- Creation of a sewer network. - Implementation of a domestic wastewater treatment plant. - The treatment plant is made up of two septic tanks, a grease trap and an infiltration field.
		Complementary stormwater and runoff natural drainage system	- Placement of phyto purification plants along the river edge.

	Waste collection system	Dry compost toilet system for solid waste	<ul style="list-style-type: none"> - Excrement and urine are separated and disposed of in containers in the dry toilet. - After each use, cover with organic material such as sawdust, leaves, or dry grass. - The buckets are emptied into a compost pile and covered with more dry material. - The compost is made to fertilize plants not for human consumption.
		Composting area for organic wastes	<ul style="list-style-type: none"> - Find a semi-shaded and aerated area. - Place containers of at least 20 liters capacity. - Place a metal mesh at the bottom of the container and pour soil without stones at the base (3-4 cm thick). - Select the organic matter (compost), you can add dry leaves. - Fill with alternating layers - Use as fertilizer for the community vegetable garden.
	Accessibility	Transversal and longitudinal connections in hillside areas	<ul style="list-style-type: none"> - Restoration and improvement of stairs and paths. - Creation of new paths to complement the existing ones. - Installation of a monorail along the stairs.
		Road safety	<ul style="list-style-type: none"> - Improvement of the pedestrian walkway.

Complementary services	Community live / Spaces for community equipment's	Medical assistance services	Adapt a multifunctional area to allow a temporary visit by a health entity.
		Educational services	Adapt a multifunctional area to allow a temporary visit by a educational entity.
		Meeting points	Creation of spaces suitable for the relationship among inhabitants.
		Sportive area	Improvement and maintenance of existing courts.
		Children's entertainment and didactic areas	Improvement of existing playground and creation of new didactic areas.
		Vegetation areas	Restoration of the existing vegetation.

(6.2) Proposal | scale 1:500

As previously specified, the intervention proposal was born from the identification of the community’s requirements according to the needs of basic and complementary services required in the public space. In which a series of strategies are proposed in order to improve the living conditions of the Puente Azul-Bajo Aguacatal settlement.

Firstly, to address the accessibility requirement in the hillside area, a system of transversal and longitudinal connections is proposed through the restoration of stairs and paths and the creation of new longitudinal paths to complement the existing ones. The creation of a public transport system called the Monorail “ Cremagliera Monorotaia” was also implemented to provide an alternative to the stairs in order to connect to the highest points of the settlement.

To deal with the requirement of Supplying food security there are two strategies: the first is the creation of community vegetable gardens, and the second is the implementation of a cooking area with a wood-burning oven. This strategy is linked to the creation of a community center identified as T2, typology 2.

To address the requirement of clean water and sanitation, four strategies were stipulated: the first one is the implementation of a rainwater collection system for irrigation of non-food plants and cleaning, the second is a water point module for food washing and preparation; this strategy is part of a broader proposal called the sanitary module, which includes toilet and shower services. The third is a drainage system, with the creation of a sewer network and the implementation of a domestic wastewater treatment plant. Finally, a complementary stormwater and runoff natural drainage system is proposed through the placement of phytopurification plants along the river edge. All these strategies are also aimed at dealing with the problem of pollution of the Aguacatal river due to illegal dumping of sewage and grey water waste caused by informal settlements.

To meet the requirement of the waste collection system, there are two strategies stipulated: the first is the system of dry composting toilets for solid waste that can later be implemented as fertilizer for non-edible plants, and the second is the location of a composting area for organic waste that could be used in the community vegetable gardens.

Finally, regarding the fifth requirement called “community life and spaces for community equipment,” it is proposed several strategies: the first is the medical assistance services and educational services provided in a multifunctional space, as well as the creation of meeting points suitable for the relationship among inhabitants. Both strategies are linked to the creation of a community center identified as T1, typology 1. Mainly, in the current public space next to the river, it is proposed to continue with the condition of the sportive area but focus on the improvement and maintenance of existing courts. It is also proposed to improve the existing playgrounds, create new didactic areas, restore the existing vegetation, and include more areas with vegetation connected to the river edge.

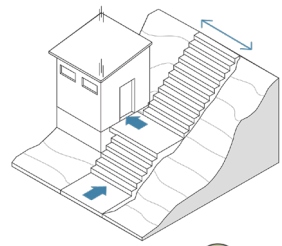
The proposal identifies potential areas for the creation or transformation of public spaces connected to the main roads, which were normally vacant lots, and potential areas for interventions within the inner courtyards that make up the grouping of several houses. It is proposed to use the potential areas connected to the main roads for the implementation of community centers with sanitary points and community vegetable gardens, while on the other hand, the use of internal patios is proposed for a smaller-scale intervention as the sanitary points, composting areas for organic waste, small vegetable gardens, and rainwater collection system in the house roofs.



Main requirements diagram
Figure 85 | Elaborated by the author

(6.2A) General plan and strategies

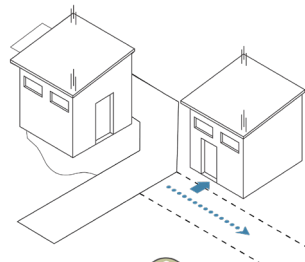
■ Restoration and improvement of the main transversal paths



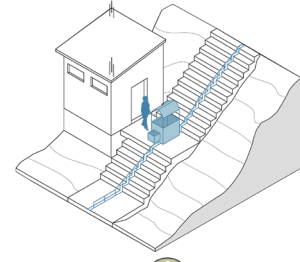
Requirements to be applied:



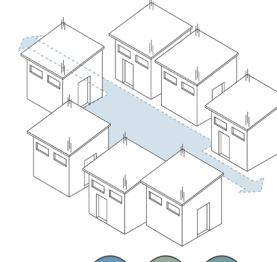
--- Creation of new paths to complement the existing ones



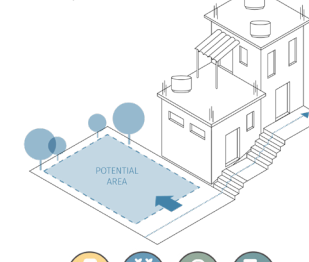
●●● Creation of a public transport (monorail)



