

An **Adaptive** strategic framework

Exploring new upgrading strategies for informal settlements in Bogotá, Colombia.

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Abstract

The rising poverty rates, internal displacement, market-oriented development and social inequalities are some of many factors that shaped the binary configuration of the so-called formal and informal urban fabric of Bogotá. Urban informality emerges as the answer to a lack of opportunities and spatial offers, evidencing the inability of the existing planning structures to embody and decode the complex conditions, dynamics and vulnerability gradients that these environments entail. Bogotá's upgrading program, despite being a crucial instrument in the transformation of informal areas, has proven to be insufficient to overcome the fragmentation between formal and informal urban dynamics, in which the generic and rigid approach has impeded the achievement of a structural change and local empowerment in a long term perspective.

The thesis proposes an alternative assessment and planning framework, as an opportunity to improve the current planning methods within a new long term perspective, that embraces and increases the adaptive capacity of the diverse vulnerable groups and systemic interrelations in the current structures of Bogotá. This, by redefining the current overview of risk and to vulnerability, as potential tools to improve the local conditions from a co-evolutionary socio-ecological approach.

The proposed Framework is therefore not a definitive and static project. In turn, it is a dynamic tool to reveal the diverse challenges but also the amount of endogenous opportunities in the local informal environments. By redefining the role of nature and the role of formal and informal actors as co-agents of change in the development process, the proposed model aims to transform the segregated dynamics of the city, empower the local and most neglected communities, reinforce bottom-up approaches and provide alternative possibilities for more resilient socio-ecological systems that in turn are prepared to an uncertain future.

Main Research Question

How can an adaptive strategic framework create a new planning vision for vulnerable areas in the city of Bogotá in order to achieve a sustainable, dynamic and cohesive urban environment?

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1. Preface

With 55 percent of the world's inhabitants living in urban areas, the mega-trend of urbanization and the growth of capitalism are one of the aspects that determined the spatial distribution of society nowadays. 81 percent of Latin America population lives in urban environments, making it one of the world's most urbanized regions in the world, after North America with 82%. (UN, 2019)

Migration, new economic dynamics and emergent territorial organization patterns where the result of the roll of Latin American countries in the imperialist global system. The capitalist trend characterized by the marginalization of the migrant population in Latin American cities, was the starting point in the introduction of the notion of informality in the field of urbanism.(Castells, 1942)

Informal settlements in Colombia date back to the end of the 19th century, but began to have greater relevance after the mid-20th century whit the activation of the urbanization process of cities. The Colombian city model is defined by the superimposition of formal and informal urban layouts articulated through infrastructure and networks. The urbanization process in the city of Bogotá has not been developed on the basis of a single urbanization model. The city model is based on the interplay of formal and informal manifestations. This does not entail the co-existence of two different cities, it is a single city that permanently overlaps and where social, political and urban conflicts have led to a multidimensional segregation of its urban environment and a regional model where all the tension and dynamics are concentrated in the capital. (Torres, 2009)

The phenomenon of informal urbanization continues to carry great weight in the production of urban space, where the called "pirate urbanizers" in Bogotá, take advantage of the expected legalization and regularization interventions to perpetuate illegal lots and capture capital gains. Vulnerable populations continue to find advantages in the informal housing market over the formal offer, which makes it a phenomenon that will remain in force if the housing and spatial policy for low-income families is not structurally transformed in order to establish responsive strategies to the problem. (Camargo Sierra, 2013).

Key Concepts: Formal/Informal development; planning strategies; adaptive governance; evolutionary resilience.



Source: Informal housing practices and progressive development in Bogota. Laura Amaya. October 22, 2014

2. Problem field

Overview

Nowadays, in most of the cities of the global south multiple urban conceptions coexist and are manifested in a same socio-spatial and political sphere. Latin American urbanization patterns are the evidence of the actual challenge related to inequality, poverty and exclusion reflected in the strong division between formal and informal ways of development and in the actual fragmentation of the urban fabric.

The following chapter contextualizes the issue of informality in the continent, highlighting its main challenges and dynamics. Added to the multiple problems of social segregation and urban fragmentation, the problems and challenges surrounding environmental, territorial and social aspects are increasing.

As the project is focused on the city of Bogotá, it is indispensable to analyze the informal dynamics and their main triggers in Colombia, since the history of the country, its armed conflict and displacement have been important determinants when dealing with the issue of informality.

Chapter Structure:

a. Urbanization trends in Latin America and the Global South

b. Informality and Global Demographic Projections

c. Urbanization in Colombia

d. Displacement in Colombia

e. Current trends of displacement in the region

Geographical Research approach



a. Latin America and the Global South

The world has been witnessing rapid urbanization processes that changed the distribution of resources and people. 81 percent of Latin America population lives in urban environments, making it one of the world's most urbanized regions in the world (After North America with 82%)(UN, 2019).

Of the world's 33 mega cities (10 million inhabitants or more) in 2018, 27 are located in the less developed regions (global South) (UN, 2018) Latin America and the Caribbean is the region with the largest proportion of the population concentrated in mega cities, and more than 100 million people live in informal settlements. Therefore, 1 in 4 people is living in self-build vulnerable environments with a lack of services. (UN, 2016)

Firstly, it is important to point out that the urban structure in Latin American cities has profound relationships with the social structure, production practices, and predominant political opinions, interests, and relations, derived from various 'domination' schemes that have shaped the history of the continent. As stated in the introduction, the starting point will be exploring the historical process of the 'dependent urbanization' theory and the spatial patterns which are a consequence of the stance and role of Latin American countries within the neo-liberal and capitalist production systems. This overview leads to envisage a 'common' problematic in the cities' spatial organization and a clear link with the phenomenon of informality or urban marginality (Castells, 1973, p.7).

The 'dependent urbanization' theory can be understood under three main features. Firstly, the accelerated demographic growth and the trend of exponential agglomeration of populations in urban areas (Castells, 1973, pp. 7-15). In this regard, Latin America's populations experienced an extraordinary and overwhelming growth after the WWII, faster than every other region of the world at the time.

In numbers, from around 149 million inhabitants in 1950, the population increased to around 352 million in 1980 [more than doubled in only 30 years]. The peak was reached in the first half of the 60s [more than 2.8 percent of accelerated growth] (CEPAL, 2000). This speeded growth evidently brought with it numerous and varied economic and spatial challenges.

Secondly, the formation of a truncated and disjointed urban fabric can be pointed out as the last feature of 'dependent urbanization' in Latin America. The disproportionate predominance of large agglomerations and the concentration of urban growth in the metropolitan region did not only affected the economic and political management of the countries, but also brought as consequence the enhancement of sociocultural separation between the urban and rural spheres, resulting in the disintegration and fragmentation between them, as well as in the internal composition of the two. This, together with the strong social stratification and the sharp intra-urban differentiation between old and new populations, gave rise to major problems of social segregation and fragmentation of contemporary cities (Castells, 1973, pp. 7-15).

Thirdly, and intrinsically related to the aforementioned feature, massive migrations in tandem with the social consequences of the continent's integration into the world economy, had an enormous impact on the processes of industrialization, urbanization, and transformation of agriculture. Moreover, this impact was almost equivalent to the dismantling of traditional economical frameworks, which together with rural impassivity, were one of the most influential aspects in the economic and urban dynamics of the metropolis.

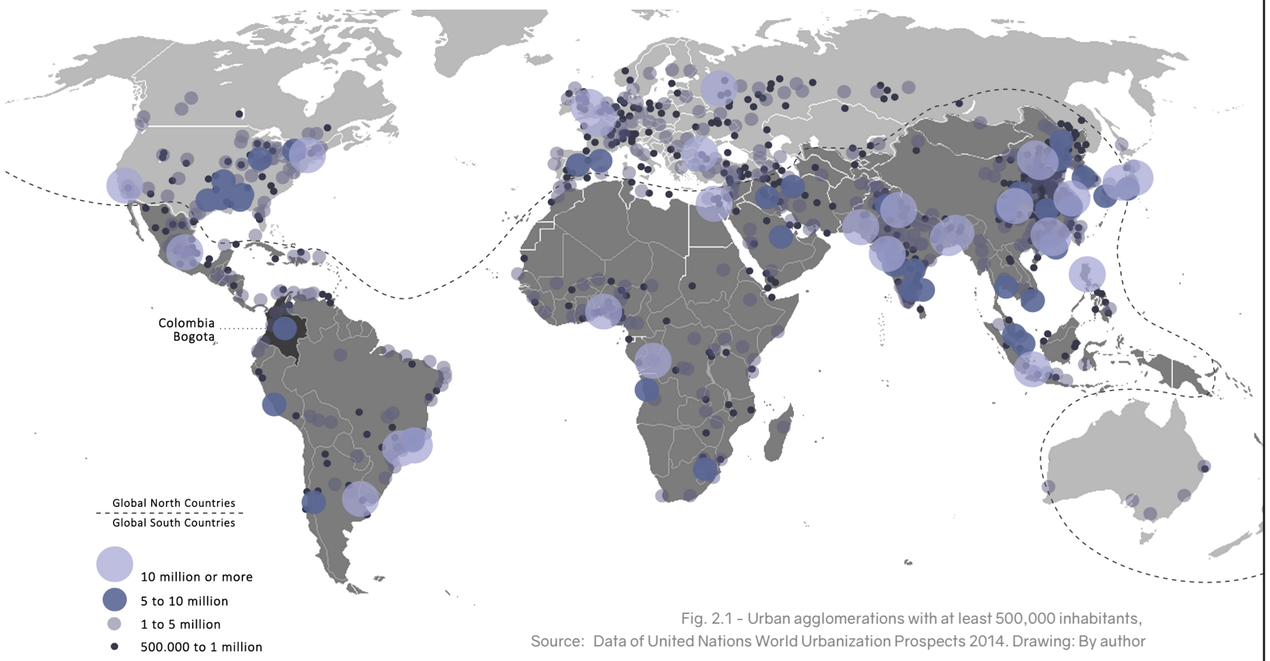


Fig. 2.1 - Urban agglomerations with at least 500,000 inhabitants,
Source: Data of United Nations World Urbanization Prospects 2014. Drawing: By author

This, caused as a consequence deep regional imbalances between the city and the countryside (Crosa, 2015). Excluding the integration of migrants into the economic system of cities and the equivalent development of productive capacity, the spatial concentration of the population in the city is defined to a large extent by the expansion of the informal sector. Thus, the emerging urban population is not only the result of the economic dynamism provided by urban structures, but to a greater extent of the rural-urban spillover in search of opportunities. With this understanding, the migratory component is essential to understand the urban growth of Latin American cities and the emergence of Urban informality as one of the main and most diverse ways of producing urban space in contemporary cities and territories (Castells, 1973, pp. 7-15).

b. Informal development and Global Demographic Projections

Nowadays, informal urbanism has a great burden on the development of contemporary cities, where in many regions it has become the main tool when forging a metropolis. According to the UN-Habitat (2012), almost 33% of the world's urban population in developing regions were living in slums. In Latin America 113 million people - 1 out of 4 persons- were living in slums in 2012. It is predicted that for 250, 3 billion people are going to live in self-build environments, challenging the actual approach to this phenomenon (See Figure 2.2).

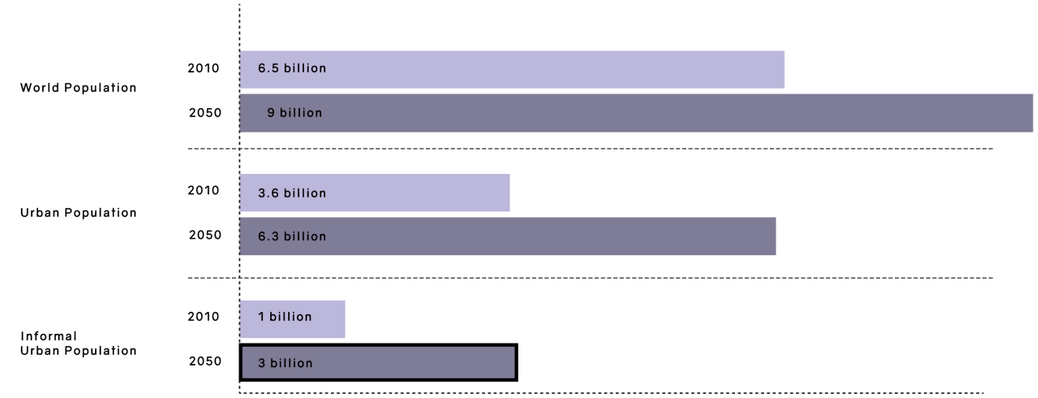
The strategies for improving these environments have generated great advances both in social terms and in the quality of life of some populations, as well as in the establishment of new knowledge and tools to address the multiple problems that arise from this informal dynamic. It has been demonstrated that the dynamics of social housing provision are not sufficient to address the problems of poverty, migration and inequality in the urban environment, so the decoding of the dynamics behind informality can be a valuable tool when exploring new alternatives. When low-income populations resort to self-construction in the absence of better alternatives, policy-makers often focus on infrastructural deficiencies and illegal construction, but understanding of development processes can provide tools and clues to think ahead and go far beyond current interventions.

These have shown positive aspects of informal areas such as social cohesion, self-organization, adaptive capacities, features that are in most cases absent in the expansions of planned cities that exclude these populations from their socio-economic dynamics and the formal construction and city sectors.

Added to the multiple problems of social segregation and urban fragmentation in the formal and informal dichotomy, the problems and challenges surrounding environmental, territorial and social aspects are becoming increasingly greater.

The UN Metropolis Nonformal symposium was created in 2013 in order to think about future strategies around urbanization issues, where through different sources, programs and academics who have worked in relation to informal settlements, it is intended to explore strategies that can prepare cities to receive large numbers of urban migrants who do not have the economic capacity to access the formal city.

Fig. 2.2 - Population Numbers



Source: Population Numbers by UN and UN-Haburar 2012, Middle Class by HSBC Global Research 2012

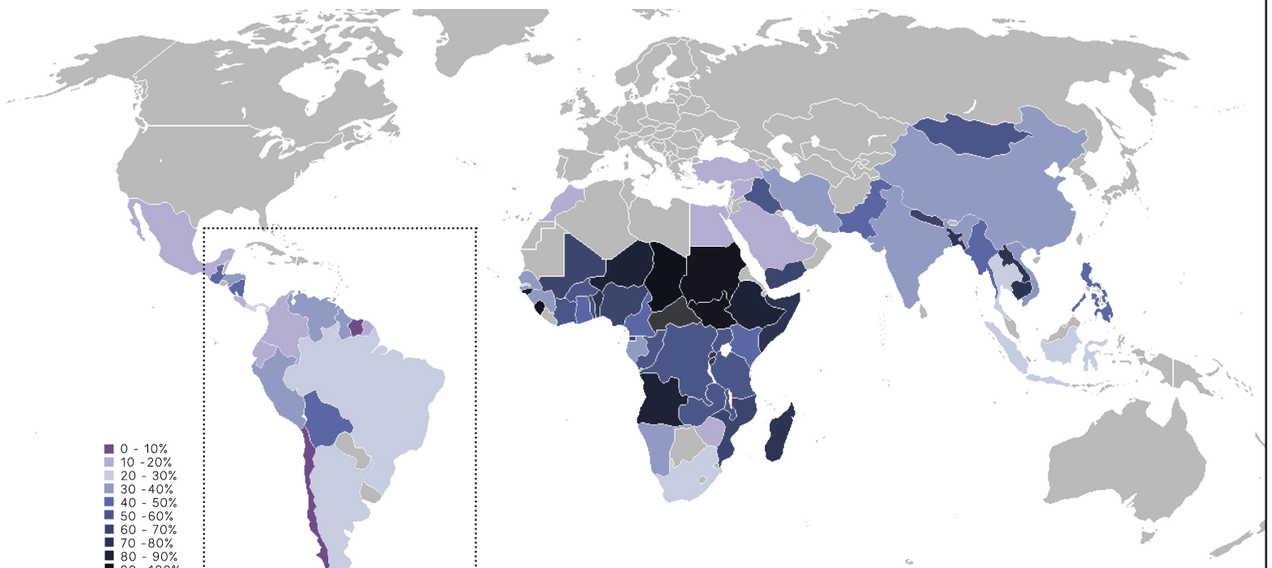
Informal Settlements in the Global South

Latin America remains the most unequal region in the world. 71% of the region's wealth in 2014 was accumulated only by 10% of the population. According to data from the World economic forum, the income of the richest people in the region grew 21% from 2002 to 2015, where the benefits of this economic growth are only captured by a very small number of the population.

This inequality is reflected in the build environment and in the quality of life. Figure 2.3 shows the thirty largest informal settlement territories in the world. Colombia is among the countries with informal settlements, with an estimated two million inhabitants living in precarious housing conditions and in a state of poverty (Manrique, 2016).

Urbanization in the Global South highlights the challenge in widening the income gap and opportunities. Social inequities and separations are defined by a lack of accessibility to opportunities, to the structure and functional systems of the city and to a minimum in standards of quality of life.

Fig. 2.3 - Countries by percentage of urban population living in informal settlements



Source: Data of United Nations World Urbanization Prospects 2005. Drawing: By author

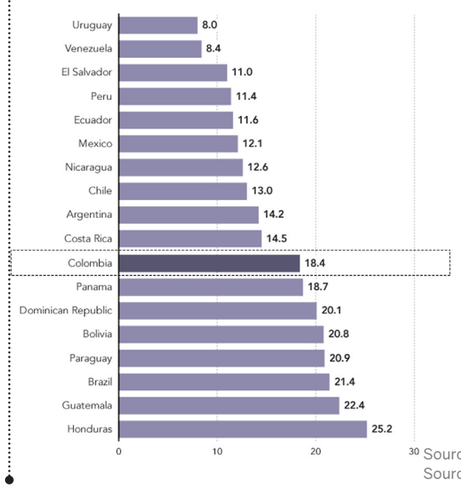


Fig. 2.4 - Inequality in Latin America

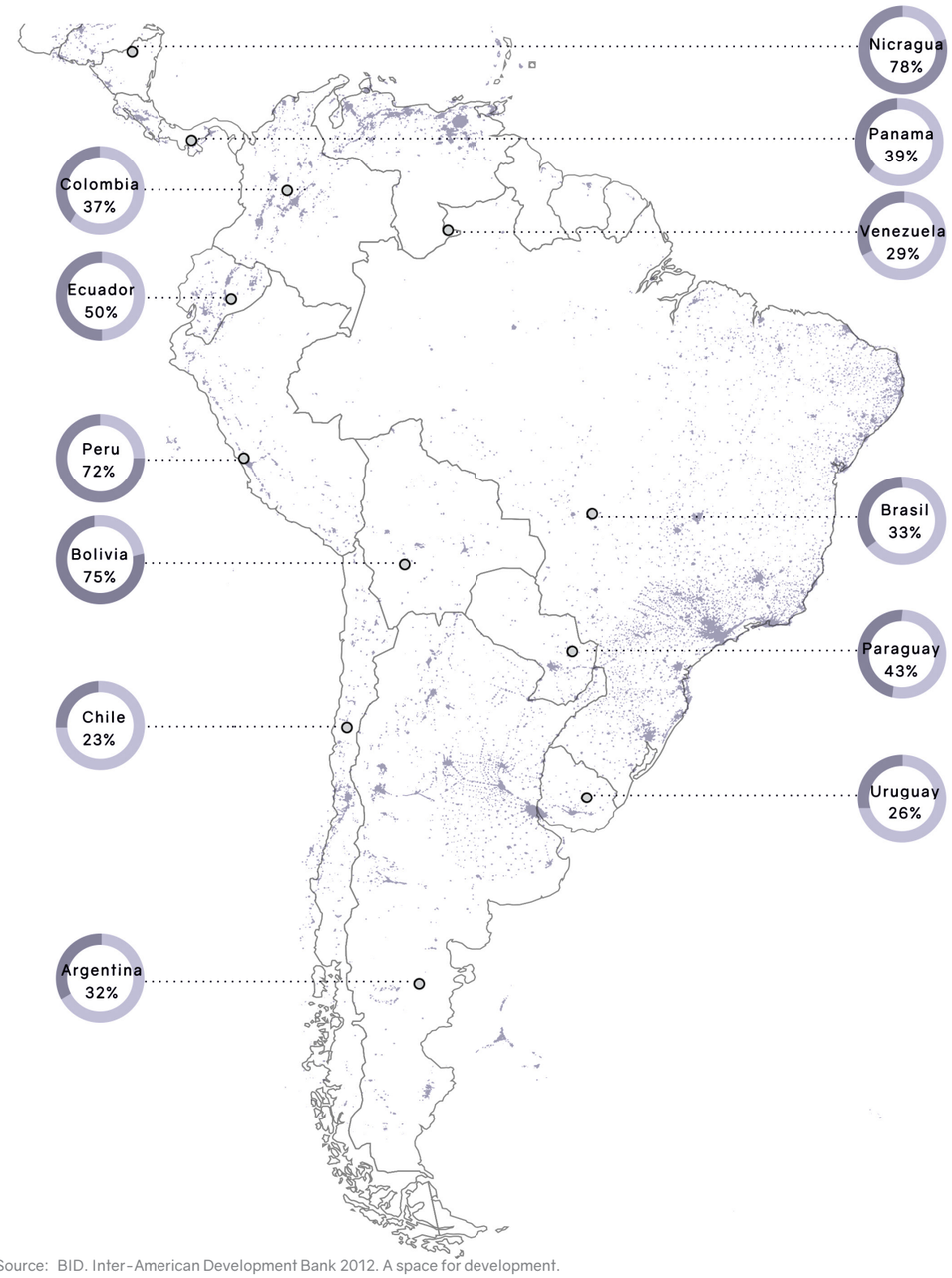
The inequality in Latin America is represented in the figure 2.4 Showing the annual income of the richest 20% in the countries in the region, in relation to the 20% annual income of the poorest population. The economic inequality is measured the larger the number results. The data was provided by Latin America analyst Adam Isacson.

Source: U.N. Economic Comission for Latin America and the Caribbean
Source: The Houffington Post.

Latin Americas Housing conditions

Latin America has high levels of social inequality, manifested in a Large number of precarious settlements in the main urban centers of the region. According to a 2012 study by the Inter-American Development Bank (BID, for its acronym in Spanish), one of three families in Latin America and the Caribbean (59 million people) lives in inadequate housing or housing built with precarious materials or lacking basic services. Nearly one million of the three million families in Latin American cities are forced to settle in informal housing and marginal areas

Fig. 2.5 - Percentage of families without a home or with a house in poor condition.



Source: BID. Inter-American Development Bank 2012. A space for development.

c. Urbanization in Colombia

Fig. 2.6 - The City of Bogotá, Colombia in Latin America.



Source: NASA night satellite image, Edited by author

c. Urbanization in Colombia

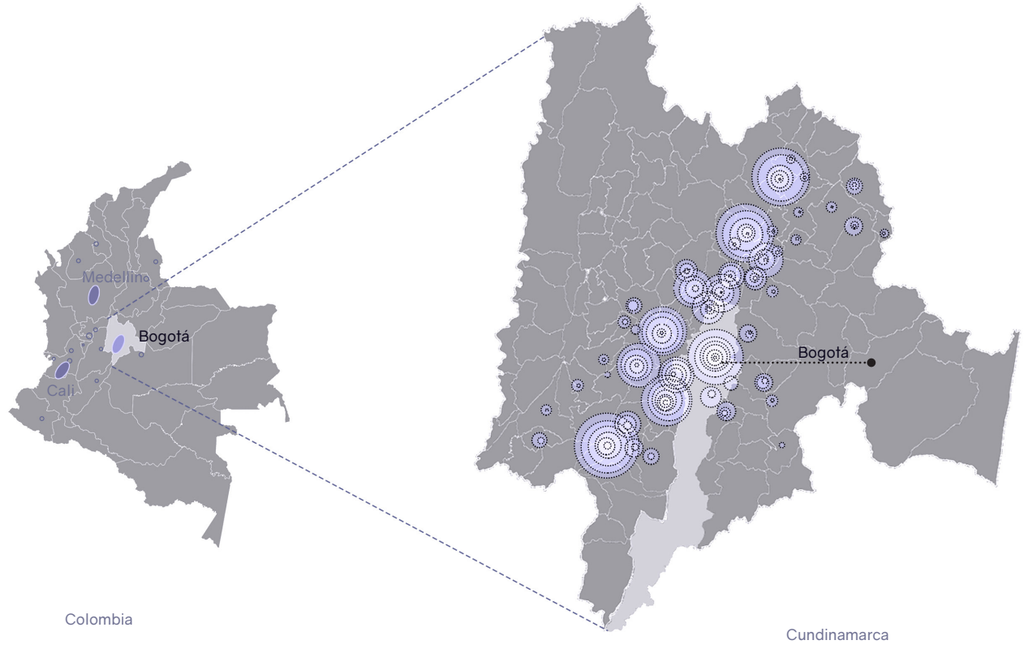
Colombia is a country characterized by its biodiversity and cultural diversity, but social conflicts and economic crises, in both urban and rural contexts, have led to increased poverty and segregation. The peripheral urban development and the migration phenomena had strong impacts from multiple spheres in the country and has generated an informal model of social production of Inequality reflected of space. (Torres, 2009)

The interurban space of metropolitan conurbation is characterized by being diffuse and fragmented, and represents the social crisis of a country that could not react effectively to the urban challenges imposed by violence and social conflict. Nowadays, informal urban growth in Colombia represents approximately one fifth of households in 2020, and the Actions to deal with this type of situation have not been comprehensive and articulated in Colombia. The institutional understanding of this socio-spatial process has not been accompanied by the state with effective strategies. (Manrique, 2016)

Metropolitan areas in Colombia are composed of regional-scale urban center and municipal-scale urban centers. The central region of Cundinamarca and the metropolitan area of Bogotá, as shown in Figure 2.5, have been the main receivers of migrations and where these conurbation processes have developed in their main satellite cities. (DANE, 2005) This social and urban phenomenon, in turn, has enormous implications on the poverty situation. The location, disconnection and lack of accompaniment by the state has generated a lack of job opportunities, a lack of basic services, and a restriction on access to education. (Manrique, 2016)

The phenomenon of metropolization in Colombian cities is caused by the dynamics of accelerated urban growth that led to an emerging edge of physical-spatial and environmental conflicts. The main urban problem for conurbated municipalities is their lack of capacity to manage the development processes of the human settlements that massively occupy these sectors. (Manrique, 2016)

Fig. 2.7 - Informal settlements in Cundinamarca



Source: From informal to integral improvement. Manrique, 2016. Pilot University of Colombia. Drawing by author

The population concentration in the main regional centers, as shown in Figure 2.6, as Bogotá Cali or Medellin have grown exponentially to the point that more than 75% of the Colombian population lives in urban areas (CODHES, 2006). With this demand, and given that the formal housing market barely meets 51% of the country's existing housing demand (DNP, 2006), it is imminent that the vulnerable and low-income population resort to alternative means to acquire housing and access opportunities.

In the case of Bogotá, it is estimated that around 20% of all urban poverty in the country is concentrated in its peripheral areas. According to this, spatial segregation can be characterized by the degree of growth, concentration and densification of informal settlements in cities such as Bogotá that have received large numbers of displaced persons. (Manrique, 2016).

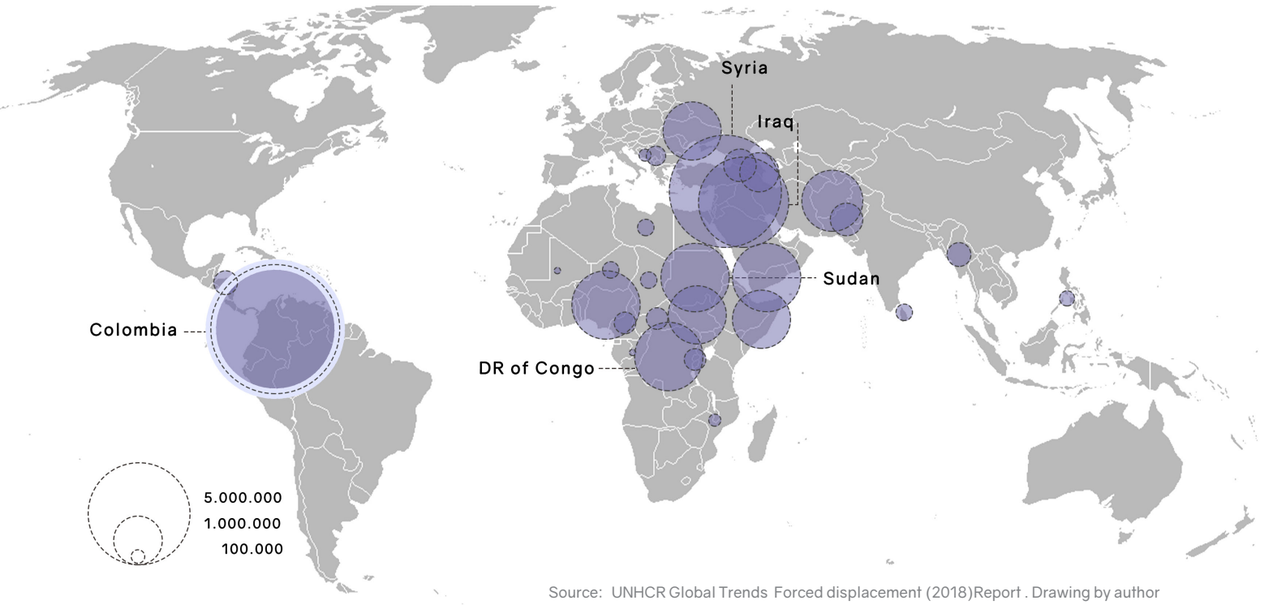
d Displacement in Colombia

The global population of forcibly displaced increased by 2.3 million people in 2018. By the end of the year, almost 70.8 million individuals were forcibly displaced worldwide as a result of persecution, conflict, violence, or human rights violations. As a result, the world's forcibly displaced population remained yet again at a record high. (UNHCR, 2018)

The highest numbers of internally displaced people (IDPs) in the world resides in Colombia and Syria, each estimated to be home to more than six million IDPs, some of whom have been displaced multiple times. Syrians continued to be the largest forcibly displaced population at the end of 2018, and Colombians were the second largest group with 8 million, 98 per cent displaced inside their country at the end of 2018. Therefore, as has been the case since 2015, Colombia continued to report the highest number of internally displaced people with 7,816,500 at the end of 2018 according to Government statistics [Figure xx]. (UNHCR, 2018)

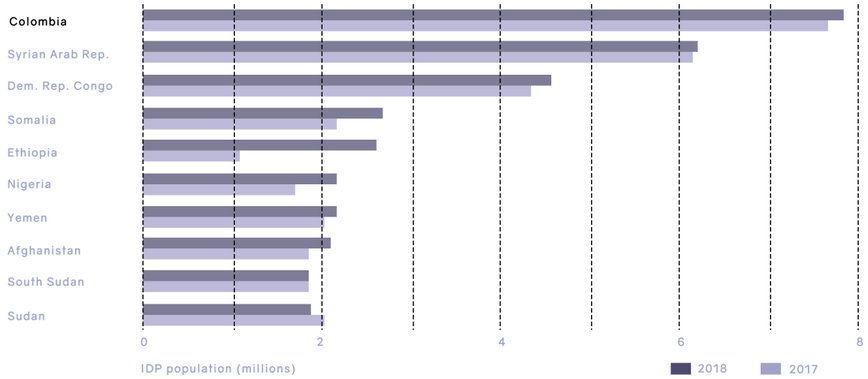
The armed conflict in Colombia, which began in 1960 (one of the longest in history) took place between the state and extreme left-wing guerrillas, followed decades later by extreme right-wing paramilitary groups, drug cartels and criminal gangs. This conflict had an enormous impact on the civilian population since the 1980s in the rural population that was dispossessed of its lands due to violence and displaced from the countryside to the cities. The peace and disarmament agreement signed in 2016 between the government and the main guerrilla group active in the country was an important step towards the consolidation of peace, although it has not definitively resolved the conflict.

Fig. 2.8 - Population in an Internal displacement situation



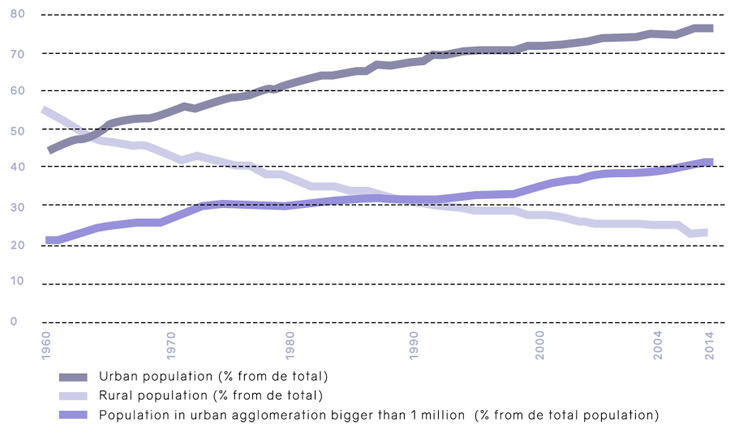
Source: UNHCR Global Trends Forced displacement (2018)Report . Drawing by author

Fig. 2.9 - Ten largest IDP Populations



Source: UNHCR Global Trends Forced displacement (2018)Report . Drawing by author

Fig. 2.10 - State of the population in Colombia by type of settlement



Source: Databank 2015. World Bank, World Development Indicators. Drawing by author

e. Current trends of displacement in the region

Fig. 2.11 - Colombias border with venezuela



Source: Colombia: Situación humanitaria en frontera colombovenezolana. OCHA, 2015.

By the end of 2018, more than 3 million Venezuelans had left their homes, traveling mainly towards Latin America and the Caribbean escaping of violence, insecurity, fear of being targeted for their political opinions, shortages of food and medicine, lack of access to social services, and economic crisis.

It is the biggest exodus in the region's recent history and one of the biggest displacement crises in the world. More than 460,000 Venezuelans have sought asylum, but procedures in the region are overwhelmed, and to date only 21,000 Venezuelans have been recognized as refugees.
In most countries a considerable number of Venezuelans might be in an irregular situation. With an average of up to 5,000 people leaving Venezuela every day, it is estimated that 5 million people could leave the country by the end of 2019. (UNHCR, 2018) Thousands cross daily into Colombia, while others head towards Brazil, Chile, Ecuador and Peru.

UNHCR (United Nations High Commissioner for Refugees) reported that, as of June 2019, more than 4 million Venezuelans had emigrated from their homeland. Colombia is the main destination of this migratory phenomenon. The most recent statistics are around 1.3 million migrants in the country.

Migration Colombia reported 1'260.594 Venezuelans in the country at the end of March 2019, and so 490,000 migrants had not regularized their situation, because they had already expired their document of entry or because they entered the country by illegal trails or passes. The city of Bogotá, the department of Guajira and Norte de Santander are the regions that most receive migrants. The latest reports from the immigration authority show an increasing trend in the number of Venezuelans in an irregular situation. In Bogotá, 23 per cent of that number are housed, or 323,840 citizens (Venezuela, 2018).

In their search for more affordable rents, migrating Venezuelans advance to informal settlements on the outskirts of Colombia's cities. In these communities, they live with displaced Colombians who are victims of the armed conflict. The lack of basic services and legal access to land puts these people at risk. (Inojosa, 2019)

Housing Demand and Government Performance

The housing policy of social interest in Colombia has started from the premise of ownership, generating a problem of very little supply in relation to the demand for housing, acerbic by the social and economic problems in the country.

In recent times there have been various social housing policies in Colombia, however, it is important to note that the relevance of this concept gained greater significance since 1991 with the issuance of a new Constitution. This Constitution enshrined a fundamental right of people to decent and adequate housing, an obligation for the State to make this right effective and to promote housing plans of social interest (Article 51 of Colombian Political Constitution) This provision at the constitutional level, in line with the 'universal' advances in international human rights, principally following the United Nations - International Covenant of Economic, Social and Cultural Rights of 1966, entails that the state apparatus must devote its efforts to ensure that the vital housing needs of the most vulnerable populations are met and guaranteed in the urban planning strategies.

The neoliberal government in the early 1990s introduced the ABC policy based on the triple element of saving (ahorro), bond (bono) and credit (credito) to help the poor in housing subsidy, integrating the private sector into the process. The plans envisaged that the private sector would build the houses and sell them to vulnerable populations, but the subsidies granted were not sufficient to own and maintain their houses. Added to this was the poor planning of these housing complexes which, by their location and design, exacerbated socio-economic and spatial segregation. Therefore, the attempts between the government and the private sector have not been effective or sufficient in proposing policies to resolve the housing crisis in Colombia. (Unni, 2015)

Over the years, several regulatory and normative developments have been made to guarantee decent social housing. To date, one of the most significant norms is Law 388 of 1997, and its regulatory decrees, which provides for strategies for territorial development and defines social housing in Colombia as housing intended to guarantee the right to housing of low-income families, populations that are identified by results of income and expenditure studies and indicators of basic and unsatisfied needs. To this purpose, it is established that the National Government must include in its 'national development plan' the number of resources and the programmes to ensure this social housing, taking into account the housing deficit, financing and the possibility of access to credit, among others. (Unni, 2015)

More recently, Law 1537 of 2012 established the rules to promote urban development and access to housing while determining the competencies, responsibilities and obligations of national and territorial governments, with the active involvement of the private sector, for the development of social housing. In addition, a specific framework was created for the categorization of social housing or vivienda de interés social ('VIS' for its acronym in Spanish) and priority housing or vivienda de interés prioritario ('VIP' for its acronym in Spanish), both intended for low-income families (Article 1 of Law 1537 of 2012).

It has been said that this classification, and the norms and regulations, to make it effective have been a turning point in the formulation of housing policies in Colombia, because for the first time it articulates housing policies with strategies for economic growth, employment generation and overcoming extreme poverty, as well as water policies, among others (Lozano, 2015).

Fig. 2.12 - Macro National Social Housing Project Green City



Source: National Macro project of Social Housing, Soacha. Image: Mendebal Construction Company

The Colombian government announced another housing policy of providing "free homes for 100,000 families every year" in 2012. This concept of free housing stems from biased views on self-help housing and the huge amount spent on the construction of houses could be employed to assist the marginalized communities to access basic services (Unni, 2015).

The VIS is the housing that meets the elements that ensure their habitability, quality standards in urban design, architectural and construction whose maximum value is one hundred and thirty-five Colombian monthly legal minimum salaries in force (around 32,000 USD) and the VIP is that social housing whose maximum value is seventy monthly legal minimum salaries in force (around 16560 USD) the latter for the most vulnerable of all (Definitions Ministry of Housing Colombia).

The production of social housing, both VIS and VIP, is linked to the market and capitalist production, which logically has an economic purpose for private companies involved in their construction. The State's role has been exclusively to regulate and grant subsidies and it is private companies that carry out the projects, with the intermediation of the financial sector who grant mortgage loans to the users. The leading role of the private sector as the only supplier of social housing has proven to be inadequate to guarantee the quantitative and, to a greater extent, qualitative demands for social housing in the country (Calle M., 2018).

The VIS and VIP housing policies were intended as housing policy instruments to control and stop informal urban sprawl in Colombian cities. However, the result has not been entirely satisfactory and many of the housing beneficiaries are dissatisfied with their housing rights. In addition, informal urbanization processes have continued and the informal city keeps growing in terms of population, extension and densification. As informal neighborhoods consolidate, they are included in the urban structure of the city and become part of its functioning.

The response from the State has been to act ex post with policies as the 'integral improvement of neighborhoods' plan, seeking to adapt the informal settlements' to the formal urban structure of the city (Saldaña, 2016) It can be said that social housing policy, mainly in the city of Bogotá, has focused on meeting the large quantitative housing deficit and has neglected the quality factor of these dwellings, in an effort to fulfill the housing demand. This is almost natural when the social housing is executed by private individuals, with the aim of obtaining greater profits.

It can be summed up that informality continues to be an alternative of urban development for low-income populations. As long as unfavorable socio-economic conditions are maintained in certain sectors of the population and the formal structures of urbanization do not satisfy, either qualitatively or quantitatively, the demand for housing, the supply of social housing as part of the dynamics of informality will remain a reality (Saldaña, 2016).

As evidenced in the current chapter, informality and its disconnection from the formal and functional structure of the city is determined by multiple factors and defined by the exclusion of certain populations from the benefits of the city.

Both in the case of Latin America, and specifically in Colombia, rural migrations, the great gap between rich and poor, and the lack of opportunities have exacerbated informal and spontaneous development on the outskirts of cities as the only resource to access opportunities and improve the quality of life. Social segregation, the fragmentation of urban space, the economic exclusion of certain vulnerable populations and the ecological vulnerability (due to the dynamics of informal settlement) are problems that require coherent and integral policies when dealing with the issue of informality.

Fig. 2.13 - Macro National Social Housing Project Green City



Source: Google Street View, 2020

f. Multidimensional Vulnerability

The following section will analyze the current conditions of the city of Bogotá, regarding the urban, social, ecological and economic systems. This in order to visualize the high fragmentation between the formal and the informal city, and to explore and understand the diverse conditions that determine the vulnerability levels of the informal areas.

Social segregation in Bogotá is understood as the relative absence of socioeconomic mix in territorial sub-units. (Planeacion, 2013). The public policy of socioeconomic stratification has been established as a mechanism that would provide equity to the public services system, forcing the most favored populations to subsidize the cost of infrastructure in the areas where the poorest population lived. The public service companies had to establish a system of differential tariffs, according to the socioeconomic level of the population of each neighborhood. (Yunda, 2019).

The Stratification system has brought many problems the methodological approach and also a high social segregation problem. It is also important to add, that poverty indicators and stratum are not necessarily correlated in all cases.

The densification of the city followed segregation patterns established by the socioeconomic stratification policy, based on differences in housing typologies and urban morphology. The spatial fragmentation in the city of Bogotá can be seen in a discontinuous urban composition on the outskirts of the city. Due to the spontaneous way of development, the fragmentation is more visible in the borders, which are more disconnected and have greater accessibility problems.