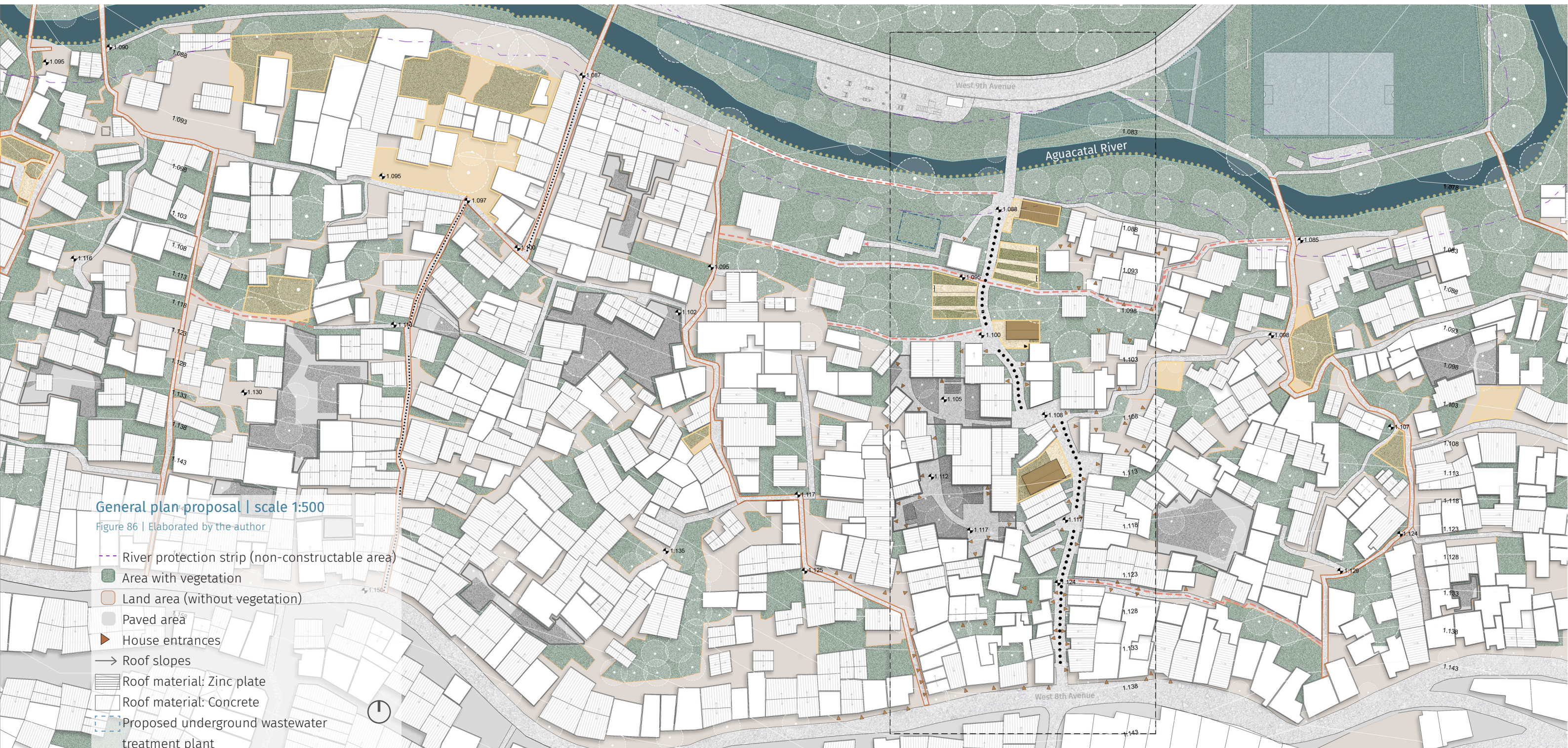
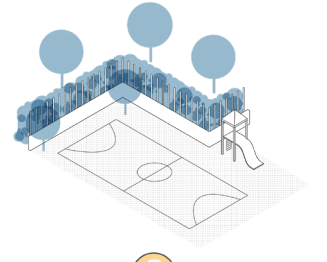
■ Potential area for interventions inside inner-courtyards



■ Potential area for public space intervention next to main paths



■ Maintenance of green areas and recreation facilities



Following the identification of key zones suitable for the establishment and enhancement of public spaces through the previously mentioned strategies, a targeted sector within the Puente Azul - Bajo Aguacatal settlement has been selected for a more comprehensive exploration. This focused analysis explores the challenges of implementing these strategies in this specific area, illustrating the envisioned transformation of public spaces aligned with both the main paths and the internal courtyards.

The public space is linked to a system of pedestrian paths that widen to become squares or platforms to frame important places along the route; for instance, the encounter of transversal and longitudinal paths, a community building or stations and waiting areas of the monorail. The monorail system is located in the center of the main transverse path up the hillside and has five main stations. At each of these stations, there is a square that connects to the proposed community centers. Additionally, it makes stops along the route to allow people to get on and off, this new public transport mechanism provides an efficient, practical and less intrusive solution compared to other systems, such as mechanical stair infrastructure.

As previously mentioned, the public spaces that are connected to the main paths have larger-scale facilities, such as community centers and community vegetable gardens. These gardens serve as communal hubs where residents can cultivate fresh produce, fostering a sense of community and promoting sustainable living practices. Additionally, they provide opportunities for educational programs on gardening, nutrition, and environmental stewardship, enriching the community's overall well-being.

The community centers are classified into two types. The first type, identified as T1 (typology 1), features a permeable structure designed to accommodate a wide range of community activities. These may include educational programs, fairs, medical visitation initiatives, or community workshops. The flexible layout and multifunctional spaces of the T1 centers are designed to support diverse needs and foster interaction among residents.

The second community center is identified as T2 (typology 2), which is designed to house community practices for food security connected to an urban agriculture network through a circular economy (dining rooms, community vegetable gardens and waste treatment for compost). It also includes meeting spaces, a kitchen and storage areas. This structure is also adjacent to a sanitary module called S2, which has a handwashing area, sink, and toilet. As access to water in the informal settlement is sometimes limited, it is proposed to use a water storage cistern, which is located in the upper part of the module.

In the public spaces designed within the internal courtyards, a sanitary module is proposed that includes a sink, laundry, dry compost toilet and shower. This is provided since many of the people in the area live in overcrowding, where the area is insufficient for the number of people living in the house, and many times these basic sanitation services are limited. The proposal also involves installing compost containers for organic waste, intending to utilize them as fertilizer for the courtyard plants. Additionally, it is suggested that each internal courtyard could host its own small-sized vegetable garden, where there can be cultivation of small plants such as basil, thyme and oregano. Lastly, as part of the sustainable initiatives, there is a proposal to install rainwater collection systems in each household. This system aims to capture rainwater runoff from rooftops, which can then be reused for various purposes such as cleaning and irrigating non-edible plants.

These interventions are all geared towards enhancing the mobility and quality of life of residents by establishing a network of pathways, squares, stations, and interconnected community spaces. This approach aims to promote sustainable development, enhance the environment, and address the unmet basic needs of the community. Additionally, it fosters community practices and social enrichment, creating a solid and productive living environment.

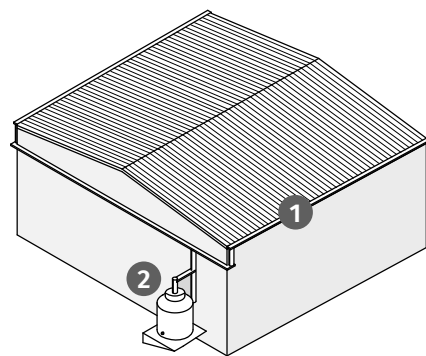


Strategies

Figure 87 | Elaborated by the author



Rainwater collection system
proposed in regular houses to reuse for cleaning or watering non-edible plants.

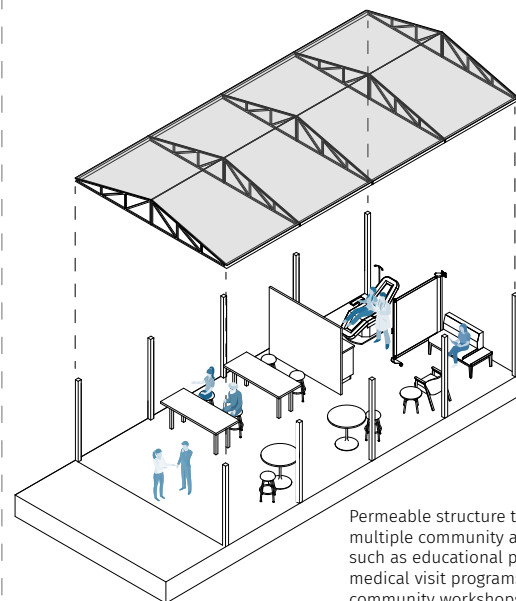


1. Rainwater drainage pipe
2. Rainwater barrel storage

Strategies included:



T1 Community center tipology 1
Multifunctional area

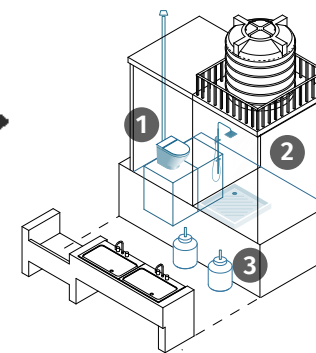
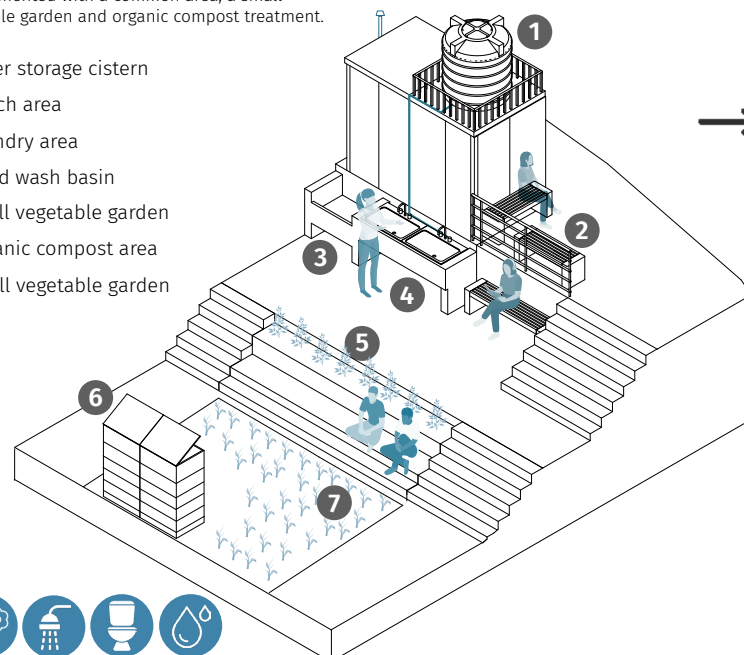


Permeable structure to host multiple community activities such as educational programs, medical visit programs or community workshops.



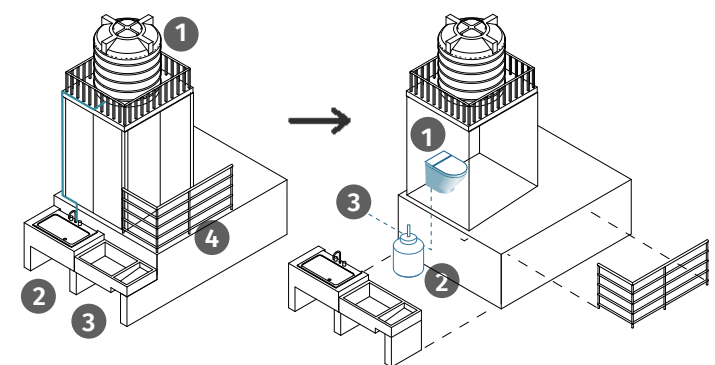
S1 Sanitary module tipology 1
Module for inner courtyards complemented with a common area, a small vegetable garden and organic compost treatment.

1. Water storage cistern
2. Bench area
3. Laundry area
4. Hand wash basin
5. small vegetable garden
6. Organic compost area
7. Small vegetable garden



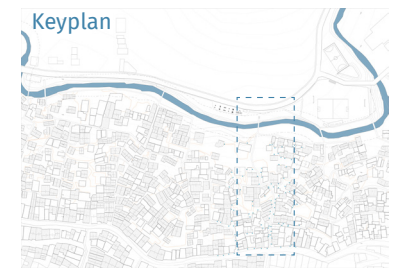
1. Dry toilet
2. Shower room
3. Gray water storage

S2 Sanitary module tipology 2
Module connected to main paths



1. Water storage cistern
2. Hand wash basin
3. Laundry area
4. Protective fence
1. Toilet
2. Gray water storage
3. connection to drainage system





Monorail

The monorail, integrated into the stairs of the main road in the area, is a transport system designed to move 2-3 people or heavy items. Its purpose is to improve access to steep areas, providing an efficient and less intrusive solution compared to more conventional systems.

Rainwater storage system

It is a rainwater collection system that was implemented in existing houses that have internal courtyard characteristics; this water goes to tanks and eventually the community can use them to water plants.

Sanitary module 1

The sanitary point is directly connected to the community centers, since they can generate the sanitation of food by means of a clean water tank and also has an area with a toilet.

Sanitary module 2

The sanitary point is directly connected to the community centers, since in these it is possible to sanitize people through showers, sinks and toilets by means of a clean water tank, and also to collect gray water.

Community center 2

Placing the community center on a platform and building a lightweight structure offers a versatile and adaptable solution. This maximizes the flexibility of the space, allowing the center to be multi-purpose and able to accommodate a variety of temporary activities.