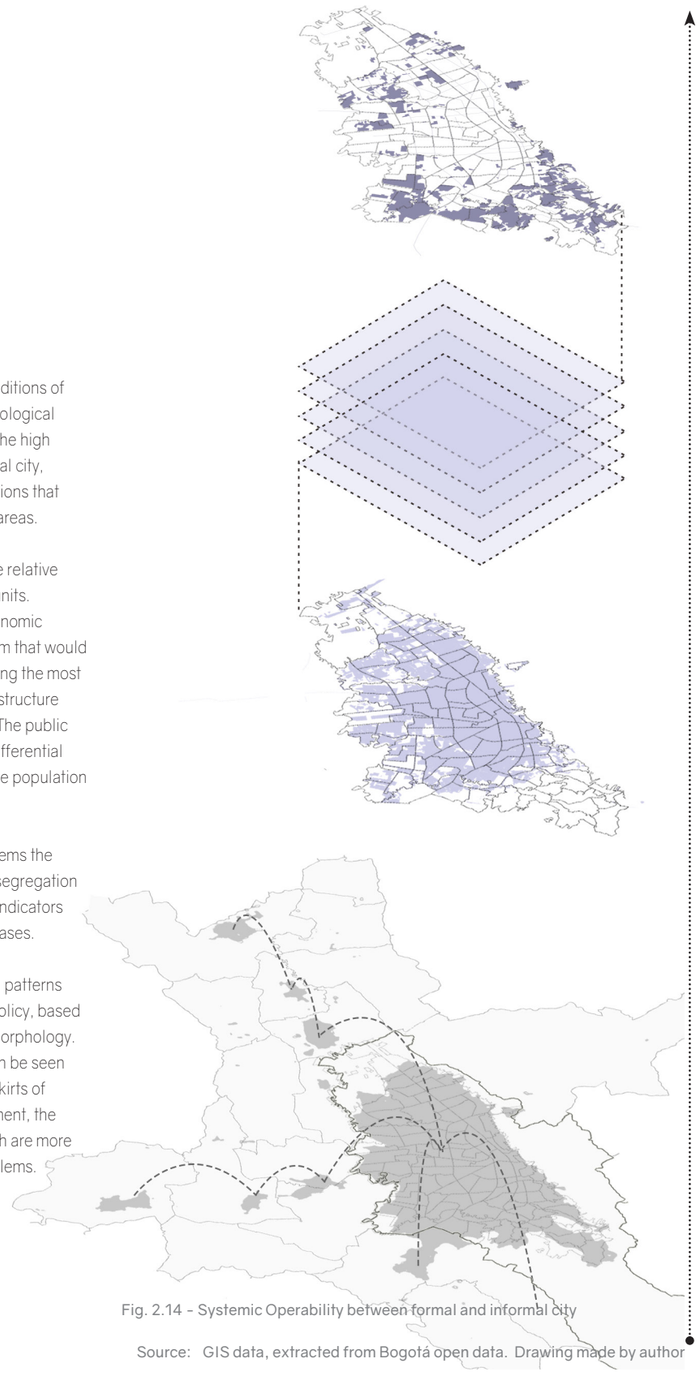
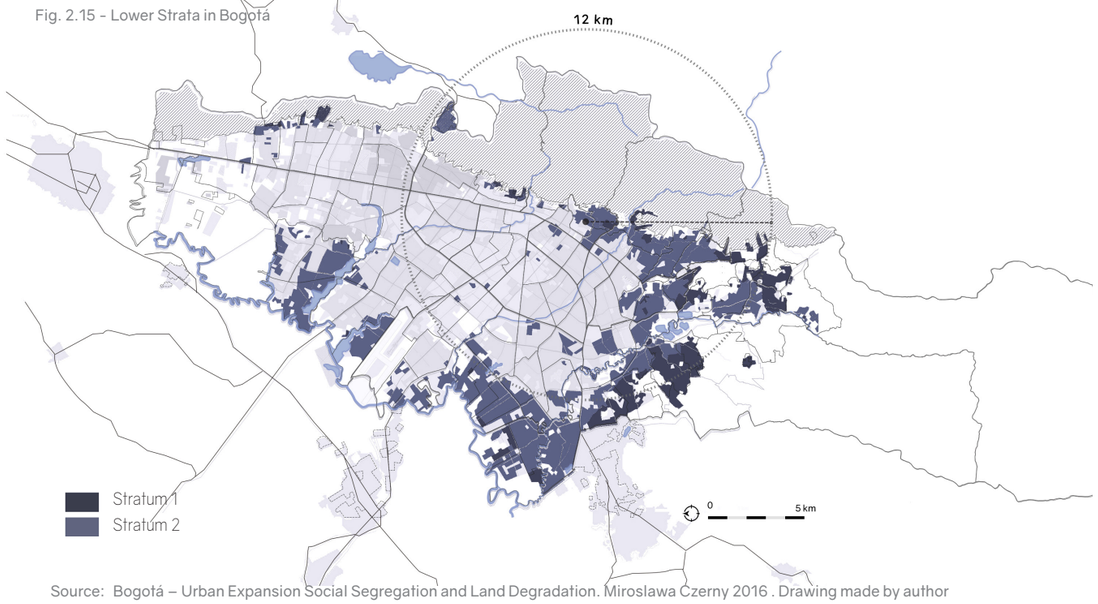


Fig. 2.14 - Systemic Operability between formal and informal city

Source: GIS data, extracted from Bogotá open data. Drawing made by author

Stratification and location:

Fig. 2.15 - Lower Strata in Bogotá

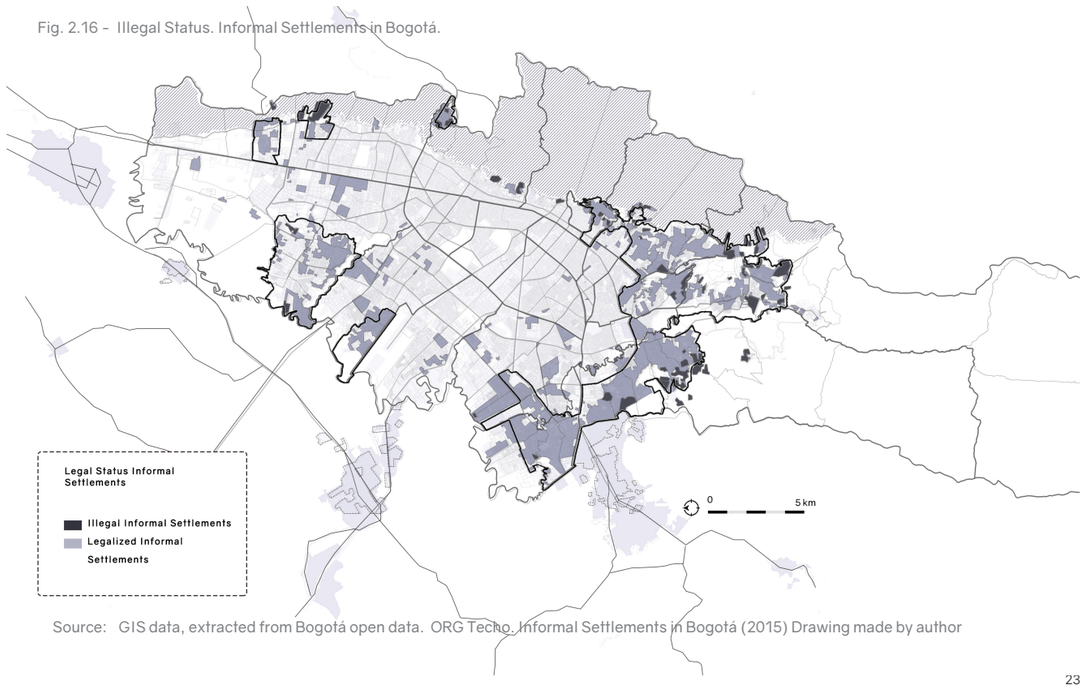


Source: Bogotá – Urban Expansion Social Segregation and Land Degradation. Miroslawa Czerny 2016 . Drawing made by author

The informal land and housing market is the main route by which a significant portion of the poor have gained access to the city, even at the cost of the illegal acquisition of land. The persistence of the phenomenon is a problem of not only price, but also that the so-called informal offer is firstly a more convenient mechanisms of land ownership.

Secondly, it offers a real estate product that presents certain advantages such as size, possibility of expansion and productive uses, and additionally an aspiration to be the object of legalization and neighborhood improvement programs that in the medium term will make up for the lack of land sold by the "pirate urbanizer". (Camargo Sierra, 2013) . During the years 2016, 2017 and 2018, an increase of 39.1% in relation to the number of occupations at the beginning of the current administration was visible, due to the different social and economic dynamics that have occurred in recent years in the country. (Habitat, 2019, p. 53)

Fig. 2.16 - Illegal Status. Informal Settlements in Bogotá.



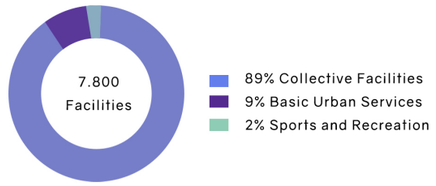
Source: GIS data, extracted from Bogotá open data. ORG Techo. Informal Settlements in Bogotá (2015) Drawing made by author

Social Infrastructure.

The overall number of social facilities is around 7,800, most of which (67%) are private, with 90% of these being small buildings, which are insufficient to improve the quality and increase the supply of education, health and welfare services. (Mayor's Office of Bogotá, 2017, p. 11)

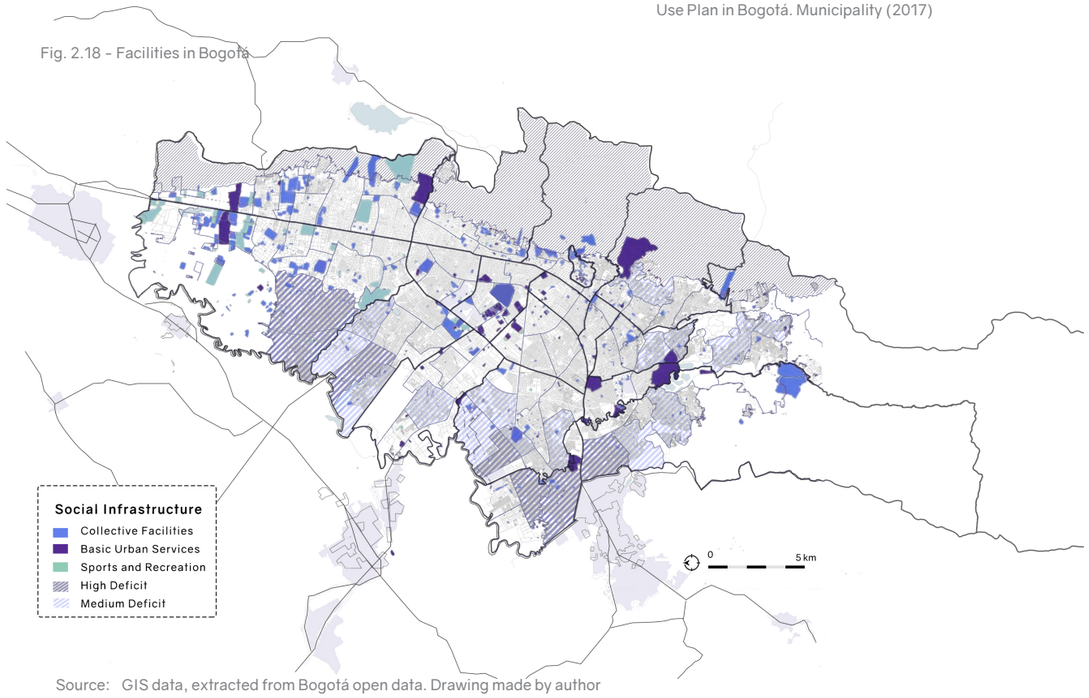
The existing facility buildings are classified into basic social services or collective facilities (health, education, social welfare, culture, etc.), basic urban services (administrative, security, supply, etc.), and recreational and sports services.

Fig. 2.17 - Facilities distribution in Bogotá



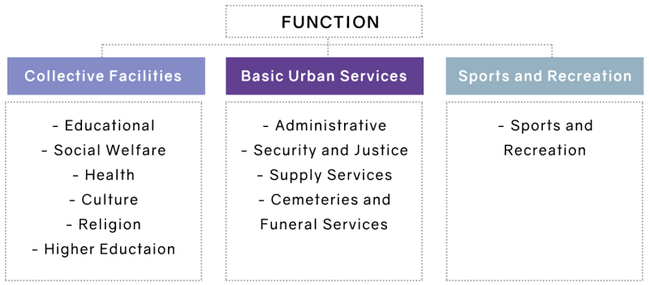
Source: Summary of the General Diagnosis of the Land Use Plan in Bogotá. Municipality (2017)

Fig. 2.18 - Facilities in Bogotá



Source: GIS data, extracted from Bogotá open data. Drawing made by author

Fig. 2.19 - Facilities. Function classification



Source: Summary of the General Diagnosis of the Land Use Plan in Bogotá. Municipality (2017)

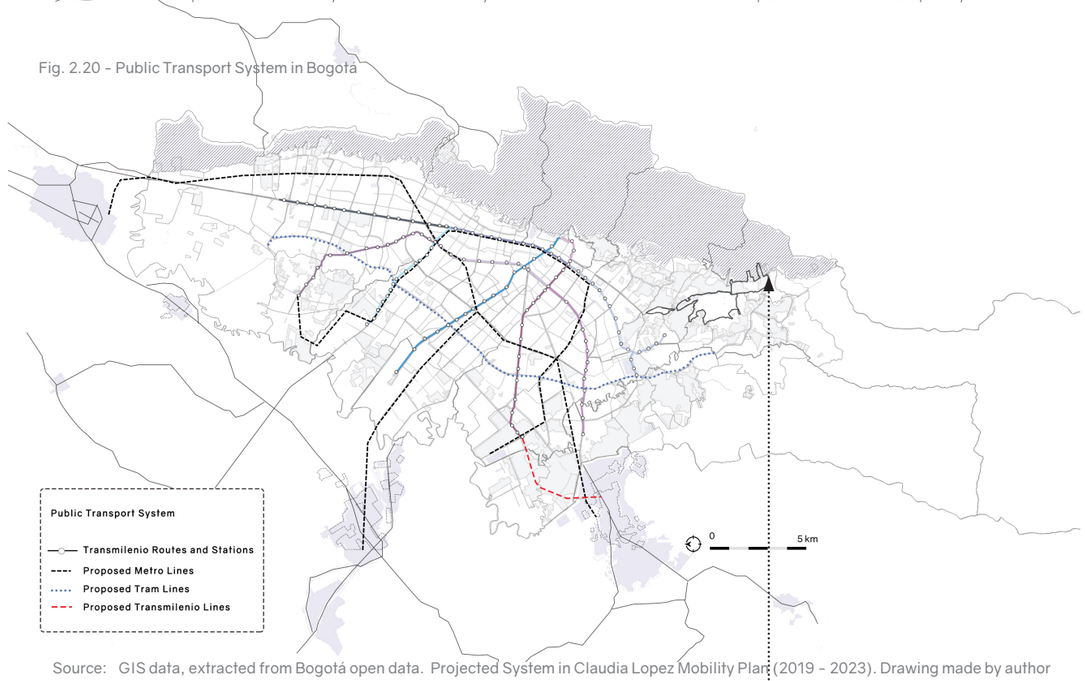
40% of the cultural facilities are concentrated in Teusaquillo (63), Chapinero (60), Santa Fe (56) and La Candelaria (45), (city center) and localities like Sumapaz (1 facility), Antonio Nariño (6) and Los Mártires (7) have only 3% of these (city periphery).

In the case of recreational and sports facilities, the town of Suba concentrates the largest number of parks and sports venues (933), followed by Kennedy (550) and Engativá (535); for its part, Sumapaz (3 facilities), La Candelaria (11) and Los Mártires (45) have the lowest percentage of such infrastructure. (Restrepo, 2019)

Public Transport:

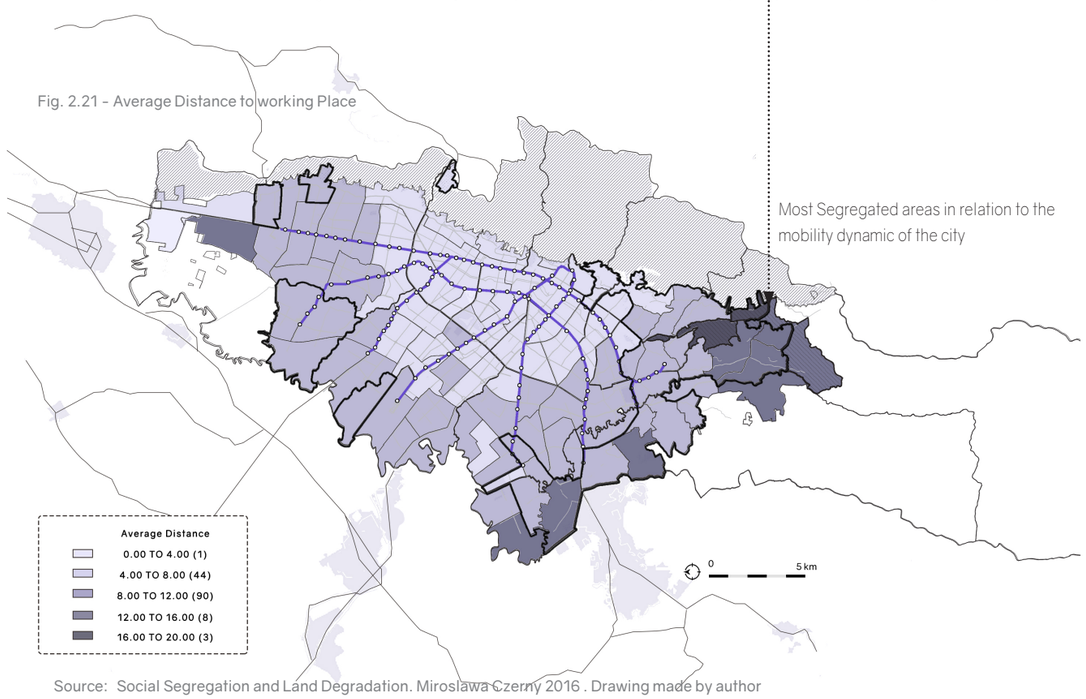
Public transport in Bogotá is composed mainly of the integration of Transmilenio, the mass transport system (2000) based on red articulated buses, with a collective bus transport system called Integrated Public Transport System (2009) (SITP "Sistema Integrado de Transporte Público" for its acronym in Spanish). At the same time, taxis and collective buses operate outside this system. The current mayor (elected at the end of 2019) Claudia Lopez, is promoting the urgent need to implement other transport systems such as the subway and tram, since the current system does not cope with urban demand versus mobility. Urban Fragmentation is visible by means of public transport networks, revealing a disconnection and inaccessibility of peripheral areas to stations that are part of the current transport system.

Fig. 2.20 - Public Transport System in Bogotá



Source: GIS data, extracted from Bogotá open data. Projected System in Claudia Lopez Mobility Plan (2019 - 2023). Drawing made by author

Fig. 2.21 - Average Distance to working Place



Source: Social Segregation and Land Degradation. Miroslawa Czerny 2016 . Drawing made by author

Ecological Systems

The exponential growth in Bogotá has generated a strong pressure on the environment, a situation aggravated by migratory phenomena within the region and the proliferation of irregular settlements near the main ecological structure of the city such as the Bogotá River and the eastern hills, as seen in photos x and x.

Nowadays, the city occupies completely the margins of the river and the hills, where the peripheral populations are in constant risk as much for floods as for removal and sliding. At the same time, the constant degradation and contamination of the river has generated serious ecological and sanitary problems. (Barajas, 2015)

The Bogotá River is located in the department of Cundinamarca and is one of the affluents of the Magdalena River and its main source of pollution. The maximum contamination level resides in the middle basin, the main axis of the capital's water system. The Bogotá River acts as the western boundary of the city and as a link between the urban and rural areas of the Sabana Region.

90% of the river's pollutant load comes through three rivers that cross the city and connect the hills with the principal River. 30 percent of the total pollution of Bogotá river comes from the Salitre, 39 percent from the Fucha stream and 21 percent from the Tunjuelo river. (Agreement No. 556 OF 2008), the main urban rivers that collect the city's sewage. Extreme conditions of biological, chemical and physical contamination have severely impacted natural elements of the city.

Geographical elements, such as eastern hills and the Bogotá River, have been considered more as closing and border spaces, and are nowadays damaged due the informal urban expansions that are at the same time in vulnerable conditions.

Flooding Risk:

Bogotá is divided into four main basins corresponding to the Salitre, Fucha and Tunjuelo rivers, which drain mainly in an east-west direction, until they reach the Bogotá River as their main receptor.
The area's most susceptible to flooding in Bogotá are located west of the city, as it corresponds to a flat area with low slope and low capacity to evacuate flows, as in areas near the main drainage basins. Decree 190 of 2004 established the Regulatory Plan for Flood Threat due to Overflow (Planeacion, 2016)

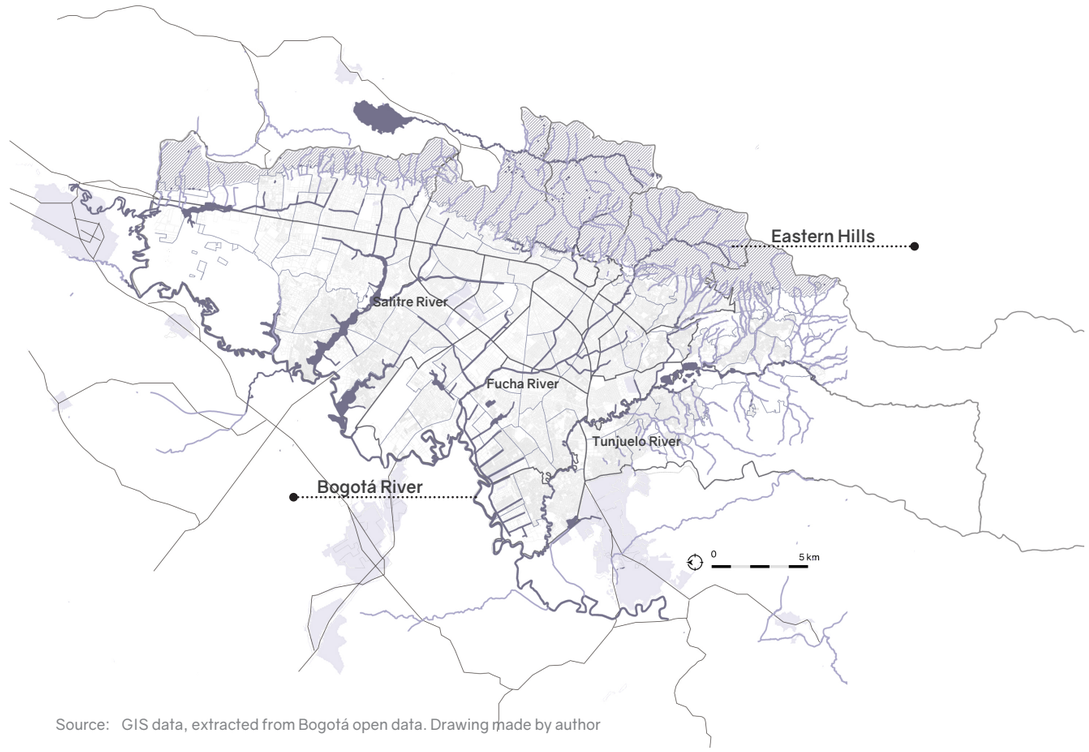


Source: [illegible] 2018. Bogotá River. Photo: Colprensa



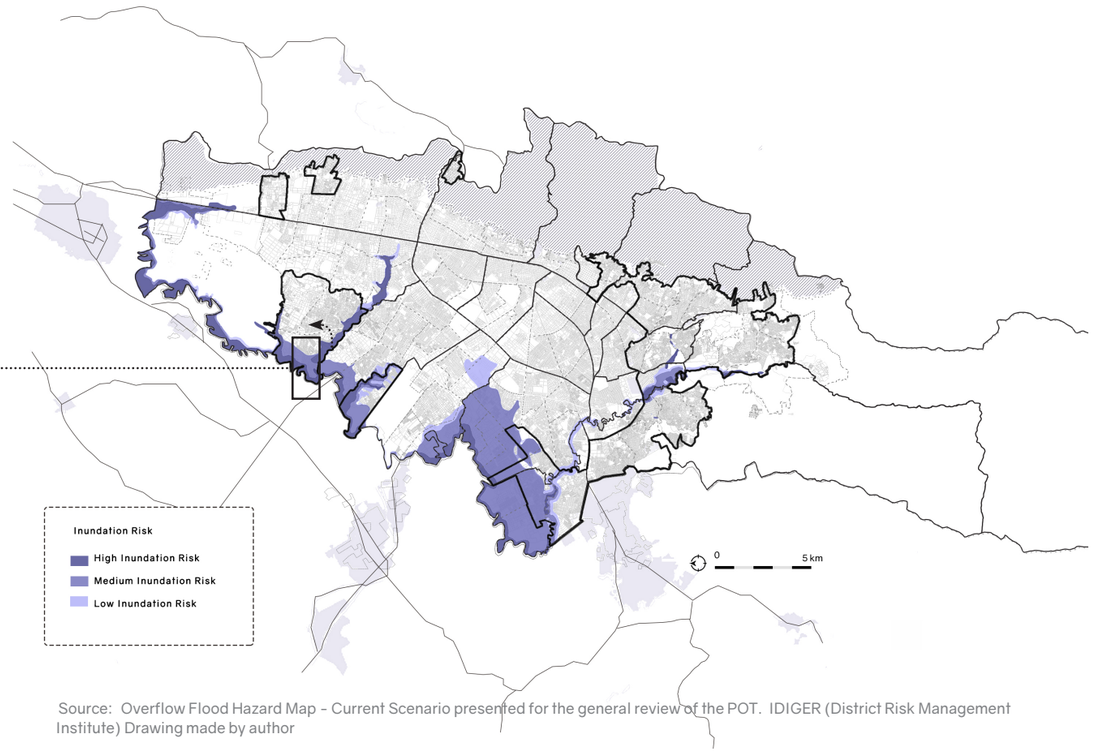
Source: The Time journal. Bogota, Colombia 2018

Fig. 2.22 - Water System in Bogotá



Source: GIS data, extracted from Bogotá open data. Drawing made by author

Fig. 2.23 - Flooding Risk in Bogotá



Source: Overflow Flood Hazard Map - Current Scenario presented for the general review of the POT. IDIGER (District Risk Management Institute) Drawing made by author

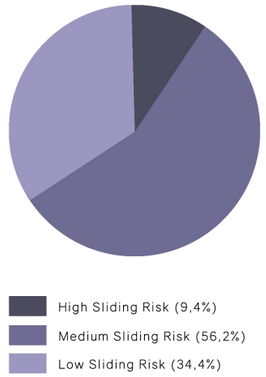
Sliding Risk:

The landslide threats in the city are identified on a morpho-dynamic map showing the affected areas. In order to understand where this threat is predominant, it is important to mention that, from a physical point of view, the city of Bogotá is made up of two relevant relief zones.

The first is a flat area towards the center and northwest and the second is an area of mountainous relief that borders the city on the south and east side, as shown in Figure 7.30. The eastern hills stand out in the second zone, which constitute in great part the territory of the localities of Usaquén, Chapinero, Santafé, Usme, Rafael Uribe and San Cristóbal. Likewise, on the south and south-western sides there are boundary hills that are characterized by their occupation with infrastructure typical of the city, and that make up the territory of the localities of Ciudad Bolivar, Usme and Sumapaz.

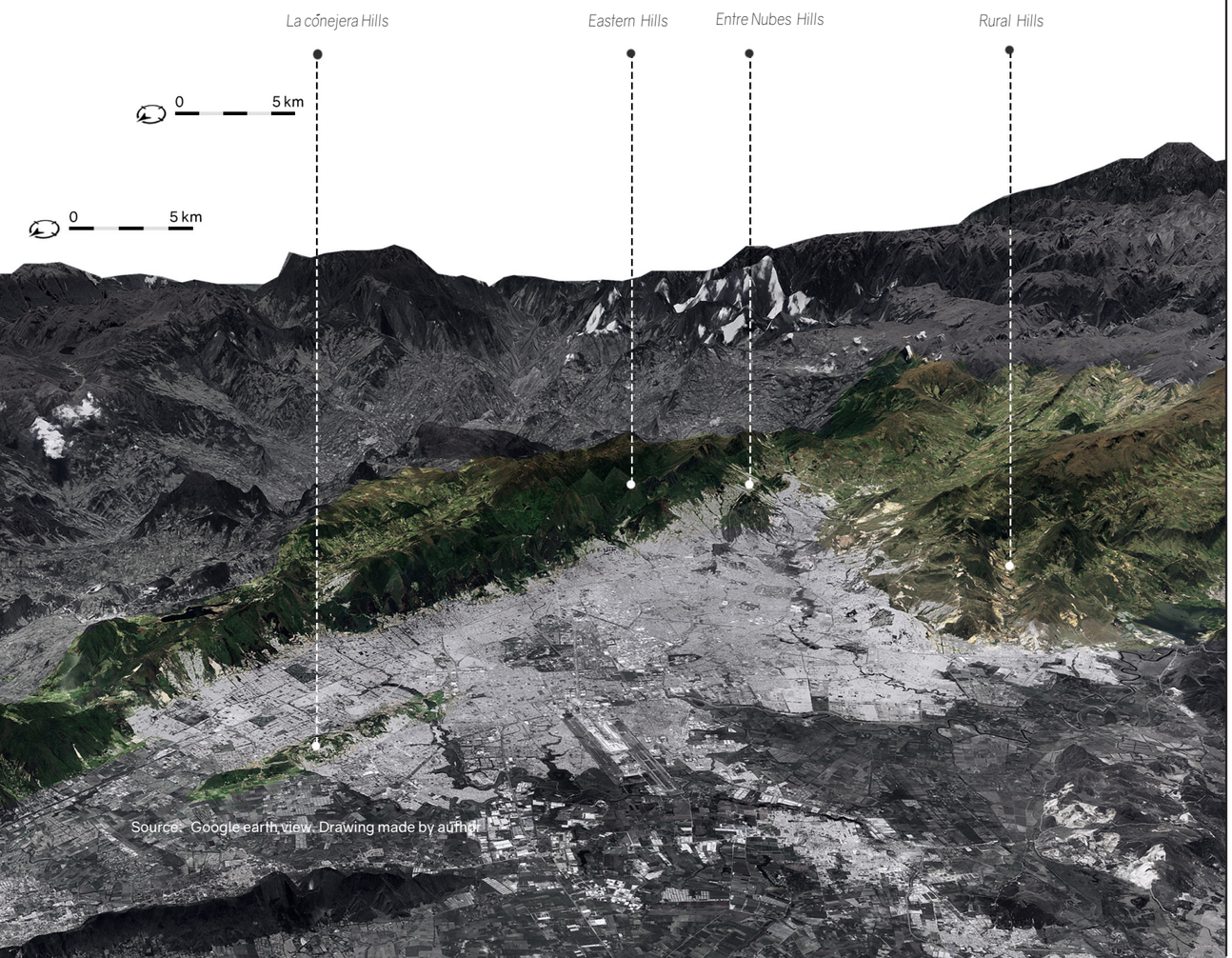
In principle, these phenomena are considered threatening, since many of the slopes that make up the hills of Bogotá have by their geology and geomorphology a predisposition or natural susceptibility to the generation of mass movements. To this is added the intervention of the population in the territory of the hills by means of exploitation of quarries and the adequacy of lands for the construction of houses (legal and illegal) without the fulfillment of the minimum technical requirements. In Bogotá, mass movements occur along the eastern hills, the southern hills of Suba and their respective foothills. (INDIGER, 2016)

Fig. 2.25 - Mass Movement Threat Rating for Urban Land



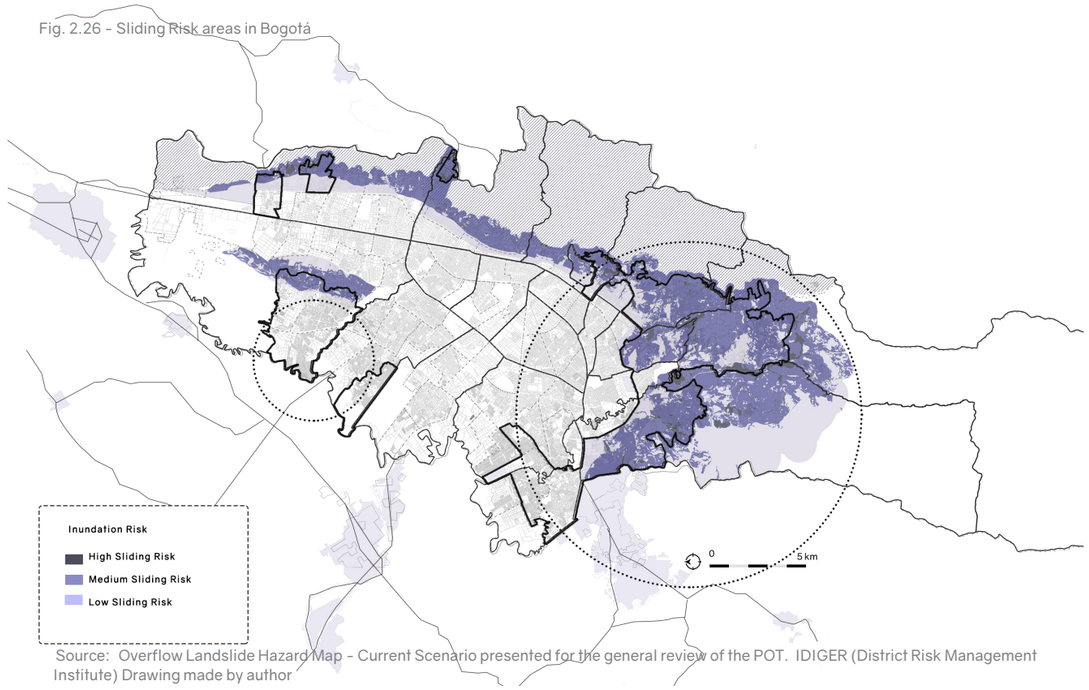
Source: General Characterization of the Risk Scenario by Mass Movements in Bogotá. Idiger 2019 (District Institute of Risk Management)Institute)

Fig. 2.24 - Mountain Areas in Bogotá



Source: Google earth view. Drawing made by author

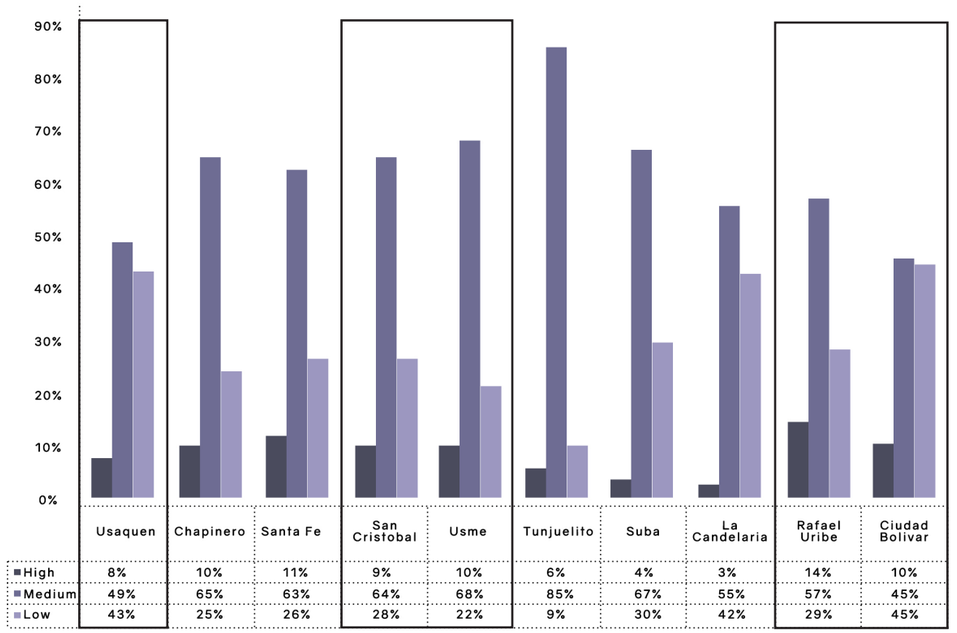
Fig. 2.26 - Sliding Risk areas in Bogotá



Source: Overflow Landslide Hazard Map - Current Scenario presented for the general review of the POT. IDIGER (District Risk Management Institute) Drawing made by author

The hills in Bogotá occupy 83% of the district area while the flat area is equivalent to 17%. Of the urban area of the Capital District, approximately 7200 Ha are in flat areas, with no landslide risk. Although the population is concentrated in the flat part, a significant number of the population is located in the hillsides of the Eastern Hills, Suba Hills and Hills in the South, mostly of them in informal settlements.
For the hillside areas, which occupy 30,776 ha, approximately 9% is categorized as high threat by mass movements (2776 ha), 56% as medium threat (16600 ha) and 35% as low threat (11400 ha) according to the mass movement threat map (Figure 7.31 and Figure 7.32). As shown in Figure 7.33, the locations with the highest susceptibility to landslides according to their threat rating are in their order: Ciudad Bolívar, Usme, San Cristóbal, Usaquén and Rafael Uribe. (IDIGER, 2019)

Fig. 2.27 - Mass Movement Threat Rating for localities



	Usaquen	Chapinero	Santa Fe	San Cristobal	Usme	Tunjuelito	Suba	La Candelaria	Rafael Uribe	Ciudad Bolivar
High	8%	10%	11%	9%	10%	6%	4%	3%	14%	10%
Medium	49%	65%	63%	64%	68%	85%	67%	55%	57%	45%
Low	43%	25%	26%	28%	22%	9%	30%	42%	29%	45%

Source: General Characterization of the Risk Scenario by Mass Movements in Bogotá. Idiger 2019 (District Institute of Risk Management Institute)

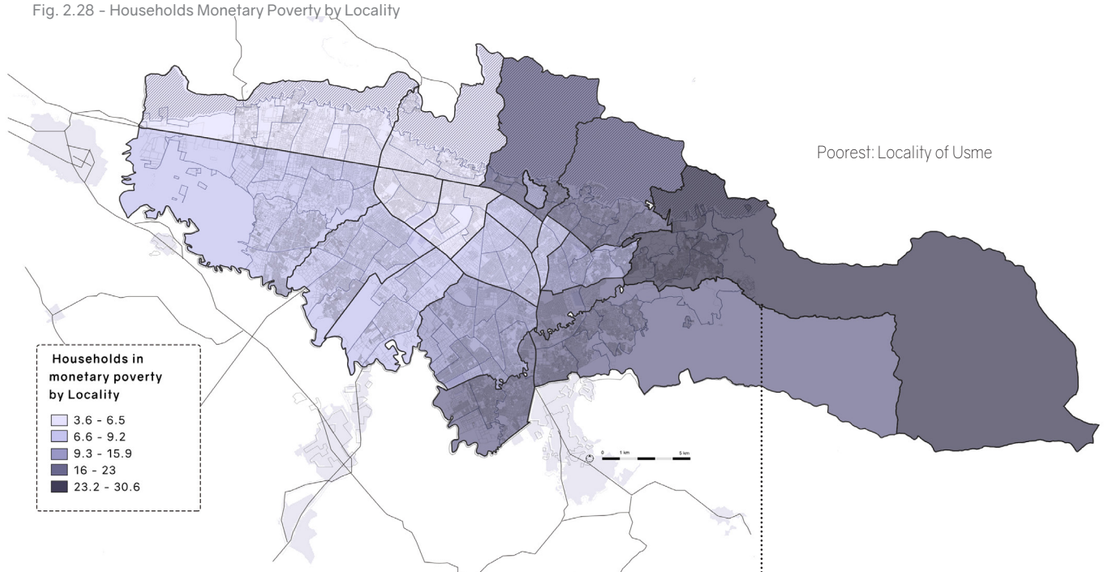
Economic Exclusion

Poverty rates:

Poverty is a complex concept and requires multiple dimensions of analysis to define it, as well as the global measurement of multidimensional poverty, with the global Multidimensional Poverty Index (MPI) developed by the United Nations Development Program and the Oxford Poverty and Human Development Initiative. This measure is inspired and guided by other similar measures, but differs from many of them in one fundamental aspect: monetary poverty is included as one of the dimensions of poverty.

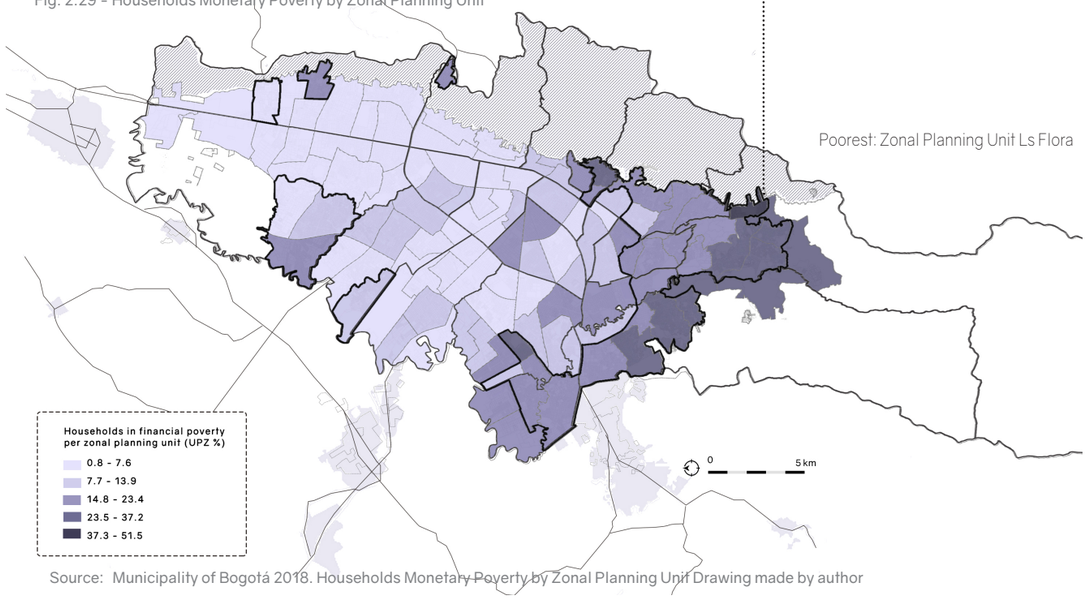
While monetary poverty certainly does not include all forms of deprivation, it captures a household's ability to meet essential basic needs (Mahler, 2018) and it will be one of the variables to take into account when choosing an analysis site. The informality and the programs around it are not only about poverty, so this indicator (the monetary one) is considered the adequate one to approach the problem of socioeconomic exclusion in Bogotá.

Fig. 2.28 - Households Monetary Poverty by Locality



Source: Municipality of Bogotá 2018. Households Monetary Poverty by Locality. Drawing made by author

Fig. 2.29 - Households Monetary Poverty by Zonal Planning Unit



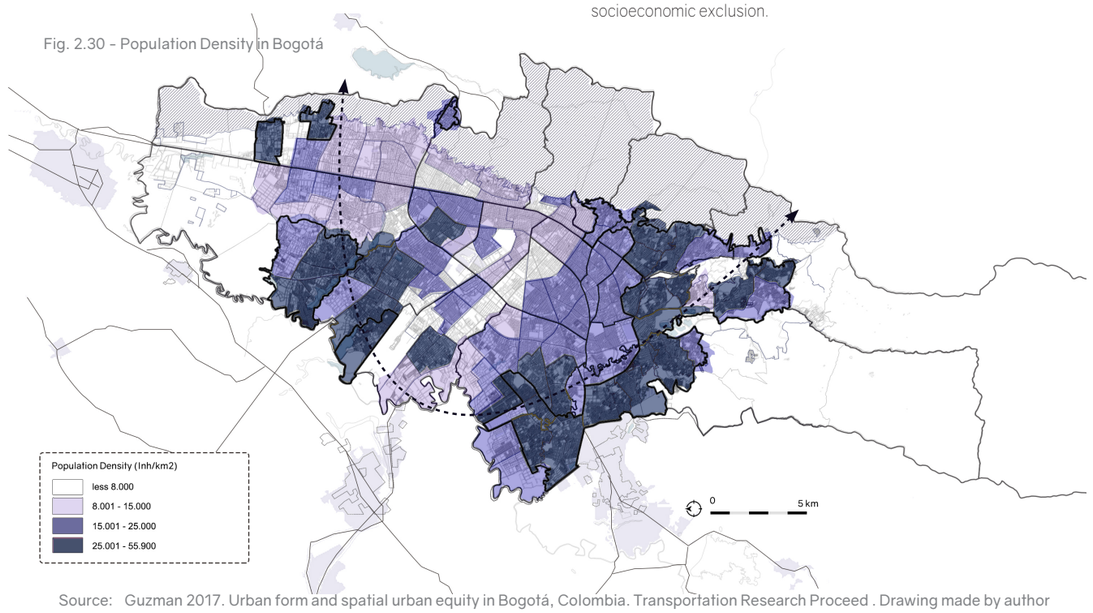
Source: Municipality of Bogotá 2018. Households Monetary Poverty by Zonal Planning Unit Drawing made by author

Job Opportunities distribution:

Access to affordable housing in the center, close to job opportunities is unthinkable for poor populations in Bogotá. The centralization of economic activities, the housing market and land regulation are some of the reasons for the fast development of informal settlements in the urban periphery, mostly concentrated in the southern part of the city. The increased housing demand of higher income groups has resulted on one hand in a rapid urbanization dynamic in the city, and on the other, in a rapid urbanization process of surrounding municipalities. This is generating a complex conurbation process between Bogotá and neighboring municipalities.

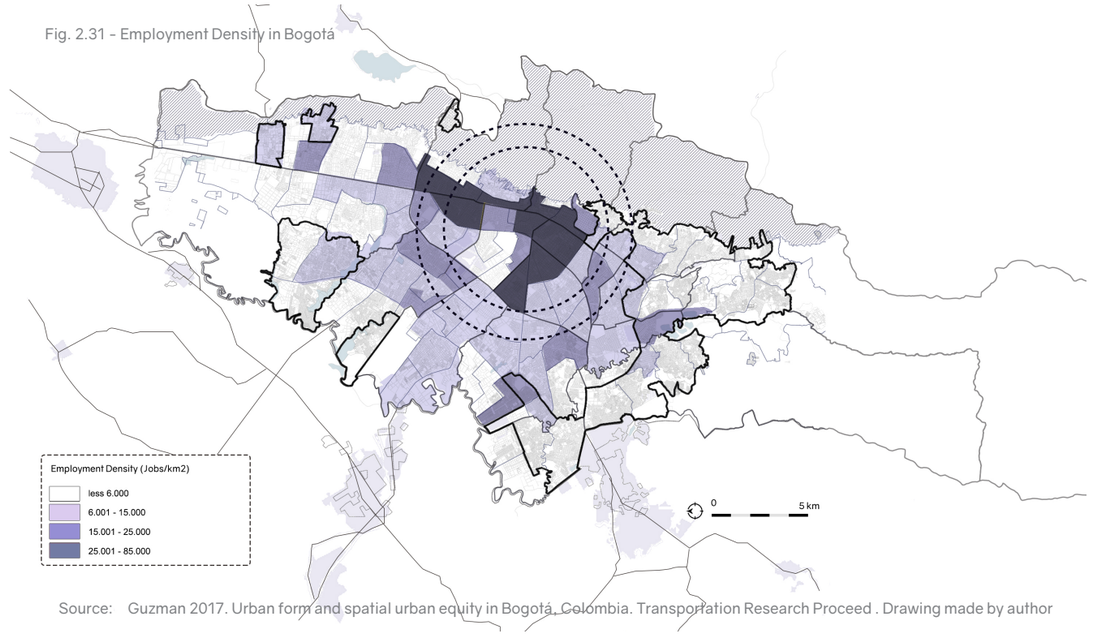
This process has resulted in high densities in low-income areas, mainly on the southern and western borders of Bogotá. Neighborhoods with higher poverty rates can reach densities of 56,000 inhabitants/km2. In contrast, the more urbanized central sectors have lower densities ranging from 6,000 to 15,000 inhabitants/km2, are multifunctional, have greater economic activity and therefore greater job opportunities. This economic and productive concentration has caused great problems of inequality and inaccessibility of vulnerable populations. The center of the city concentrates on average 44% of the jobs of the city. (Guzman, 2017) These two indicators, both the population density and the concentration of jobs, highlight the areas most affected by the city's socioeconomic exclusion.

Fig. 2.30 - Population Density in Bogotá



Source: Guzman 2017. Urban form and spatial urban equity in Bogotá, Colombia. Transportation Research Proceed . Drawing made by author

Fig. 2.31 - Employment Density in Bogotá



Source: Guzman 2017. Urban form and spatial urban equity in Bogotá, Colombia. Transportation Research Proceed . Drawing made by author

3. Problem Focus

Overview

The formal development instruments, traced back to a functionalist paradigm based on the hierarchical idea of control, are not always able to decode the complexity in the metabolism of a territory (Lutzoni, 2016).

In the other hand, the economic and spatial informality gained so much strength nowadays, that the actual institutional and political attempts of "formalization" do not seem to be the only solution, neither to be sufficient. Therefore, the tension between these ways of urban development reflect the urgent need to evaluate and understand the notions of the formal and the informal city, that became inseparable and with a complex interdependent condition (Hernández, 2010).

The following chapter highlights the management models around informality, both in a general way and in a specific way exemplified in the case of Bogotá, in order to demonstrate the urgent need of proposing new strategies to achieve sustainable, inclusive and equitable cities and on the other hand to manifest the relevance of the topic for urban planning and design in a social and scientific sphere,

Chapter Structure:

a. Management models of Informal Settlements

b. Informal development. The case of Bogotá

c. Social and Scientific Relevance



Informal Settlement in the periphery of Bogotá
Source: Google Maps. Street View

a. Management models of Informal Settlements

The emergence of informal settlements is a global phenomenon, driven by multiple factors as population growth, migration and displacement, weak governance structures and policies, socioeconomic disparities and lack of affordable housing.

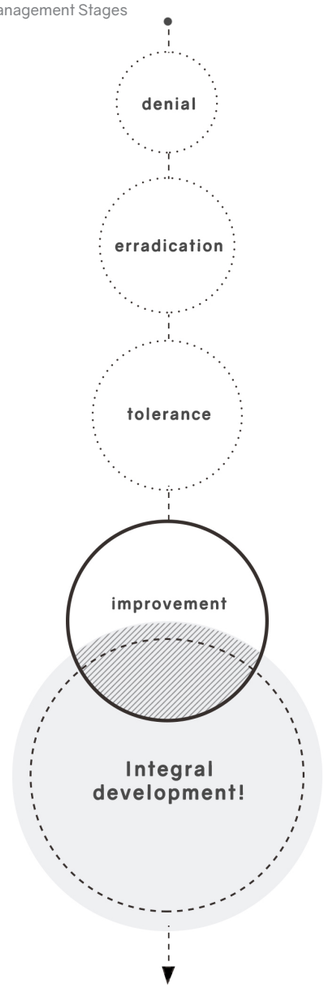
These environments are usually based on illegal appropriation of the land, with a lack of urban services, infrastructure and without building regulations that, together with the complicated environmental and geographical characteristics in which they are normally located, has generated an enormous risk and vulnerability for these populations.

Many governments and municipalities had different ways of dealing with self-guided constructions. One of the first stages, nowadays still present is the denial of this type of settlements in the structures of the city. Governments refuse to acknowledge the existence of informal settlements creating a clear social and spatial segregation in the city structures and disruption in the urban systems. City authorities went also in an eradication phase in which vulnerable population were forcibly removed from their settlements and relocated in social housing projects, usually far away from the city center.

The attitude ranges from the opposition and denial, to the unwilling tolerance with the realization of the unstoppable reality and the impossibility to provide social housing in order to solve the problem. Nowadays, mostly Latin American countries or India, are in the Improvement phase. The upgrading of informal settlements, through tenure regularization and infrastructure provision, is widely accepted and the current trend related to informality.

Despite improvement strategies being pivotal to the socio spatial transformation of informal settlements the efforts are not tackling the phenomenon in earlier stages and are spending a big amount of resources. In Colombia, the costs of post facto upgrading are 2.7 times more for the same level of provision in a planned development (Payne, 2001). Urban design and planning is challenged nowadays to explore methods and strategies in order to anticipate to this reality.

Fig. 3.1 - Management Stages



Principles to address informality

Christian Werthmann, professor of Landscape Architecture and Design at the Leibniz University Hannover, curated two major conferences on informal urbanization called Metropolis Nonformal for the UN Habitat, in which different experts around the world are evaluating and discussing the next strategies for the expected 3 billion people that are going to life in informal settlements in 2050 according to UN reports (UN-Habitat 2012).

In order to do so, Werthmann proposes 10 principals for urban designer in order to establish a different approach. (Werthmann, 2014)

1. Terminology
2. Comprehension
3. Collaboration
4. Transdiciplinarity
5. Process
6. Food and Water
7. Economy
8. Multi-functional
9. Multi scalar

How to address Informality ?

Incremental urbanism is related to the urban growth by processes of self-management and self-construction, which fall outside state control. As evidenced in the previous chapter, UN projections estimate that populations residing in informal settlements will increase to 3 billion people by 2050 worldwide.

This projection creates the great challenge of envisaging ways in which inter and multidisciplinarie approaches can engage in such practices to generate more sustainable and just cities. To this end, it is necessary to recognize the existence and functioning of informal settlements, which can neither be eradicated nor replaced, and which represent a development model with significant socio-economic and urban values for contemporary cities.

Furthermore, this incremental process is a mode of development that is constantly changing, updating and restructuring. Understanding its rationale, location, dynamics and morphology is a first step when proposing strategies for its modification. The deconstruction of the urban paradigm regarding the current forms of urban design and planning must be precisely linked to the emerging notions and informal structures of self-management and self-organization.

Incrementalism tries to understand both the organizational process and the interconnection between different forms, actors and information. Moving away from the framework imposed by notions of formality [or legality], it is a question of understanding how the forms change and at the same time generate new dynamics in the territory.

Dovey poses a key challenge related to improving informal environments through the same incremental process by which they arose. The author presents the key arguments for intervention in order to view incremental urbanism as part of improvement strategies. It is considered of the greatest importance to outline each of the variables proposed by Dovey, in order to subsequently argue how these strategies can [and should] be directed with a preventive approach. This items are the following and are also applicable to the early stage development framework:

1. Avoiding displacement:

In situ upgrading is the only way to avoid displacement .

2. Preserving adaptability:

The informal economy that emerges in this type of informal settlements has a strong and close relationship with the street and public spaces. Local and domestic production is linked to the capacity and intensity of pedestrian mobility networks, where different flows of information as well as informal products and practices generate income and, therefore, economic sustainability for low-income populations. Formalization and social housing normally standardize dwellings without direct access to road networks, where production spaces become less efficient and economical. Progressive urban and spatial development processes are linked to these informal economic practices. Informality becomes not a condition but a resource to deal with poverty and a tool that transforms inhabited space in unforeseen and dynamic ways.

3. Enabling tenure security:

Although land tenure exists in informal settlements, it is usually due to invasion processes outside the legal framework. However, the buildings are owned by the residents, who generate income from them through leases, as noted above. In the formalization process it is usual for the landlord to become a tenant, leaving former renters homeless. The greatest opportunity, according to Dovey, is related to incremental tenure from informality to formality. Property security is more clearly and efficiently established in anticipative strategies than within the incremental process of upgrading programs.

4. Environmentally responsive design:

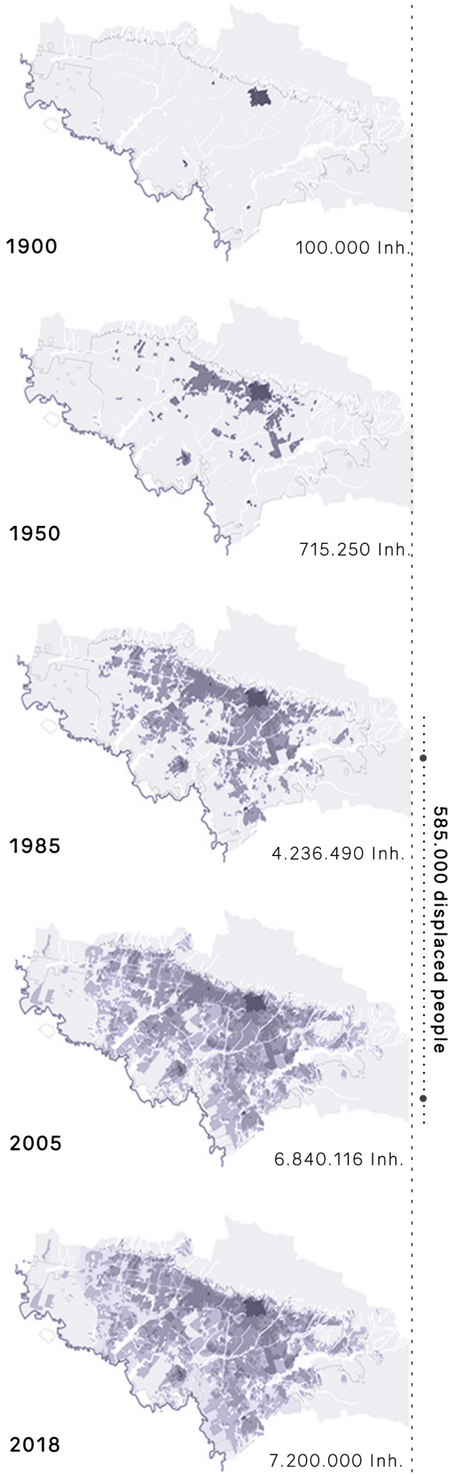
Informal settlements usually have high population densities and a highly pedestrian approach. The construction process involves recycled materials, where incremental transformation generates a smaller footprint and a low-carbon development model.
It is also important to note that informal settlements in Latin America are largely characterized by their location in vulnerable areas tied to ecological structures. Responsible environmental design must be related not only to the dynamics of development and mobility, but also from the outset to their location and their relationship to ecological contours.

5. Aesthetic/heritage issues:

The informal order can emerge from a varied repetition of adaptive processes, which in many cases can even be a tourist attraction. It is necessary to understand that, being so closely linked to the urban process of development of a city, informality becomes an inherent element of the city, and each neighbourhood can and must gradually be improved without eliminating its identity. The author argues that it is necessary to implement solutions that do not aim at developments on the periphery of cities.

The above elements demonstrate that progressive shifts towards informality can be addressed both in existing structures and morphologies and in prospective development models. According to Dupey, incremental improvement has greater potential because it is linked to existing infrastructures where the development framework is incremental, informal and spontaneous, and where interventions have not been limited to spaces in the peripheries of cities. (Dovey, 2016).

Fig. 3.2 - Urban and population growth of Bogota



b. Informal development

The case of Bogotá

Urban development of Bogotá

The city, called Santafé de Bogotá, was founded in 1538, under the discovery ordinances issued by Charles I in 1523 and modified by Philip II in 1573. At the beginning of the 20th century, the city had 100,000 inhabitants and occupied 306 hectares. It is here that the transformation from a small city to a modern city begins. (Martinez, 2010)

In the period from 1910 to 1920 the population increased from 100,000 to 235,000 inhabitants (more than double), and went on to occupy 1958 Ha. At the end of this period, the foreground called "Bogotá Futuro" arises, with the purpose of establishing the criteria to control and to adopt measures for the expansion of the city. At the end of the 1920s, the department of Urbanism was created in Bogotá, with the aim of establishing a reorganization of the city guided by the architect Karl Bruner. (Martinez, 2010)

Between 1930 and 1950, major urban problems arose in the city, linked to issues of infrastructure, the environment and migration. In 1930 only 29% of Bogotá's population was urban. After the 40's, the agrarian structure lost relevance and there was an exponential increase in the urban population generating a considerable urban growth. (Beltran 2005) This generated a great demand for urban land, services and infrastructure accompanied by an increase in the population; especially in the fifties and sixties when the migratory processes from the countryside to the city intensified due to the effects of the phenomenon of the political and armed conflict in the country.

It was in this period (1930) that Municipal Decree 156 was issued, identifying working-class neighborhoods in order to apply preferential tariffs for public services. In the 1940s, the second development plan of the city was adopted, "Plan Soto Bateman", which zoned the city and proposed the widening of certain roads in order to decongest the city center. Given the increase of the population and the rural migrations in the process of Industrialization in Colombia, added to the political violence of the time, policies of working class housing were implemented in the city. The municipality already recognized for this time some informal developments that did not comply with the existing norms. (Martinez, 2010)

At the end of the 1950s, it had a population of 648,000 and occupied an area of 5,000 hectares, where the recurrent urban themes of the time already revolved around the slums or workers in the preferred neighborhoods. By means of the District Decree 185 of 1950 a pilot plan is adopted led by the architect Le Corbusier. In just 10 years, Bogotá went from 5000 hectares to 14,600 and had already had 1,700,000 inhabitants.

For the sixties, the urbanization process presented as a characteristic the increase in the costs of urban land; likewise, the main institutional policy decisions were taken with the appearance of the financing system for social housing and the establishment of a strong physical-spatial action of the financial capital through the Savings and Housing Corporations, added to several attempts of regularization of the self-produced city. (Beltran 2005) The district agreement 1 of 1961 and the agreement 68 of the same year where norms were established to offer a better urban development of the so called informal neighborhoods and where the possibility of legalization and incorporation of certain zones is opened. In 1967, Agreement 65 was adopted, which issued the city's fifth development plan. (Martinez, 2010)

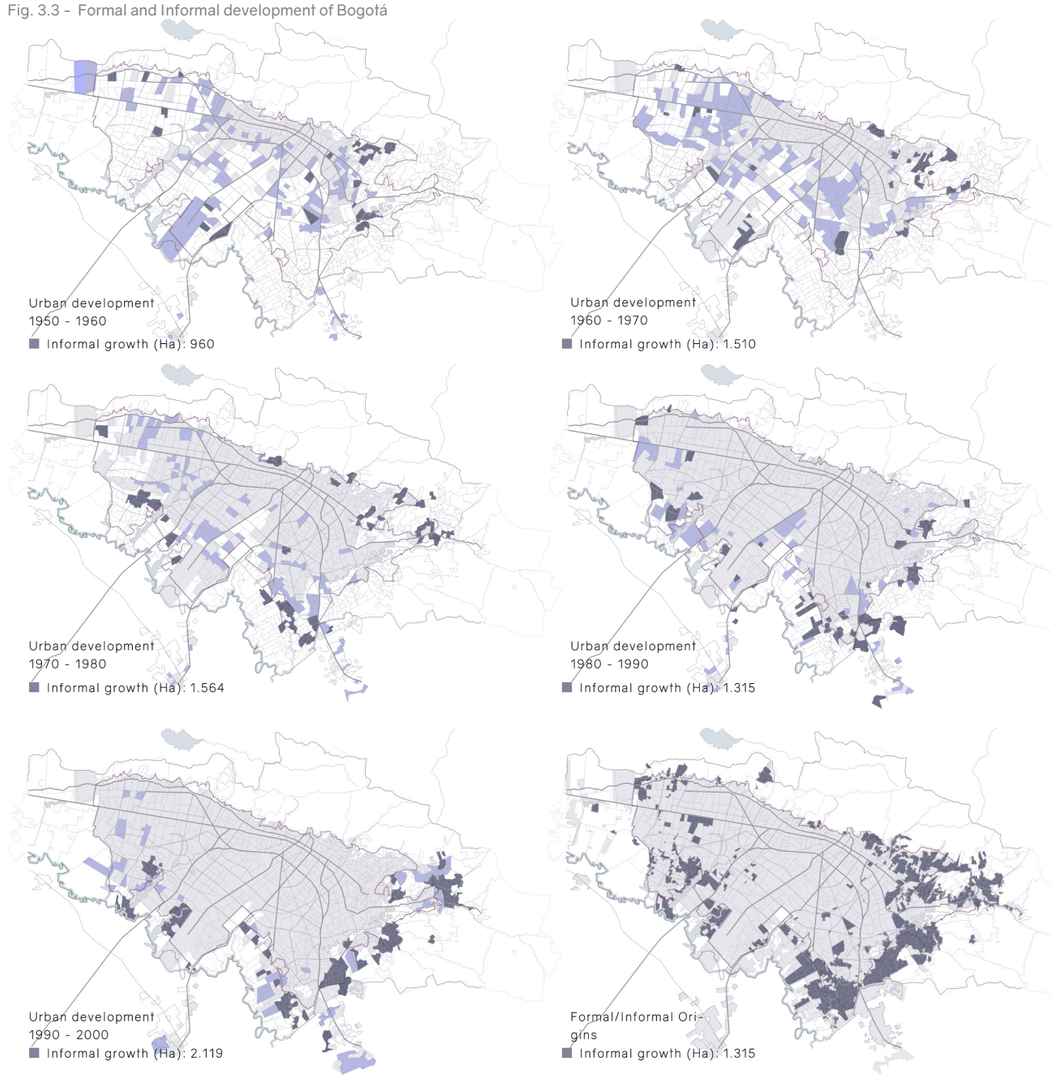
Source: Ciudad Informal Colombiana. Carlos Alberto Torres (2009)Universidad Nacional de Colombia. Drawing made by author

At the end of the 1970s, almost 50% of Bogotá's urban area (13,985 hectares) could be considered informal. The 6,500 hectares were occupied by 206 settlements, of which 90 had arisen within four years. The need for housing was very high and development policies for popular housing were scarce. In the following years, from the 1970s to the 1980s, there was a construction boom where a large number of legal developments were built (and illegal developments continued).

Legalization ceases to be the exclusive responsibility of the administrative department of district planning, to be a shared activity between public service companies, disasters, social action, popular housing box among others. In 1997, national law 388 (in force until now) was passed, guaranteeing the social function of property and defining the concept of social interest housing. With the issuance of the Bogotá Land Use Plan, neighborhoods and developments of informal origin acquire the treatment of Integral Improvement, in order to establish there urban transformation programs that strengthen social and infrastructure investments. (Martinez, 2010)

By the end of the twentieth century, Bogotá presented multiple problems related to the supply of public services, health and education, large quantitative and qualitative deficits in housing an annual increase of 400 hectares occupied informally. (Beltran 2005) Today the city has almost 8,000,000 inhabitants, where large social gaps, lack of mobility infrastructure, inaccessibility to formal housing markets mark the research line of this work. As explained before, Formal and informal growth has been a parallel development process in the city of Bogotá. In a period of 50 years, it is evident that both, formal and informal development, have common development logics, seen in the tendency for both to progressively fill urban voids as the urban fabric expands. On the one hand, formal developers fill urban voids or attach themselves to urbanized land on the urban periphery, while informal developers or pirates develop areas generally on the urban periphery, away from urbanized areas, and without any order, planning, or articulation with the existing city. (See Figure 3.3)

Fig. 3.3 - Formal and Informal development of Bogotá



Source: Colombia: Housing and Land for the Urban Poor. Davila, j. 2006 UCL . Drawing made by author

Fig. 3.5 - Formal and Informal development of Bogotá

Fig. 3.4 - Informal Urban and population growth in Bogota

Total Bogotá area

163.636,95 Ha

- Urban: 37.972 Ha (23,2%)
- Expantion area: 2.974 Ha (1.8%)
- Rural area: 122.687 Ha (75%)

Settlement that started informally

10.990,13 Ha

- Urban: 8.172,92 Ha (21,5%)
- Expantion area: 311,48 Ha (10,5%)
- Rural area: 2.505,73 Ha (2%)

A. Chorrillos
B. Quiba Bajo
C. Mochuelo Alto
D. Pasquilla
E. El Destino
F. Betania
G. Nazareth
H. San Juan
I. La Unión
J. Nueva Granada

0 5 km 20 km

The phenomenon of informal urbanization in Bogotá is a mechanism of urban development that takes on great importance in the city. The production process involves agents and logics that, in spite of providing housing with a lack of quality and infrastructure, are able to partly satisfy the demand of the poor population that still cannot satisfy the formal markets in Bogotá. (Camargo 2013)

This population does not have sufficient income to cover the formal market prices of urbanized land and housing. But the persistence of the phenomenon is not simply a problem of price. Informal urbanization offers more convenient mechanisms of access to land, a real estate product that presents certain advantages (size, possibility of expansion and productive uses, "urban freedom"), and additionally an aspiration to be the object of legalization programs and neighborhood improvement that in the medium term will make up the lack of infrastructure and quality sold by the pirate urbanizers. (Camargo 2013)

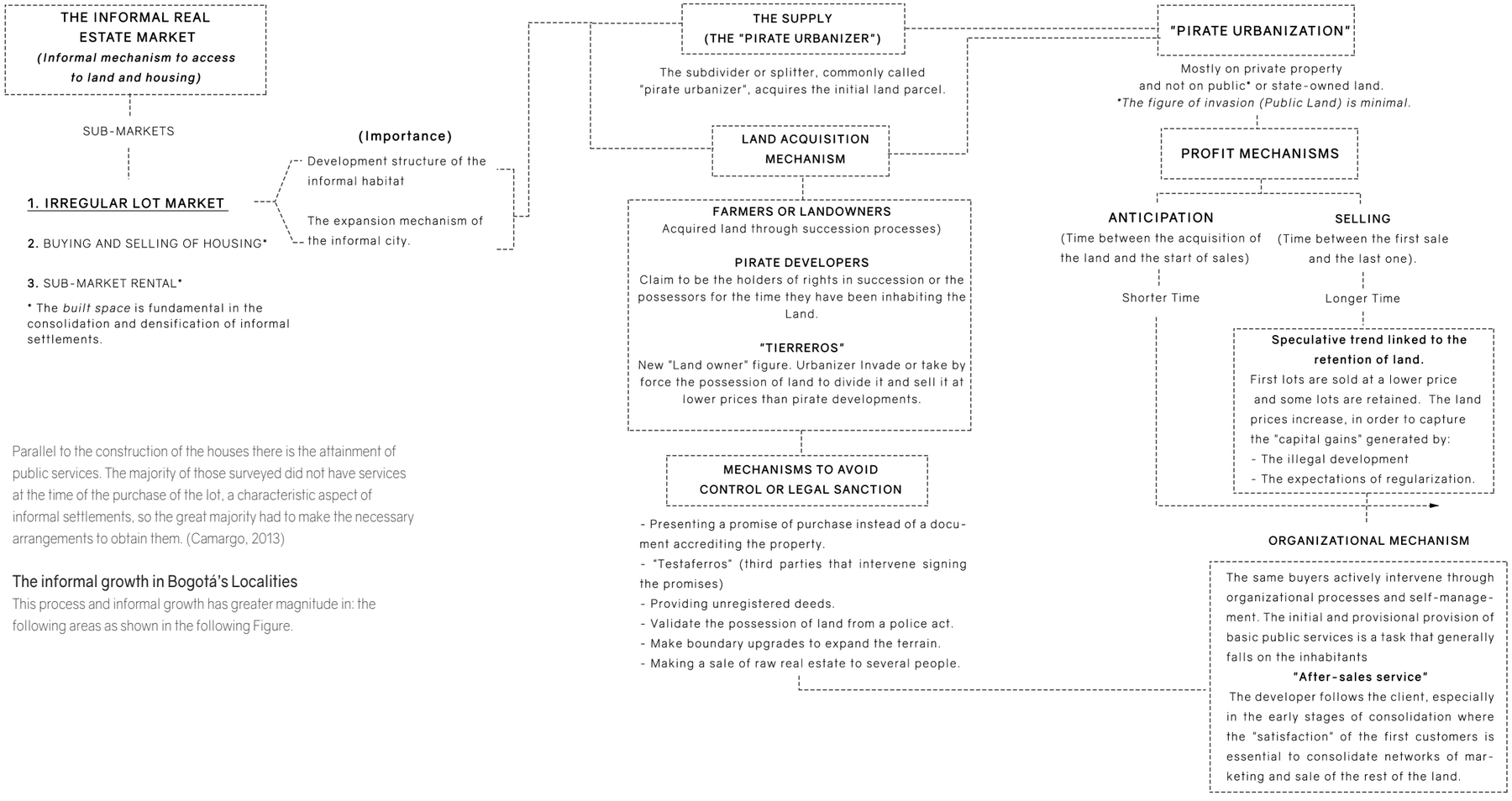
Also, one of the main advantage of the informal market over the formal market for affordable housing is that the poorest families do not have to resort to banking, which facilitates access to land for those who cannot formally show that they have the capacity to save and pay for housing. (Camargo, 2013)

As shown in Figure 3.8, the informal real estate market is composed of (1) the market for irregular lots, (2) the purchase and sale of housing and (3) the rental sub-market. In markets 2 and 3 the object of the transaction besides the land is the built space, and are fundamental in the consolidation and densification of settlements. Both the purchase and rental of housing in these settlements are also a mechanism of access to the city for many people.(Camargo, 2013)

The process of production of the informal urban space goes through a long process in which several agents intervene: in the first instance the commonly called "pirate urbanizers", acquires the initial land globe. The occupations in Bogotá have occurred mostly on private properties and not on lands of public or state property. Public lands are usually occupied in areas of environmental or hydric restriction that are under the tutelage of public service entities; therefore, informal urban growth has been conditioned to the existence of private land. Consequently, the figure of invasion is historically minimal with respect to the illegal lot or, more colloquially, "pirate urbanization". (Camargo 2013)

In order to begin the process of selling and transforming this globe of land into a real estate product, the pirate developer subdivides the land into plots and sometimes adapts the land with minimum conditions. The construction of a dwelling is a progressive process that begins at the moment they receive the land and lasts for many years. This is followed by the achievement of public services, urban legalization, regularization and / or subsequent inclusion in neighborhood improvement programs, which in general are a great effort of the community that is added to the price paid for the lot. (Camargo 2013)

Fig. 3.7 - The Informal real estate market process

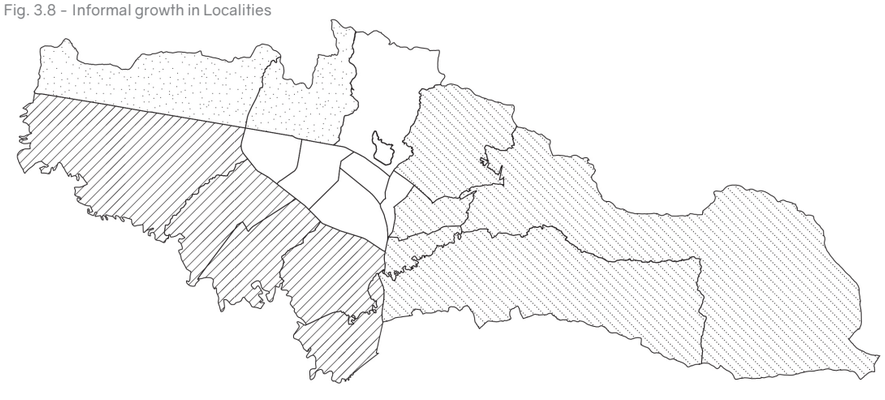


Parallel to the construction of the houses there is the attainment of public services. The majority of those surveyed did not have services at the time of the purchase of the lot, a characteristic aspect of informal settlements, so the great majority had to make the necessary arrangements to obtain them. (Camargo, 2013)

The informal growth in Bogotá's Localities

This process and informal growth has greater magnitude in: the following areas as shown in the following Figure.

Fig. 3.8 - Informal growth in Localities



Source: Camargo Sierra, A., & Hurtado Tarazona, A. (2013). Urbanización informal en Bogotá: agentes y lógicas de producción del espacio urbano. Revista INVI, 28(78), 77-107

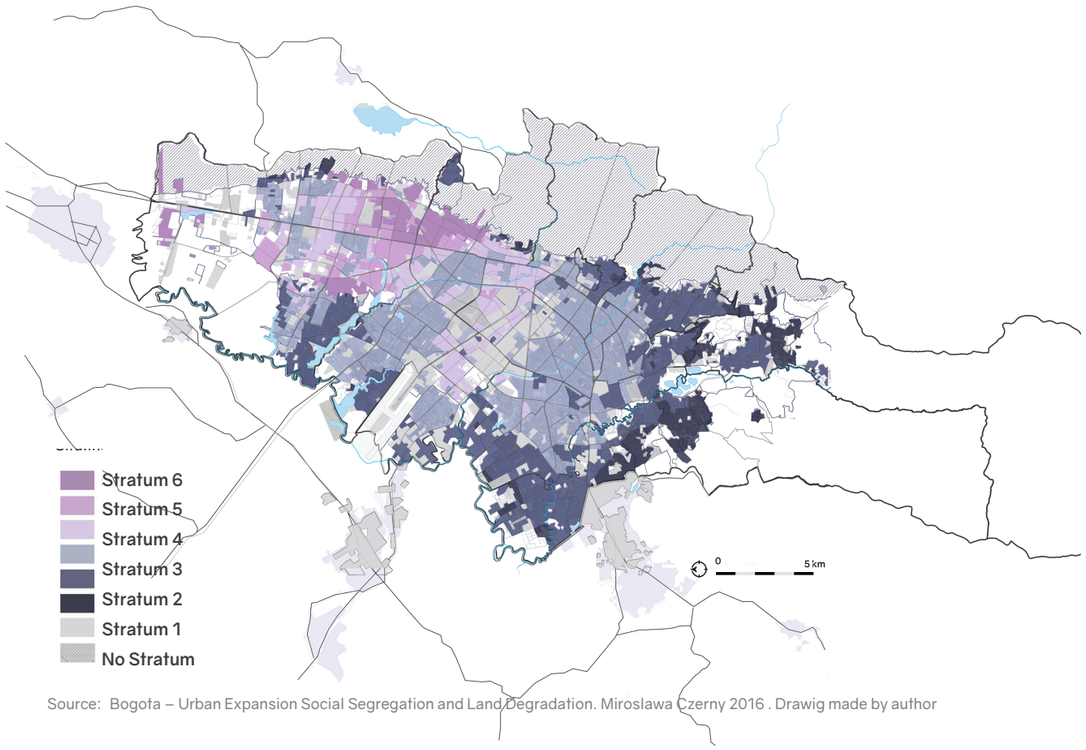
Source: Camargo Sierra, A., & Hurtado Tarazona, A. (2013). Urbanización informal en Bogotá: agentes y lógicas de producción del espacio urbano. Revista INVI, 28(78), 77-107

Stratification Systems in Bogotá

The public policy of socioeconomic stratification has its origins in the fragmented urban structure between the formal city and the informal city in Colombia. The policy was established as a mechanism that would provide equity to the public services system, forcing the most favored populations to subsidize the cost of infrastructure in the areas where the poorest population lived. The public service companies had to establish a system of differential tariffs, according to the socioeconomic level of the population of each neighborhood.

According to the Bogotá District Planning Secretariat, nearly 50% of the population lived in blocks classified in strata 1 and 2 (settlements of informal origin in the process of consolidation) and approximately 15% of the population lived in upper strata 4, 5 and 6 in 2011. (Yunda, 2019)
This system achieved in recent decades Bogotá leave the indicators of public service coverage close to 100%, stratification has brought problems in its methodology and a great impact and social segregation in addition to the fact that poverty indicators and stratum are not necessarily correlated in all cases.

Fig. 3.9 - Social Stratification System in Bogotá



Source: Bogota – Urban Expansion Social Segregation and Land Degradation. Miroslawa Czerny 2016 . Drawig made by author

The urban development in Bogota is based in part by private investment directed through the socioeconomic stratification system. The densification of the city in recent years has not followed the model established by the POT, but rather the segregation patterns established by the socioeconomic stratification policy, based on differences in housing typologies and urban morphology. This biased distribution of investment is facilitated by the influence of private sector agents in the development of urban norms (Yunda, 2019).

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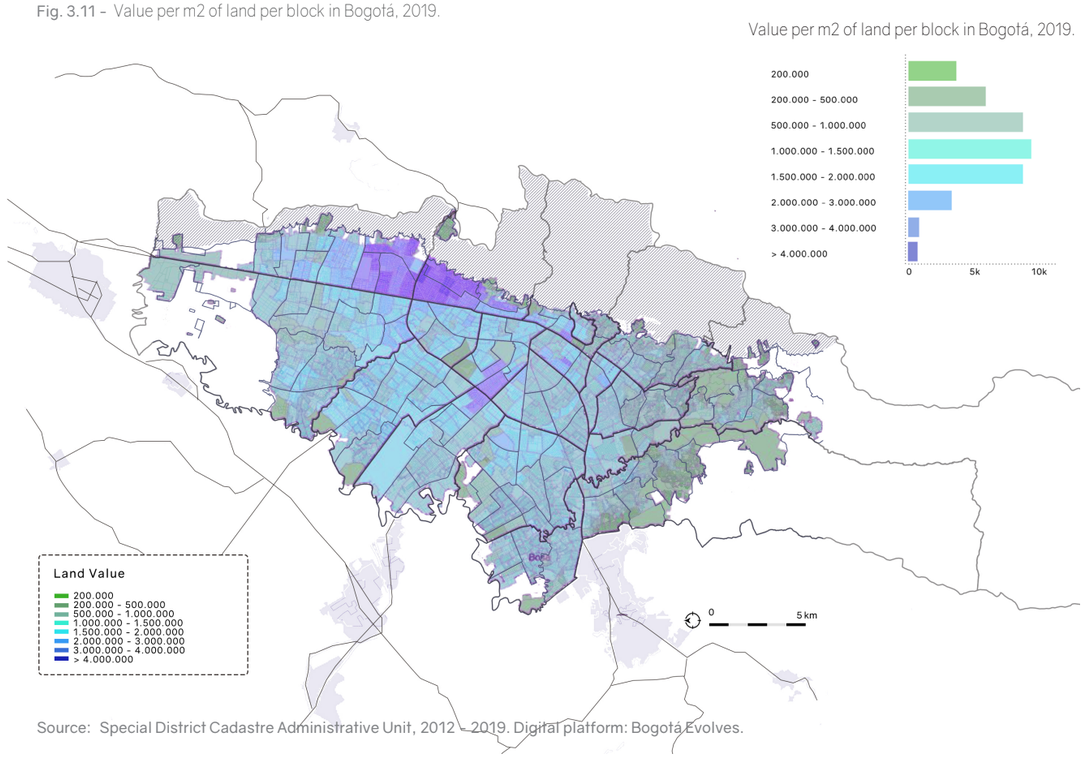
This system achieved in recent decades Bogotá leave the indicators of public service coverage close to 100%, stratification has brought problems in its methodology and a great impact and social segregation in addition to the fact that poverty indicators and stratum are not necessarily correlated in all cases. In Bogotá there is an urban development biased in part by private in-vestment directed through the socioeconomic stratification system.

The densification of the city in recent years has not followed the model established by the POT, but rather the segregation patterns established by the socioeconomic stratification policy, based on differences in housing typologies and urban morphology. This biased distribution of investment is facilitated by the influence of private sector agents in the development of urban norms (Yunda, 2019).

Only 1.9 percent of the population lives in the upper strata located in the north of the city, as opposed to more than 50 percent of the resident population living in the lowest strata areas in the periphery, that in most of the cases, are developed in a local informal process, in which self-build residential units are the only opportunity they find to supply the demand that the formal market has not been able to.

Spatial fragmentation is visible as well in land prices. Informality is caused by the impossibility to access the formal city market, and this is clearly related to the high land prices in the central areas of the city. The fragmentation of space is also given by the given value, where certain areas of the city by having lower prices generate new dynamics of development.

Fig. 3.11 - Value per m2 of land per block in Bogotá, 2019.



Source: Special District Cadastre Administrative Unit, 2012 – 2019. Digital platform: Bogotá Evolves.

Housing Demand in Bogotá

The District Planning Secretariat (Secretaria de Planeacion distrital, SDP for its acronym in Spanish) determined, based on official estimates of preliminary counts from the 2018 census and migration data provided by the National Administrative Department of Statistics (DANE), that Bogotá will require between 770,000 and 926,000 new housing units by 2031 (Planeacion, 2019). To determine how many new dwellings the city requires, the SDP took into account 3 sources, with different scenarios: population growth during the life of the POT- (Plan de Ordenamiento Territorial or Territorial Ordinance Plan, POT for its acronym in Spanish)- (if we are more people), change in household composition (if households will be smaller in the future), and the existing deficit and evolution of informal developments (Planeacion, 2019).

The need for housing is not necessarily shaped by an increase in the number of inhabitants but also by the existing deficit, the informality in the generation of housing and the reconfiguration of households. In addition, the population currently living with heads of household (especially young people), who could form new households in the future, was analyzed. This does not include the effect of migration (Planeacion, 2019).

Therefore, According to preliminary published figures from the 2018 Census, between 2017 and 2018 alone between 89,000 and 96,000 Venezuelans with a vocation for residence migrated to Bogotá. An additional 233,000 people are currently expected to migrate throughout the period from other cities, municipalities, departments and countries, consistent with historical information published by DANE (Planeacion, 2019).