Vegetable Gardens

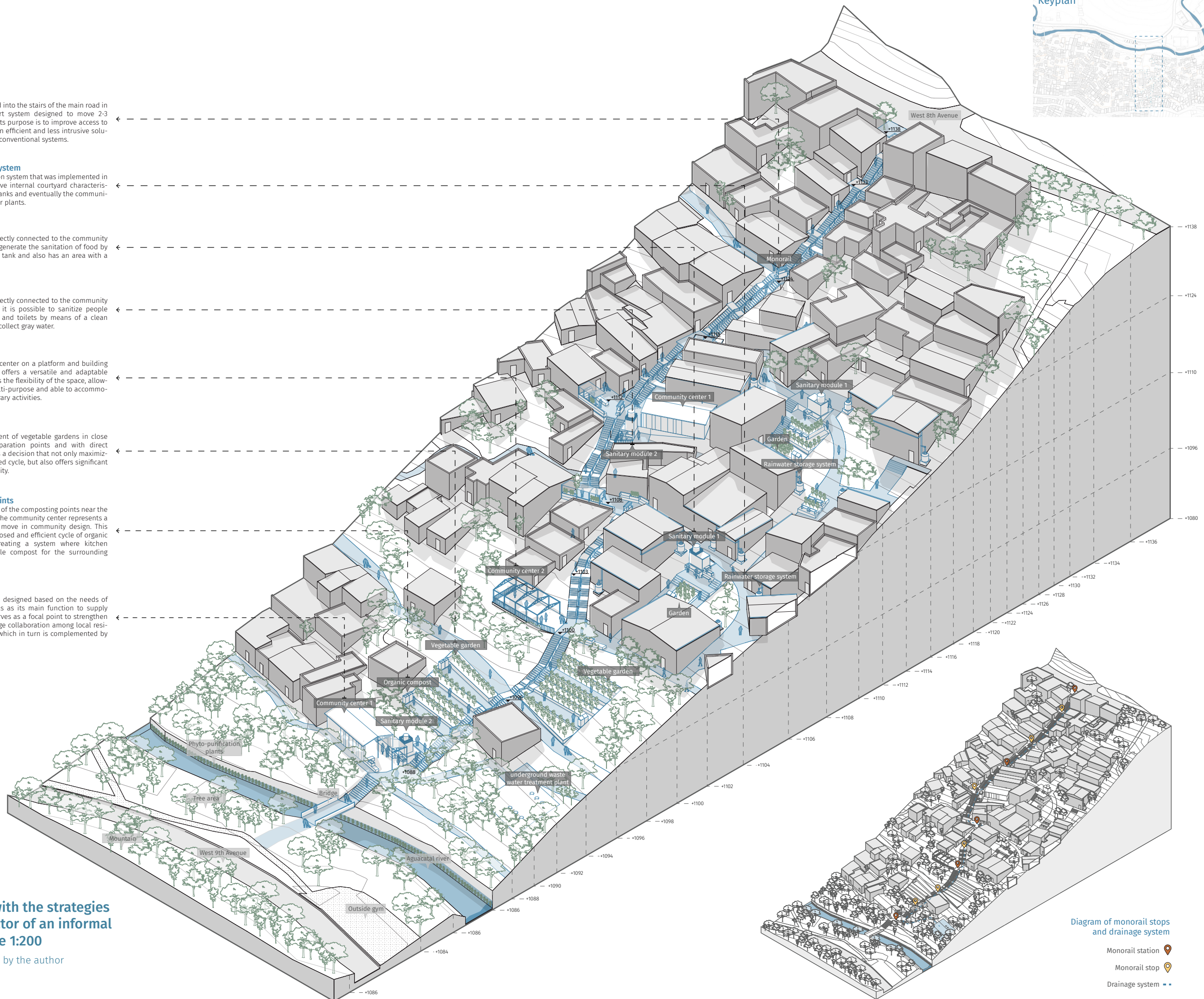
The strategic arrangement of vegetable gardens in close proximity to food preparation points and with direct access from stairwells is a decision that not only maximizes efficiency in the closed cycle, but also offers significant benefits to the community.

Organic compost points

The strategic placement of the composting points near the vegetable gardens and the community center represents a smart and sustainable move in community design. This approach promotes a closed and efficient cycle of organic waste management, creating a system where kitchen waste becomes valuable compost for the surrounding gardens.

Community center 1

Is conceived as a space designed based on the needs of the community that has as its main function to supply food security. It also serves as a focal point to strengthen social ties and encourage collaboration among local residents to prepare food, which in turn is complemented by the sanitary point.



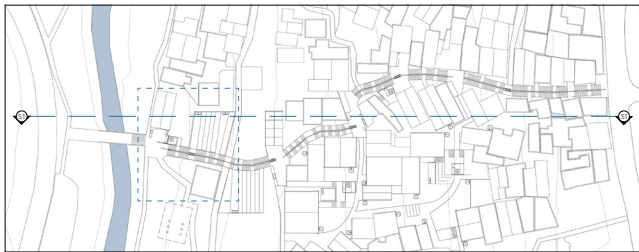
(6.4) Isometry with the strategies applied in a sector of an informal settlement scale 1:200

Figure 89 | Elaborated by the author

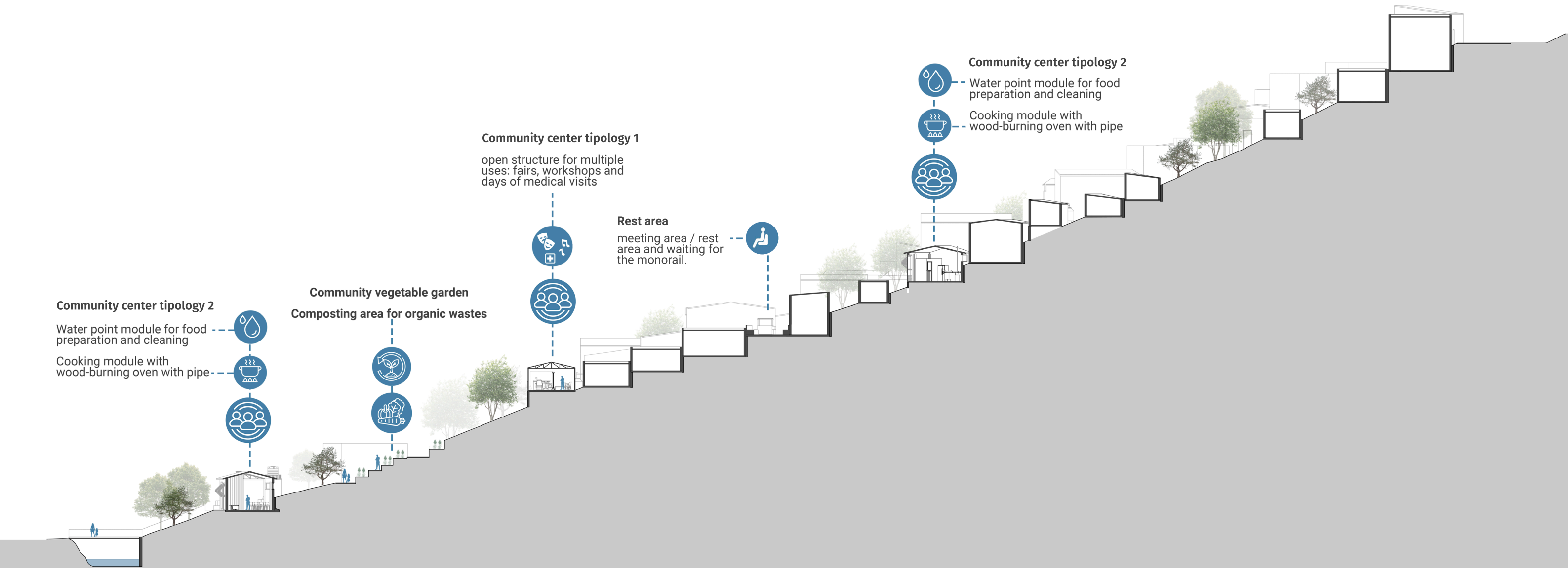
Diagram of monorail stops and drainage system