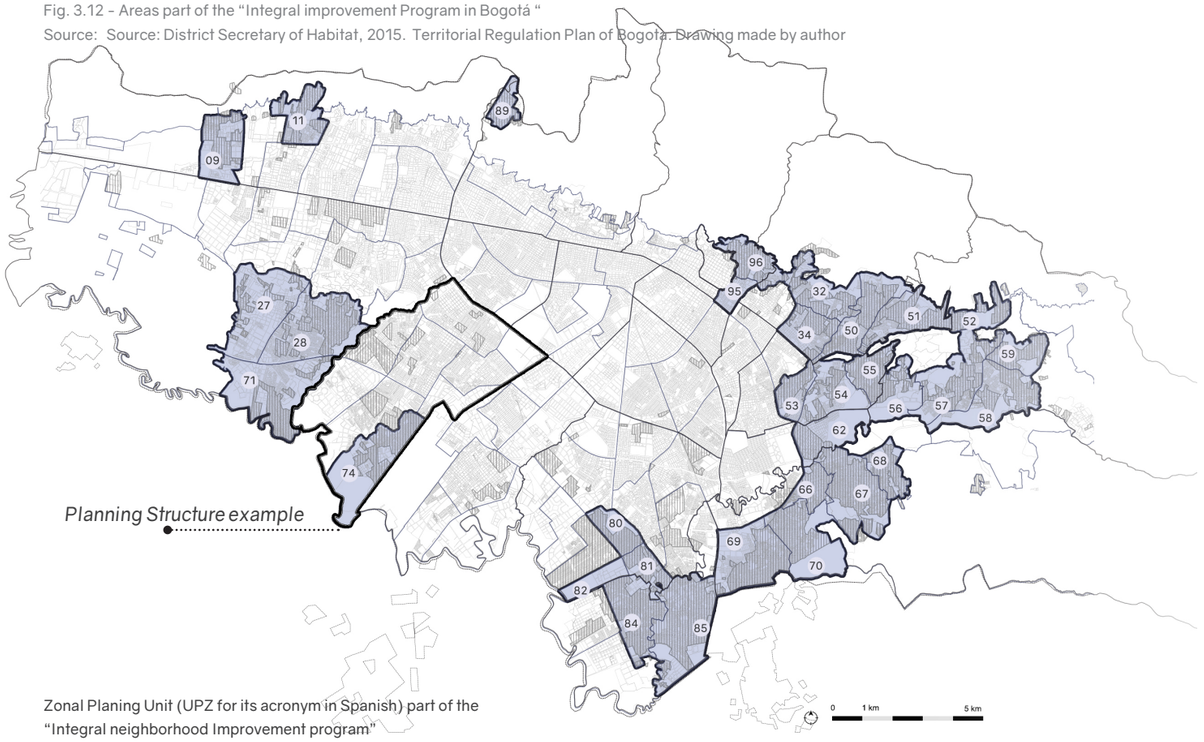
Planning Systems in Bogotá

The city of Bogotá is subdivided in 20 localities, that are structured by 117 Zonal Planning Units (UPZ for its acronym in Spanish, Unidad de Planeamiento zonal) 31 UPZ are defined under the treatment of integral improvement caused by the urban and social inequalities of this areas, by which the normative conditions and the urban guidelines are formalized in order to integrate them to the city. (Subdirección de Barrios, 2016)

While the housing policy at the national level has received poor success, interventions at the city level have addressed the needs of people living in informal settlements in this areas. The challenges in relation to displacement, informality and socioeconomic inequality are variables that contribute to defining and characterizing the strategy of the Integral Neighborhood Improvement Programs, a mechanism through which the District Administration through the District Habitat Secretariat has created a series of programs that guide and advance the actions of complementation and/or adaptation in housing and in the urban space of settlements of informal origin.

This with the purpose of correcting the physical, environmental and legal deficiencies generated by their origin outside the urban norms. The strategy to combat poverty and improve the quality of life in the case of Bogotá has meant that attention is concentrated on the population of strata 1 and 2 and towards urban settlements characterized as informal. (Habitat, 2019)

Fig. 3.12 - Areas part of the "Integral improvement Program in Bogotá "
Source: Source: District Secretary of Habitat, 2015. Territorial Regulation Plan of Bogotá. Drawing made by author



Zonal Planing Unit (UPZ for its acronym in Spanish) part of the "Integral neighborhood Improvement program"

LOCALIDAD USAQUEN
09. Verbenal.
11. San Cristóbal Norte.

LOCALIDAD CHAPINERO
89. San Isidro -Patios.

LOCALIDAD SANTA FE
95. Las Cruces.
96. Lourdes.

LOCALIDAD SAN CRISTOBAL
32. San Blas.
34. 20 de Julio.
50. La Gloria.
51. Los Libertadores.

LOCALIDAD USME
52. La Flora.
56. Danubio.
57. Gran Yomasa.
58. Comuneros.
59. Alfonso López.

LOCALIDAD TUNJUELITO
62. Tunjuelito.

LOCALIDAD BOSA
84. Bosa Occidental.
85. Bosa Central.

LOCALIDAD KENNEDY
80. Corabastos.
81. Gran Britalia.
82. Patio Bonito.

LOCALIDAD ENGATIVA
28. Engativá.

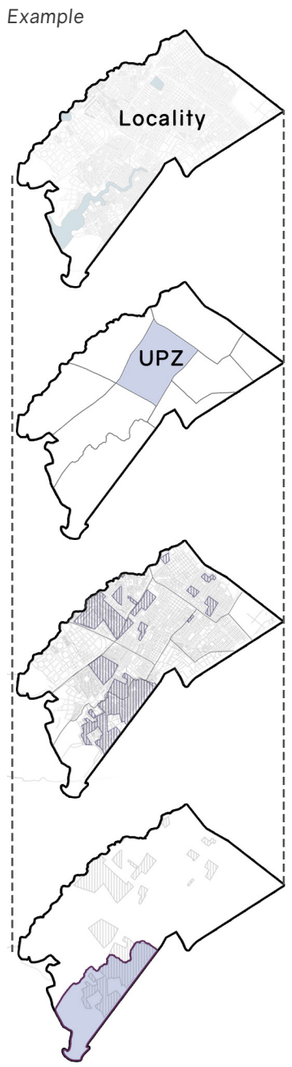
LOCALIDAD SUBA
27. Suba.
28. El Rincón.
71. Tibabuyes.

LOCALIDAD RAFAEL
53. Marco Fidel Suarez.
54. Marruecos.
55. Diana Turbay.

LOCALIDAD CIUDAD BOLIVAR
66. San Francisco.
67. Lucero.
68. El Tesoro.
69. Ismael Perdomo.
70. Jerusalén.

Planning Structure

Fig. 3.13 - Territorial classification in the planning Structure of Bogotá



Locality

Bogotá is subdivided into 20 localities

(Usaquén, Chapinero, Santa Fe, San Cristobal, Usme, Tunjuelito, Bosa, Kennedy, Fontibón, Engativá, Suba, Barrios Unidos, Teusaquillo, Los Mártires, Antonio Nariño, Puente Aranda, La Candelaria, Rafael Uribe, Ciudad Bolívar and Sumapaz)

UPZ

Unidad de Planeamiento zonal or zonal planning unit (-UPZ for its acronym in Spanish)

An urban subdivision that is composed of one or more neighborhoods within a locality whose objective is to define the urban policy of the sectors.

Informal Settlements

The areas marked as Informal Settlements are urban areas that started as a self build and spontaneous settlement in Bogotá. As shown before, this type of urban development varies in time, in which older settlements are already legalized and part of the formal and legal structure of the city, and the newest in the outskirts are still categorized as illegal and informal.

Upgrading and Improvement Zones

The UPZ in the outskirts of the city have a special treatment, called Integral Improvement zones. This has a special urban treatment and a specific policy in order to legalize and formalize self build environments

"Integral neighborhood Improvement program"

To carry out the improvement of areas of informal origin, the Sub-direction of Neighborhoods of the District Secretary of Habitat part of the legalization processes. This process begins with the conformation of the urban files where the urbanistic study is made for the approval of the plan where the subdivision of the land is evidenced and the expedition of the urbanistic regulation.

The next step is the regularization, which through inter-institutional articulation, provides public services, infrastructure and urban equipment to the settlement. These processes are complemented later with the interventions of qualitative improvement of housings and provision of the corresponding titling of property in relation with the Popular Housing entity. (Hábitat, 2019)

The process of informal land occupation (and/or illegal land alienation) is a dynamic that manifests itself mainly in the peripheral areas of the city, in those zones that are adjacent to the city edges, that receive the urban pressure exerted by the urban developments of formal origin and that can be located in protective or rural soil and in zones of ecological vulnerability. (Hábitat, 2019)

De-marginalization Program

The latest district administration of Bogotá (2016 - 2019), led by mayor Enrique Peñalosa, implemented a strategy to 'de-marginalize' the city, executed by the Habitat Secretariat. This strategy developed a series of programs aimed at improving integral aspects of the most vulnerable neighborhoods in Bogotá (Hábitat, 2019). Within these parameters, 'de-marginalization' represents the Mayor's response to unplanned development of the city, in which all of the public entities responsible, led by the Habitat Secretariat, along with the communities and the private sector, unify efforts to improve the urban environment and the housing in informal settlements. The aim is to enhance the inhabitants' quality of life and, ultimately, to overcome the situation of socio-spatial segregation (Hábitat, 2019).This strategy comprised the following phases and action areas, as published by the Bogotá Habitat Secretariat (Hábitat, 2019):

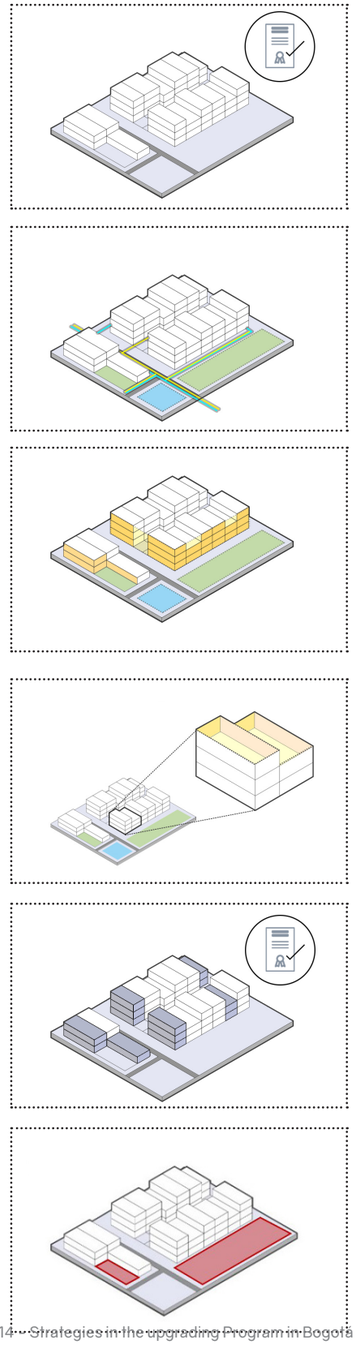


Fig. 3.14 - Strategies in the upgrading Program in Bogotá

Action areas

1) The departure point was a procedure for the legalization of informal settlements. From that point onwards the informal neighborhoods are introduced into the formal structure of the city.

2) Subsequently, these informal neighborhoods are connected to the public services networks i.e. sewage and water supply networks, energy, as well as roads, in addition to social investments and school facilities, in order to achieve an 'integral' upgrading of the neighborhoods.

3) As a next step, the facades of the houses are painted following community participation processes aiming to improve the neighborhood's environment and security.

4) Afterwards, the Habitat Secretariat attends the housing of the poorest and provides repairs of roofs, floors, kitchens and bathrooms, through a program of 'housing upgrading'.

5) At a final stage the property title is only provide to whoever proves ownership, and due to the illegal character of this development the process is complicated This work is carried out in collaboration with the 'Housing Fund for the People' ('Caja de Vivienda Popular' in Spanish). Legalization (1) does not imply property rights (5). The neighborhood can be included in the official plans of Bogotá, but formal law still does not offer any guarantee or alternative for the ownership.

6) The next efforts are concentrated in the control of new informal developments in the area.

Source: Habitat District Secretariat. Bogota. Drawing made by author

The process of upgrading informal settlements is carried out by the Slum Sub-Directorate of the Habitat Secretariat via the following activities (Hábitat, 2019):

a. Legalization:

Informal settlements' legalization entails the popular residential space production processes along with land use planning, providing the opportunity for public intervention. During this intervention, the Slums Sub-Directorate fulfills the function to conform the urban proceedings prior to their final filing before the District Planning Secretariat ('Secretaría Distrital de Planeación' ('SDP') for its Spanish acronym). The SDP subsequently conducts an urban planning study, endorses the 'plot plan' and, finally, delivers the urban planning regulations [legalization resolution]. (Hábitat, 2019).

b. Regularization:

The urban regularization occurs when there is evidence of generation or alteration of public spaces, road networks or recreational uses in a pre-legalized neighborhood. The Slum Sub-Directorate, once again, is responsible for preparing the urban reports prior to their submission to the SDP, so that this Entity can subsequently perform the necessary urban study, approve the 'plot plan' and issue the urban regulations [by means of a resolution] (Hábitat, 2019).

c. Formulation of upgrading interventions:

c.1 Characterization:
First, an urban-territorial and socio-economic diagnosis is prepared for the units to which the program will apply, in order to measure the quality of life of the inhabitants.

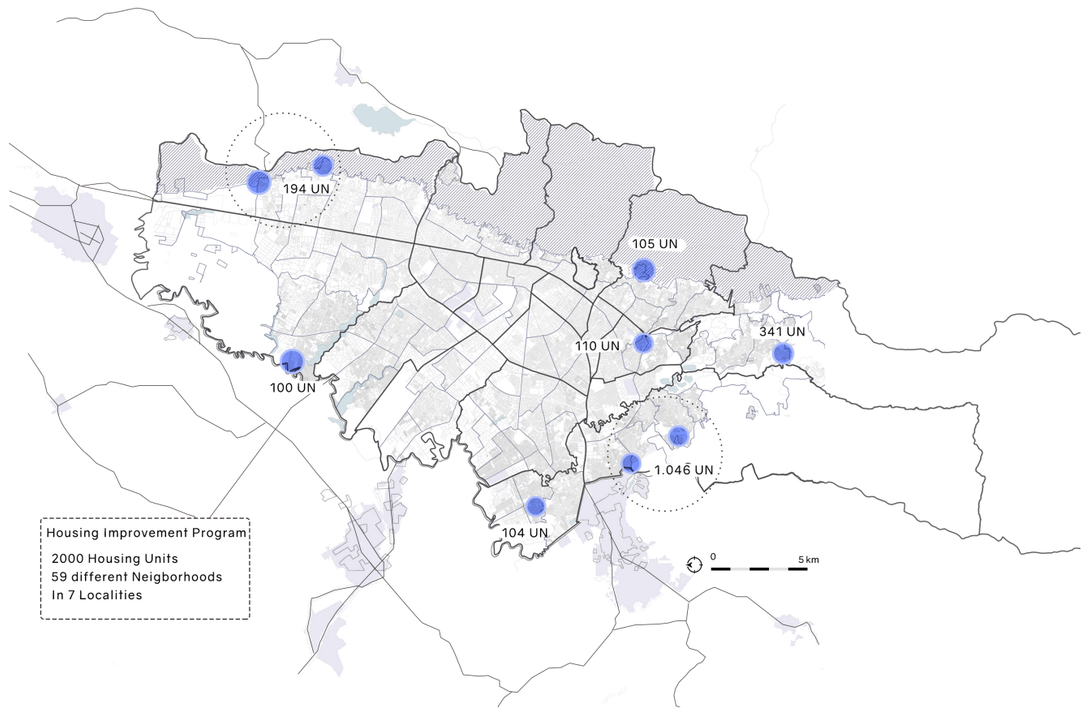
c.2 Prioritization:

Secondly, intervention areas are determined on the basis of shortcomings expressed in terms of quality of life (Hábitat, 2019).

d. Slum upgrading:

Finally, the administrative, financial and operational coordination plans are implemented to effectively execute, monitor and provide social support for the urban upgrading interventions in the informal settlements and the housing upgrading, which have as an ultimate objective that families have better housing conditions (Habitat, 2019).

Fig. 3.15 - Housing Improvement Program



Source: Habitat District Secretariat. Management Report and Results 2018. Sub-direction of Neighborhoods. Drawing made by author

HabitARTE program

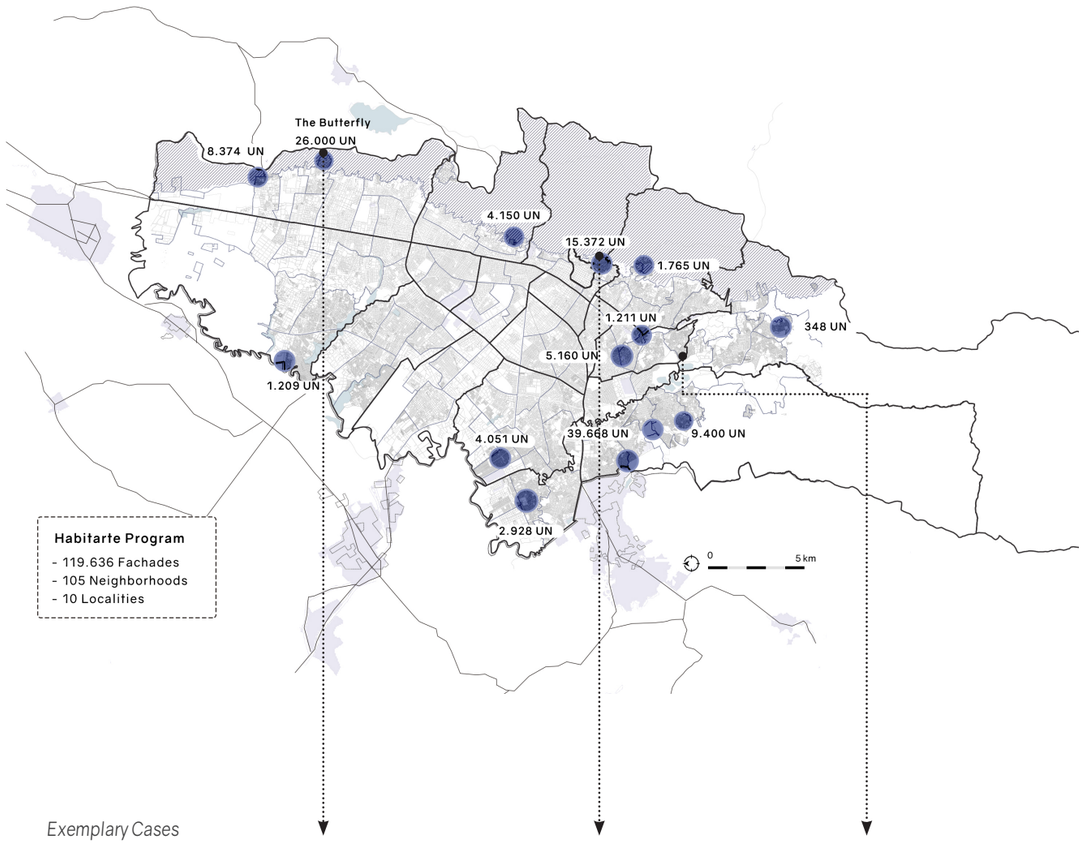
The Mayor's Office of Bogotá, through the District Secretary of Habitat, created the Habitarte strategy as a proposal to transform environments of informal origin. Through spaces of participation through art and color, processes are generated for the social and physical consolidation of the territories. The objective revolves around the community taking ownership and increasing the sense of belonging to its environment, transforming the city's neighborhoods. (Habitat, 2019)

The interventions are a strategy of social and community work where urban artistic interventions are carried out, where the citizens from their appropriation of the territory propose and choose the concept of the works. The main objective of the program, according to the Secretary of Habitat, is to rescue the soul of the neighborhood, reviving the sense of belonging to the place, achieving the incentive of coexistence through community work. (Habitat, 2019)

Between 2016 and 2018, interventions were generated in 98 neighborhoods in 9 locations of the city involving 8000 facades, creating 80 murals, 3 Macro-murals, and 2,467 citizens were trained in arts such as stucco, painting, working at heights, among others. The program aims to contribute to the strengthening of the human capacities of citizens who live in informal neighborhoods, with the aim of making them become promoters of transformation processes at the local level. (Habitat, 2019, pp. 37-39).

This program promotes citizen participation with the processes of territorial development through different interventions and activities that have an impact, in the short term, on the quality of public space in the city. The inclusion component is a central element of the project. The strategy promotes the integration of the community in the different strategies generating connections and networks of dialogue and interaction between citizens and institutions of the formal city. (Habitat, 2019, pp. 37-39)

Fig. 3.16 - HabitARTE Program
Source: Habitat District Secretariat. Management Report and Results 2018. Sub-direction of Neighborhoods



The Butterfly
"Habitarte" Upgrading Program in Bogotá

The Color of the Wind
"Habitarte" Upgrading Program in Bogotá

The River of Life
"Habitarte" Upgrading Program in Bogotá



Source: Twitter Enrique Peñalosa. Mayor of Bogotá D.C.

The Butterfly
"Habitarte" Upgrading Program in Bogotá



Source: Cartel Urbano Journal, 2017

The Color of the Wind
"Habitarte" Upgrading Program in Bogotá



Source: Cartel Urbano Journal, 2017

The River of Life
"Habitarte" Upgrading Program in Bogotá

Control Areas to prevent Informal development

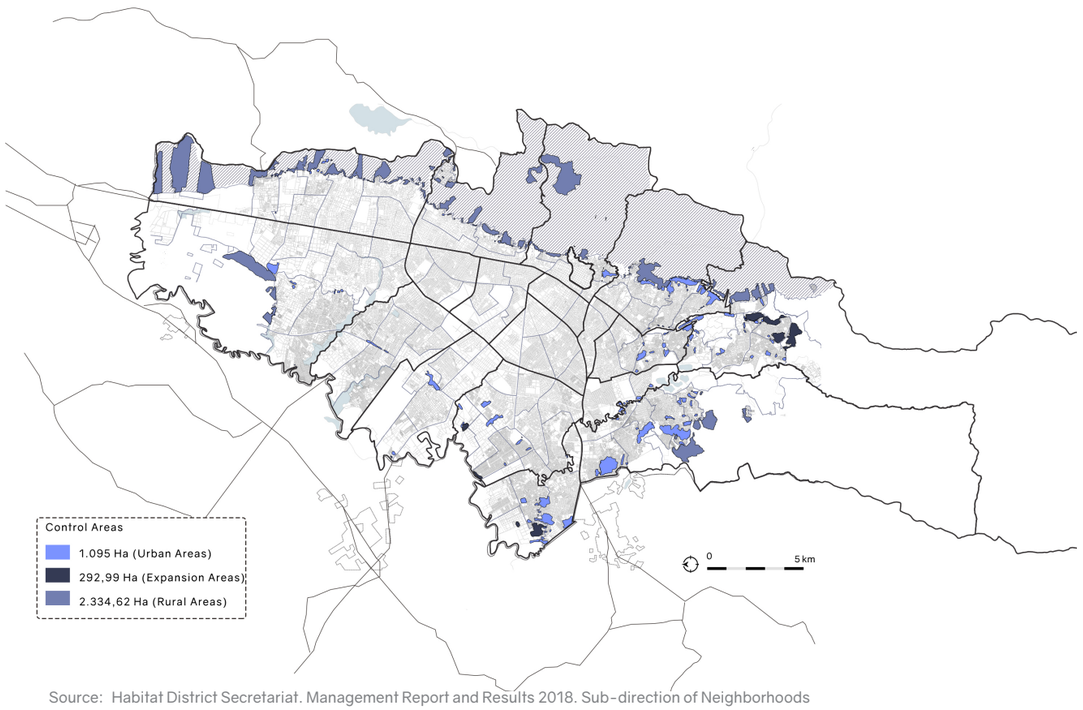
The District Habitat Secretariat, through the Subsecretariat for Housing Inspection, Surveillance and Control (SIVCV), monitors and controls illegal urban developments. The objective of this, according to the entity, is to prevent citizens from being swindled by criminal or "land" gangs (process explained in the chapter of Problem Field, The Informal Real State Market), and to stop the appropriation of private or public property or that affects the ecological structures of the city.

The monitoring work is done prioritized in sectors called Monitoring Poligons which are an area or territory identified as a susceptible zone or in process of illegal development, either by settlement or alienation, which is subject to surveillance and monitoring to advance work to prevent occupation and illegal development within the framework of our competencies.

The monitoring management carried out by the Habitat entity is articulated with entities such as the Secretariats of Government and Social Integration, the Local Mayor's Offices and the Public Prosecutor's Office, which exercises monitoring functions by making control visits to the established polygons. This in order to identify, georeference, characterize and update the existing occupations in it, and in turn prevent the emergence of new developments in these areas. Once the illegal occupation is confirmed, the information is sent to the respective local mayor's office, which must exercise the function of urban control. In 2003, 132 monitoring polygons had been defined with 813 hectares identified as susceptible to informal development. In 2015, 245 polygons with 3,663 hectares were defined. In these polygons, 18,861 illegal occupations were identified in which more than 34,000 people live, according to a report made on June 30, 2015. The information provided by the entities indicate that there is an informal occupation index: Ciudad Bolívar with 6,911 occupations, followed by Rafael Uribe with 2,663; Bosa with 2,079; Usme with 1945; and Usaquén with 1,564. Approximately 8,540 families occupy these areas of the city, of which around 6,000 come from other cities in the country. (Hábitat, 2019)

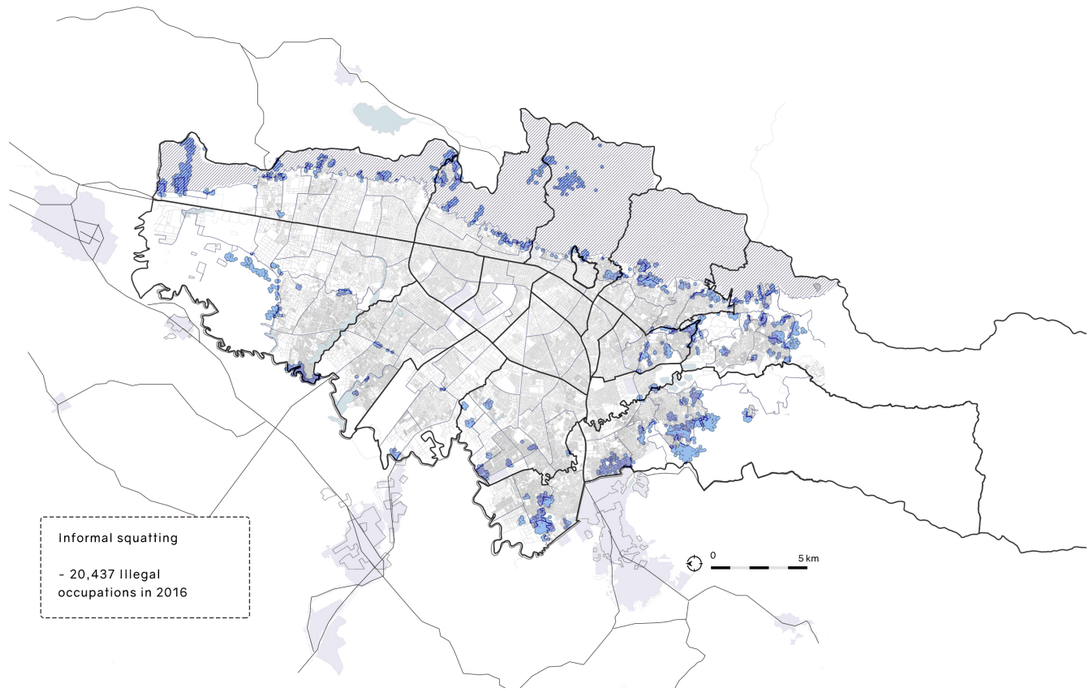
During 2018, as a result of the joint actions of monitoring and urban control carried out with the localities of Usaquén, Chapinero, Santa Fe, San Cristóbal and Usme, 119 new occupations were sealed in Easter Hills and 103 occupations were dismantled in the Entrenubes Ecological District Park. . (Habitat, 2019, p. 53)

Fig. 3.17 - Control Areas to prevent Informal development.



Source: Habitat District Secretariat. Management Report and Results 2018. Sub-direction of Neighborhoods

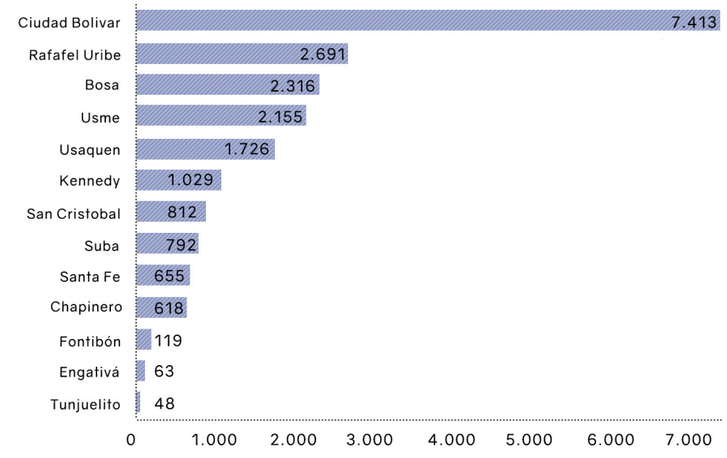
Fig. 3.18 - Informal land occupation areas



Source: Development Plan. Secretary of Habitat. 2016 - 2020.

Of the 265 polygons defined by the Secretary of Habitat, the polygons located in the eastern hills, the polygons on the southern edge of Ciudad Bolívar, Bosa, and the polygons of the Entrenubes Park have been prioritized for aerial monitoring. These zones have been prioritized because they are areas of special importance to the district and because they present a greater risk of occupation. (Habitat, 2019, p. 53)

Fig. 3.19 - Illegal occupations in 2016



Source: Development Plan. Secretary of Habitat. 2016 - 2020.

Upgrading Program in Bogotá

The following chapter will analyze the instruments that have been applied in relation to improving informal settlements in Bogotá. This section will explain how to structure this first phase of the analysis, which aims to evaluate the actions that have been implemented by relating them to the problems of the exclusion cycle identified in the previous chapter. This scale of analysis is quite broad and complex, so there will be a general analysis in relation to previous policies, and a more detailed analysis of current policies and their historical correlation.

In the city scale many interventions have addressed the needs of informal settlement inhabitants. Upgrading program were established in order to provide basic services, and land titles were awarded to ensure the housing needs. Despite this initiatives, Bogotá faces an unstoppable phenomenon of informality and illegality.

According to the Bogotá program's quality of life report (BCV, 2018), since 2010 between 2,000 and 4,500 informal plots have appeared per year, which can represent more than 30 percent of what is generated in subsidized housing (VIS and VIP). In 2015, there were 8,233 families settled in at-risk areas. In 2016 it had risen to 15,247 and in 2018 another 610 were added. This, while between 2016 and 2018 the Mayor's Office achieved the resettlement of 2,031 families and had delivered 4,191 of 10,000 housing titles proposed in its Development Plan. (BVC, 2018)
Added to this, there are also legalized neighborhoods in the city that have modified their urban structure, from the subdivision of lots, generation of new roads, occupation and / or generation of public space for parks.

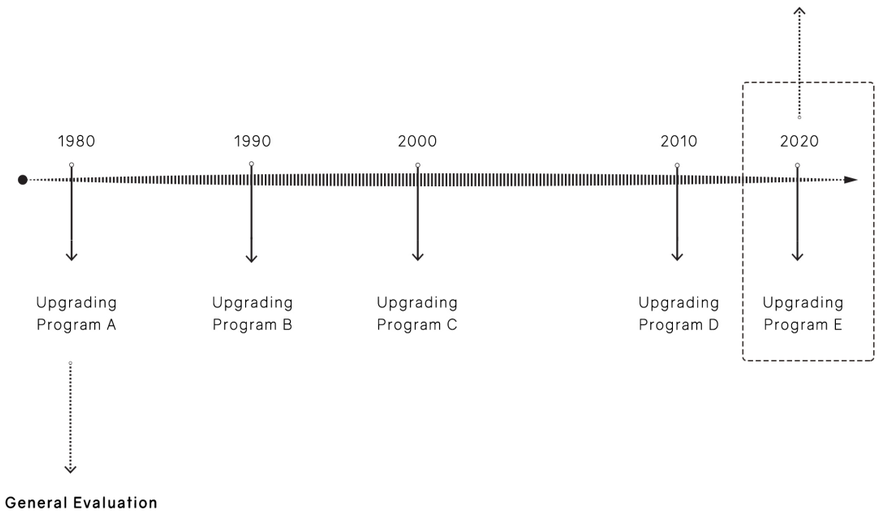
The administration's approach is based on an regularization instrument, by which urban and regulatory adjustments are made in order to fix the alterations in public spaces originally determined, without seeking into the development nature of the original informal settlements. (In 2016 228 legalized neighborhoods were subject of regularization in 15 localities of the city) (SDH, 2016). This Section will analyze in depth the current planning instrument regarding to Informal settlements in order to identify the problems and further needed strategies in order to establish a integral program.

The above information suggests that despite the efforts of public entities to improve the housing conditions of settlements of informal origin, the phenomenon persists. The absence of a coordinating and guiding entity for the hole metropolitan area has great socio-spatial and economic repercussions. There is an evident need for political innovation, in which the participation of society should have a voice in the elaboration of agreements and restructuring strategies related to the geographical space with an innovative approach to metropolitan management.

This agreements and strategies should not only have a coordination and following line with next administrations, it should also establish agreements with the other authorities of the municipalities of the region, with which autonomy should serve to improve the quality of life of the whole area, generate autonomous programs in order to empower the weakest localities and therefore not only achieve local benefits or local improvement programs. (Alfonso O, 2017, pp. 337-426)

In order to analyze the upgrading program of informal settlements in Bogotá, it will first be necessary to carry out a historical account of the initiatives and strategies proposed by the mayor's office. This will be done for two main reasons. The first, to be able to establish integral conclusions that take into account different programs and initiatives in the city without biasing the evaluation to a single administration or to a single period of time, as well as to evaluate the continuity and synergy between administrations in Bogotá. The second reason concerns being able to appropriate successful policies or actions within the proposal or to discard the shortcomings that have already become visible throughout the historical recount.

Fig. 3.20 - Upgrading Program Evaluation Diagram

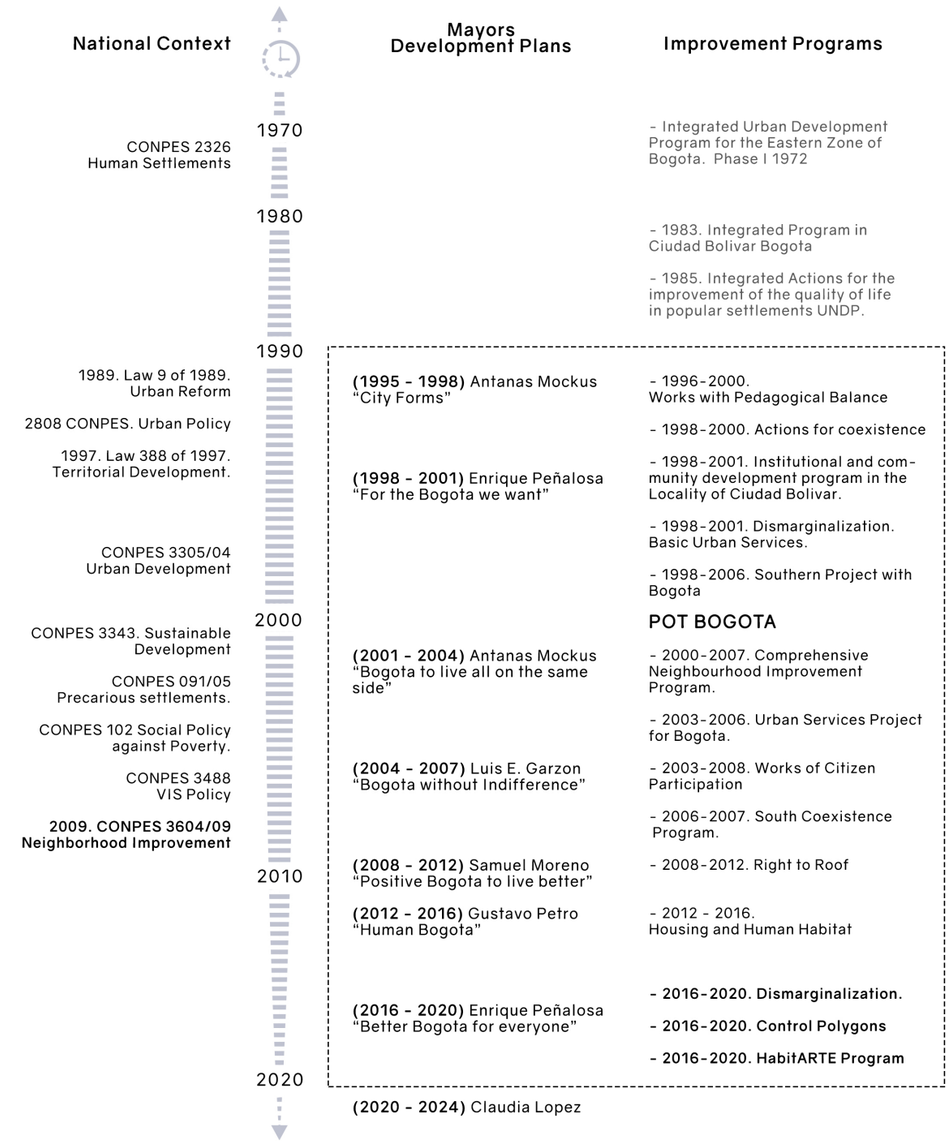


Upgrading Programs in Bogotá

There are several approaches in the different Development Plans of the city of Bogotá around the integral improvement of informal neighborhoods, evidenced in the Figure 3.18.

This chapter aims to recount the main improvement strategies from the 1990s to the present, in order to evaluate the effectiveness, comprehensiveness and continuity of the processes promoted. Analyzing the efforts and failures of the strategies in Bogotá is going to be useful when proposal new and alternative strategies for the informal city.

Fig. 3.21 - Time-line. Mayors and Improvement Programs in Bogotá



Source: CONPES 3604 de 2009 (The National Council for Economic and Social Policy, El Consejo Nacional de Política Económica y Social (CONPES) for its acronym in Spanish)

Major: Antanas Mockus

Time Period: 1995 - 1998

Development Plan: "Formation of City"

Upgrading Strategies:
1. Works with Pedagogical Balance
2. First contacts of the Project of Integral Improvement of Southern Neighborhoods with Bogotá in 1997.

Integral development measures

The main objective of the program "Works with pedagogical balance" was to strengthen the participation and organizational processes of the Neighborhood Community in the city of Bogotá. The program aimed to encourage community organizations in poor neighborhoods to participate in new developments or in the recovery of public spaces under a competition modality. The participating groups competed for the financing of the proposed project. The municipal investment was up to 15,000 dollars, which in some cases almost doubled thanks to the support of organizations, self-construction and the technical support of universities. (Hernandez, 2018, pp. 100-101)

The proposed projects focused on intervention in pedestrian networks and communal public spaces (for example the construction or recovery of parks, pedestrian walkways, stairs, avenues, platforms, improvement of facades, and communal halls).
From a socio-spatial approach, the program is a method to recover the collective use of public space, and seeks to transform the neighborhoods based on the real needs of the communities. The transformation of abandoned fields, invasions or cliffs into parks, squares or staircases created an appropriation of the community of its environment and improved the quality of life of the communities. Although there were initiatives to improve the relationship of the population with its environment, the strategies did not go beyond the intervention of public space. (Hernandez, 2018, pp. 100-101)

The most outstanding achievements in the period between 1996 and 1999 were:
- The rehabilitation of 332 recreational and sports areas.
- The construction of 123 footpaths and footbridges
- The expansion of recreation and mobility supplies for the community
- The construction and renovation of 104 community centers.

Governance and Management

From the Governance and Management perspective, the program wanted to encourage the development of proposals (starting from their design to their construction and maintenance) to be carried out by the community. The program promoted participation and integration processes in the neighborhoods, and encouraged the construction of bonds and networks of co-habitation among residents. (Hernández, 2018, pp. 100-101)
The management behind the program promoted a fair competition for the diverse groups that were interested. The organization of the community and the formulation of the project were the main elements taken into account in order to win the contest. The contest achieves the integration, participation and organization of the community in the elaboration of common purposes. The financing is the result of the initiative and effort of the communities themselves, which encourages a great sense of belonging and appropriation of the work they have done. The program's strategies focused on a participatory social project, creating training and follow-up workshops. Regulatory processes were strict in order to comply with the legal integration of these works into the city. An integral legal process was proposed, articulating legalization and habilitation tools in urban projects of local scale. (Integration of formal standards with more flexible methods of space production) (Hernández, 2018, pp. 100-101)

Major: Enrique Peñalosa

Time Period: 1998-2001

Development Plan: "For the Bogotá We Want"

Upgrading Strategies:
1. Dismarginalization
2. Works with Pedagogical Balance
3. Project of Integral Improvement of Southern Neighborhoods with Bogotá: South with Bogotá
4. Institutional and Community development

Integral development measures

Demarginalization (1998-2000).
The actions are centered in the expansion and improvement of road infrastructure, public services, public space and recreational infrastructure. In addition, this program focuses on the adaptation of risk zones and attention to affected families. During the Peñalosa period, the following programs were also implemented: Actions for Coexistence, Institutional and Community Development of Ciudad Bolivar, Comprehensive Neighborhood Improvement Program, and the Actions Booklet. The **South project** (part of the demarginalization program) and the **community institutional development program** in Ciudad Bolivar were highlighted in the analysis. (Torres, 2010)

1. Integral Improvement of Southern Neighborhoods with Bogotá: Southern Project (1997 - 2001)
The Project established as a priority the attention to sectors of strata 1 and 2, through the Demarginalization Program and aimed to develop sustainable strategies in the communities surrounding the park called between clouds in Bogotá (83,000 people), in which infrastructure projects were proposed, environmental conditions were improved, and institutional coordination mechanisms were implemented. The lines of action were aimed at the social component (participatory planning, community organization), works (water management, environmental protection and housing) and institutional strengthening (inter-institutional coordination). Difficulties in the social component centered on a lack of orientation, a lack of information to the communities and a lack of integration of different demographic segments. In works and infrastructure, both environmental preservation strategies and sewerage and aqueduct works had positive impacts on the environment. **In this program incorporates for the first time the environmental dimension in urban planning works as a priority strategy.** (Torres, 2010)

2. Ciudad Bolívar Institutional and Community Development Program (1998 - 2001)
The program was created through four sub-program: small and medium-sized enterprises; strengthening and inter-institutional coordination; improvement of housing; and support for women and young people. The objective of the policy was to improve the living conditions of the most underprivileged groups in Ciudad Bolívar, emphasizing the creation of opportunities for women and young people as well as the provision of basic services. It should be noted that the administrative department of communal action was responsible for supporting the operation of the Productive Credit Fund, offering organized communities the necessary guarantees for **the development and strengthening of small businesses built from cooperation resources of the European Union.** (Torres, 2010)

Governance and Management

1. The overarching objective of this project was the institutionalization, at the district level, of a replicability model of integral improvement of areas with neighborhoods in progressive development, through coordinated planning and management and organized community participation. The main lessons learned are the creation of a management unit whose mission was to seek impact on the definition of standards of care, to ensure equity in the distribution of benefits and sustainability of the improvement process. (Torres, 2010)

2. The program resulted from the technical and financial agreement between the European Union and the Colombian government, with an institutional responsibility at the district level in order to execute improvement programs for vulnerable populations in Ciudad Bolivar. (Cepeda, 2013)

Major: Antanas Mockus

Time Period: 2001-2004

Development Plan: "Bogotá to live all on the same side "

Upgrading Strategies:
1. Neighborhood and House Improvement Program
2. Works with Pedagogical Balance.