- Monorail station
- Monorail stop
- Drainage system

(6.5) General section with applied strategies | scale 1:200
Figure 90 | Elaborated by the author



Keyplan



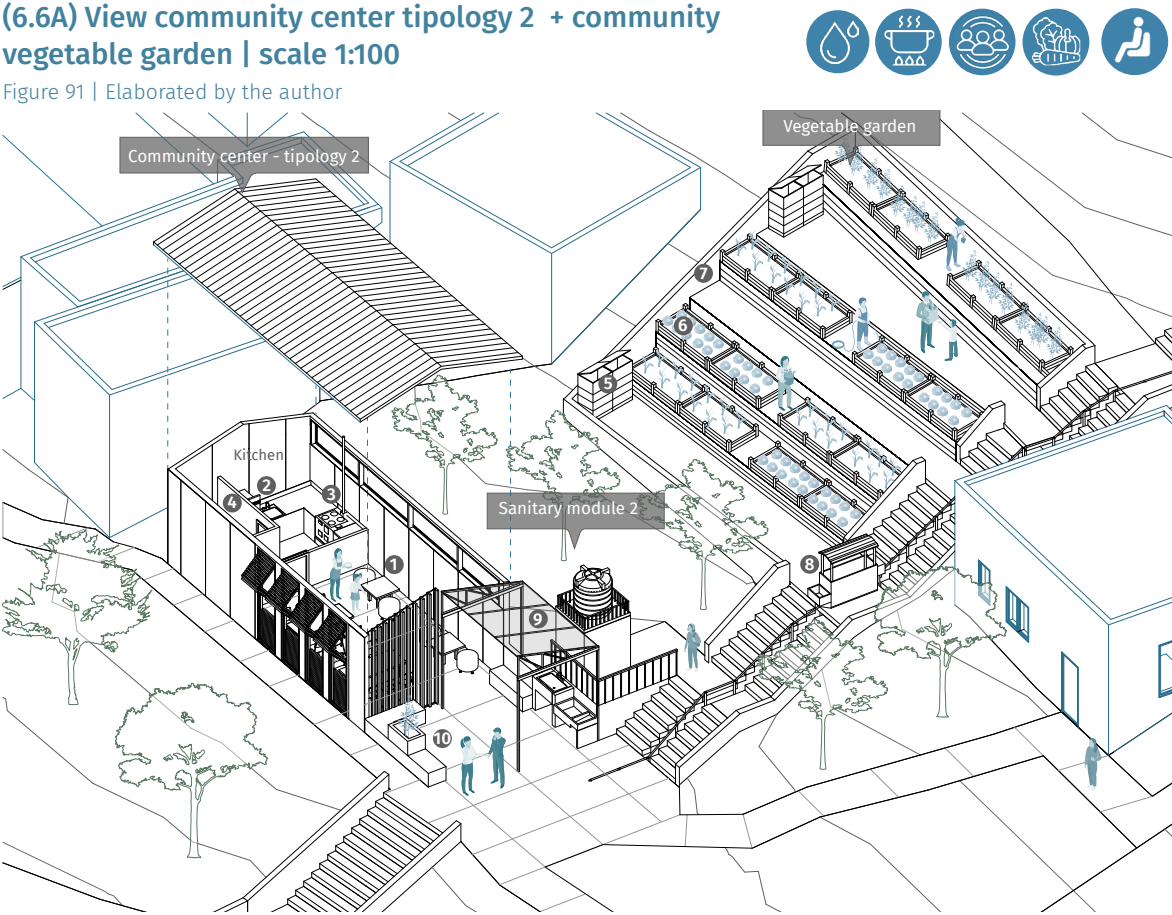
(6.6) Proposal | scale 1:100

Building Community: Enhancing Public Spaces for Social Enrichment

This new public space not only offers essential technical provisions like the monorail system, water collection and sanitary modules but also goes beyond its functional aspects to offer a unique identity for the community it serves; it becomes a symbol of shared culture, fostering activities and meeting points for the inhabitants. This multifaceted approach not only addresses basic needs but also contributes to the cultural and social enrichment of the community.

(6.6A) View community center tipology 2 + community vegetable garden | scale 1:100

Figure 91 | Elaborated by the author



Community center Tipology 1 - Facilities

- 1. Eating area
- 2. Dishwashing
- 3. Wood-burning oven
- 4. Kitchen storage

Transversal and Longitudinal connections

- 8. Monorail
- 9. pergola
- 10. meeting point- platform

Community vegetable garden - composition

- 5. Organic compost area
- 6. Vegetable planting bed
- 7. Protective wall

(6.6B) Circular community food production system

The community center serves as a focal point for promoting food security and sustainable urban agriculture practices. It is intricately linked to an interconnected system that fosters a circular economy, incorporating dining facilities, community vegetable gardens, and waste treatment areas for composting. This integrated approach ensures environmentally conscious management of resources while supporting community engagement and resilience.