Integral development measures

1. Neighborhood and House Improvement Program:
The interventions were focused on illegal neighborhoods located in peripheral areas (strata 1 and 2). The objectives were focused in covering 98% of the water supply and 86% of the sewerage in already legalized neighborhoods, in the construction of 80 km of access roads, in the maintenance of 760,000 m2 of local roads and in the coordination of inter-institutional actions that would generate an integral development of the neighborhoods. In addition, the program aimed to resettle and improve the living conditions of families located in high-risk vulnerable areas and to control illegal urbanization through an integrated inter-institutional management system with training and information for the community on regulations. (Torres, 2010)

2. Works with Pedagogical Balance
Among the commitments are interventions in 300 neighborhoods through the program works with educational balance in relation to community enterprises with the aim of improving social and economic conditions of the community, accompanied by actions of coexistence and community cooperation.(Cepeda, 2013)

- **Eco Neighborhoods:** The idea of the Eco-neighborhoods had the objective of transforming communities into ecological neighborhoods, where social and environmental well-being could be developed through the transformation of behaviors, participation and the capacity of individuals to be agents of a new development" (Mayor's Office of Bogotá, 2003).

In this administration, the Integral Improvement and the Project South with Bogotá had some modifications. In 2002, the Integral Improvement Program was assigned to the Popular Housing Fund (Caja de Vivienda Popular) and the Project South with Bogotá was incorporated as the basis for the Integral Improvement Program. (The interventions continued to be divided for a while, with two different approaches, two management teams and two international sources of financing without greater levels of cooperation, diminishing the expected impact of the unification of efforts at the district level) The budget of the South Program with Bogotá was in turn raised by the German entity with the aim of promoting peace and conflict prevention. (This money was provided in order to finance road works and community facilities in the area) (Cepeda, 2013)

Governance and Management

1. Neighborhood and House Improvement Program:
From the governmental perspective, this program focused on the development of shared responsibility actions among the public, social and community sectors, with which it seeks both the improvement of the physical infrastructure of the place and the appropriation and participation of the families in the proposed projects. (Torres, 2010)

2. Works with Pedagogical Balance
The Eco-neighborhoods program was focused on integral, sustainable and coordinated development between public entities and communities in order to establish a culture of development not focused on the physical and infrastructure, but on human processes and the resolution of social problems and conflicts in the community. In 2000 the budget was reduced by half and the program was canceled. (Torres, 2010)

Major: . Luis Eduardo Garzón

Time Period: 2004-2008

Development Plan: "Bogotá without indifference"

Upgrading Strategies:
1. The Habitat program (integral upgrading)
2. Works with Citizen Participation
3. Project South

Integral development measures

1. The Habitat Program:
The Habitat program considered the continuation of the integral neighborhood improvement program and proposed new programs called: Bogotá with a Roof, risk prevention actions, urban renewal operations and public home services for the habitat (Mayor's Office of Bogotá (2005) pp. 50, 75). These programs were focused on renovating areas of the city, improving precarious environments and generating opportunities for the acquisition of housing in a legal form and taking action to prevent risks in informal settlements. This approach integrated issues such as land management and use, housing, facilities, environment, heritage, culture and public space, etc. (Cepeda, 2013)

2. Works with Citizen Participation:
The program aimed to improve social, environmental, productive and urban conditions of the neighborhoods through small-scale projects with high citizen participation. This was established through a methodology of direct linkage of the community are made works like poplar groves, stairs, pedestrian routes, trails, parks, among others, coordinated with the regulation of the Land Use Plan and its policies of use, occupation and development of the city.(Cepeda, 2013)**3. Project. Sur with Bogotá:**
The program proposed a more detailed and closer intervention of physical and social improvement, including infrastructure works and urban equipments in a territory of 41 neighborhoods, focused on the participation of the communities and the strengthening of their organizational structures. This approach, represented by the SUR Project, was the transition phase towards an intervention in the framework of the SUR Coexistence Program that prioritizes physical and social improvement in high conflict areas. Improvements in access, coverage of public services, housing and public space were proposed. (Cepeda, 2013)

Governance and Management

1. The Habitat Program:
The "Habitat Policy 2007-2017" was formulated in the Development Plan "Bogotá without Indifference" (2004 - 2007). This approach led to the creation of Metro Housing and the Urban Renewal Entity, ERU. The entities related to the habitat sector were articulated Through the public-private initiative called " Pact for Decent Habitat", as the technical support for the formulation of the integral habitat policy, with the objective to articulate the resources and potential of the Capital District, the National Government, the financial sector, the private builders, the real estate markets, the construction, the non-governmental organizations, the professional associations and the international cooperation organizations, among others. This approach integrated issues such as land management and use, housing, facilities, environment, heritage, culture and public space, etc. Complementarity, the administrative reform of the District created the District Department of Habitat - SDHT. (Cepeda, 2013)

2. Works with Citizen Participation:
This program proposed to strengthen social organization through the development of works of community interest and local investment implemented through participation, co-financing and design of shared solutions of community organisations and district entities. Citizens of Bogotá participate in this project through social and community organizations. The objective was to increase the capacity of the organizations to design, structure, build, control and sustainability of projects to improve the environment of incomplete informal neighborhoods, based on the execution of their own initiatives and learning from their own experience. (Cepeda, 2013)
3. Project. South with Bogotá:
The Project was the second financial cooperation program between the governments of Colombia and Germany in the field of comprehensive neighborhood improvement. The first was carried out in the city of Medellín (PRIMED)..

Major: Samuel Moreno Rojas

Time Period: 2008-2012

Development Plan: "Positive Bogotá: for a better life"

Upgrading Strategies:
1. Right to a roof
2. Program to improve the neighborhood
3. Habitat Alliance Program
4. South Coexistence Program
(Continuation of the South Project with Bogotá)

Integral development measures

1. Right to a roof
The program was based on construction, improvement, relocation and provision of subsidies, focused on the management of social interest housing with emphasis on social interest and priority housing. The projects developed under this program sought to resettle 4,545 families in unmitigated high-risk areas, provide housing solutions for 4,000 displaced families, own 6,000 plots of land and identify 8,000 homes in strata 1 and 2, and improve structural and living conditions and housing improvements in rural areas. (Cepeda, 2013)

2. South Coexistence Program
This program was the continuation of the SUR Project with Bogotá. The objectives of this program are to improve the conditions of coexistence in the localities of Ciudad Bolivar, Bosa, San Cristobal, Usme and Rafael Uribe and to promote a culture of peaceful conflict management and reconciliation, through social programs and investments in community infrastructure and public spaces of high social conflict; to improve the socio-economic conditions of the population by creating training, temporary jobs, assistance to vulnerable groups, and temporary opportunities for women heads of household. The program was designed to be implemented over four years and focused on recovering public spaces and social and cultural facilities.

Governance and Management

1. Right to a roof
The program, with various approaches and sub-programs such as " My legal house ", " My house, safe territory ", " I improve my house ", among others, had as objectives to work with multiple public entities in participation and consultation with the affected communities. As institutional mechanisms, to face the problem of housing of informal origin, the functions and responsibilities of the different district en-tities were established, so that during the validity of the plan, they would institutionalize programs and actions tending to counteract the offer of informal housing and programs that incorporate alternative mechanisms of housing production and orient with programs of promotion, formation and diffusion, in the peripheral sectors, the families that do not have a title of property. (Cepeda, 2013)

2. South Coexistence Program
This project aimed to promote international coordination in the investment of resources and the continuous monitoring of impacts. From the perspective of management and involvement of actors, this project from its beginning involved both municipal and international public actors and succeeded in linking the community in many of the proposals both physical and social transformation of the territory to be intervened, which in this specific case showed major social problems of violence, displacement, domestic violence among others. The projects for reconciliation and promotion of conflict resolution were an important initiative when it came to intervening in vulnerable sectors from a social perspective. (Cepeda, 2013)

Major: Gustavo Petro Urrego

Time Period: 2012-2016

Development Plan: "Human Bogotá"

Upgrading Strategies:
1. Housing and Human Habitat
2. Comprehensive Neighborhood and Housing Improvement Program

Integral development measures

1. Housing and Human Habitat
This program was focused on solving three priority projects: In the first instance, the production of land and urban planning for the construction of priority interest housing; in the second instance, it was focused on granting subsidies to the offer of leasing or acquisition with preference rights; and in the third instance, it aimed to continue with the line of the program of integral improvement of neighborhoods and housing explained below. On the one hand, it was intended to generate an economic support and generate new housing. On the other, through the improvement program, it was intended to upgrade informal areas through certification, legal recognition, and housing improvement. (Cepeda, 2013)

2. Comprehensive Neighborhood and Housing Improvement Program
The Program aimed to improve the urban environment of legalized neighborhoods, and was oriented to public infrastructure investments such as roads, public services and parks.
At the same time, it aimed at recovering environmental elements in strategic areas of informal settlements, which by means of joint interventions would manage to promote social cohesion and a participatory culture in areas of both social and ecological vulnerability.
The program also sought to promote land titling, building recognition, neighborhood legalization and housing improvement in informal settlements. (Cepeda, 2013)

Governance and Management

1. Housing and Human Habitat
In this program, social and economic rights components were incorporated, focusing on State commitments and efforts to achieve a sufficient supply of housing, with bearable costs and greater accessibility due to better conditions of location in the city and, therefore, of urban integration.
This program sought to eliminate and mitigate, depending on the type of household, the barriers arising from difficulties in obtaining credit or generating own savings. The programs priority criteria took into account households in a situation of displacement and vulnerable social conditions. (Cepeda, 2013)

2. Comprehensive Neighborhood and Housing Improvement Program
From the governmental perspective, this program focused on the development of shared responsibility actions among the public, social and community sectors, with which it seeks both the improvement of the physical infrastructure of the place and the appropriation and participation of the families in the proposed projects. (Torres, 2010)

Revisiting the Upgrading Program in Bogotá City

It has been pointed out that the integral slum upgrading policy in Bogota, has been implemented with a mainly corrective nature, by means of attempting to insert the notion of 'informality' into the formal discourse. In addition, slum upgrading programs are also seen as complementary to social housing policies that promote development of urban space (Tovar, 2007).

Urban complexity is derived from a multiplicity of elements which contribute to the formulation of upgrading programs which must consider actions in multiple fields, including inter alia infrastructure projects, institutional management and other social components, coordinated by district authorities. However, in most cases the notion of 'integrality' in the upgrading programs is merely referred to the actions of a multiplicity of institutions with specific functions, be they complementary or in competition with each other, and do not consider sufficiently some key areas and their potential impact (Tovar, 2007):

In the first instance, there is the socioeconomic dimension, related to the existence of [objective and subjective] conditions for the production and reproduction of the community. The second sphere is the cultural dimension, especially focused in the creation of parameters and rules for communal coexistence and safety, and to identify the collective 'identity', as well as the construction and generation of interaction, links and social networks among them. The third area is the political dimension, which is essential for the formulation of public policy and for determining institutional measures that envisage and ensures long-term sustainability [going beyond an incumbent government]. In addition, the promotion of public participation, the reinforcement of democracy, and political and administrative decentralization are also fundamental features to take into account in this political sphere. Finally, the environmental and territorial sphere must foster the identity processes within the territory, while promoting the habitat structure among the institutions and the community (Tovar, 2007).

In view of the above, it is relevant to emphasize that slum upgrading programs in Bogotá face diverse problems that demand execution and multi-sectorial interventions from the authorities with the concurrence of the private sector. Such policies must involve the community as a 'subject' in the upgrading processes, as decisions in this respect have direct impact on them. They should have the possibility to contribute effectively to public management and to the city's development, by moving beyond the standard social control for infrastructure construction (Tovar, 2007).

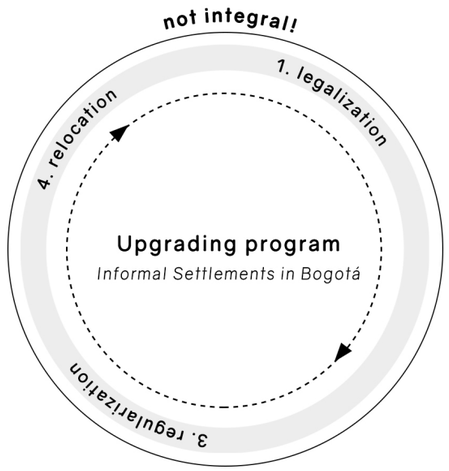
In this sense, community participation would strengthen democracy by abandoning the conception of the population as an 'object', or merely beneficiary, of programs. The participation of the community must be the cornerstone on which the community's future is built rather than just an intervention strategy and side-element (Tovar, 2007). Therefore, an update of the slum upgrading programs in Bogota must take into account the following considerations:

Since there are different approaches to the intervention model direction in terms of upgrading, it is important to bear in mind that these programs are determined by the urban-specific model. A dichotomy between the social and the physical-spatial aspects is evidenced in the scope of an intervention, stemming from the activities of the participating institutions. It could be pointed out that, despite recent attempts to develop a habitat and housing public policy for Bogotá that articulates institutional action, the importance and extent of intervention has not been critical or sufficiently transcendent. The aforesaid, because the focus has been only on the production of new housing and by providing specific recognition to the slum upgrading program (Tovar, 2007).

In this regard, to date, it has not been possible to completely overcome the fact that each institution involved has their own conception of development and operates according to their own agenda, making inter-institutional intervention difficult, doubling efforts and causing disarticulation within their actions. In spite that the slum upgrading program has as objective and basis the reduction of the poverty and the enhancement of the standard of living, interventions have predominantly a physical focus [i.e. infrastructure], failing to fully incorporate the social element in the upgrading plans. In other words, in practice the upgrading programs are still developed on the conception of community as an 'object' and not by engaging the population as a 'subject' of their development (Tovar, 2007).

In addition, aware that decentralization is essential to enhance slum upgrading programs and the promotion of effective and real involvement of the community in urban planning and public policy formulation processes, it must be said that there are many obstacles for achieving real decentralization. To sum up, nowadays, the slum upgrading system does not have the position it ought to have within Bogotá's political institutional hierarchy and administrative structure and much remains to be done to involve citizens and strengthen the social aspect of interventions (Tovar, 2007).

Fig. 3.22 - Current Strategies in Upgrading Program in Bogotá.



c. Relevance and Reflections

Scientific relevance

Contemporary cities are defined by diverse conceptions of urban development, manifesting and developing in the same space. The complex coexistence of social, political, and economical dimensions is challenging the dichotomy between the formal and informal city and challenging the definition of the informal to go beyond the normal understanding of the phenomenon as the city of the poor. (Lutzoni, 2016)

The socio-spatial and socioeconomic fragmentation between the formal city and the informal city is evidence of the failure in the urban planning sphere to recognize informality as part of the city's operational and organizational system. The impossibility to access the city' s functional structure leads to a constant poverty cycle, which today finds an answer through improvement programs in generic and individual interventions without consideration of the real dynamics and needs of the intervened populations. This mode of "stamp urbanism", is focused primarily on housing needs and does not consider the particular situation of these populations in order to provide opportunities and generate comprehensive responses in improvement projects. One of the major flaws of these programs is to optimize processes and, as mentioned above, to stamp a solution focused on residency to different environments. The appropriateness of the framework is defined in understanding that each informal space requires a particular analysis under the same model of analysis and decoding.

Opening the debate about public policies, counteracting the actual planning mechanisms, and evaluating the disconnected institutional and political dynamics, is relevant for future urbanization processes in developing countries. Local perspectives and a flexible planning structure could activate and change the segregated dynamics of the city. The co-production of space, local development and bottom-up approaches have demonstrated to be a key factor in the activation of the urban environment and could be a tool in order to empower vulnerable communities not only in a spatial dimension, but in an economic, political and social dimension.

Understanding all the challenges and opportunities in this type of settlements could redefine the tools in which segregation, social disparities and fragmented urban fabrics are analyzed and intervened in many contexts in which these problematics tend to grow with the time.

The project contributes to the work field of informal urbanism within the context of Bogotá, in Colombia. The investigation in this thesis explores the potential behind an adaptive framework as an integral tool in order to upgrade informal settlements in a local scale, and also create mechanism and networks to connect de informal city within the functional structures of the formal urban structure. This would lead to the improvement of vulnerable areas and would establish an alternative approach when dealing with self-build environment.

The research methods behind this analysis, are intended to reveal the complex socio spatial, socioeconomic and socio ecological dimension behind the informal structures, highlighting the importance of communities and multidimensional cooperation between different actors as part of a change. As stated before, the proposed outcome will be defined as an adaptive strategic framework, in which clear design and planning guidelines will be established in order to create a holistic upgrading initiative for the city. These guidelines can be tested in every informal settlement, but the results are adaptable and flexible in order to respond in a comprehensive way to the need and potentialities of the context. The understanding behind the structure of this framework could provide a useful approach and recognition of the needed actions in order to implement inclusive and effective policies, and further research would be necessary in order to test the adaptability and change of the actions in different contexts.

Having Identifies a specific case of analysis and design, the results could have a valuable contribution in the understanding of the informal geographies in Bogotá and its governmental and political background. The proposed actions are going to embrace and analyze the already implemented programs, and will offer an analytical perspective on how to deal with the issue from a theoretical, analytical and design perspective.



Source: Visions of the San Germán neighborhood. Nathalia Guerrero. Editor VICE magazine Colombia (2018)

Fig. 3.23 - San German. Informal Settlement in Bogotá.

Community members work together to install light poles. Photo: Ana Cristina Vallejo.

The urban space should be a common arena providing equal opportunities. The progressive transformation of the existing environment is the key in order to generate equal and sustainable opportunities in society, in which every person should have the minimum rights and services in the city.

4. Research approach

Overview

The following chapter will go through the proposed research approach in which problem statement, the research aims and objectives and the propose research questions of the proposal are centered on the critical evaluation of the planning approach and planning scope of the current upgrading Program in the city of Bogotá.

Chapter Structure:

a. Problem Statement

b. Research Aim and Objectives

c. Research Questions



Source: Tumbler. “La desigualdad social no existe” Bogotá, Colombia. 2018.

a. Problem statement

The rising poverty rates, internal displacement, the market-oriented development and deep socioeconomic inequalities have led to a binary configuration of the urban fabric in Bogotá, defined as the formal and informal city.

The Informal urbanization process has a major importance in the production of urban space and involves different vulnerabilities rates in the social, spatial and environmental domains. The upgrading program in Bogotá, although being crucial in the transformation of informal settlements, has not succeeded in generating a structural change due to the implementation of generic and short-term interventions that, on one hand, have not a clear continuity regarding the evolutionary and complex character of this type of upgrading process and, on the other one, are not correlated towards social and environmental resilience.

Therefore, the planning scope should expand their capacity in order to address and embrace the uncertain future in a long term perspective by re-imagining the role of local and formal actors as active agents of change in the functional transformation of the territory and in the evolutionary empowerment of the vulnerable populations, through the planning process.

Fig. 4.1 - Problem Statement



b. Research Aim and Objectives

General Aim:

The project aim is to design an alternative complex model to improve the current slum upgrading platform within a new perspective that embraces a long term adaptive vision and redefines the role of formal and informal actors as agents of change in a co-creation process.

Objectives:

- Reduce the multidimensional vulnerability of informal settlements in Bogotá
- An evolutionary integration of social, economic and environmental systems within the functional dynamics of the formal city.
- Reinforce the endogenous capacities of vulnerable populations in informal settlements.
- Guide the coexistence and resilience of social and ecological systems.
- Redefine the approach and way of intervening in informal settlements in Bogotá.

Conceptual Framework

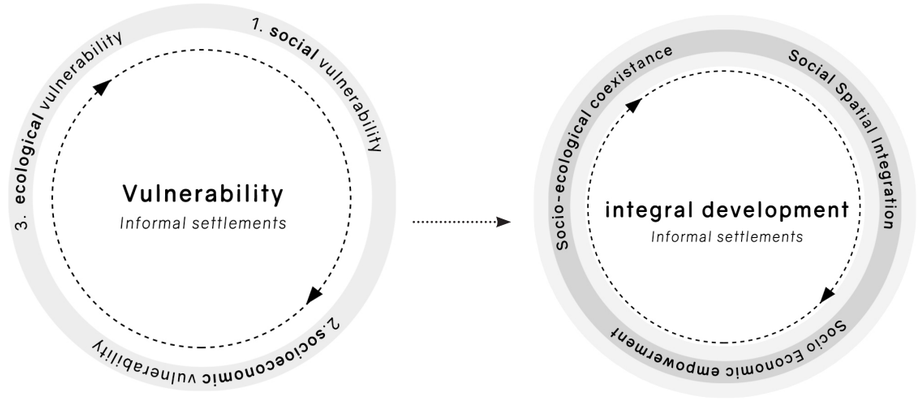
The critical evaluation of the current planning approach, places resilience and the different vulnerability gradients at the core that will guide the cohabitation and co-evolution between social and environmental systems.

The notion of vulnerability is understood as the capacities of communities to react and adapt to external shocks in its environment, and therefore resilience as the capacity to preserve and transform the system (Brunetta, 2019)(Kelly & Adger, 2000).

In order to analyze the systemic challenges and the local capacities to counteract them, the understanding of the vulnerability in informal areas will be analyzed in three main groups: social vulnerability, socioeconomic vulnerability and ecological vulnerability.

Three concepts are placed as the the final objectives regarding the vulnerability analysis, supporting from a theoretical point of view the needed actions and transformations in the social, economic and ecological domain.

Fig. 4.2 - Problem Field and Proposed Concepts



Socio Spatial Integration

The objective regarding socio/spatial Integration aims to permeate the social and spatial barriers in Bogotá, and integrate the vulnerable populations and informal fabric within the functional and structural systems of the city. This integration considers the physical and the planning scope, exploring the co-creation and the collaborative participation between formal and informal agents as crucial elements in order to achieve a evolutionary integration of social and spatial systems.

Objectives: Sharing, Collaboration, Inclusion

Socio Economic empowerment

The notion of social economy and therefore the empowerment of low-income populations, the diffusion of innovation strategies, the co-production of knowledge and space, the implementation of new forms of organization, new development management policies and the synergy of these strategies with other functional systems of the city (Barquero, 2007) are some of the socio economic objectives and initiatives that should be implemented in the proposed systemic operations at multiple scales.

Objectives: Opportunities, Autonomy, Cooperation.

Socio Ecological coexistence

The socio-ecological approaches to resilience, defined also under the notion of 'evolutionary resilience', acknowledge that society and nature are interdependent systems. This conception introduces a dynamic interaction between persistence, adaptability, and transformative capacities across multiple scales and time frames, within more interactive and imaginative planning systems. Therefore, this notion naturally rejects rigid methods of space planning and focuses in a greater extent on the source of creativity required by the ubiquity of change and its intrinsic uncertainties

Objectives: Adaptability, Preparedness, Creativity

Adaptive Strategic Framework

The multiple social, economic and environmental problems and challenges in contemporary cities have led to a rethinking of the way in which governments manage environmental resources and how they approach urban socio-economic structures. During the last decade, the concept of adaptive governance has been proposed as an alternative to the traditional prediction and control regime, focused on self-organization through flexible institutional arrangements that foster innovation and resilience (Rijke, 2012). The vicious cycle of socio-spatial and socioeconomic exclusion, related to conventional forms of public administration, can be addressed in an innovative way from the adaptive governance approach.

Therefore, it requires the cooperation and correlation of formal and informal systems for their operability (Leanne, 2013). This framework could accommodate informal and local solutions within more formal functional and governance structures in the city, creating new opportunities networks and new interactions with the formal functional urban structure. Exploring the management of the negotiated processes between informality and formality can provide clues in order to reformulate the current system dynamics towards an adaptive and a resilient process, in which a change in one of the variables will generate multiple impacts on the others and awareness in a state of uncertainty (Dovey, 2012).

Each informal settlement has different living conditions and fosters different day life patterns. This unique and changing condition requires strategies that are specifically adapted to the needs of the particular local situation. In turn, this type of approach requires a balance in power and responsibility relations between government structures, local communities and other actors involved in the process, which, depending on the context and their needs, can vary and adapt. Therefore, flexibility and an adaptable assessment is an indispensable part of the change implementation process. The shift of the idea of categorizing communities as passive beneficiaries, to empowering them inclusively as active partners in decision-making and in improving their socio-economic and socio-spatial conditions is needed (Leanne, 2013).

The governmental management of a complex system, from an adaptable perspective, is based on one hand on the knowledge acquired by the experiences and the lessons of the process and on the other hand on organizational theories. The former is based on including at multiple scales the dynamics and impact of socio-ecological processes in management structures. This in order to adopt a process of learning and continuous adaptation and adjustment. The latter, based on the organizational theories, focuses on the need to achieve a balance both in power relations, responsibilities attributed to the different communities, government agencies and other bodies involved.

This approach is focused on managing a process rather than an architectural end product. Through a flexible management multiple networks and actors are receptive to change as opposed to traditional forms of administration and public planning (Leanne, 2013). This type of planning framework, requires an adaptive long term perspective vision , that is not visible in the actual planning framework in Bogotá.

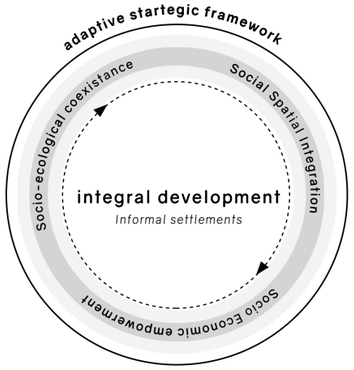
Informal urban settlements are complex systems (Dovey, 2012) and both, their analysis and possible interventions, require flexible and negotiated participation and collaborative management. The theory of complex adaptation systems (CAS) analyzes the dynamics of complex systems and where both the functioning and the performance of the system depends on the interactions between its component parts. These systems are characterized by their non-linear processes, their diversity of agents, their multiplicity of approximation scales and their components of self-organization and emergent features (Wohl, 2018).

The concept of integration is based on understanding the different dimensions that should be part of a development policy to counter exclusion. In order to do this, the proposal starts by addressing the problems enunciated in the exclusion cycle with three concepts that will structure the projected strategies. Socio spatial Integration, Socio Economic empowerment and Socio ecological coexistance are the three pillars that will structure the adaptive actions and policies to be implemented. The following section will explain each of the notions in relation to its theoretical supporting framework.

Social and natural dynamics are in a constant state of change, making them complex systems. The planning system in Colombia, and specifically the slum-upgrading programs, can be considered as strategic when devising planned interventions to tackle specific social, ecological and economic challenges associated with informal settlements. The difficulty, and the attempt to revisit the idea of strategic planning, is focused on the fact that these strategies do not consider the evolutionary and adaptive nature of these environments, as they are focused on the development of punctual interventions in a short term perspective. This type of interventions are not sufficient in situations of such complexity and rapidly advancing inequality. Thus, it is necessary to generate integration, active participation and empowerment scenarios oriented towards adaptive and flexible processes in a long-term perspective.

The proposal of an adaptive strategic framework is rooted in the premise of building a process that fits in with existing planning instruments in Bogotá, one that can be considered a management and handling model replicable in a number of settings under a longer time-frame of development. This standpoint should address comprehensively the social, economic and environmental spheres. In this way, projects are able to consider all the necessary aspects to achieve structural change, while flexibility can be directly translated into the dynamic and evolutionary nature of local developments.

Fig. 4.3 - Conceptual Approach diagram



c. Research questions

How can an adaptive strategic framework create a new spatial and planning vision for vulnerable areas in order to achieve a sustainable, dynamic and cohesive urban environment in the city of Bogotá?

Sub research questions

The sub-research questions are structured to guide the analytical, design and evaluation process of the thesis. Through the questions categorized in the analytical framework, the aim is to achieve a critical assessment of the current planning framework in Bogotá, highlighting the shortcomings and challenges in identifying and counteracting the main problems of these areas. The questions categorized in design framework aim to formulate and design an alternative methodology to counteract and improve the conditions of vulnerability in informality.

By considering an adaptive and evolutionary approach over time, the evaluation of the proposal will aim to answer questions regarding the flexibility and adaptive capacity of the proposal.

Analytical Framework

- SRQ1 — ***What are the main challenges and contributions of the current up-grading program in Bogota?***
- SRQ2 — ***What are the conditions that contribute to the vulnerability of infor-mal settlements in Bogota?***

Design Framework

- SRQ3 — ***How can an adaptive strategic framework contribute towards socio eco-logical resilience of informal settlements?***
- SRQ4 — ***Until what extend can the co-creation between formal and informal agents guide an evolutionary transformation of informal settlements?***

Evaluation Framework

- SRQ5 — ***How can an adaptive strategy integrate formal and informal dynamics in Bogota and counteract socio-spatial segregation?***
- SRQ6 — ***To what extent does the proposed model have the capacity to adapt and counteract uncertain risks?***

5. Theoretical Framework

Overview

The socio-spatial and socioeconomic fragmentation between the formal city and the informal city is evidence of the failure in the urban planning sphere to recognize informality as part of the city's operational and organizational system. The impossibility to access the city' s functional structure leads to a multidimensional vulnerability, which today finds an answer through improvement programs in generic and punctual interventions without a real consideration of the daily life systems and dynamics. This mode of "stamp urbanism", is focused primarily on housing needs and does not consider the particular situation of these populations in order to provide opportunities and generate comprehensive responses in improvement projects. (Sepulveda, 2016)

Strategic Framework

The urban space should be a common arena that provides the capacity and opportunities to evolve and transform in time. The evolutionary transformation of the existing environment in time should provide more equal and sustainable opportunities in society over time. The proposed framework seeks to find planning and urban design strategies that demonstrate the urgency and need to integrate vulnerable populations into the functional structure of the city. The integration of the values and particularities of the informal city, as well as the ideas and daily life systems of the populations in these environments, are indispensable at the time of implementing these strategies. The idea of integral improvement should not be defined by means of an imposition of formalization and legalization strategies, but should consider both the contributions and the needs of these populations to generate a coherent response with the environment.

Adaptability of the framework

The critical assessment regarding the multidimensional vulnerability is dynamic and diverse depending on the contextual particularities and require a critical analysis that embraces this particular challenges as potential lines of development. One of the major flaws of these programs is to optimize processes and, as mentioned above, to stamp a solution focused on residency to different environments.

Chapter Structure:

a. Concept: Socio Spatial Integration
Theories:
- Social Cohesion (Fonseca, 2019)
- Urban Integration (Jimmy, 2019)

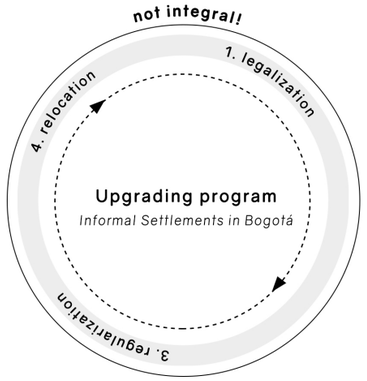
b. Concept: Socio Economic empowerment
Theories:
- Economic Infrastructure (Marx, 2011)
- Endogenous development (Baquero, 2007)

c. Concept: Socio Ecological Coexistence
Theories:
- Evolutionary Resilience (Davoudi, 2013)(Nunes, 2019) (Masnavi, 2019)

d. Concept: Adaptive Governance and expanded Strategic approach

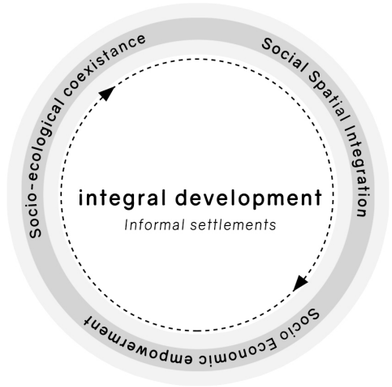
Research Structure

Problem Statement



The problem and starting point of the project is focused on the shortcomings of the upgrading program of informal settlements in Bogotá. The established strategies are focused in the formalization and legalization processes of the neighborhoods, in the regularization of public services and in the improvement of housing units. It is important to clarify that despite being important actions to improve the quality of life of the family or neighborhood that is part of the program, these strategies are not comprehensive and do not consider social and economic aspects when providing opportunities for integration and empowerment to vulnerable populations. In turn, these programs improve housing, but do not generate a real integration of these areas to the functional structure of society. In this way, the problems of spatial fragmentation and social segregation, such as poverty and lack of opportunities, persist.

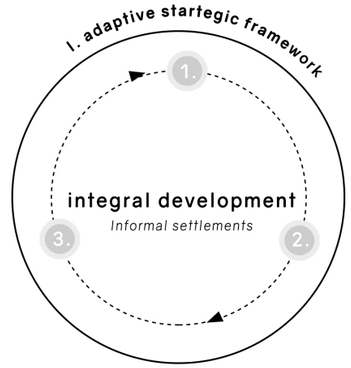
Research Aim



Conceptual Framework

The Objective is focus in reformulating the current programs around informality in Bogotá, in order to establish a common frame to counteract the spatial and socioeconomic segregation in the city. The aim is to enhance the adaptability, particular characteristics and specific needs of each area, and thereby achieving a comprehensive policy for vulnerable populations.

Theoretical approach



The theoretical framework is focused on supporting the objectives enunciated as part of the proposal for an adaptive strategic framework. Each objective is focused on enhancing Bogotá's current improvement program by deepening the social, ecological, economic and spatial dimensions of the problems in vulnerable and low-income environments. Several theories were proposed to support and explain each objective.

1.
- Social Cohesion (Fonseca, 2019)
- Urban Integration (Jimmy, 2019)

2.
- Economic Urban Infrastructure (Marx, 2011)
- Endogenous development (Baquero, 2007)

3.
- Evolutionary Resilience (Davoudi, 2013)(Nunes, 2019) (Masnavi, 2019)
- Complex Adaptive Systems (Dovey, 2012)

I. Adaptive Governance (**Leanne (2013) (Adger, 2012)**

a. Concept: Socio Spatial Integration

Socio-spatial Integration

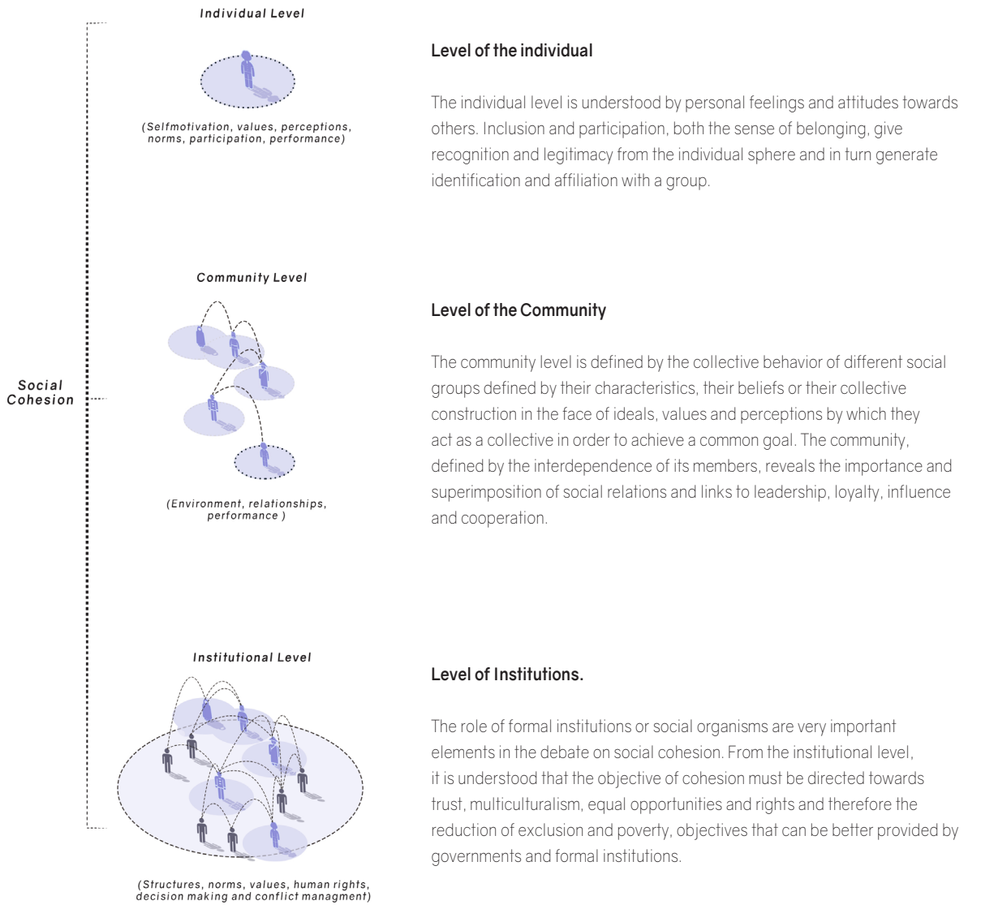
Social cohesion revisited: A new definition and how to characterize it (Fonseca, 2019)

Urban organization and the imbalance in their socio-economic systems have had an enormous impact on social segregation. The social construction around cohesion is complex because it depends on multiple geographical, political, economic and cultural factors, despite always having the common goal of creating a society in which individuals can coexist and interact regardless of differences. This concept is a key feature in addressing social resilience and its dimensions.

The analysis presented by Xavier Fonseca (2019) exposes the perspectives for studying social cohesion, and the levels at which it occurs and which should inherently be considered in order to acquire a global understanding of the complex construction of this concept.

This levels and possible factors related to cohesion, in the context of resilient cities, are described below.

The text has been very useful to highlight the necessary social levels and components required to establish integration between society and space. The conditions for establishing the necessary coexistence and dynamism in a space are generated from the individual sphere to the public and municipal sphere. The interrelations of individuals and their appropriation or perception of their environment can be a key tool when it comes to building an integrated and sustainable environment.



Level of the individual

The individual level is understood by personal feelings and attitudes towards others. Inclusion and participation, both the sense of belonging, give recognition and legitimacy from the individual sphere and in turn generate identification and affiliation with a group.

Level of the Community

The community level is defined by the collective behavior of different social groups defined by their characteristics, their beliefs or their collective construction in the face of ideals, values and perceptions by which they act as a collective in order to achieve a common goal. The community, defined by the interdependence of its members, reveals the importance and superimposition of social relations and links to leadership, loyalty, influence and cooperation.

Level of Institutions.

The role of formal institutions or social organisms are very important elements in the debate on social cohesion. From the institutional level, it is understood that the objective of cohesion must be directed towards trust, multiculturalism, equal opportunities and rights and therefore the reduction of exclusion and poverty, objectives that can be better provided by governments and formal institutions.

Fig. 5.1 - Framework to characterize social cohesion. Made by author based on Social cohesion revisited: a new definition and how to characterize it. Xavier Fonseca 2019

a. Concept: Socio Spatial Integration

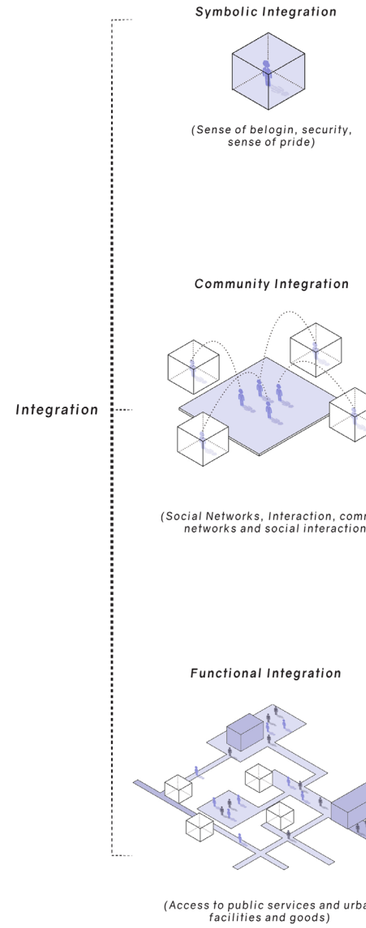
Socio-spatial Integration

Urban fragmentation and the analysis of the concept of integration
Spatial Patterns of Residential Fragmentation and Quality of Life in Nairobi City, Kenya (Jimmy, 2019)

Urban fragmentation is an increasingly common phenomenon around the world and is associated with rising inequalities and socio-spatial exclusion among urban population groups. In the range of spatial and social disparities, most evident in the global south, low-income residents are most affected by social problems of insecurity, exclusion, lack of resources, disconnection, lack of opportunities and access to services, among others.

Social exclusion and informality reveal gaps in wealth possession and inequality in social status. Several authors recognize fragmentation as the main agent of the proliferation of informal settlements, while others assert that informality is the result of this fragmentation (Jimmy, 2019).In fact, what is clear is that there is an interrelationship between fragmentation and social status and that spatial barriers have negative impacts on access to city opportunities and services. To address this phenomenon and to take a step towards inclusion, a holistic and integrated approach is required. This in order to change the social perception of space, as well as its function and use.

To this end, Eunice Jimmy (2019) proposes comprehensive urban planning as an approach to address the complexity of an informal settlement (in the paper located in Nairobi, Kenya). This type of integrated planning focuses on socio-economic, political and technological issues in vulnerable settlements and establishes different types of integration as the pillars for achieving better quality of life and connections between the formal and informal cities.



Symbolic integration (Sense of belonging):

The analysis shows a correlation between symbolic integration and quality of life with housing and security in slums. Individuals satisfied with their housing also have a sense of belonging to their neighborhood. In other words, individual attachment and belonging to their property generates a feeling of identification and belonging with the community.

Community integration (Social networks):

Community integration depends on the interactions and non-hierarchical contacts of different social groups. They are social ties created, the recognition of the role as an equal member and contributor in the social spatial construction of an environment, is a key element when approaching the urban integration of a community.

Functional integration (Access to public services and facilities):

Functional integration refers to the ease of access to opportunities and facilities that exist within cities. The distance and quality of opportunities, access to services and institutional management, both private and public, are keys to a process of integration.

The typologies of integration, as well as the levels of cohesion discussed above, reveal the need to address the problem from a variety of approaches. The notion of identity and the social interrelations established in an informal neighborhood are key elements when it comes to proposing a socio-spatial urban integration. To this end, it is recognized that functional integration, or the institutional level of cohesion, is only one of the actors that must participate when it comes to breaking down both social and spatial barriers resulting from inequality and exclusion.

Fig. 5.2 - Integration Dimension and Indicators . Made by author based on Spatial Patterns of Residential Fragmentation and Quality of Life in Nairobi City, Kenya. Eunice Jimmy (2019)

b. Concept: Socio Economic empowerment

Socio-economic empowerment

Long-Term City Visioning and the Redistribution of Economic Infrastructure (Marx, 2011)

The inability to incorporate the economic action capacity of low-income populations when dealing with poverty and inequality has led to an unequal distribution of opportunities in the city. Municipal strategies continue to concentrate productive public investment in formal areas of the city that are already considered growth-enhancing. Areas of the city that are inhabited by poor people will continue to be economically marginal as the opportunities and evidence on which to build strategies that invest directly in the economic agency of the poor are restricted (Marx, 2011). Thus, in those territories with strong socioeconomic inequalities, and where integration processes have not improved equality, their continuity over time tends to create socioeconomic institutions that favor the most influential interest groups (Barquero, 2007).

The understanding of the economic agency of poor groups is conditioned to the notion of economy and to the existing patterns of urban distribution. Understanding the socio-spatial correlation behind socioeconomic inequities can open possibilities for alternative possibilities regarding the creation of resilient and sustainable urban configurations (Marx, 2011). As Edwuard Soja states, spatial problems do not replace class analysis, but they can be an integral element in understanding social inequities and class struggle in modern capitalism and production relations. The structure behind the urban distribution of agents establishes the social division of the city and at the same time the economic disparity. The socio-spatial dialect thus represents a call for the re-inclusion of socially produced space as something more than an by-product, suggesting that social classes have a complex interrelation and are interdependent to generative economic structures (Soja, 1980).

So, it is established that governmental and planning agencies have a responsibility to invest and maintain social and economic infrastructure and provide a platform for economic growth, as well as the responsibility to coordinate a spatial redistribution of investments. Such strategies must confront existing complex models and patterns, where attempts to alter fragile agreements and relations are resistant to change (Marx, 2011). Resistance to change must be approached under a process of progressive and incremental transformation (Dovey, 2016), where it is necessary to go beyond the notions of formality and legality, in order to realize the process in which the dynamics are organized and related in space. The urban environment and the opportunities that are provided would be constructed by means of decisions of the people that live there without the rigid imposition of a norm. Space is then considered as a cooperative process that responds to the needs of those who inhabit it, rather than a fixed and stable architectural result.

Endogenous development. Theories and policies of territorial development (Baquero, 2007)

Endogenous development is an interpretation that analyzes a complex reality in order to adapt to its socioeconomic needs, recognizing its processes, cultural values and institutions. This type of development seeks to find more flexible forms in the territorial organization of production. For this it is necessary to reformulate the variables that are part of the economic analyses of a territory and the recognition that the socio-cultural and institutional components have a strategic value in the processes of evolutionary development and resilience of a city. To this end, local development initiatives can be considered as one of the answers to the problems and challenges related to socio-economic integration and urban equity (Barquero, 2007).
The fundamental characteristic of an endogenous development policy is that local initiatives aim to influence the forces and mechanisms that determine the process of capital accumulation. This policy should act in an articulated way on all the development mechanisms, improving the interrelations between them and thereby generating a sustainable development of a part of the city, understood as an indispensable part of a wider urban complex system. (Barquero, 2007)

The notion of social economy and therefore the empowerment of low-income populations, the diffusion of innovation strategies and the co-production of knowledge and space, the implementation of new forms of organization, new development management policies and the synergy of these strategies with other functional systems of the city (Barquero, 2007) are some of the socio economic objectives and initiatives that should be implemented in an Adaptive Strategic Framework.

Endogenous development policy argues that development initiatives differ from one territory to another. Whatever approach is adopted, development policies must be built on the correlation of economic, social, environmental, institutional, urban, political and cultural factors that are uniquely combined in each territory. (Barquero, 2007) This approach, considered as flexible and moldable, not only manages what could be a policy of improvement of an informal settlement, but goes beyond the integration and empowerment of the vulnerable population to the functional dynamics of what is considered the formal city. Embracing complexity is therefore based on considering the particularities of each area, the scales of correlation, and the multiple layers and interconnections that influence and compose a territory. (Leanne, 2013)

The process of economic integration, discussed as an example of the multiple interventions that could be explored under the notion of adaptability and resilience, makes it possible to analyze urban development processes, propose viable solutions to the challenges of contemporary cities and learn in the process. The eradication of poverty and structural change in informal settlements from an integral perspective should be one of the main objectives of urban policies nowadays. (Barquero, 2007)

c. Concept: Socio Ecological coexistence

Socio-ecological coexistence

Evolutionary resilience

- **Evolutionary Resilience and Strategies for Climate Adaptation (Davoudi, 2013)**
- **Does a review of urban resilience allow for the support of an evolutionary concept? (Nunes, 2019)**
- **Exploring urban resilience thinking for its application in urban planning: a review of literature. (Masnavi, 2019)**

Firstly, it is paramount to state that resilience is a scientific concept applied to several disciplines of knowledge. Masnavi quoting Alberti's famous definition, points that resilience is "[...] the extent to which a system is capable of absorbing risks and reorganizing itself." (Masnavi, 2019). Accordingly, resilience has been understood as a framework or capacity to effectively manage unforeseen challenges and risks associated with complex systems. The resilience thinking approach evokes the cumulative and self-reinforcing effects of diverse problematics, imbalances, and hazards as an interlinked system (Leanne, 2013) with the capacity to absorb risks and disruption and the adaptive capability towards change, while maintaining and improving the system's essential functionalities (Masnavi, 2019). In this sense, considering that the concept of resilience encompasses changes, this notion leads to planning that focuses on uncertainty, which is a novelty in relation to traditional urban thinking (Nunes, 2019).

Furthermore, from a doctrinal point of view resilience has been defined and catalogued in three main notions, as follows: 'engineering resilience', 'ecological resilience' and 'socio-ecological' or 'evolutionary resilience'.

The socio-ecological approaches to resilience, defined also under the notion of 'evolutionary resilience', acknowledge that society and nature are interdependent systems. This conception, challenges the notion of a stable equilibrium of both 'engineering' and 'ecological resilience' by introducing a dynamic interaction between persistence, adaptability, and transformative capacities across multiple scales and time frames, within more interactive and imaginative planning systems. Therefore, this notion naturally rejects rigid methods of space planning and focuses in a greater extent on the source of creativity required by the ubiquity of change and its intrinsic uncertainties (Davoudi, 2013).

In the same vein, the limited focus on social processes in the 'engineering' and 'ecology' stream of resilience has both positive and negative impacts on resilient processes. Which is certain and somehow disconcerting is that memories, local capacities, networks, and cooperative relationships [the intentionality of human action and intervention] have received little space at the time of devising strategies to foster resilience. In this regard, it is appropriate to consider that in addition to the phases of adaptability, persistence, and transformability, a phase of 'preparation' [as entitled by Simin Davoudi], must take a major place in the formulation of urban development strategies (Davoudi, 2013).

In a social context, the importance of incorporating technologies, forecasts, human learning, and even ingenuity is understood and necessary. Thus, complex adaptive socio-ecological systems can become more or less resistant depending on their capacity to be prepared, to be persistent and robust, to be flexible and adaptable, and to be innovative and transformative. These attributes can be achieved through social learning, increasing the possibilities of resisting or absorbing disruption, without crossing a threshold into an undesirable and possibly irreversible trajectory, and moving towards a more desirable path. This through creativity and imagination at the institutional, community, and individual levels and by means of cultivating flexibility, creativity and the multi-scale capacity for cooperative initiative. 'Evolutionary resilience' promotes the institutionalization of the awareness of the dynamics of adaptability as a way of improving preparedness and, with it, the ability to influence the direction of future transformations (Davoudi, 2013).

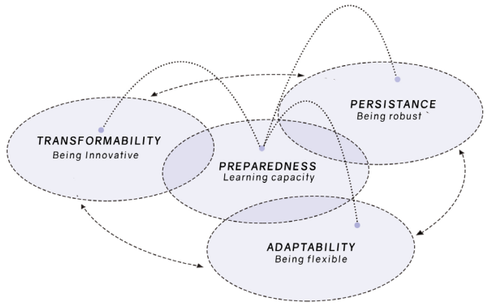


Fig. 5.3 - Dimensional Framework for resilience building. Source (Davoudi, 2013), diagram made by author

In this sense, the socio-ecological dimension has become an essential concept for cities and urban development, due to the aforementioned problematics i.e. exceptional agglomeration of population in the city and economic activities, which leaves the cities exposed to diverse and greater risks with potentially demolishing consequences. In other words, to ground somewhat the theoretical discussion, the concepts of resilience, risk, and vulnerability must be related to social systems and to the opinions and needs of the populations, as well as to the natural systems and physical assets (Leanne, 2013). To a greater extent, this 'socio-ecological' or 'evolutionary resilience' allows more comprehensive and flexible analyses. Urban resilience challenges traditional urban planning, and environmental management strategies, to be integrated as single concept or combination of different approaches towards resilience. The uncertainty and dynamism of the future can be better, and more accurately, addressed through an integrated view of 'evolutionary resilience' that enables the discovery of challenges, opportunities, and applicability in urban planning and development (at 428) (Nunes, 2019).

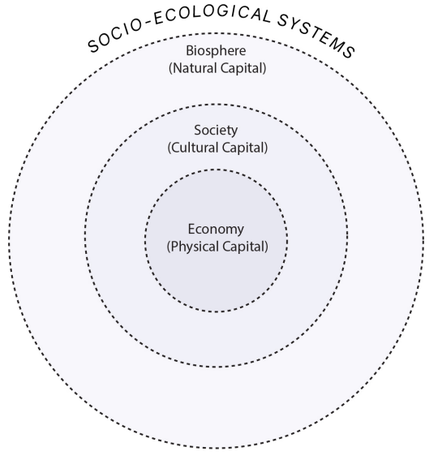


Fig. 5.4 - Interlinked social-ecological systems. Source (Lade, 2017), diagram made by author

In the same line of argumentation, resilience has become a useful concept in urban planning, and especially as a light in the traditional debate between formal and informal development, for the following reasons. Firstly, it emphasizes the need to consider human settlements and the inherent risks to which they are globally exposed, understanding that economic, social, cultural and environmental problems are interrelated. Secondly, it underscores the imperative need to interpret the dynamics of informal settlements in the context of wider urban areas and in the long-term framework of urban transformation. This, because informal areas are located within, and shaped by, larger and more complex systems. Lastly, resilience naturally is aware of the existence of retroactive effects, or perverse circles, that can destabilize and alter the development trajectories of systems, with the potential to lead them to a crisis. These informal settlements must be improved and transformed over time into more secure and prosperous communities, without eliminating their weak social fabric. In this way, resilience will depend on taking advantage of possible [positive] external connections and on the capacity to transform the processes that cause vulnerability (Leanne, 2013) . To sum up, the crucial features in the notion of resilience as a correlated to social and ecological aspects, as proposed by Davoudi, are focused on the intentionality of human actions, the possible outcomes of the resilient process, and to the influence of power and politics in planning and decision making in order to respond effectively to challenges (Davoudi, 2013).

These social science methodologies have been oriented towards the analysis of complex systems, characterized by nonlinear dynamics and unpredictable trajectories and results. These dynamic systems are increasingly examined from a multilayered and multi-stakeholder perspective, and address issues such as endogenous growth, evolutionary behavior, and resilience (Reggiani A., 2001).

Complex Adaptive Systems

Dovey, K. (2012). Informal Settlement and Complex Adaptive Assemblage. International development planning Review, 34, 371-390.

- (2012). Informal urbanism and complex adaptive assemblage. International Development Planning Review 34, 349-368.
- (2016). Incremental Urbanism: The Emergence of Informal Settlements. In K. H. Olsson, Emergent Urbanism : Urban Planning & Design in Times of Structural and Systemic Change (p. Part I. Chapter 6). Ashgate.

The theory of complex adaptation systems (CAS) analyzes the dynamics of complex systems and where both the functioning and the performance of the system depends on the interactions between its component parts. These systems are characterized by their non-linear processes, their diversity of agents, their multiplicity of approximation scales and their components of self-organization and emergent features (Wohl, 2018). These components are independent, but at the same time they depend on and adapt to each other in an unpredictable and uncertain way.

Assembly thinking implies a non-linear logic in which the order of the city emerges unpredictably from multiplicity; spatial thinking and design thinking can incorporate such non-linear logic. Changes at one level of the system can have great impacts on the whole functioning, just as large plans can be truncated by small elements and functions in parts of the system. The understanding of the whole system starts from the adaptation and the organization of its parts, where certain patterns can emerge with characteristics linked both to the process and to the environment in which the processes took place, which in this case can be interpreted as the interdependence and relationship between the formal and informal spheres in the emerging regime. (Dovey, 2012)

The unpredictable nature of the development and adaptability of the system are linked to the interconnection and resilience of its assemblies. The ability to adapt to change, without losing its identity or falling into a completely new regime, demonstrates the dynamic quality in the notion of system resilience. The dynamic capacity in the different states of adaptation shows again the importance of the process and not of the result, and as informality has achieved by means of flexibility in its nature of development to generate a social and formal environment in constant evolution and vitality where the complexity in its assemblages has generated multiple forms of adaptation (Dovey , 2012).

Understanding how negotiated processes between informality and formality can be managed can provide clues for reformulating current system dynamics towards adaptation and a resilient process. Urban variables such as land, economic vitality, architectural norms, social mixes, transport, etc. such as governance levels and types have various assemblage options in order to generate a resilient process within the informal system and in its relationship to the formal system. Changing one of these variables will generate an adaptive process of the others. The provision of tenancy or formal ownership of a house to a member of the informal settlement can generate an economic dynamic of both sale and rent of the property.
The diversity and redundancy of the system are the factors that determine its resistance to change and adaptation. Redundancy, understood as the capacity of the system to function in many ways in relation to functions and flows, generates greater productivity in change. Redundancy and its relationship to the resilience of the system are overshadowed when formal planning seeks optimal efficiency of the system (Dovey, 2012).

The phases of growth, conservation, liberation and reorganization defined in the cycles of change and innovation in CAS can be linked to the dynamics of the informal development process. The growth phase is clearly linked to the initial informal invasion of the territory. The conservation phase is understood as the moment of consolidation of these settlements, the improvement in infrastructure and the formalization process that generates the loss of adaptability. The following phases of liberation may be linked to demolition and resettlement processes that are not the usual case of evolution, and the process of reorganization as the creative emergence of a new order.

These cycles of change are linked to different hierarchies of scales in which interconnection occurs horizontally as well as vertically. Informal settlements and their resilience can only be understood under a multi-scale approach as this same can occur or stagnate at any level. On a larger scale, the interface between the formal and informal city is evident, but on a smaller scale it is where the individual's relationship with his or her urban environment is understood. Given the transversality of the process and the multiplicity of directions and the unpredictable nature of the change, the author proposes a change in the approach of the system. The understanding of the notion of system is identified as the top-down control of the state and the market, linked to formality. This is why the concept is translated into "complex adaptive assembly" which evidences synergies and negotiation between formal and informal practices (Dovey, 2012).

Assembly, like CAS, understands multi-scale and mutlidicsciplinary relationships and the importance of minor scale in adaptation processes. The theoretical frameworks focus on understanding the relationship and dynamics of scales and the impacts of small interventions on emerging effects at higher levels, where informality is assembled through multiscalar connections, both physical and intangible. Informality, not understood as the illegal, vulnerable and poverty condition, is a fundamental tool for the functioning of complex adaptive assemblages. Understanding the dynamic processes of urban assembly between the informal and the formal is the first step in proposing sustainable interventions and strategies. The crucial issues of research lie in the myriad of ways in which the formal and the informal are intersected, not from a perspective guided by outcome design but

Theoretical Framework Overview

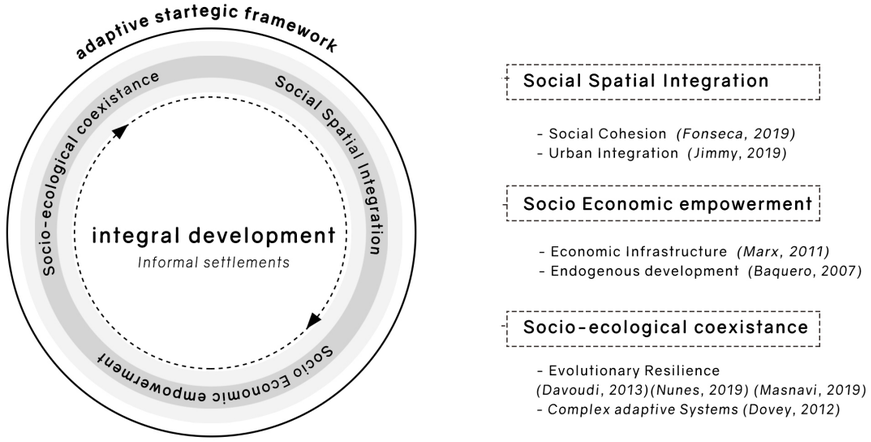


Fig. 5.5 - Conceptual and Theoretical Framework overview.

The three proposed concepts, which arise from counteracting the vicious circle of exclusion, are supported by the different theories explained throughout this chapter. The policies around informality must appropriate and understand that exclusion must be tackled from different fields simultaneously, and that the integration of society, as well as the connectivity of space and the provision of opportunities are indispensable elements when it comes to improving the quality of life of vulnerable populations.

d. Concept: Adaptive Governance and expanded strategic approach

Adaptive Governance

Adaptive Governance

Leanne (2013). Averting a downward spiral: building resilience in informal urban settlements through adaptive governance

Informal urban settlements are complex systems (Dovey, 2012) and when it comes to analyze them and proposing possible interventions, it is paramount to consider flexible and negotiated participation with stakeholders, pursuing collaborative management. The 'complex adaptation systems' (CAS) theory analyzes the dynamics, functioning, and performance of complex systems as a whole that depends on interactions between its constituent elements. These systems are characterized by their non-linear processes, their diversity of stakeholders, the multi-scalar approximation towards them, and their self-organization and emergent features (Wohl, 2018). In this sense, traditional methods, i.e. normative enforcement and generic and uniform urban development procedures, have proven to be insufficient and lacking a coherent connection with the multiple and dynamic features of informal settlements.

As stated above, the vicious cycle of socio-spatial and socioeconomic exclusion, related to conventional forms of public administration (Leanne, 2013) can be addressed in an innovative way from an 'adaptive governance' approach. This, requires permanent cooperation and correlation between formal and informal systems for their effective operability. With this approach, informal and local solutions could be allocated within functional and more formal governance structures in the city, generating new networks, opportunities, and interactions (Leanne, 2013).

The 'adaptive governance' management of a complex system is based on the one hand on knowledge, acquired by learning strategies and experience and, on the other, through other organizational theories. The former, involves understanding the dynamics and impacts of socio-ecological processes in management structures at multiple scales, in order to adopt a learning, continuous adaptation, and adjustment strategy. The latter, is based in organizational skills, focused on the need to achieve balance in power relations and within the responsibilities assigned to the communities, government agencies, and other stakeholders.

This approach focuses on managing the process rather than the results [i.e. an architectural end product] and explores how through management stakeholders can be permanently involved, open, and receptive to change (Leanne, 2013). Exploring the management of a negotiated processes between informality and formality can provide clues of specific needs and challenges of a place, and therefore turn generic interventions towards a comprehensive strategy. Each informal settlement has different living conditions and fosters different day life patterns. This unique and changing condition requires an adaptable assessment to the needs of the particular local situation and a balance in power and responsibility relations between government structures, local communities and other actors involved in the process. There is a urgent need to shift the idea of categorizing communities as passive beneficiaries, to empowering them inclusively as active partners in decision-making and in improving their socio-economic and socio-spatial conditions (Leanne, 2013).

The concept of resilience depends on understanding and taking advantage of external connections and networks that can potentially have a positive impact and thus be able to generate transformation in the processes that cause the vulnerability of the settlement. Therefore, an adaptive governance framework could foster this process by strengthening local capacities, process that will depend on collaboration among stakeholders, the sharing of responsibility for collective risks (Leanne, 2013). This flexible and committed approach goes beyond the management of informal settlements (Karpouzogloua, 2016) to a multidimensional and multi-scale integration approach taking economic, ecological, spatial and social components in a holistic way into account.

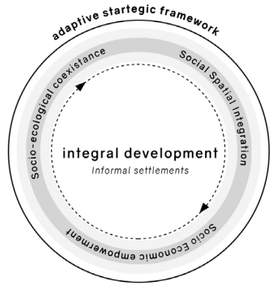


Fig. 5.6 - Adaptive Strategic Framework as the operability guideline of this project

DEVELOPING AN ADAPTIVE GOVERNANCE APPROACH

a. An holistic approach

Several complex strengths and factors influence the development of socio-ecological systems in urban areas. Resilience requires active cooperation between the administrative authorities of the various territories, the Government and other stakeholders. A responsive and proactive approach by the district's housing, planning, engineering, economic development and community protection offices is required to improve the supply of public services. In this regard, it is important to note that the norms, financing standards and regulations, in general, are generally determined by national Governments. In this sense, close collaboration and coordination among the district and local levels with the national sphere is imperative to ensure the required flexibility. The implementation of an adaptive governance approach requires meaningful participation through a dedicated platform that engages key stakeholders and community-based organizations to address problems and gaps in, for example, waste disposal, recycling and collection services, among others. Diligently devising solutions to these sort of complex problems is likely to generate opportunities in terms of employment and income generation at the district and local levels. (Leanne, 2013)

b. Security and social cohesion

In order to achieve progress and investment in a given sector, it is necessary to undertake all the necessary actions to effectively formalize and legitimize the determined informal settlement as a residential area. In addition, it is imperative to provide the residents with the basic rights needed to live properly in the settlement. One essential component has to do with increasing security, since this will encourage the population to adopt a long-term vision and perceive the settlement is their home, even by investing in upgrading their shelters as time passes. On the other hand, there are a variety of costs generally associated with full-ownership of land, including taxes and other services fees and contributions, it might be desirable to adopt a gradual approach to secure the land tenure over time, concomitantly with the rising incomes of the inhabitants, allowing incremental rights towards full traditional ownership of the land as well. (Leanne, 2013)

An interesting and very useful way to promote the active participation of the community is that the authorities work with the local residents to gather reliable data on the area and that the information be collected by members of the community themselves. This type of collaborative work, which could also be called 'co-production', is increasingly being used in practical problem solving by grassroots or community based organizations to achieve better and higher living conditions. Co-production challenges the traditional approaches towards the service provision. This is not a linear process which follows strictly the rules and procedures prescribed from the top, but reaffirms the necessity of social construction and negotiation between all stakeholders (Leanne, 2013).

c. Integrating communities and changing spatial patterns

Installing improved services and the overall upgrading of the informal settlement may require some households to be relocated in order to decrease the settlement's density and reconfigure its distribution. For example, the 'relocation' approach may be aimed at generating space for essential infrastructure and ensuring effective access for service delivery vehicles. The international community acknowledges that, provided community involvement occurs, more significant physical restructuring can be generated through consolidation of land parcels, the creation of new street layouts and land use adjustments. This can liberate land's value and enable the construction of several-story buildings, increasing housing density, while providing more living space for individual households and minimizing health and welfare problems associated with overcrowding. (Leanne, 2013)

In this regard, it is very important to consider population growth, making it particularly relevant to identify some additional land suitable for low-income housing, which ideally is located in areas capable of bridging the fragmented physical and social fabric of the neighborhood. An approach could be to aim for people with reasonably stable incomes to access multi-story rental housing - for example, shopkeepers, domestic workers, security guards. As long as these projects are well designed and formulated, often in partnership with private promoters and inevitably involving adjacent communities, the projects could also attract middle-income residents, fostering social diversity and allowing some cross-subsidization to improve the sustainability of the area by consolidating mixed-income zones. Relocating certain individuals from informal settlements could also release space to enhance housing and economic opportunities for the remaining residents who otherwise might not be employable, thus increasing the value of their assets. (Leanne, 2013)

d. Boosting jobs and livelihoods

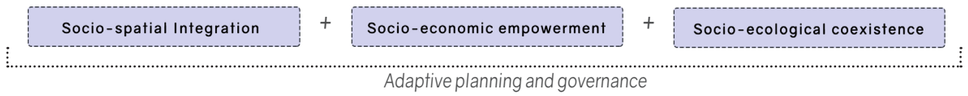
Employability is an essential feature of the renovation efforts in the area. The more jobs available, the less vulnerability, poverty, alienation, crime and all other activities that threaten the peace and tranquility of the communities. Additionally, increased income levels of residents also help to enhance settlement, to the extent that households can afford to pay some service fees and to consolidate their dwellings in the long term. Furthermore, job creation programs in which the beneficiaries actively contribute to the local economy and community are more likely to mobilize tangible support from other communities in the vicinity of the settlement and to extend their welfare measures accordingly. (Leanne, 2013)

It is important to keep in mind that in the long term strengthening and diversifying the local economy and boosting the labor-intensive sectors depends on co-operation with the private sector and the support from national authorities, with the ultimate aim of attracting investment and promoting business expansion. In the short term, a start might be made with the creation of temporary jobs by means of public works programs which transfer skills and experience to community members. One immediate priority should be to make full use of governmental funds for these programs. Second, it is paramount to build a local infrastructure of active labor market services that connects the inhabitants of the informal settlement with jobs beyond the settlement area. This requires systematic information on relevant vacancies in the broader labor market, small subventions to cover transportation costs and employment searches, and access to trainings that provide people with better skills and enhance their employability in a dynamic labor market. A third objective, is to build economic capacity through improving both the quality and quantity of support for local enterprises, whether formal or informal. Appropriate advice and training can contribute to the improvement of their products and services, the enhancement of their financial and accounting skills of these owners, and the improvement of their marketing methods. For these purposes, stronger business planning and management is necessary to help businesses to grow and adapt to changing markets. (Leanne, 2013)

e. Fostering innovation and learning

The claims on public resources from poor communities will continue to be a reality in the near future. Innovation and creativity are very important to meet the growing expectations and new risks to the environment, public health and economy. Through better communication with and trust in public authorities, people could access alternative, less-expensive technologies as temporary solutions. (Leanne, 2013)
Upgrading the area requires a comprehensive approach rather than opting for measures which are not systematic and intended in the short term. This means working closely with the community in order to understand their needs and co-produce solutions. Additionally, this will help in capacity-building and in creating a more resourceful community. It is incumbent upon the district authority to create an enabling environment for action and shared responsibility among its various constituencies, along with private sector stakeholders, NGOs and other government offices. An outward focus is required, as well as a focus on meeting internal challenges, and understanding the dynamics of the settlement itself. Creativity, innovation and flexibility are essential, given the general lack of experience in dealing constructively and purposefully with informality. (Leanne, 2013)

Conclusion - Theoretical Interrelations and Overview



The problem identified focuses on the planning and improvement processes related to informal settlements in Bogotá. It is important to recognize that the current improvement program proposed by the municipality is a strategic plan. This project establishes a problem and some specific areas of intervention, is structured under certain budgets, involves local, public and private actors and proposes a methodology in order to approach and intervene these urban areas. Despite this, it is considered that this planning methodology is structured under short term perspectives without a clear continuity in the development process of this areas and without an integral vision when it comes to improving these sectors.

As explained in the previous sections, the critical analysis regarding these policies focuses on the limited scope when proposing strategies that integrate **socio-spatial, socioeconomic and socio-ecological** variables and objectives within the current strategies. These factors are indispensable in this type of intervention and need to be considered within this planning structures.

The current improvement program, analyzed under the notion of socio-spatial integration, shows that interventions are standardized and do not recognize the particularities of each place. By understanding the dynamics of urban development in Bogotá and by highlighting the great variability of the informal urban sphere in terms of location, degrees of consolidation and the social and demographic composition of each sector (urban poor, migrants, displaced people, etc.), the need to understand and intervene in a specific and responsive manner to the complex social, cultural and economic aspects becomes imperative in contexts of exclusion and vulnerability.

In turn, analyzing the improvement program under the concepts of socio economic empowerment and socio ecological coexistence, it is evident that these proposed interventions have not succeeded in establishing a development process that integrates the economic dynamics and the environmental structures as determinant factors when proposing a physical intervention. Despite the fact that the basis of neighborhood improvement is the fight against poverty and the improvement of the quality of life, the proposed interventions are based on a physical condition that is disconnected from the cultural, social and economic dynamics.

Therefore, when analyzing the program in relation to the three concepts, the disconnection and disarticulation between the proposed spatial interventions and the socioeconomic dynamics, the potentialities of the environment and the socio cultural dynamics of the informal settlements is evident and proposed as a further challenge. (See Figure 5.7).

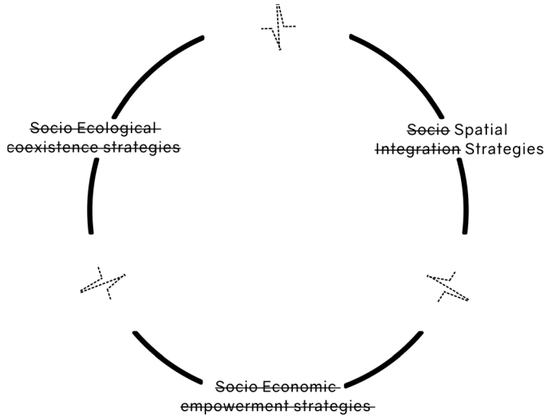


Fig. 5.7 - Disconnection of proposed concepts in the current planning framework in Bogotá.

What if...?

The proposal, focused on the three concepts of **socio spatial integration, socio economic empowerment and socio ecological coexistence**, aims to address the vulnerability and exclusion from an integrated approach, This aspects are indispensable when structuring a policy for a long-term development process.

The interrelation of these concepts highlights the importance of understanding and exposing the socio-cultural conditions as a key element when formulating a spatial intervention. This approach identifies identity, socio-cultural structures, historical context and values as a starting point when evaluating both the ecological potentials in a particular area, and the possible economic networks and interventions related to the functional structure of the city. In other words, interventions must be synchronized and respond coherently to the needs and components that define a specific community and its context.

The intersection between multiple dynamics is therefore a helpful tool in order to address the needed normative challenges, institutional changes and power balance that allow for change and adaption in order to reach social change. Therefore, Adaption is understood as a process defined by knowledge agency and context mediated and manage through power and cultural values. (Nightingale, 2012)

An integrated and coherent spatial intervention cannot be detached from the socio-cultural, economic, and environmental aspects of the informal area. A proposal, focused on the objective of enabling spatial accessibility, must recognize the multiple dynamics and networks that are linked and that are dependent on the physical networks. Understanding and highlighting where a population segment works and their daily life systems is a determining factor when it comes to intervening or proposing urban strategies linked to economic empowerment, public space or the mobility infrastructure (space - economy).

Consequently, the challenge is to recognize the adaptive and evolutionary condition of these heterogeneous conditions, and to seek a planning tool that responds in an evolutionary and flexible manner to these changing and site-specific conditions, allowing a further development and empowerment in a long term perspective. The approach of understanding and decoding strategic planning in Bogotá towards an adaptive approach, seeks to facilitate the interrelation of these three concepts and thereby minimize vulnerability and exclusion. The understanding of the correlation and variability of this strategies seeks to provide development tools that will integrate the informal sectors into the formal urban dynamics, and will provide an alternative planning approach when dealing with informal areas.

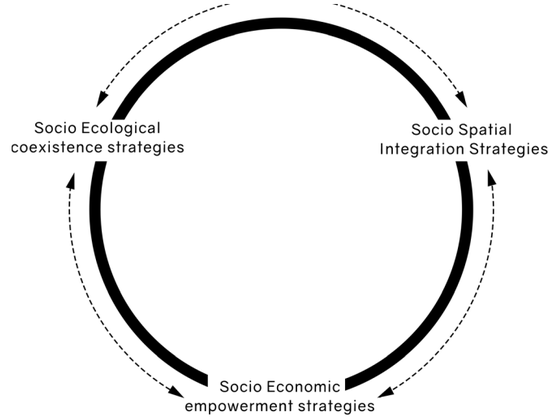


Fig. 5.8 - Proposed integral approach in the planning structure of Bogota.

5.1 Theory Paper

Towards an adaptive strategic framework for urban development

Advocating for a resilient, alternative and democratic path

Paper structure

Sections:

1. Introduction

2. Revisiting the traditional planning and design frameworks in Latin America

2.1. Separation geographies

2.2. Informal insurgency

3. The new political alternatives

3.1. 'Evolutionary resilience' thinking

3.2. A shift to an adaptive paradigm

4. The application of 'evolutionary resilience' and 'adaptive governance' in socio-economic urban networks

4.1. Revisiting the poor's economic agency in Latin America: considering the experience of Medellin as case-study

4.2. The 'endogenous development' and local adaptation strategies

5. Conclusions

5.1. General conclusions

5.2. Final considerations and recommendations

abstract.

Urban informality emerges as one of the main and most diverse ways of producing urban space in contemporary cities and territories, defying formal design and planning processes that have demonstrated nowadays, in certain contexts, a lack of appropriation and connection with the social, economic, political and spatial dimensions. The fast pace and complexity in which cities develop challenge the traditional ways of examining the dichotomy between the notions of formality and informality and the 'functionalist paradigm', which is based on a rigid structure for the control of space (Lutzoni, 2016).

In Latin America, and in general in the global south, urbanization patterns have been characterized by a spatial and socio-political tension between formal and informal development, evidencing the inability of the existing planning and developing frameworks to embody and decode the complex conditions and dynamics that this tension represents (Hernández, 2010). Therefore, currently, it seems appropriate to broaden the definition of the informal beyond the understanding of the phenomenon as the city of the poor and marginalized (Lutzoni, 2016) considering theories which enable more comprehensive and realistic analyses of the subject-matter. This paper will examine and apply the notions of 'evolutionary resilience' and 'adaptive governance' to the current planning and design frameworks, in order to propose a reconfiguration thereof, with the purpose of achieving more comprehensive and democratic development strategies.

Keywords. Formal/Informal development; planning strategies; adaptive governance; evolutionary resilience.

1. Introduction

Nowadays, in most of the cities of the global south, multiple conceptions of urbanism coexist and manifest in the same socio-spatial and political sphere, causing realities that go beyond the scope of the traditional theories used to study urban development. The case of Latin America, in which the analysis will be circumscribed, is pertinent in this respect because the existing urbanization patterns are one of the best examples of the current challenges for urbanism in relation to inequality, poverty, and exclusion, as evidenced in the strong division between formal and informal ways of development and in the fragmentation of the urban fabric. These formal development instruments, traced back to a 'functionalist paradigm' based on a hierarchical idea of control, have proven not to be able to decode the complex metabolisms of the city or territories in every case (Lutzoni, 2016). On the other hand, informality has gained so much ground and strength nowadays that the existing institutional and political attempts of 'formalization' do not seem to be the adequate solution, neither to be sufficient to address the intricacies of reality.

Therefore, the tension between these traditionally bifurcated avenues for urban development reflect an urgent need to re-evaluate and re-envisage the notions of the formal and the informal city from a novel perspective, understanding their complementarity and interdependent condition (Hernández, 2010). This topic is so broad that with the time and space limitations of this paper, it is indispensable to circumscribe the analysis to a specific region, as stated previously –Latin America–, and dimension of urban development, which will be the spatial translation of the socio-economic dimension related to vulnerable communities of informal settlements, in order to be able to delve deeper and offer some sound final conclusions.

In this sense, it is important to briefly contextualize some considerations related to the subject-matter in Latin America and to mention the premises under which the study will be conducted. To begin with, the notion of informality in the field of urbanism is related to the capitalist trend characterized by the marginalization of the migrant population in Latin American cities. Migration, new economic dynamics and emergent territorial organization patterns where the result of the role played by Latin American countries within the 'imperialist' global system. Therefore, the theory of 'dependent urbanization' (Castells, 1973), which will be further analyzed in the next section, intended to introduce the interrelation between the urban and the socioeconomic structure in the informal sphere of cities, not focusing on the 'external' dependence of Latin American countries caused by 'neo-colonial' globalization schemes, but on the 'internal' reproduction of urban inequity (Roy, 2009).

Indeed, these unequal socioeconomic and spatial realities led to the emergence of the traditional binary –formal and informal– configuration of the situation. The urban complexity behind the relationship between formal and informal development is reduced to highlighting the features that characterize its opposite pole. The positive lessons and 'know-how' of the emerging development strategies associated with informality, conducted outside the rigid structure of spatial control, are excluded, denigrated and de-legitimized in many cases. Formality, is understood as the regulated and planned urban sphere contrasted with informality meaning the unregulated and uncontrolled growth of space on the edge of a society. Almost understood as the cure and the disease, the good and the evil. The critical capacity assigned to the two terms is blurred by simplifying and separating the complex condition they represent (Lutzoni, 2016).

Hence, when proposing an alternative approach for the understanding of the formal/informal paradigm it is necessary to abandon the dichotomous approach and rather explore the potential contributions between the two areas of development, exalting their intrinsic values. In this sense, the notion of informality will be analyzed and decoded, not as an opposite of the formal, but as a complementary phenomenon and as an active and valuable process in the development of urban space and its dynamics.

For this purpose, the analysis is composed by a revision of the above mentioned 'dependent urbanization' theory, and by a revision of the unpredicted failures which led to a reconsideration of the role of the State in urban planning strategies, and the importance of participation of various stakeholders in the invention processes. This section aims to show how currently governments are not seen, solely, as the drivers of the economy and/or the architects and urbanists for effective development. Additionally, it is pointed out the importance of considering informality as a 'rupture of power' notion and an 'insurgent' form of citizenship participation (Müller, 2017) [section 2].

The conclusions of section 2 will support the need for seeking new political alternatives that can deal with the complexity of the formal/informal relationships, which must be more flexible and comprehensive in order to address the vulnerable conditions of a specific urban environment (Leanne, 2013). In this endeavor, the notion of 'evolutionary resilience' (Nunes, 2019) (Davoudi, 2013) will be explored, as a tool to understand the complex and multiscalar challenges faced by informal urban settlements, based on the correlation of both socio-ecological and socio-economic systems and on the need to interpret the dynamics within larger and more complex systems. Resilience will depend on taking advantage of possible [positive] external connections and on the capacity to transform the processes that cause vulnerability. Complementarily, the concept of 'adaptive governance' is proposed as the organizational framework, as it recognizes the complexity and the flexibility necessary in the planning strategies, instead of instituting standard procedures. An ideal response requires participation, collaborative management and adaptability to the specific needs and conditions of a place (Leanne, 2013) [section 3].

The following section will demonstrate the application of the proposed theoretical framework [section 3] to socio-economic urban networks. This with the aim to revisit the poor's economic agency in Latin America and test the theory of 'endogenous development' (Baquero, 2007), which comprehends both resilience and adaptive governance elements, as key strategies to counteract and address the unequal balance in the city [section 4]. Lastly, some considerations will be provided as final conclusions, considerations, and recommendations for future studies [section 5].

2. Revisiting the traditional planning and design Frameworks in Latin America

2.1. Separation geographies

Firstly, it is important to point out that the urban structure in Latin American cities has profound relationships with the social structure, usual production practices, and predominant political opinions, interests, and relations, derived from various 'domination' schemes that have shaped the history of the continent. As stated in the introduction, the starting point will be exploring the historical process of the 'dependent urbanization' theory and the spatial patterns which are a consequence of the stance and role of Latin American countries within the neo-liberal and capitalist production systems. This overview leads to envisage a 'common' problematic in the cities' spatial organization and a clear link with the phenomenon of informality or urban marginality (Castells, 1973, p.7).

The 'dependent urbanization' theory can be understood under three main features. Firstly, the accelerated demographic growth and the trend of exponential agglomeration of populations in urban areas (Castells, 1973, pp. 7-15). In this regard, Latin America's populations experienced an extraordinary and overwhelming growth after the WWII, faster than every other region of the world at the time. In numbers, from around 149 million inhabitants in 1950, the population increased to around 352 million in 1980 [more than doubled in only 30 years]. The peak was reached in the first half of the 60s [more than 2.8 percent of accelerated growth] (CEPAL, 2000). This speeded growth evidently brought with it numerous and varied economic and spatial challenges.

Secondly, and intrinsically related to the aforementioned feature, massive migrations in tandem with the social consequences of the continent's integration into the world economy, had an enormous impact on the processes of industrialization, urbanization, and transformation of agriculture. Moreover, this impact was almost equivalent to the dismantling of traditional economical frameworks, which together with rural impassivity, were one of the most influential aspects in the economic and urban dynamics of the metropolis. This, caused as a consequence deep regional imbalances between the city and the countryside (Crosa, 2015). Excluding the integration of migrants into the economic system of cities and the equivalent development of productive capacity, the spatial concentration of the population in the city is defined to a large extent by the expansion of the informal sector. Thus, the emerging urban population is not only the result of the economic dynamism provided by urban structures, but to a greater extent of the rural-urban spillover in search of opportunities. With this understanding, the migratory component is essential to understand the urban growth of Latin American cities (Castells, 1973, pp. 7-15).

Thirdly, the formation of a truncated and disjointed urban fabric can be pointed out as the last feature of 'dependent urbanization' in Latin America. The disproportionate predominance of large agglomerations and the concentration of urban growth in the metropolitan region did not only affected the economic and political management of the countries, but also brought as consequence the enhancement of sociocultural separation between the urban and rural spheres, resulting in the disintegration and fragmentation between them, as well as in the internal composition of the two. This, together with the strong social stratification and the sharp intra-urban differentiation between old and new populations, gave rise to major problems of social segregation and fragmentation of contemporary cities (Castells, 1973, pp. 7-15).

The internal segregation in the urban fabric linked to the absence of an urban planning system, led to the informal constitution of large marginal areas and represents, according to Castells, the most striking phenomenon of 'dependent urbanization'. Only after understanding the processes that gave rise to the emergence of the different modalities of urban development, it is possible to assess the current dichotomy that separates the notions of formal and informal city. However, this perspective, while historically valuable and enriching, must be revisited in order to address deeper the issue from social, economic and cultural scopes that are intrinsically related to urban space.

2.2. Informal insurgency

From a historical-economic point of view, linked to the aforementioned 'dependent urbanization' theory and its segregating consequences, it is important to point out that in the last decades Latin America has seen the expansion of the so-called 'financial capitalism', which ironically has seen by several scholars as considerably unproductive. As neoliberalism started to expand wildly most countries were confronted with new challenges: inefficient and corrupt political regimes, stagnation of national economies, and the failure of development decision-makers to formulate adequate development policies. Therefore, as mentioned in the introduction, these unintended setbacks led to rethink the role of the State within urban planning strategies. It can be said that, currently, governments are no longer considered as the only motor of the economies, nor the architects and urbanists of development (Smith, 2016).

As stated by David Harvey, this new era has seen a shift from urban 'managerialism' to urban 'entrepreneurialism', understanding the State role only as one of the several stakeholders of the market system, rather than a regulator and having its traditional leading role (Roy, 2009). These circumstances, to a large extent, led to seeking new political alternatives that could embrace this new condition of co-production and cooperation between different agents (Smith, 2016).

It can be said that informality is commonly the main path for the production of metropolitan space and urban planning in most of the Latin American cities. In this sense, informality should be seen as a 'structured' field itself, through the application of different methods and procedures with social, expansive, and extra-legal parameters. Then, informality moves beyond being just an economic variable and becomes a complete discourse of urban resistance to hegemony and an original and autonomous way of producing space (Roy, 2009) (Müller, 2017). These multiple variables had led to a disproportionate invasion of the urban poor through the construction of far-reaching survival strategies in the peripheries of cities, which has been described as an "insurgent form of citizenship" (Holston, 2008), arising in unregulated environments as part of the struggle to belong to the urban and functional structure of the city. Consequently, informality should not be understood just as an indicator of how the poor are urbanizing, but as a power struggle. Peripheral suburbs have become emblematic settings

in which inhabitants claim their right to live in the city (Lefebvre, 1968). This vindication of urbanity in the peripheries is also one of the causes of segregation within informal peri-urban environments and turns out to be a more pressing problem for social cohesion (Müller, 2017).