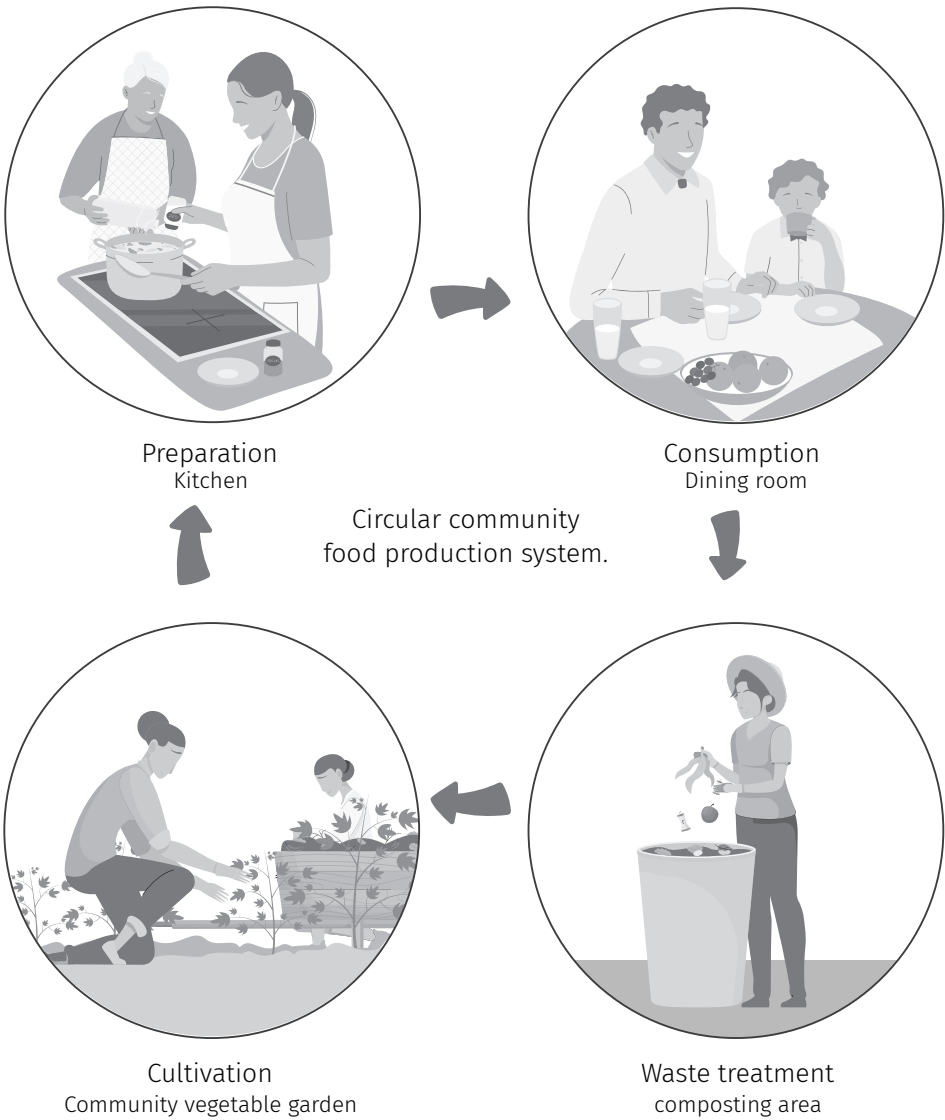
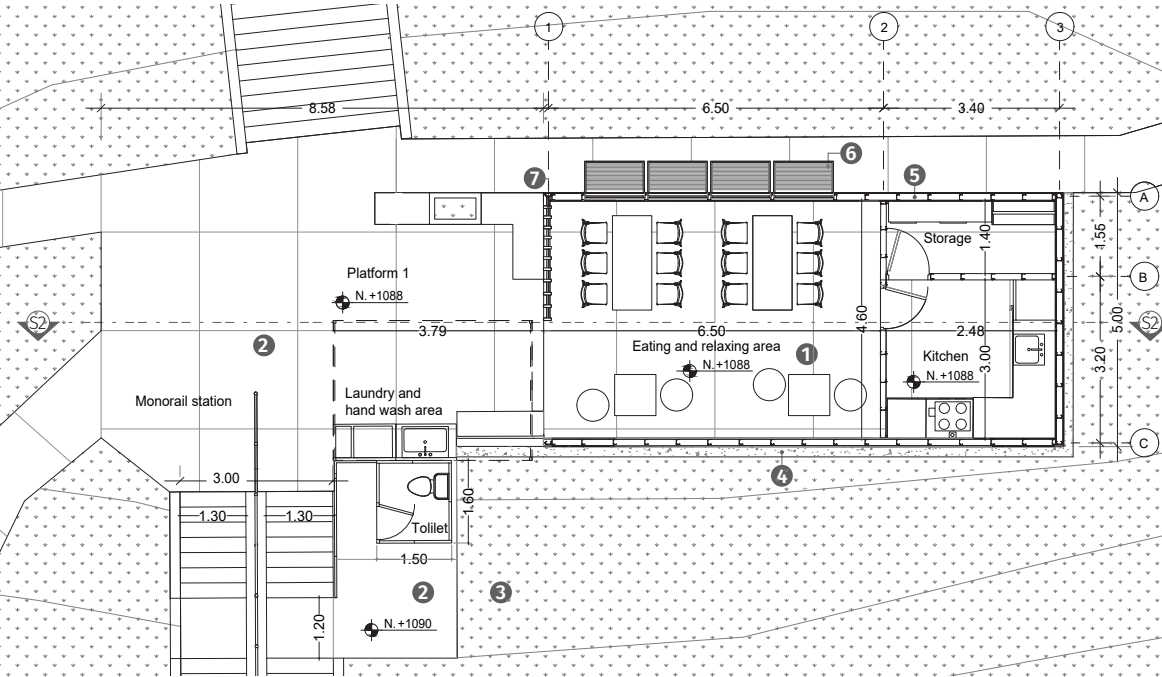


Diagram: circular community food production system

Figure 92 | Elaborated by the author

(6.6C) Plan community center tipology 2 | scale 1:100
Figure 93 | Elaborated by the author



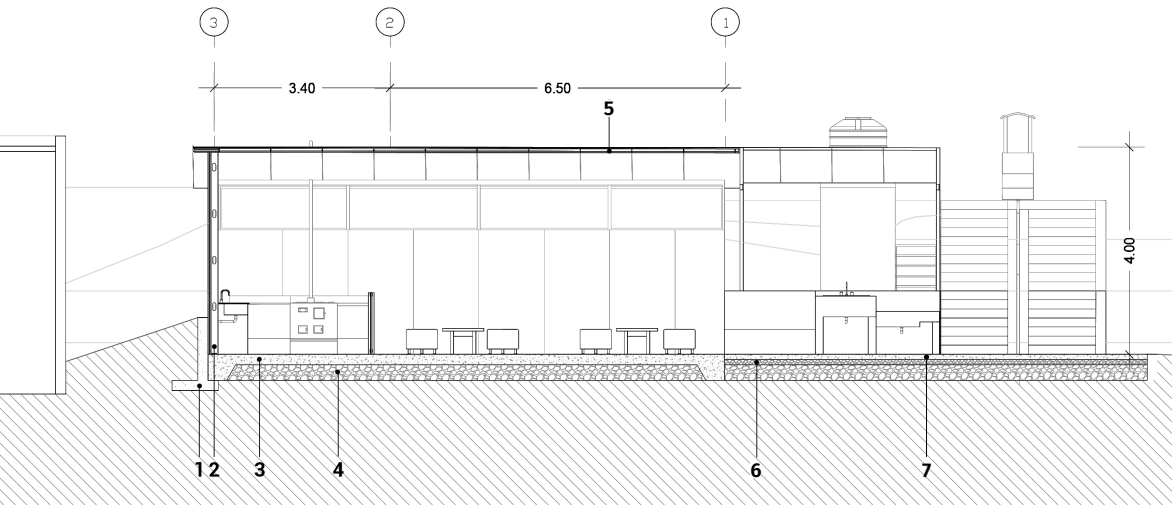
Legend

- 1. Concrete slab platform
- 2. Pervious concrete slab
- 3. Grass
- 4. Reinforced concrete retaining wall
- 5. PGC steel studs with drywall panels
- 6. Wooden blind
- 7. Wooden lattice 10 x 30 cm

Community center adaptability

The project uses materials and construction systems such as drywall panels, OSB and polycarbonate, materials that can be handled by the local workforce and help maximize the flexibility and adaptability of the models to ensure their easy scalability and replicability, which are fundamental aspects for ensure that these solutions can be successfully implemented in diverse communities.