Social fragmentation and the enhancement of democratic governance have led to the decentralization of public administration. The centralized state crisis as a protectorate has transferred political responsibilities and actions to social movements, considered as public forums in which groups can better express the collective and pluralistic identities of the populations that they represent. These emerging social movements constitute the beginning of the construction of alternative social identities and greater participation in legitimate and successful modalities of alternative government development discourses (Müller, 2017).

In the same vein, there will be greater inclusion of traditionally marginalized groups in the political sphere as an effect of democratization. This expansion of participation channels to new actors would broaden the spectrum for consensus and increase the influence of the most vulnerable sectors in the political decisions that affect them (Müller, 2017). Informality, then, becomes a way of executing more and more efficiently in cities, or portions of cities, with fewer resources (Roy, 2009), depending on the use of potential networks and the capacity to transform the processes that are the cause of vulnerability (Leanne, 2013).

3. The new political alternatives

Considering what has been said so far, it is now important to discuss two novel theories of social sciences considered to be suitable as new political alternatives for addressing the formal/informal paradigm from a fresh urban planning perspective as follows.

3.1 Evolutionary Resilience thinking

Firstly, it is paramount to state that resilience is a scientific concept applied to several disciplines of knowledge. Masnavi quoting Alberti's famous definition, points that resilience is "[...] the extent to which a system is capable of absorbing risks and reorganizing itself." (Masnavi, 2019). Accordingly, resilience has been understood as a framework or capacity to effectively manage unforeseen challenges and risks associated with complex systems. The resilience thinking approach evokes the cumulative and self-reinforcing effects of diverse problematics, imbalances, and hazards as an interlinked system (Leanne, 2013) with the capacity to absorb risks and disruption and the adaptive capability towards change, while maintaining and improving the system's essential functionalities (Masnavi, 2019). In this sense, considering that the concept of resilience encompasses changes, this notion leads to planning that focuses on uncertainty, which is a novelty in relation to traditional urban thinking (Nunes, 2019).

Furthermore, from a doctrinal point of view resilience has been defined and catalogued in three main notions, as follows: 'engineering resilience', 'ecological resilience' and 'socio-ecological' or 'evolutionary resilience'.

The socio-ecological approaches to resilience, defined also under the notion of 'evolutionary resilience', acknowledge that society and nature are interdependent systems. This conception, challenges the notion of a stable equilibrium of both 'engineering' and 'ecological resilience' by introducing a dynamic interaction between persistence, adaptability, and transformative capacities across multiple scales and time frames, within more interactive and imaginative planning systems. Therefore, this notion naturally rejects rigid methods of space planning and focuses in a greater extent on the source of creativity required by the ubiquity of change and its intrinsic uncertainties (Davoudi, 2013).
In the same vein, the limited focus on social processes in the 'engineering' and 'ecology' stream of resilience has both positive and negative impacts on resilient processes. Which is certain and somehow disconcerting is that memories, local capacities, networks, and cooperative relationships [the intentionality of human action and intervention] have received little space at the time of devising strategies to foster resilience. In this regard, it is appropriate to consider that in addition to the phases of adaptability, persistence, and transformability, a phase of 'preparation' [as entitled by Simin Davoudi], must take a major place in the formulation of urban development strategies (Davoudi, 2013).

In a social context, the importance of incorporating technologies, forecasts, human learning, and even ingenuity is understood and necessary. Thus, complex adaptive socio-ecological systems can become more or less resistant depending on their capacity to be prepared, to be persistent and robust, to be flexible and adaptable, and to be innovative and transformative. These attributes can be achieved through social learning, increasing the possibilities of resisting or absorbing disruption, without crossing a threshold into an undesirable and possibly irreversible trajectory, and moving towards a more desirable path. This through creativity and imagination at the institutional, community, and individual levels and by means of cultivating flexibility, creativity and the multi-scale capacity for cooperative initiative. 'Evolutionary resilience' promotes the institutionalization of the awareness of the dynamics of adaptability as a way of improving preparedness and, with it, the ability to influence the direction of future transformations (Davoudi, 2013).

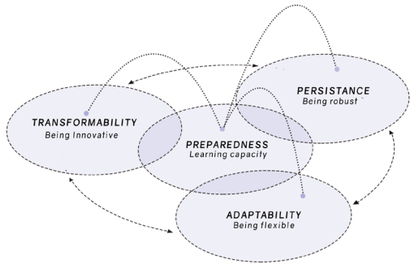


Figure 1. Dimensional Framework for resilience building. Adapted from "Evolutionary Resilience and Strategies for Climate Adaptation" by S. Davoudi, 2013.

In this sense, the socio-ecological dimension has become an essential concept for cities and urban development, due to the aforementioned problematics i.e. exceptional agglomeration of population in the city and economic activities, which leaves the cities exposed to diverse and greater risks with potentially demolishing consequences. In other words, to ground somewhat the theoretical discussion, the concepts of resilience, risk, and vulnerability must be related to social systems and to the opinions and needs of the populations, as well as to the natural systems and physical assets (Leanne, 2013). To a greater extent, this 'socio-ecological' or 'evolutionary resilience' allows more comprehensive and flexible analyses. Urban resilience challenges traditional urban planning, and environmental management strategies, to be integrated as single concept or combination of different approaches towards resilience. The uncertainty and dynamism of the future can be better, and more accurately, addressed through an integrated view of 'evolutionary resilience' that enables the discovery of challenges, opportunities, and applicability in urban planning and development (at 428) (Nunes, 2019).

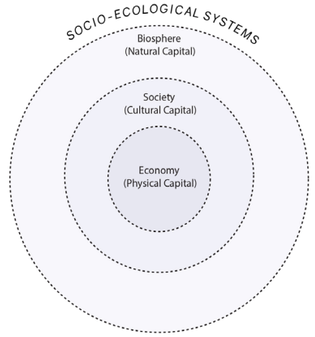


Figure 2. Interlinked social-ecological systems. Adapted from "Resilience offers escape from trapped thinking on poverty alleviation" by S. Lade, 2017.

In the same line of argumentation, resilience has become a useful concept in urban planning, and especially as a light in the traditional debate between formal and informal development, for the following reasons. Firstly, it emphasizes the need to consider human settlements and the inherent risks to which they are globally exposed, understanding that economic, social, cultural and environmental problems are interrelated. Secondly, it underscores the imperative need to interpret the dynamics of informal settlements in the context of wider urban areas and in the long-term framework of urban transformation. This, because informal areas are located within, and shaped by, larger and more complex systems. Lastly, resilience naturally is aware of the existence of retroactive effects, or perverse circles, that can destabilize and alter the development trajectories of systems, with the potential to lead them to a crisis. These informal settlements must be improved and transformed over time into more secure and prosperous communities, without eliminating their weak social fabric. In this way, resilience will depend on taking advantage of possible [positive] external connections and on the capacity to transform the processes that cause vulnerability (Leanne, 2013) . To sum up, the crucial features in the notion of resilience as a correlated to social and ecological aspects, as proposed by Davoudi, are focused on the intentionality of human actions, the possible outcomes of the resilient process, and to the influence of power and politics in planning and decision making in order to respond effectively to challenges (Davoudi, 2013).

These social science methodologies have been oriented towards the analysis of complex systems, characterized by nonlinear dynamics and unpredictable trajectories and results. These dynamic systems are increasingly examined from a multilayered and multi-stakeholder perspective, and address issues such as endogenous growth, evolutionary behavior, and resilience (Reggiani, 2001). Considering that human beings and nature are part of interrelated socio-ecological systems, the economic activity arising from these interactions (Lade, 2017), will be further analyzed in section 4.

3.2 A shift to an adaptive paradigm

This paper argues that an ideal and natural complement to the 'evolutionary resilience' theory is the ground breaking concept of 'adaptive governance'. Nowadays, the multiple social, economic, and environmental challenges in contemporary cities have led to rethinking the way in which, principally, governments manage environmental resources and their approach towards urban socio-economic structures. During the last decade, the concept of 'adaptive governance' has been proposed to be used as an alternative to the traditional prediction and control regime, focusing on the capacity of self-organization through flexible institutional arrangements that foster innovation and resilience (Rijke, 2012).

Informal urban settlements are complex systems (Dovey, 2012) and when it comes to analyze them and proposing possible interventions, it is paramount to consider flexible and negotiated participation with stakeholders, pursuing collaborative management. The 'complex adaptation systems' (CAS) theory analyzes the dynamics, functioning, and performance of complex systems as a whole that depends on interactions between its constituent elements. These systems are characterized by their non-linear processes, their diversity of stakeholders, the multi-scalar approximation towards them, and their self-organization and emergent features (Wohl, 2018). In this sense, traditional methods, i.e. normative enforcement and generic and uniform urban development procedures, have proven to be insufficient and lacking a coherent connection with the multiple and dynamic features of informal settlements.

As stated above, the vicious cycle of socio-spatial and socioeconomic exclusion, related to conventional forms of public administration (Leanne, 2013) can be addressed in an innovative way from an 'adaptive governance' approach. This, requires permanent cooperation and correlation between formal and informal systems for their effective operability. With this approach, informal and local solutions could be allocated within functional and more formal governance structures in the city, generating new networks, opportunities, and interactions (Leanne, 2013). The 'adaptive governance' management of a complex system is based on the one hand on knowledge, acquired by learning strategies and experience and, on the other, through other organizational theories. The former, involves understanding the dynamics and impacts of socio-ecological processes in management structures at multiple scales, in order to adopt a learning, continuous adaptation, and adjustment strategy. The latter, is based in organizational skills, focused on the need to achieve balance in power relations and within the responsibilities assigned to the communities, government agencies, and other stakeholders. This approach focuses on managing the process rather than the results [i.e. an architectural end product] and explores how through management stakeholders can be permanently involved, open, and receptive to change (Leanne, 2013).

Exploring the management of a negotiated processes between informality and formality can provide clues of specific needs and challenges of a place, and therefore turn generic interventions towards a comprehensive strategy. Each informal settlement has different living conditions and fosters different day life patterns. This unique and changing condition requires an adaptable assessment to the needs of the particular local situation and a balance in power and responsibility

relations between government structures, local communities and other actors involved in the process. There is a urgent need to shift the idea of categorizing communities as passive beneficiaries, to empowering them inclusively as active partners in decision-making and in improving their socio-economic and socio-spatial conditions (Leanne, 2013).

The concept of resilience depends on understanding and taking advantage of external connections and networks that can potentially have a positive impact and thus be able to generate transformation in the processes that cause the vulnerability of the settlement. Therefore, an adaptive governance framework could foster this process by strengthening local capacities, process that will depend on collaboration among stakeholders, the sharing of responsibility for collective risks (Leanne, 2013). This flexible and committed approach goes beyond the management of informal settlements (Karpouzogloua, 2016) to a multidimensional and multi-scale integration approach taking economic, ecological, spatial and social components in a holistic way into account.

Taking the innovative theoretical approaches set out above, the following section will explore resilient and adaptive strategies in relation with socio-economic systems within informal settlements, underlining how these interlinkages can potentially have as effect alleviation of poverty. It is relevant to reemphasize that the socio-economic dimension is only one of many variables that compose a reformulation strategy for existing urban planning policies, and that as previously stated, other socio-ecological, cultural, and spatial components which are not discussed in depth in this paper have as much relevance in an integral proposal for an 'adaptive governance' framework.

4.The Application of 'evolutionary resilience' and 'Adaptive governance' in Socio-economic urban Networks

4.1. Revisiting the poor's economic agency in Latin America: Considering the experience of Medellin as case-study

To land the theoretical analysis presented so far, it is considered appropriate to use the experience of Medellin as case-study, to visualize characteristics of urban planning strategies in a Latin American city that, despite their success in other areas, deserve a reinterpretation from a resilient and adaptive perspective in a socio-economic dimension. The city of Medellin, the second largest city in Colombia, in early 2000s implemented a 'radical' government experiment under the concept of 'social urbanism', which transformed the world's most violent city at the time into a global example of innovation (Coletta, 2019, pp. 63-65). But what are the real transformations behind these strategies in Medellin? Underlying the interventions in marginalized neighborhoods in the city, there are standard needs, considered as such by the authorities, and resolved eminently from the formal sphere and procedures of the city. Urban interventions such as large parks and sidewalks, monumental libraries, and street art tourist attractions, despite having generated changes in the physical structure and, somehow, in the collective interpretation of this type of informal settlements, are not embedded in the living logics of space and are at risk of turning into superficial transformations, guided by the currents of neo-urbanism, urban marketing, and contextual urbanism (Montoya, 2014).

From this example arises the possibility of suggesting that while approaches towards the redistribution of social infrastructure have had massive physical impacts on the urban structures of informal neighborhoods in Medellin, the limitations of the formal discourse and procedures of the 'social urbanism' in such complex contexts are now evident, almost 15 years after they were implemented, in the persistent violence and high poverty rates (Montoya, 2014). This paper therefore argues that the redistribution of economic infrastructure has limited influence on urban development approaches (Marx, 2011), and can be seen as one of the key elements in considering adaptability and resilience as a novel approach to urban planning and poverty alleviation.

Precisely, the inability to incorporate the economic capacity for action of low-income populations when dealing with poverty and inequality leads to unequal distribution of opportunities in the city and rooting these conditions generating an almost unbreakable reality. Local strategies continue to concentrate public investment in formal areas of the city that are already considered growth-enhancing, restricting new possibilities for productivity in other neglected areas. Thus, in territories with strong socioeconomic inequalities where 'integration' processes have not improved equality standards, their continuity over time tends to create socioeconomic institutions that favor the most influential groups of society (Baquero, 2007).

The segment of the city inhabited by poor people will continue to be economically marginal as the opportunities to build strategies that invest directly in the economic agency of the poor are restricted since the inception of formal urban planning strategies. In this sense, the economic agency of the poor is conditioned in one hand to the notion of economy as such and, on the other, to the existing patterns of urban distribution. In other words, the socio-spatial correlation behind socioeconomic inequities enables possibilities for alternative strategies for resilient and sustainable urban configurations (Marx, 2011). As Edwuard Soja states, spatial problems do not replace class problems analysis, but they can be an integral element when understanding social inequities and class struggle in modern capitalism and production relations. The structure behind the urban distribution of people establishes the social division of the city and at the same time the economic disparity within them. The socio-spatial dialect thus represents a call for the re-inclusion of socially produced space as something more than an sub-product, suggesting that social classes have a complex interrelation and are interdependent to generative economic structures (Soja, 1980).

Governmental and planning authorities have the responsibility to invest and maintain social and economic infrastructure providing platforms for economic growth, while having the responsibility of coordinating investments on spatial redistribution. Such strategies must confront existing complex models and patterns, where attempts to alter fragile agreements and relations are resistant to change (Marx, 2011). Resistance to change must be approached under a process of progressive and incremental transformation (Dovey, 2016), constructing strategies through collective means, where it is necessary to go beyond the notions of formality and legality, in order to understand the 'big picture' and the processes in which these dynamics are organized in space terms. The urban environment and the opportunities that will arise would be formulated by the decision of the affected populations, quitting the ill-suited tradition of rigid imposition of norms. The space, then, is considered as a cooperative process that responds to the needs of those who inhabit it, rather than a fixed and stable architectural product.

4.2. The 'endogenous development' and local adaptation strategies

It is also worth mentioning existing urban development strategies that propose specific socio-economic policies involving resilience and adaptation. In this sense, the so-called 'endogenous development' (Baquero, 2007) entails an interpretation of complex realities in order to adapt the socioeconomic needs of the society, by means of acknowledging the processes, cultural values, and institutions within a system. This development strategy seeks more flexible paths in the territorial organization of production. For this purpose, it founds necessary to reformulate the variables of the traditional economic analyses in a territory by recognizing socio-cultural and institutional components as strategic values within the processes of 'evolutionary development' and resilience of a city. In this sense, local development initiatives can be considered as one of the needed elements for the effective socio-economic integration and as a solution for urban equity challenges in contemporary cities (Baquero, 2007).

This strategy argues that development initiatives differ from one territory to another. Whatever approach is adopted, development policies must be built on the correlation of the economic, social, environmental, institutional, urban, political, and cultural factors that are uniquely combined in each territory(Baquero, 2007). This flexible and adaptable approach goes beyond the integration and empowerment of the vulnerable population to the functional dynamics of the formal city. It embraces complexity based on considering the particularities of each context, the scales of correlation, and the multiple layers and interconnections that compose a territory, in order to enhance resilience and reduce vulnerability by comprehensive political and planning strategies (Leanne, 2013).

Local initiatives aim to influence the forces and mechanisms that determine the process of capital accumulation, with the purpose of integrating various forms of development, improving the interrelations between them, and thereby generating a sustainable development in specific portions of the territory and, in general, within the wider urban system (Baquero, 2007). The strategies and policies that promote the autonomy of local communities are framed under the notion of 'social economy'. This idea arises as a response to social deficiencies, which neither the market nor the State has been capable of resolving through rigid and formal ways, in order to overcome the separation between capital and labor and introduce solidarity into the economic process itself (Toscano, 2000). Some of the socioeconomic objectives and initiatives that should be implemented in an 'adaptive governance' framework would necessarily include: empowering low-income populations by the diffusion of innovative strategies, the co-production of knowledge and space, the implementation of new forms of organization, new management policies, and synergies with other functional systems of the city (Baquero, 2007).

5. Conclusions

5.1. General conclusions

The failure of traditional urban planning in Latin America in recognizing the dynamics and real needs of the people, while acknowledging informality as a part of the operative and organizational system of the city, has generated an unequal distribution of opportunities and has promoted a cycle of exclusion that urgently demands a reconsideration in the planning approach. To this end, this paper presented a reformulation of the action framework, focused in exploring the relationship between the notions of 'evolutionary resilience', 'adaptive governance' and, lastly, 'endogenous development' [which involves components of the previous two, applied specifically to socioeconomic dimensions] as part of its strategic trends. As argued throughout the paper, human settlements and their inherent risks must be addressed from the correlation of economic, social, cultural, and environmental dimensions, with the imperative need to interpret risks under the dynamics of larger and more complex systems.

To this end it became clear that, under the notion of 'evolutionary resilience', urban planning, socio-economic systems, and environmental management are integrated under a unifying concept that allows for a broader, more comprehensive, and flexible dimension of analysis. At the same time, understanding the socio-spatial dialogue behind socioeconomic inequalities may provide alternative possibilities for more resilient urban reconfiguration, adaptable to the diverse characteristics of the contemporary city. This represents a call for the re-inclusion of socially produced space as more than just a sub-product, suggesting that social disparities, embedded in a cycle of exclusion, have an interrelation and interdependence with the generating structures which are influenced by formal development instruments rooted in the hierarchical notion of control. (Leanne, 2013) (Marx, 2011) (Soja, 1980).

For this purpose, a strategic planning framework was proposed on the basis of cooperation and balance of power, responsibilities and management, understood under the notion of 'adaptive governance'. This, in order to explore the characteristics of negotiated management between informality and formality and, thereby, to orient current generic interventions towards comprehensive urban development strategies. These strategies should be adapted to the conditions, needs and potentialities of the particular context, through interventions, management, and planning perspectives.

As the main subject of analysis, the complexity of socio-economic dimensions was examined, in which conclusions lead to understand that initiatives for local development are potentially one of the solutions to socio-economic integration and urban equity challenges in contemporary cities, understood in terms of 'endogenous development'. Empowering low-income populations by the diffusion of innovative strategies, the co-production of knowledge and space, the implementation of new forms of organization, new management policies, and synergies with other functional systems of the city are part of the 'adaptive governance' strategy.

This approach, naturally, has limitations. There are major obstacles when it comes to devising strategies that break down generic and rigid intervention models. It is acknowledged that this type of proposals involve more time, resources, efforts, and require deeper analysis, greater willingness to evaluate multiple management and development models, and, in turn, needs multi-stakeholder cooperation, which challenges current power hierarchies and traditional methods.

Nonetheless, the 'adaptive governance' structure based on the notion of resilience calls for the urgent production of more just and conscious urban spaces. The challenges posed by the elimination of poverty, the structural and functional transformation of urban systems, and the need for adaptation and resilience to processes that involve society and its environment must be addressed through innovation and must inspire the development of comprehensive solutions. These solutions must be addressed from multiple spheres, involving diverse stakeholders at various scales, in order to achieve comprehensive, sustainable, and dynamic results.

5.2. Final Considerations

The comprehensiveness of new urban planning schemes is determined by a variety of domains that are included as part of the problematic, the scales at which they operate, the stakeholders involved, and the extent to which they are resilient to the changes and risks faced by specific settlements. As discussed, socio-economic necessities are only one part of the equation. Future elaboration will be required in the other dimensions which must be integrated into a holistic development system [based on adaptive governance], i.e. socio-cultural, ecological dimensions, etc. In turn, there is a perceived need for a practical assessment that tests the notions and theories put forward in this paper from various perspectives.

Despite the obvious problem of social segregation and inequity in the urban sphere, major changes are currently being seen in policies concerning informality in Latin America. There is enthusiasm and hope for change and the strategies suggested in this paper may contribute to the path of inclusion and transformation that today's world demands.

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6. Methodological framework

Overview

As stated in the previous chapter, both the concepts and the support theories, are oriented to reduce the vulnerability in informal areas in Bogotá, by proposing an alternative assessment and planning approach. The road map through the methodological framework organizes the research and design methods that are going to guide the final outcome of the project.

Chapter Structure:

a. Methodological Structure

b. Research Methods.

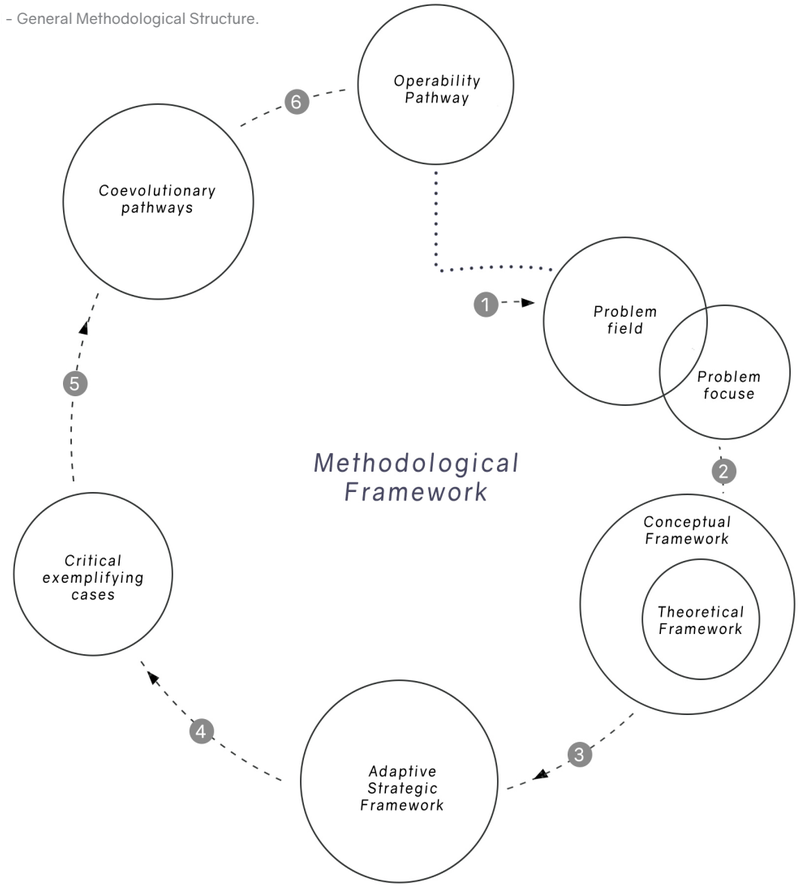
c. Expected Outcomes

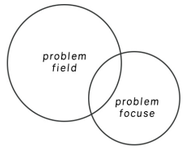
d. Timetable

e. Scope and Limitations

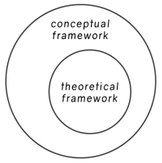
a. Methodological Structure

Fig. 6.1 - General Methodological Structure.





1. Problem Field and Problem Statement:
After having delved into the problem of the vicious cycle of exclusion, the development of the thesis focuses on the lack of integrity when it comes to establishing planning strategies that counteract the vulnerability in informal environments.



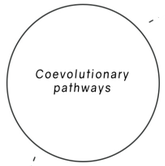
2. Conceptual and Theoretical Framework:
The strategies that are expected to be elaborated in this work will be sustained under three concepts that in turn are supported under various theories, explained in the previous chapter.



3. Adaptive Strategic Framework:
After having delved into both the concepts of adaptability and integrity, as well as the supporting theories, a strategic framework is established which will be explained in the present chapter.



4. Critical exemplary cases
The critical cases are chosen in order to test the proposed framework and assess the vulnerability gradient in two different informal areas.



5. Co evolutionary Pathways: The analysis and proposals of the previous point, will be tested through the construction of scenarios that involve the integration of this area under broader urban systems.

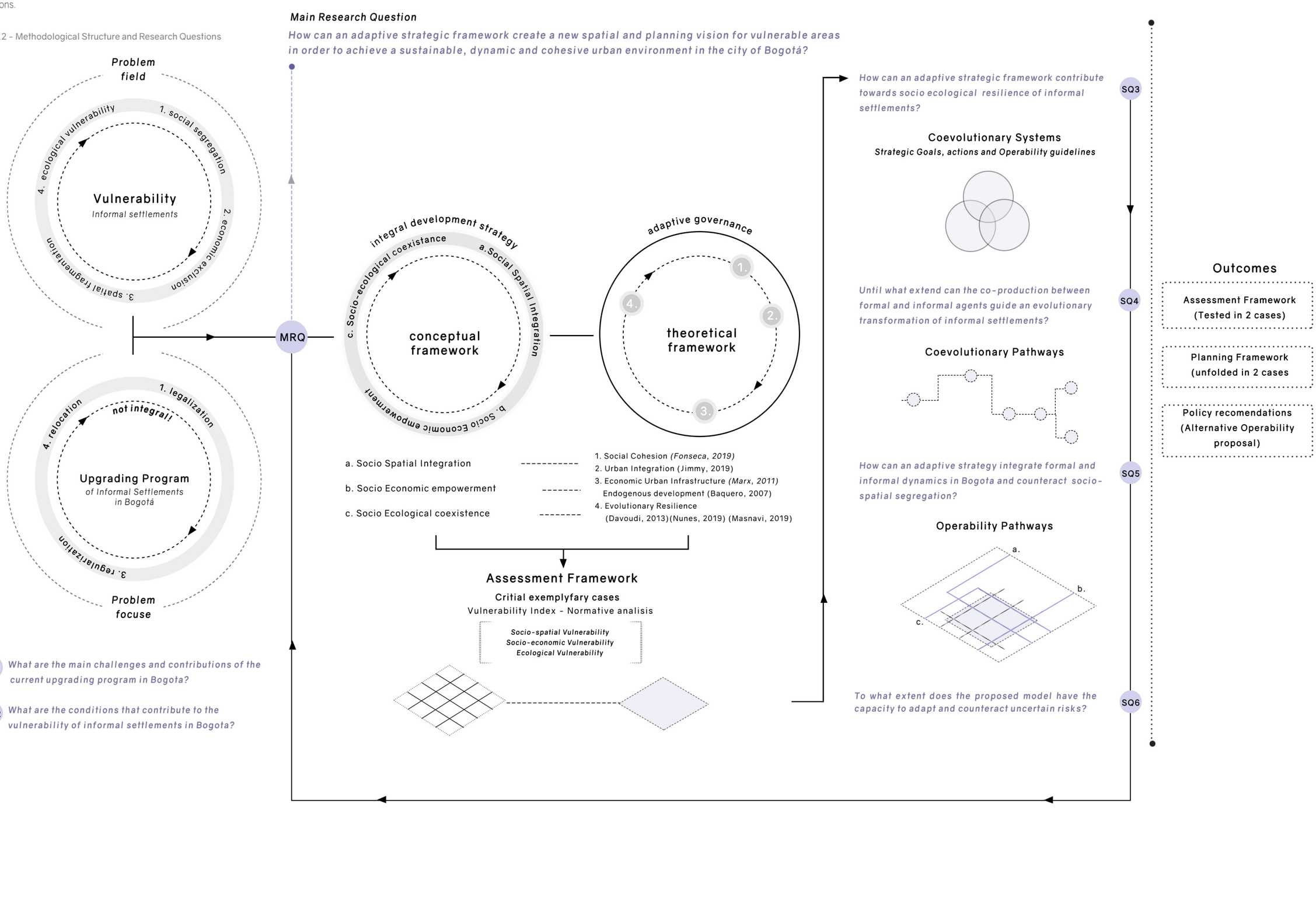


6. Final Outcome:
The final outcome is the design of an assessment and planning framework, unfold in the development of two co-evolutionary scenarios in two case studies.

a. Methodological Structure

The diagram (Figure 6.2) illustrates in detail the road-map of the present work, relating each step with the proposed sub research questions.

Fig. 6.2 - Methodological Structure and Research Questions



Proposed assessment Framework

The complexity of understanding, analyzing and therefore addressing the particular challenges in informal environments, determined by a wide range of interrelated conditions, requires a complex assessment system. Therefore, it is imperative, on the one hand, to redefine the analytical and assessment methodology regarding the particular needs and conditions of each settlement and, on the other hand, to articulate such an assessment to the existing planning structures. This, in order to guide a proposal that synchronizes and restructures the current strategic planning platforms into an adaptive and evolutionary framework.

The following Figure summarizes the proposed analytical and design process. The first one is focused in analyzing the vulnerability conditions and the normative dimension regarding the upgrading program in this areas. For this purpose, the analysis will be carried out through of a proposed **Vulnerability Index,** explained in the analytical framework, that seeks to reveal the multiple gradients in the social, economic and ecological vulnerability of the area of analysis.

This process is based on the recognition and analysis of variables that define the social, economic and ecological vulnerability of informal areas in order to propose a planning and design methodology that responds to the particular needs of the sector, in which the assessment will reveal the vulnerabilities and potentialities of the area. As these areas have different characteristics in relation to their level of consolidation, their location and their relationship with the environment, there are many variations and gradients in the vulnerability measurement. Through the understanding of each dimension of analysis (social, socioeconomic and ecological), a general diagnosis will summarize that discoveries and correlations between the diverse vulnerabilities and discoveries in the areas, evidencing important facts of the structural, functional and distributional dynamics.

The vulnerability gradient, that is measured under the posed variables, is related to the contextual characteristics and to the developed plans part of the municipal improvement strategies. Therefore, in order to have a complete understanding of the area, the second part of the analysis (point # 4) is focused on the assessment of the implemented actions driven by the municipality, the time and the actors involved in this process in order to reveal the gaps in the current planning framework in Bogotá in the critical chosen cases.

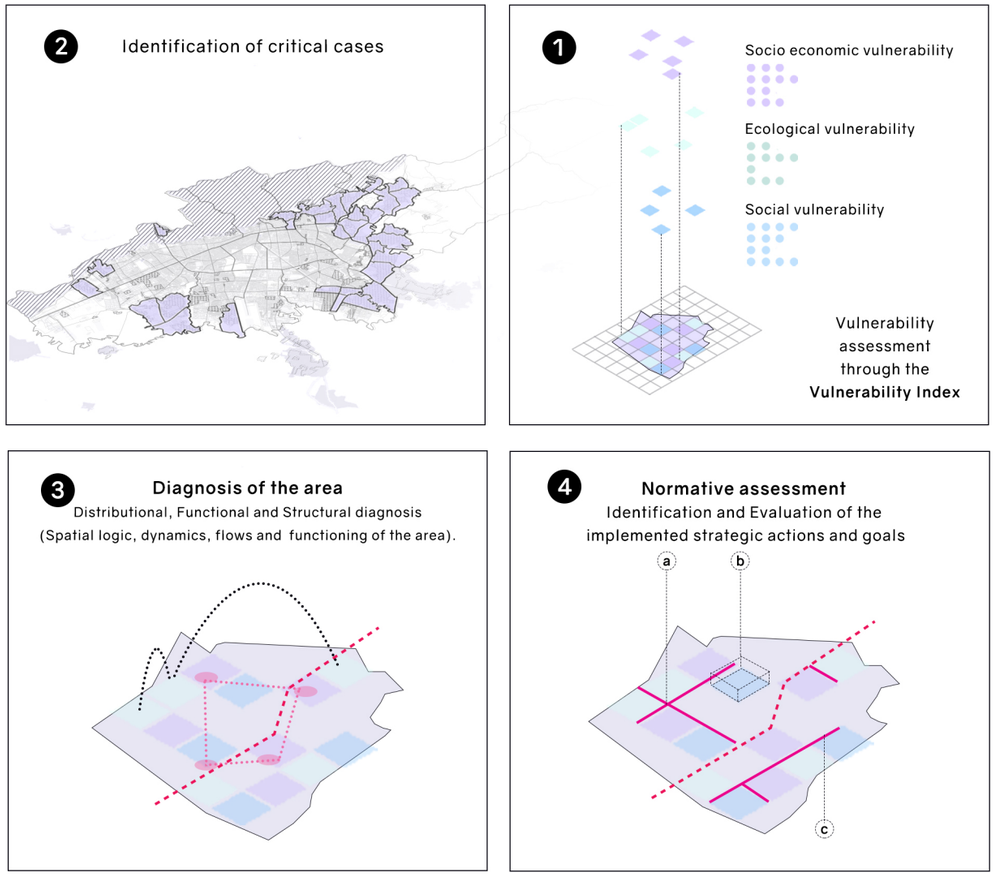


Fig. 6.3 - Unfolding of the proposed assessment Framework

The second section is focused on the design of a new planning process that appropriates the vulnerability assessment as the guiding force for a co-evolutionary transformation.

To this end, the proposal of strategic goals will embrace and explore the co-evolutionary condition of social and ecological systems. These goals will be defined by strategic actions that will reconfigure the relationships and roles of actors involved in mitigation and neighborhood improvement plans.

The implementation of these actions in a long term scenario will open the possibility of an evaluation and collaboration process between actors of different actions, and will evidence the progressive transformation of formal and informal agency.

With the construction of the transformation scenarios, the subsequent evaluation stage will demonstrate flexibility in the implementation of the actions through adaptive pathways, with the purpose of demonstrating that the order in the adaptive process does not obstruct the fulfillment of the proposed goals.

On the other hand, the design of a concrete case will show the spatial implications in the co-creation between formal and informal actors, evidencing the transformation in the current notion of co-production implemented in the improvement program in Bogotá.

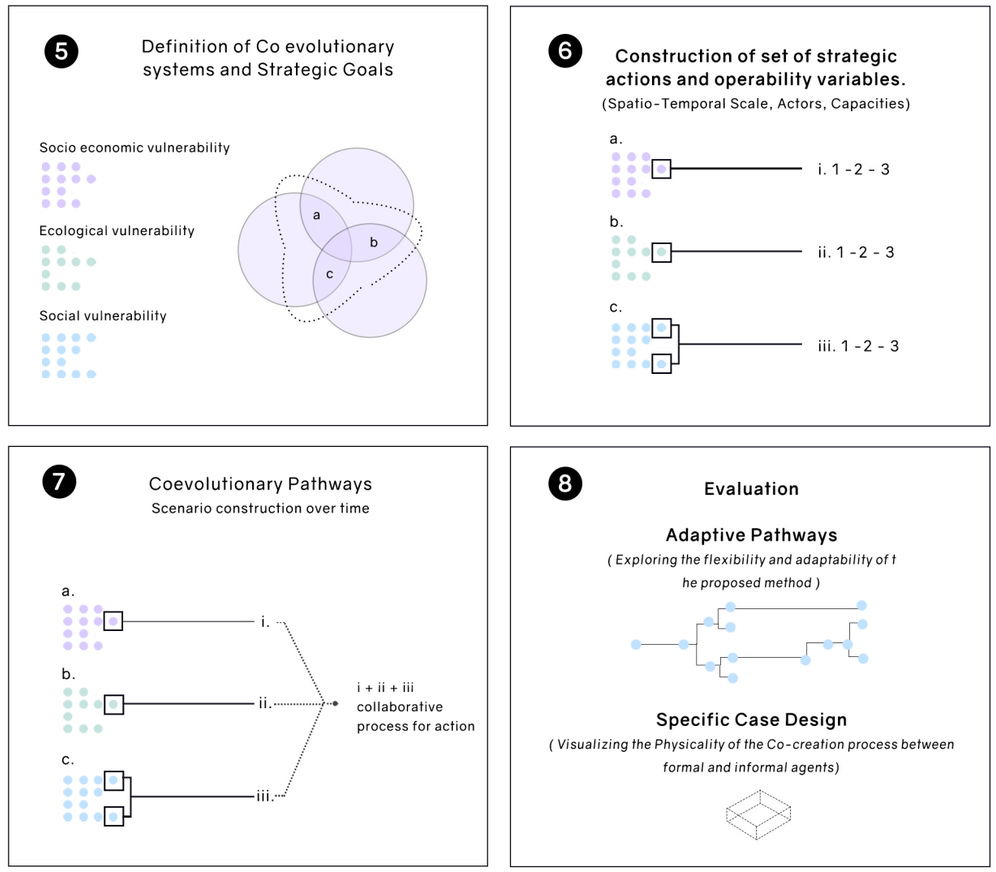


Fig. 6.4 - Unfolding of the proposed planning Framework

b. Research Methods

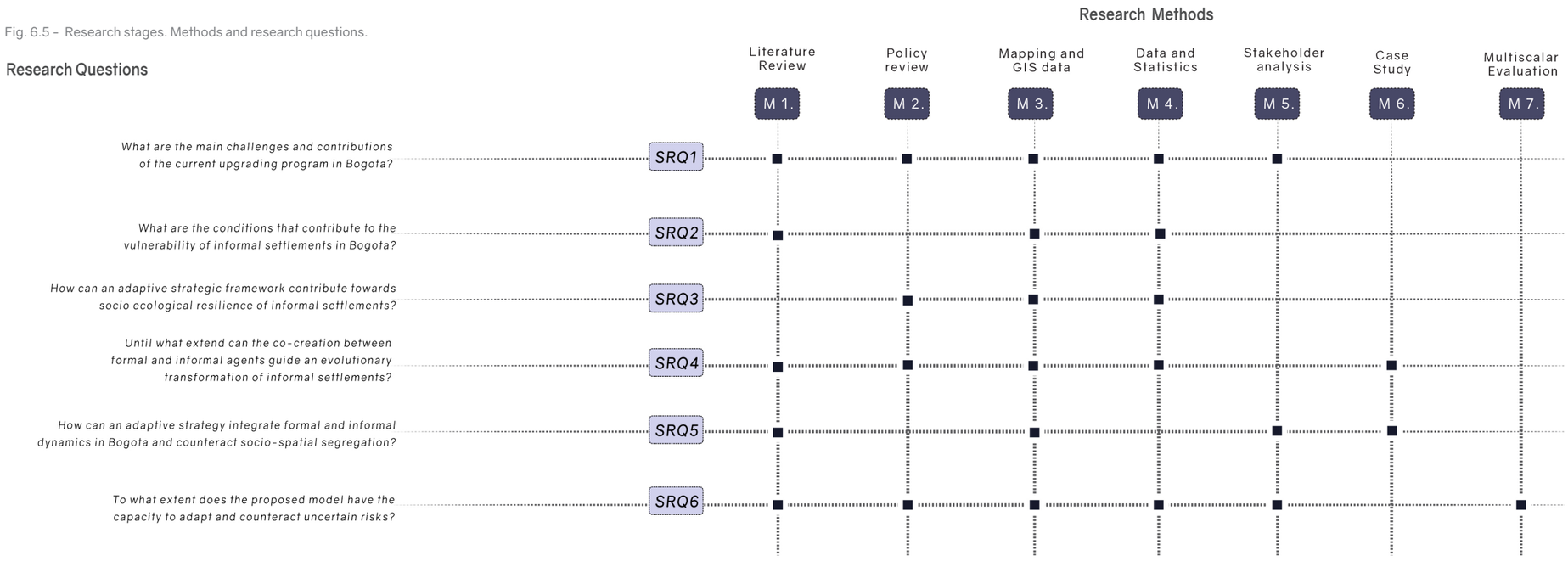
Research stages
Methods and research questions.

The proposed methods were selected in order to be able to develop the analytical framework and therefore its possible interventions. These methods are mixed, in which the correlation between qualitative and quantitative variables will provide a more complete understanding of the territory and the operability of the complex system. The methods are listed below and will be analyzed and explained in the following section:

- Literature Review
- Mapping and GIS data
- Data and Statistics
- Policy review
- Stakeholder analysis
- Case Study
- Adaptive Pathways

Each method is going to provide the tools to solve the sub research questions, and therefore to be able to reach the expected outcomes of the thesis explained in the next section. The explanation of the relevance and validity of the different methods of analysis will be related to the answer to the analysis questions.

Fig. 6.5 - Research stages. Methods and research questions.



M 1. Literature Review

Definition: Search and appropriation of literature related to the problem of analysis and its theoretical and conceptual basis for possible interventions and proposals.

Sub Question addressed: 1,2,4,5,6

Main Sources:
- SAGE, Science direct; Springer;TU Delft Repository, Books.
- Secretaria Distrital de Planeacion de Bogotá / District Secretary of Planning of Bogotá (SDP).
- Latin American and Caribbean Economic comission (CEPAL).

Objectives:
The objectives of this method were focused on understanding the implications and challenges around informality (exclusion cycle) where factors such as social segregation, spatial fragmentation, ecological vulnerability and economic exclusion were analyzed through different theories in order to arrive at a proposal. The different papers and documents are part of the theoretical framework. At the same time, the phenomenon of informality in Latin America, globalization, neoliberal policies and their implications in developing countries were analyzed.

M 2. Policy Review

Definition: The method focuses on the search and analysis of multiple documents and regulations regarding the neighborhood improvement program in Bogotá and other policies and regulations associated with the problematic of exclusion.

Sub Question addressed: 1,3,4,6

Main Sources:
- Plan of Territorial Regulation of Bogotá. (POT, Plan de Ordenamiento Territorial de Bogotá for its acronym in Spanish) Decree 190 of 2004
- District Secretary of Planning. Comprehensive Neighborhood Improvement Program
- District Secretariat of Habitat
- CONPES 3604 de 2009 (The National Council for Economic and Social Policy, El Consejo Nacional de Política Económica y Social (CONPES) for its acronym in Spanish)
- Development Plan 2016-2019. Bogotá Better for everyone. Mayor, Enrique Peñalosa.

Objectives: The objective is focused on collecting, analyzing and synthesizing the main planning instruments in relation to informality in Bogotá. The objective is to identify the governance structures, the actors involved and the challenges imposed by the current planning system.