(6.6D) Section 2 community center tipology 2 | scale 1:100
Figure 94 | Elaborated by the author



Legend

- 1. Reinforced concrete retaining wall
- 2. PGC steel studs with drywall panels
- 3. Concrete slab platform
- 4. Stone sub-base
- 5. Roof with sheet metal top, water and air barrier, OSB panels and steel structure.
- 6. Stone layer
- 7. Pervious concrete slab

(6.6E) Chapter 6 conclusion

As illustrated in this chapter, the proposal for the Puente Azul-Bajo Aguacatal settlement addresses a range of community needs through strategic interventions. These include enhancing accessibility and implementing measures for food security, clean water, sanitation, waste management, and community life enhancement. The plan integrates both large-scale initiatives such as the monorail system, public squares and community vegetable gardens, as well as smaller-scale projects like composting areas, sanitary modules, and rainwater collection systems. By identifying areas for public space transformation, the plan aims to improve living conditions, promote environmental sustainability, and foster community well-being. Furthermore, the strategies target comprehensive development by integrating facilities such as community centers with two different typologies to respond to the diverse needs of the population while Initiatives such as rainwater collection systems and the incorporation of phytopurification plants along the river edge promote environmental resilience. Aligned with the Sustainable Development Goals, these interventions aim to enhance mobility, quality of life, and community integration.

Conclusions

In conclusion, this study has revealed a significant reality in the urban structure of Cali, evidencing a fragmented city where most informal settlements are excluded from the strategic projects of the city. The identification of this fragmentation underlines the urgent need to develop strategies that are coherently integrated within the future vision of the city. Detailed analysis revealed irregular growth in informal settlements, generating residual areas with latent potential to become valuable public spaces. These previously neglected areas represent key opportunities for positive transformation that directly impact the quality of life of residents and contribute to the urban fabric in a comprehensive manner.

Within the informal neighborhoods, two distinct types of residual spaces have been identified, some with block center characteristics and others adjacent to the main paths. These spaces offer strategic points for planned interventions that can contribute to the improvement of the urban environment. The possibility of transforming public space through design strategies focused on the provision of basic services such as food security, water access, sanitation, waste collection, improved accessibility and the integration of specific projects stands out as a key solution. Moreover, accessibility in informal hillside settlements has emerged as a critical element in achieving a comprehensive public space transformation. The monorail proposal, linked to a system of stairs and platforms, is positioned as a proper solution, adapted to the unique morphology of this sector, to enhance mobility and connectivity.

The transformative role of public spaces in addressing the needs of informal settlements cannot be overstated. This research contributes to the discourse on more equitable, sustainable and inclusive urban development for the community and the city by actively including informal settlements in the city's strategic projects. The significance of public space emerges as an essential factor; proper design, connectivity, and equitable access to these spaces have the potential to address fundamental needs, significantly enhancing the quality of life and social integration of populations residing in informal settlements. It is recommended for future applications of these strategies to involve the community in the decision-making and project construction processes. Community involvement can provide valuable insights, foster a sense of ownership among community members and enhance the potential impact and sustainability of the interventions. Finally, this thesis serves as a call to action, urging urban planners and policymakers to embrace a holistic approach that prioritizes the creation of public spaces as integral components in the pursuit of a cohesive and socially integrated urban landscape.

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48. Territorial problems identified by UPU-8 citizens during the period 2012-2016, Elaborated by the author based on (Subdirección de planificación del territorio, 2016). document PROCESO DE PARTICIPACIÓN CIUDADANA PARA LA FORMULACIÓN DE LA UNIDAD DE PLANIFICACIÓN URBANA 8 – CERROS.pdf
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50. Current state of the sector's problematics | scale 1:5000, Elaborated by the author
51. Section A - Historical and heritage center | scale 1:1000, Elaborated by the author
52. Section B - Aguacatal river lower part | scale 1:1000, Elaborated by the author
53. Section C - Ecological routes | scale 1:1000, Elaborated by the author
54. Section D - Informal settlements | scale 1:1000, Elaborated by the author
55. Formal and informal contrast, source: (Skytrip, 2022). screenshot <https://www.youtube.com/watch?v=Qsl6iUVI-zE>
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57. Informal settlements in Aguacatal neighborhood, Elaborated by the author based on (Peláez & Franco, 2019). <https://www.cali.gov.co/loader.php?lServicio=Tools2&lTipo=descargas&lFuncion=descargar&idFile=38310>
58. SISBEN average score, Elaborated by the author based on (Peláez & Franco, 2019)
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62. Education graphic, Elaborated by the author. Based on (DANE, 2018). <https://geoportal.dane.gov.co/#gsc.tab=0>
63. STRATA (According to electricity bill classification, Elaborated by the author. Based on (DANE, 2018). <https://geoportal.dane.gov.co/#gsc.tab=0>

64. Land use, main activities and public space actual situation | scale 1:500, Elaborated by the author

65. Photographic Report. Puente Azul-Bajo Aguacatal, Elaborated by the author

66. Sections actual situation | scale 1:200, Elaborated by the author

67. Intervention zone with an indicative flood protection strip, Elaborated by the author

68. Type of park - Border (Parque La Tercera Edad - Santiago de Cali), source: (MAEPE, 2018). pp. 120. https://idesc.cali.gov.co/download/guias/manual_maepe.pdf

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81. Community center ground floor, source: Ce Wang. <https://www.archdaily.com/985694/community-hall-of-dahei-new-village-one-university-one-village>

82. Image of people using the space, source: Ce Wang. <https://www.archdaily.com/985694/community-hall-of-dahei-new-village-one-university-one-village>

83. Interior of the community center, source: Ce Wang. <https://www.archdaily.com/985694/community-hall-of-dahei-new-village-one-university-one-village>

84. Table of requirements, strategies and tactics for informal settlement, Elaborated by the author

85. Main requirements diagram, Elaborated by the author

86. General plan proposal | scale 1:500, Elaborated by the author

87. Strategies | Elaborated by the author

88. General plan and strategies | scale 1:200, Elaborated by the author

89. Isometry with the strategies applied in a sector of an informal settlement scale 1:200, Elaborated by the author

90. General section with applied strategies | scale 1:200, Elaborated by the author

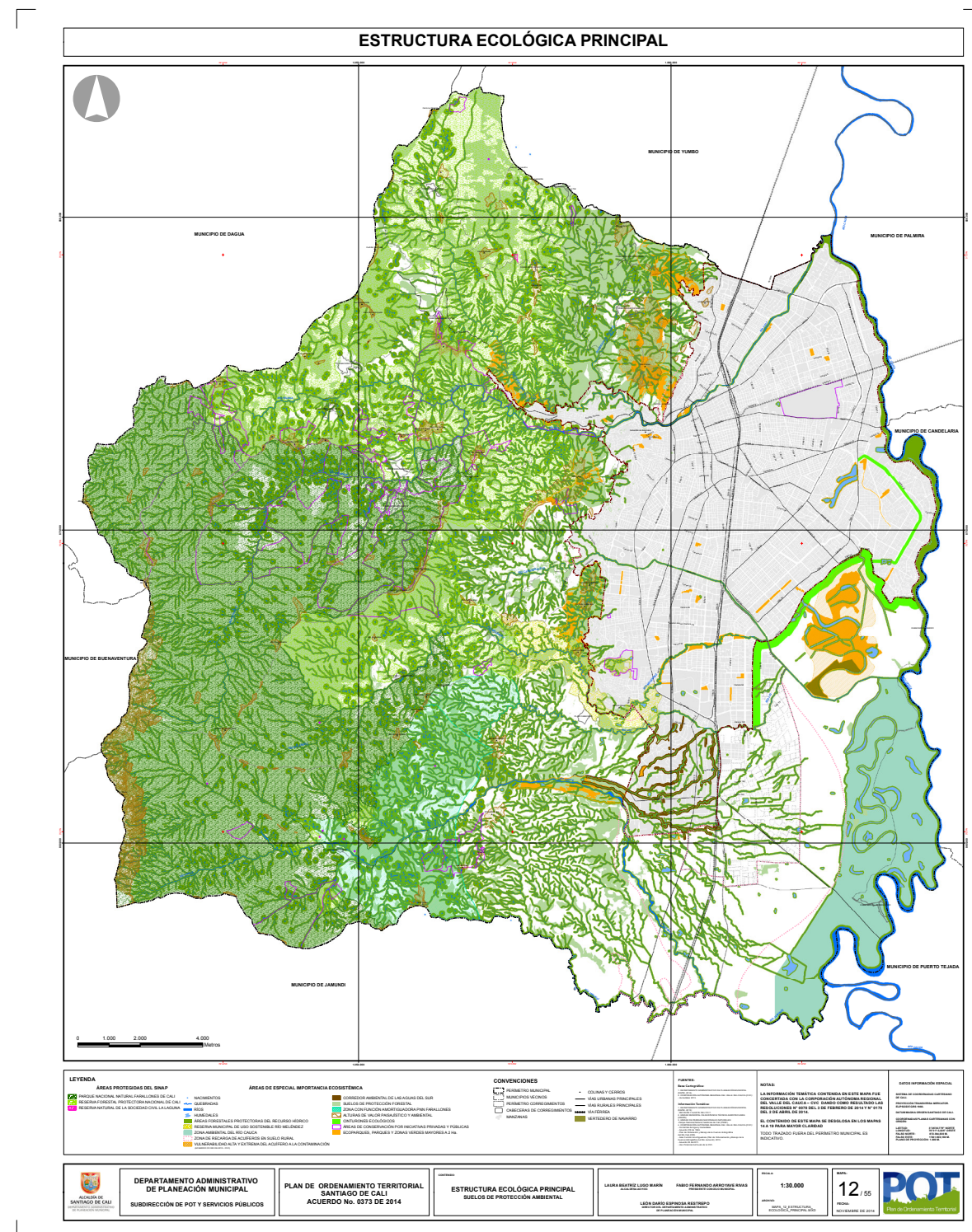
91. View community center tipology 2 + community vegetable garden | scale 1:100, Elaborated by the author

92. Diagram: circular community food production system, Elaborated by the author

93. Plan community center tipology 2 | scale 1:100, Elaborated by the author

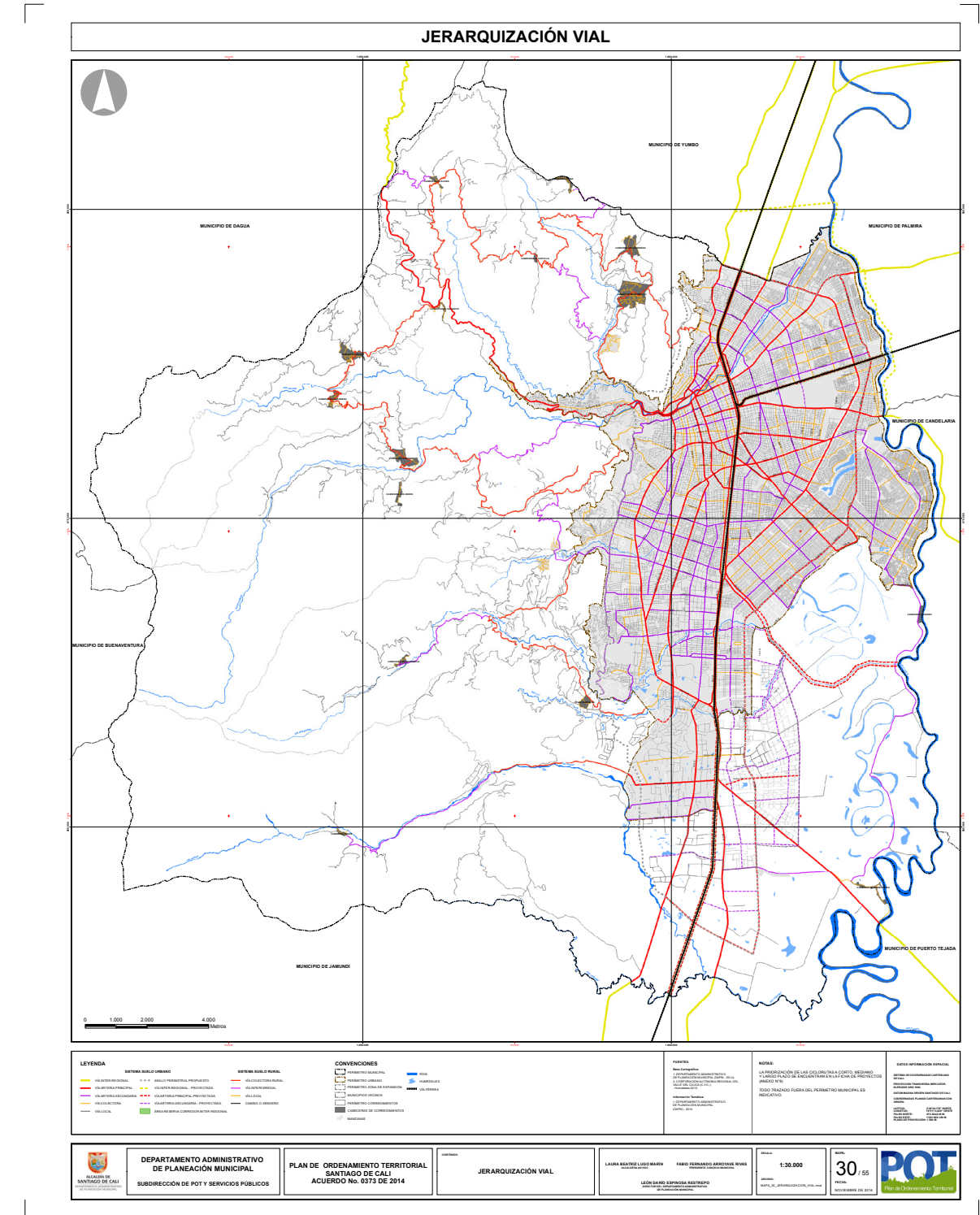
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Annex 1. Main ecological structure. POT



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Annex 2. Road hierarchy. POT



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