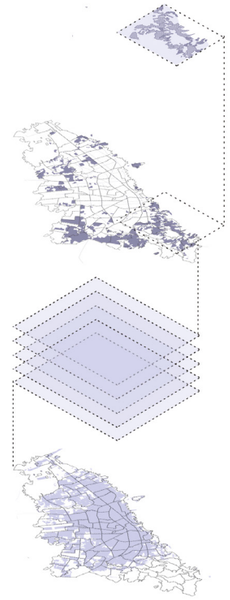
M 3. Mapping and GIS data

Definition:
Mapping and GIS tools define the spatial relationships, the urban patterns, the data bases related to space, the multiple configurations and correlations with different territorial scales.

Sub Question addressed: 1,2,3,4,5,6

Main Sources:
- Open data Bogotá (Shape Files). Development Plan: Bogotá better for all. (2016-2020)
- Existing maps and cartography.
- Maps of the POT 190 of 2004
- Shape Files Bogotá and Colombia. (Open Sources like BBBike)

Objectives:
The objective of this method is to map the main variables that cause and represent the exclusion cycle in Bogotá. To do this, the data and maps will be focused on analyzing the socioeconomic spatial structure, land use, public space, social networks, functional structure, mobility dynamics and ecological infrastructure of the city and the specific sector of analysis.



M 4. Data and Statistics

Definition:

This method is focused in the collection of statistical data, and a critical interpretation of the results regarding to the different variables that are determining the exclusion cycle in Bogotá.

Sub Question addressed: 1,2,3,4,6

Main Sources:

- World Bank
- Open data Bogotá.
- Development plan: Bogotá better for all (2016-2020) Municipality of Bogotá
- Habitat District Secretary. Official Documents
- Secretary of Planning. Official Documents
- DANE. Entity responsible for the planning, collection, processing, analysis and dissemination of official statistics in Colombia.
Shape Files Bogotá.

Objectives:
This method is useful when it comes to providing a quantitative measure of the inequalities that are evident in the informal urban sphere in Bogotá.

This method is also helpful in providing concrete data on development trends, population growth, densities, legal status and important data from informal sectors of the city. These data, in relation to the qualitative information of these environments, will propitiate a complete understanding of the problem in order to interpret and draw coherent conclusions for the proposal.

M 5. Stakeholder analysis

Definition:

Identification and analyzes of the actors related and involved in the planning and development of informal settlements and upgrading policies.

Sub Question addressed: 1,5,6

Main Sources:

- Development plan: Bogotá better for all (2016-2020) Municipality of Bogotá
- Habitat District Secretary. Official Documents
- Secretary of Planning. Official Documents
- Plan of Territorial Regulation of Bogotá. (POT, Plan de Ordenamiento Territorial de Bogotá for its acronym in Spanish) Decree 190 of 2004
- District Secretary of Planning. Comprehensive Neighborhood Improvement Program
- Analysis of Informal Practice in Bogotá. News and Interviews.

Objectives:
This method has as its main objective the identification of the actors involved in the process of both exclusion and improvement of informal settlements in Bogotá. In order to do so, it is necessary to identify the actors by the multiple hierarchies and spheres (public, private, local or informal) in which their relationships and responsibilities are structured, and therefore be able to propose adaptive networks of power management and responsibility in the proposed strategies.

M 6. Case Study

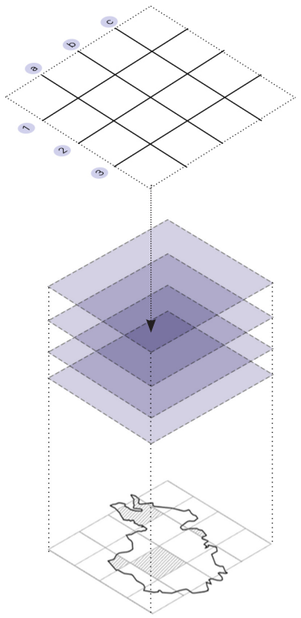
Definition:
This method is focused on the analysis of a specific case in the city of Bogotá, in order to exemplify the problems and possible interventions from an integral and adaptable perspective. The aim is to analyze the different layers that structure the sphere of informality and exclusion, and to exemplify through management strategies and through urban designs and interventions how the proposed strategic framework can be implemented.

Sub Question addressed: 4, 5

Main Sources:
Open data Bogotá. Development Plan: Bogotá better for all.
Existing maps and cartography, Google maps, Google earth.
Maps of POT 190 of 2004
Locality Data (Planning Secretary)

Objectives:
The Objectives are focused on understanding the dynamics behind an informal settlement from multiple spheres (economic, social, spatial, ecological, etc.) in order to develop strategies that address the problem from an integrated perspective. For this purpose, the analysis of the case and its subsequent proposal have the objective of demonstrating and testing the adaptable framework.

Adaptive Strategic Framework



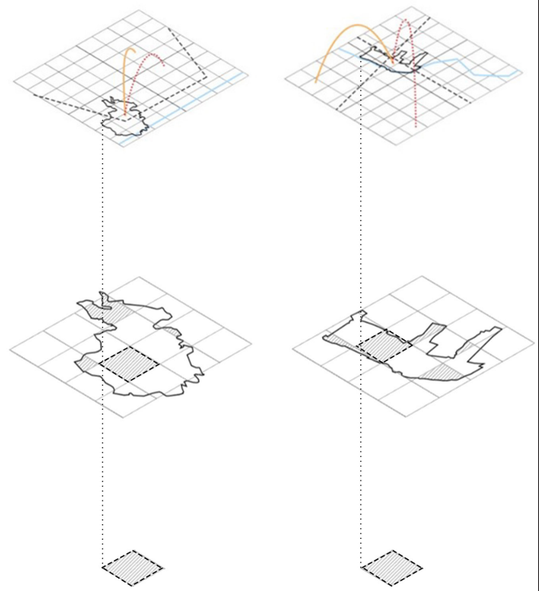
M 7. Co-evolutionary and Adaptive pathways

Definition:
The elaboration of specific trends as future scenarios, is proposed in this project as a method to inform the strategies and design of the specific case chosen (method 6).
The construction of scenarios allows the understanding of future trends over time, and how society and the urban systems could react to it. This method is proposed as a tool for imagining possible connections and strategies that expand the interventions proposed on a local scale to an urban scale.

Sub Question addressed: 6

Main Sources:
- Urban Analysis and Design Project in the chosen Case Study (Method 6)
- Research Questions and Research aims
- Adaptive Strategic Framework (Operability guidelines and Spatial Toolkit)
- GIS (Urban Scale)

Objectives:
The aim of this method is to evaluate the possible integration of the informal urban area with the functional formal structures of the city, and to evaluate the proposed strategies in a local and urban scale.



c. Expected Outcomes

An adaptive assessment and planning Framework

The adaptive planning framework aims to create a collaborative process for action, proposed as a complementary approach to the current upgrading program for informal areas in the city of Bogotá, in which existing conditions of an urban context can be appropriated and therefore guide the evolutionary transformation of a particular location. The collaborative process is not only applied to the development of a specific intervention, but to the evolutionary transformation of the role and interpretation of informal and formal actors as agents of change.

Outcome

1. A proposed and tested alternative adaptive assessment and planning framework for informal settlements in the city of Bogotá.

2. A scenario example that demonstrates the proposed co-creation between formal and informal agents, In order to clearly visualize the contribution of this work in reconstructing the fundamentals of the co-design by redefining the role of designers and planners in this type of context.

1. An alternative operability for the current program in the city

The results are aimed to solve from multiple scales, multiple spheres and multiple operability possibilities the problems identified in the vulnerability index.. The informal city should be functionally connected to the formal planning and spatial structures of Bogotá, while generating opportunities for growth and cohesion on a local scale.

Fig. 6.7 - Multi scalar Functionality of the Expected Outcomes



Planning Zone (meso)

Adaptive assessment and planning Frameworks unfolded in to critical cases

Bogota City (macro)

Demostrate how the implementation of this method could integrate informal areas into the functional and structural elements of the formal city over time.

Local (nano)

Specific Case study that exemplifies the proposed co-creation of a strategic action between formal and informal agents.

Fig. 6.6 - Expected Outputs and Outcomes

	Sub Research Questions		Expected Outputs	Expected Outcomes	Research Aims
Analytical Framework	SRQ1	*What are the main challenges and contributions of the current upgrading program in Bogota?*	Evaluation of the upgrading programs in Bogota	Adaptive Assessment Framework	- Reveal a method to Reduce the multidimensional vulnerability of informal settlements in Bogotá
	SRQ2	*What are the conditions that contribute to the vulnerability of informal settlements in Bogota?*	Formulation of an alternative assessment approach for the upgrading program of Bogota		
Design Framework	SRQ3	*How can an adaptive strategic framework contribute towards socio ecological resilience of informal settlements?*	Proposed Co-evolutionary subsystems and Strategic Goals	Adaptive Planning Framework	- An evolutionary integration of social, economic and environmental systems within the functional dynamics of the formal city. - Reinforce the endogenous capacities of vulnerable populations in informal settlements.
	SRQ4	*Until what extend can the co-creation between formal and informal agents guide an evolutionary transformation of informal settlements?*	Coevolutionaty pathway		
	SRQ5	*How can an adaptive strategy integrate formal and informal dynamics in Bogota and counteract socio-spatial segregation?*	Critical analysis of the multiscalar Systemic Operability	2 Design Cases	- Guide the coexistence and resilience of social and ecological systems.
Evaluation Framework	SRQ6	*To what extent does the proposed model have the capacity to adapt and counteract uncertain risks?*	Operability Pathways	Proposed Operability of the Upgrading Program	- Redefine the approach and way of intervening in informal settlements in Bogota.

Output: Story of what you produced, results achieved immediately after implementing an activity.
Outcome: Level of performance. Considered as mid-term results, they are not seen immediately after the end of each activity.

d. Timetable

In order to frame the problem and the project direction, the time schedule shown in Figure 6.23 shows the time process in which each step is going to be resolved. As it is evident in the table, the first part of the work is driven mainly by an analytical approach in relation to the literature, concepts and theories that guide the elaboration of the bases in which the proposal will be structured, Further on, the methods and processes are going to be focused in an urban analysis of all the necessary components to have a complete understanding of the problems of the sector and of the aspects to intervene. The third part is aimed at design strategies, which will then be evaluated by building scenarios on a larger scale. The last phase of the project is aimed at evaluating, reflecting and assessing the results obtained.

e. Scope and Limitations

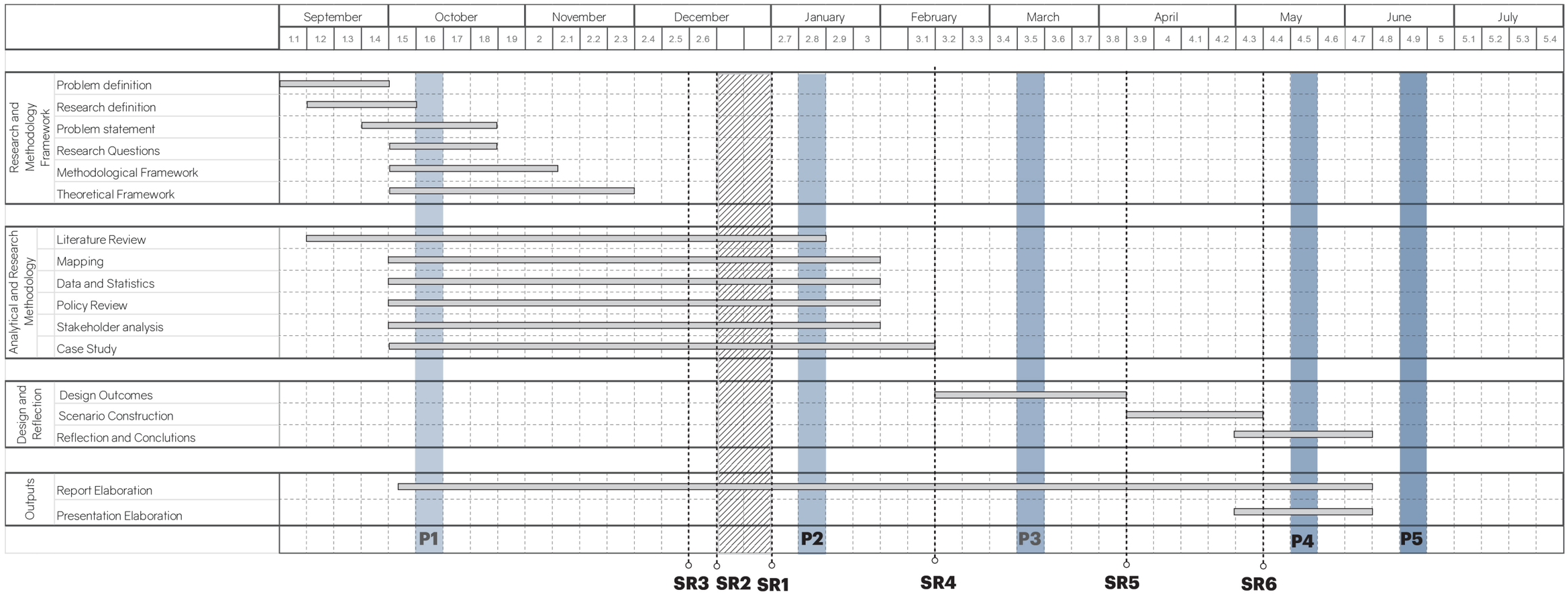
The final scope of the Project is to understand the multiple dynamics and flows that shape the cycle of exclusion in the city of Bogotá, evidenced in the development of informal settlements. The final aim is to reformulate and propose alternative strategies from the current upgrading program in Bogotá, in order to integrate populations and informal structures to the functional formal systems of the city.

As evidenced in the previous chapters, it is imperative to recognize the complexity that characterizes this issue. Addressing the objectives of socio-spatial integration, socioeconomic empowerment and socio-ecological coexistence in parallel is essential when it comes to proposing integral strategies in which each element must be considered as a key factor in the proposed approach. Therefore, one of the limitations is linked to the complexity and multiplicity of factors to take into account when proposing a strategy, added to the multiple actors that must be involved. However, it is considered possible and necessary for the present research. To this end, as explained in the theoretical framework, the three concepts break down clear variables of analysis in order to specify the directions in which both the research and the proposal will be focused.

Colombia is a country recognized worldwide for its programs on the improvement of informal neighborhoods. Cities such as Medellin and Bogotá have been recognized for their proposals around concepts such as social urbanism or their innovations in mobility issues. In spite of this, from the analysis of the instruments and policies implemented in recent years, it is evident that the interventions have not achieved an integral transformation of the environment and that many of the ideas and proposals do not end up being carried out due to problems in financing, time and management, corruption and clientelism, among others.

The limitations in this research topic are linked to political and administrative powers, which can shape certain ideals of the proposals for their economic and political viability. The proposal will break these hierarchical schemes of control and power and is aware of the difficulties and time that can be given for an implementation of this approach, recognizing and appropriating the great advances of Bogotá and Colombia in the face of this problem that is recognized worldwide.

Fig. 6.8 - Process Schedule



7. Analytical framework

Overview

The following section will explain in more detail the designed tools to perform the analysis of the two critical chosen areas. The chapter is composed of two parts. The first one explains the proposed index and goes through the analysis of the multidimensional vulnerability in both cases, and the second one explains and analyses the actions implemented by the upgrading program in the areas of analysis.

Chapter Structure:

a. Assessment Framework

b. Critical chosen Case 1: Zonal Planning Unit La flora
- Assessment through the Vulnerability Index
- Summary of Vulnerability gradients
- Diagnosis of the area

c. Critical chosen Case 2: Zonal Planning Unit Lourdes
- Assessment through the Vulnerability Index
- Summary of Vulnerability gradients
- Diagnosis of the area

d. Normative Assessment
- Normative Assessment Critical chosen Case 1
- Normative Assessment Critical chosen Case 2

a. Assessment Framework

1. Vulnerability Index

The complexity in understanding and analyzing informality and therefore the complexity in addressing the particular challenges determined by a great variety of conditions requires a complex assessment system. The following proposed Vulnerability Index, seeks to reveal the multiple gradients in the social, economic and ecological vulnerability and the possible interrelations between the findings.

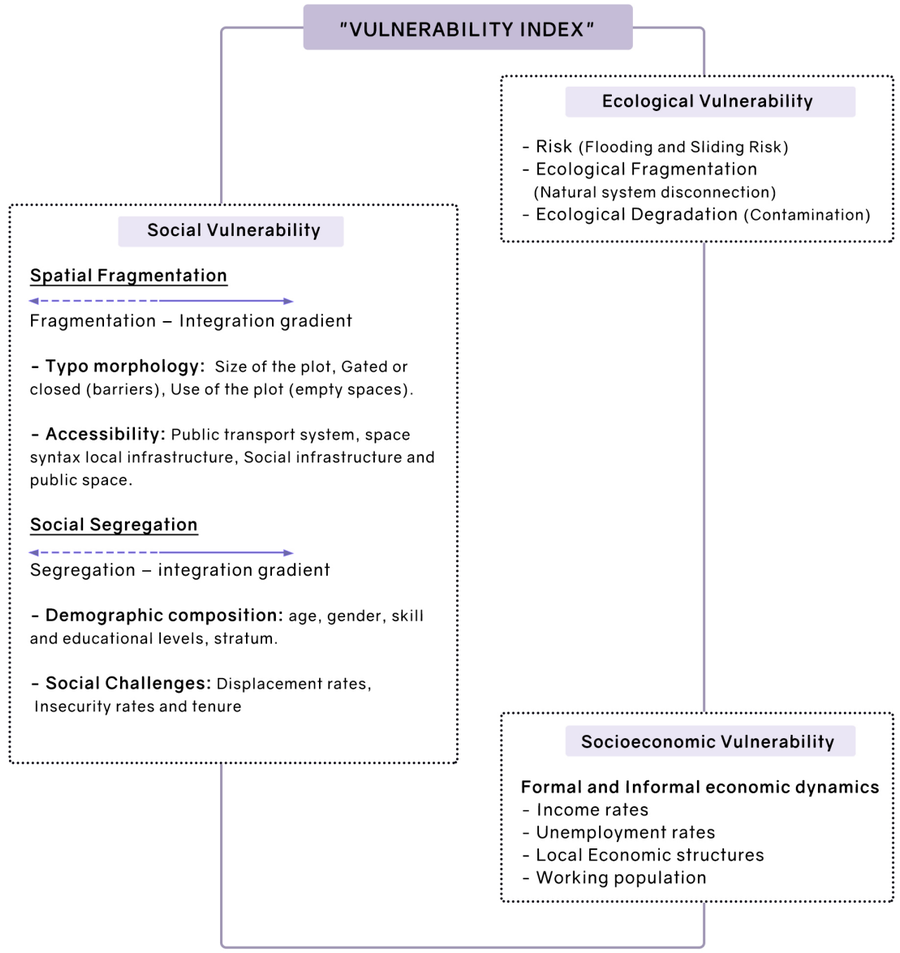
The social vulnerability analysis is structured with variables regarding the understanding of spatial fragmentation and social segregation in the area, based on identifying deficiencies in relation to basic social needs and material and spatial goods. For this purpose, urban variables were identified in relation to the services and basic rights that should be provided under the functional and social structure of the city.

The ecological vulnerability is assessed through the analysis of risk conditions, the fragmentation, and the degradation of the ecological structures. The location in vulnerable areas both to flooding and landslides hazards, and the subsequent contamination of these ecological bodies are the main issues to analyze and explore. Ecological fragmentation attempts to assess the degree of discontinuity and fragmentation of ecological elements as part of an integrated urban system.

The Socio-economic vulnerability is based on the variables in relation to the economic dynamics of the population, defined by means of the classification of the actors, their opportunities in relation to the distribution of opportunities and their degree of poverty in relation to income and activity revealing the economy dynamics of the place.

The vulnerability assessments must be approached from a inter-relational perspective, in which the economic structures, the sociocultural spheres and the ecological structure are integrated and assessed in a synchronized strategy.

Fig. 7.1 - Proposed Assessment Framework. Vulnerability Index



a. Assessment Framework

Vulnerability Assessment

The assessment process regarding the vulnerability index starts with a correlated analysis between a typo-morphological analysis, a local integration gradient measure regarding mobility infrastructures and public transport, land uses and diverse barriers in order to reveal the multiple gradients between spatial fragmentation or integration, and therefore reveal the structural connection systems and highest vulnerability areas.

This structural systems will be the further on crossed with the layers regarding the functional and social local dynamics and structures revealing the possible socio spatial interactions in the vulnerability gradients and the biggest challenges inside the planning unit.
The analysis goes then through the interrelation between the analyzed social systems and the natural context, evaluating the interrelation between the vulnerability rates of informal areas and the high ecological risk.

The assessment is categorized per neighborhood regarding the vulnerability gradient for each variable, assessing from very low to very high the findings in the place,

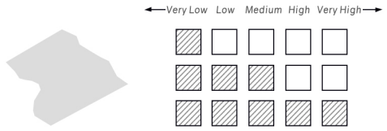
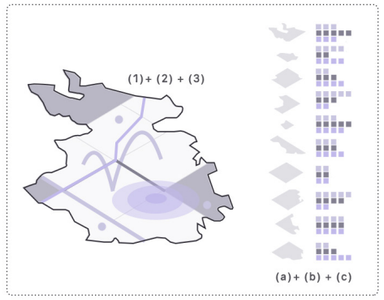


Fig. 7.2 - Summary of the variables of the Vulnerability Index tool



The conclusions of the index-related analysis are categorized into two results: the first is the compilation of the various gradients in the dimensions of analysis (social, socioeconomic and ecological) for each sector; and the second result is the overlapping of all the variables of the analysis in order to be able to evaluate in a general manner the structural, functional and distributive dynamics of the entire area. The multi-scalar understanding of both, first the variables that define the vulnerability gradient for each neighborhood and secondly the understanding of the functional structure of the entire system, provides a correlated understanding of the assessment results. The interventions to counteract local problems and specific needs can at a same time strengthen the functional dynamics at different spatio temporal scales.



Identification of critical exemplifying areas

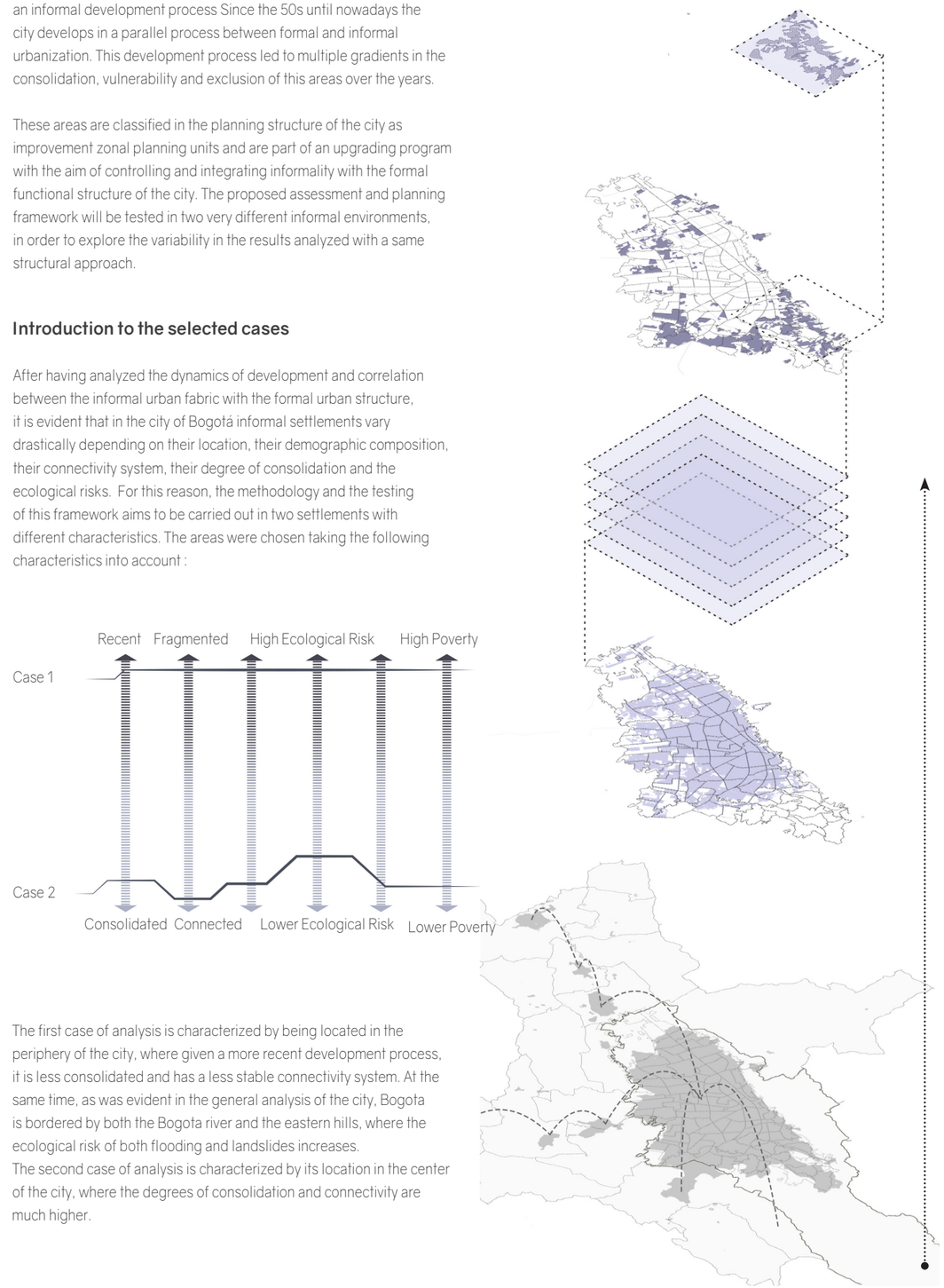
More than 20 % of the urban fabric in the city of Bogotá started in an informal development process Since the 50s until nowadays the city develops in a parallel process between formal and informal urbanization. This development process led to multiple gradients in the consolidation, vulnerability and exclusion of this areas over the years.

These areas are classified in the planning structure of the city as improvement zonal planning units and are part of an upgrading program with the aim of controlling and integrating informality with the formal functional structure of the city. The proposed assessment and planning framework will be tested in two very different informal environments, in order to explore the variability in the results analyzed with a same structural approach.

Introduction to the selected cases

After having analyzed the dynamics of development and correlation between the informal urban fabric with the formal urban structure, it is evident that in the city of Bogotá informal settlements vary drastically depending on their location, their demographic composition, their connectivity system, their degree of consolidation and the ecological risks. For this reason, the methodology and the testing of this framework aims to be carried out in two settlements with different characteristics. The areas were chosen taking the following characteristics into account :

Fig. 7.3 - Multi scalar implications of the critical cases



The first case of analysis is characterized by being located in the periphery of the city, where given a more recent development process, it is less consolidated and has a less stable connectivity system. At the same time, as was evident in the general analysis of the city, Bogota is bordered by both the Bogota river and the eastern hills, where the ecological risk of both flooding and landslides increases.
The second case of analysis is characterized by its location in the center of the city, where the degrees of consolidation and connectivity are much higher.

Selection of critical exemplifying areas

The assessment framework will be tested in two case studies. The planning unit la flora and the planning unit Lourdes are chosen as opposites being one located in a high ecological risk area in the periphery.... and the other one being located in the center of the city, more consolidated and with a higher connection SYSTEM with the formal URBAN structure

Eastern Hills

Critical example: Case 2
ZONAL PLANNING UNIT: LOURDES

Critical example: Case 1
ZONAL PLANNING UNIT: LA FLORA

Areas part of the Upgrading Program

0 2.5 km 5 km

b. Critical chosen Case 1: Zonal Planning Unit La flora



Source: Google Earth View, 2020.

The Vulnerability Index will analyze from a social point of view in relation to the fragmentation and segregation gradients in relation to the physical space and infrastructure as well as the demographic composition of the sector. From the environmental point of view, the aim is to analyze the different challenges around the risks, degradation and disconnection of ecological bodies, and from the economic point of view, to analyze the dynamics, potentialities and challenges of the economic structures present in the sector.

The Zonal Planning Unit 52. La Flora is located in the periphery of the city. The area is made up of 10 neighborhoods that began to develop in an informal process and are now legalized as parf of the upgrading program of the municipality. The planning unit has 7.59 hectares of protected land within the 50.66 hectares of urban expansion land, in the center of the area. These two partial plans (15 and 16) are determined under housing development treatment and currently there is no plan adopted for their development.

The area is delimited on its eastern side by the main ecological structure of the city, the eastern hills, and on the western side by the hills that constitute the ecological park "Entre nubes". The unplanned urbanization of the reserve zones that border the UPZ on its western side represents a factor in the deterioration of the quality of life of the population with high deficiencies in urban infrastructure, equipment, transportation services, and coverage of public services.

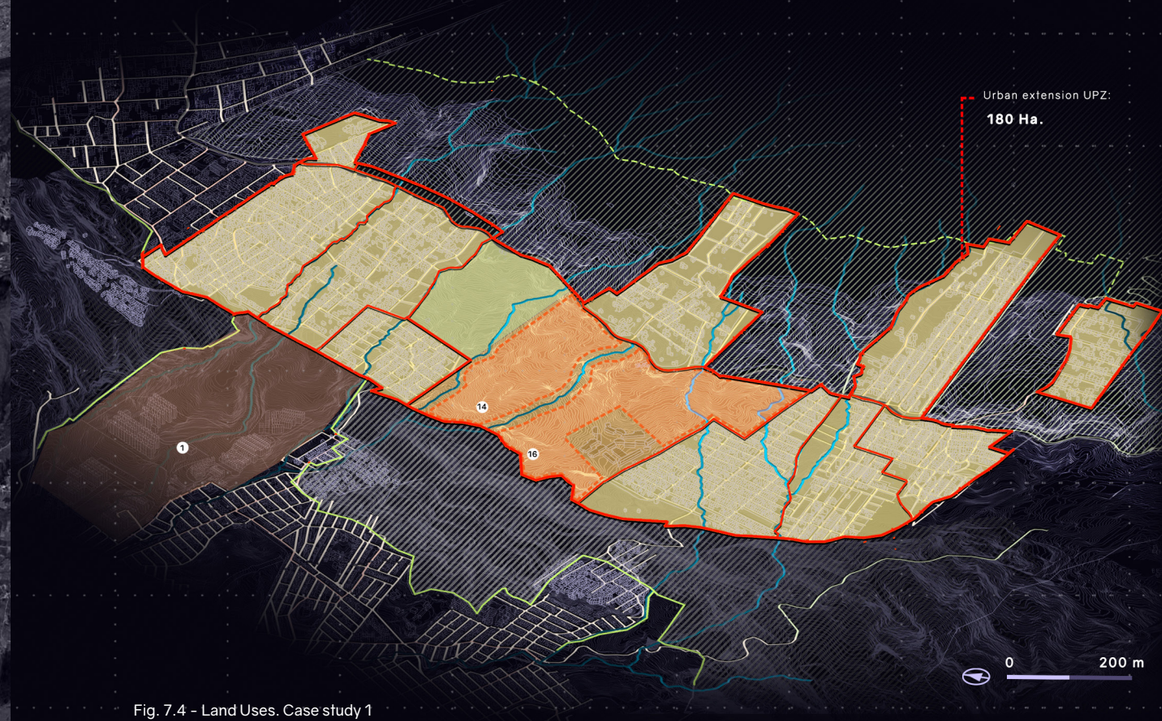


Fig. 7.4 - Land Uses. Case study 1

Neighborhoods

1. La Flora
2. La Cabaña
3. Ciudad Londres Rural
4. Doña Liliana
5. Villa Diana
6. Los Soches
7. Juan Jose Rondon
8. Tihuaque
9. Las Violetas rural
10. San Pedro Sur rural

Zonal Planning Unit
52 La Flora

Land Classification

- Urban
- Urban expansion land
  - Urban Treatment: Development
  - Predefined Partial Plans:
    14. Usme 80. Area: 114.25 Ha.
    16. Villa Diana II: 24.31 Ha.
  - Adopted Partial Plan:
    1. Bolonia
- Protected area
- Forest area

Source: Map made by author. GIS data, extracted from Bogotá open data.

Social Vulnerability
Spatial Fragmentation – Typo morphological analysis

To evaluate social vulnerability, the methodology begins with an analysis of the typology of the blocks and the incidence of this type of configuration on the spatial fragmentation. The analysis showed six types of configurations. As shown in the following images, the zone has consolidated blocks, especially in the northern zone, it has larger blocks in the process of consolidation, rectangular grids that are in the process of consolidation and large areas that if they are not completely empty have few developments. Through the categorization of these spaces it is evident to see how the composition in the local mobility infrastructure, the size of the blocks, the unused space, and the amount of connectivity elements has a great incidence in the fragmentation of the space. In this specific case, the flora is better connected in its northern zone and has a greater degree of spatial fragmentation in the southern sector. This degree of integration will be measured in the following variable, by crossing these conclusions with an analysis in space syntax.

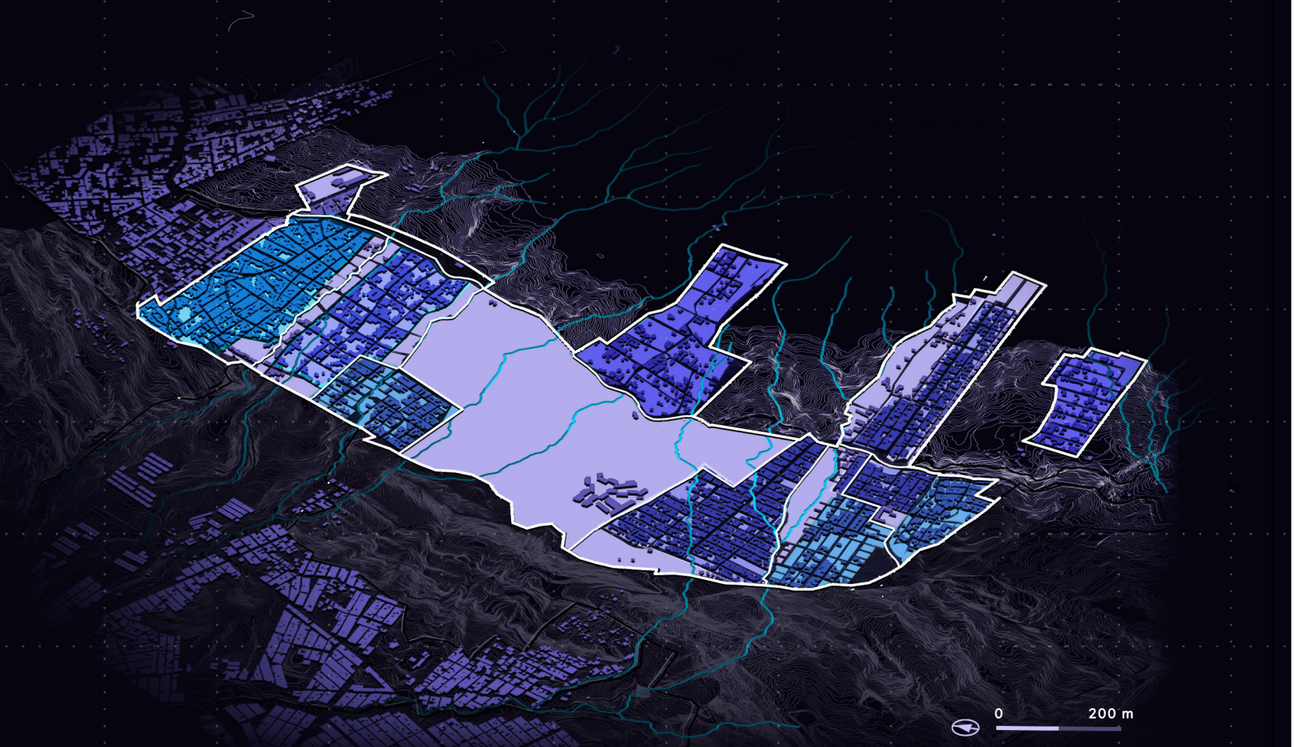


Fig. 7.5 - Social Vulnerability Index. Spatial Fragmentation - Integration gradient. Typo morphology Case study 1

Neighborhoods

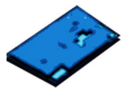
1. La Flora
2. La Cabaña
3. Ciudad Londres Rural
4. Doña Liliana
5. Villa Diana
6. Los Soches
7. Juan Jose Rondon
8. Tihuaque
9. Las Violetas rural
10. San Pedro Sur rural

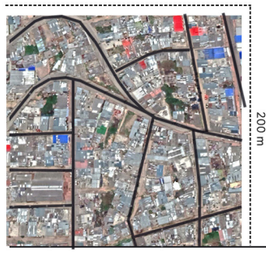
Vulnerability Assessment
Spatial Fragmentation - Integration gradient

Very High
High
Medium
Low
Very Low



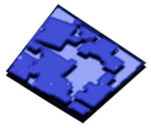
Consolidated





Consolidation rate: high
Available space: very low

Big Plots
Consolidation process





Average Size: 70x80m
Average Area:5.600 m2
Consolidation rate: medium
Available space: medium

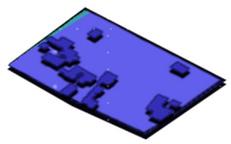
Rectangular Plots
Consolidation process





Average Size: 25x70m
Average Area: 1750 m2
Consolidation rate: medium
Available space: medium

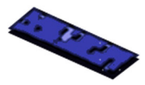
Big empty plots
Few constructions





Average Size: 140x90m
Average Area:12.500 m2
Consolidation rate: Low
Available space: High

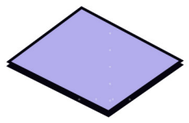
Rectangular plots
Higher consolidation gradient





Average Size: 25x90m
Average Area: 2.250 m2
Consolidation rate: medium - high
Available space: medium - low

Empty space





Consolidation rate: Not apply
Available space: 100%
Accesibility: Low

Social Vulnerability Index
Spatial Fragmentation - Accessibility

The Social Vulnerability Index regarding the measure of local integration of the neighborhood shows that a large part of the area is disintegrated from the context, where only the road shown in red is articulated to the city. This road constitutes the structuring axis of the Planning Unit, where mobility and accessibility to the different neighborhoods are derived from this axis.

The neighborhoods located in the northern part of the area have a better connected road network. On the other hand, the neighborhood in the southern area have one better connected and accessible structural axis that articulates the areas in an east-west direction. This connection road is disrupted when it meets the ecological park "Entre nubes". This disruption in the road network generates a disintegration of the sector with the urban dynamics on the other side and limits accessibility to only one main road.

The undeveloped area in the central zone is currently a barrier to integration between the north and south zones. As seen on the map, the neighborhoods on the eastern side of the structural axis are isolated and function as independent elements.

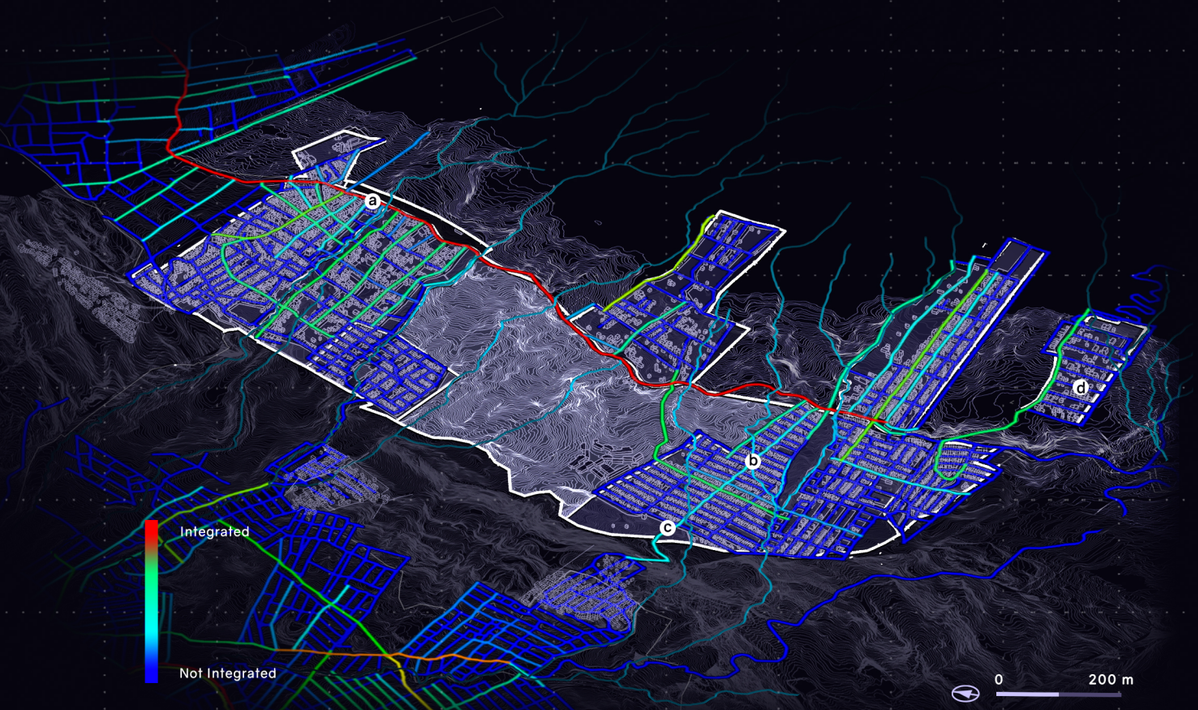
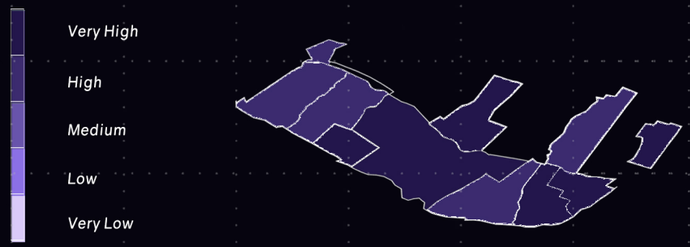


Fig. 7.6 - Social Vulnerability Index. Spatial Fragmentation - Integration gradient. Space Syntax, Case study 1

Neighborhoods

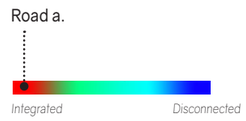
1. La Flora
2. La Cabaña
3. Ciudad Londres Rural
4. Doña Liliana
5. Villa Diana
6. Los Soches
7. Juan Jose Rondon
8. Tihuaque
9. Las Violetas rural
10. San Pedro Sur rural

Vulnerability Assessment
Spatial Fragmentation - Integration gradient



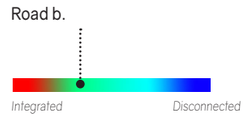


Source: Google Street View., 2019



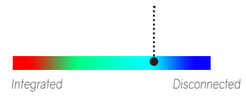


Source: Google Street View, 2019



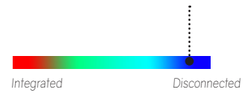


Source: Google Street View, 2019





Source: Google Street View, 2019

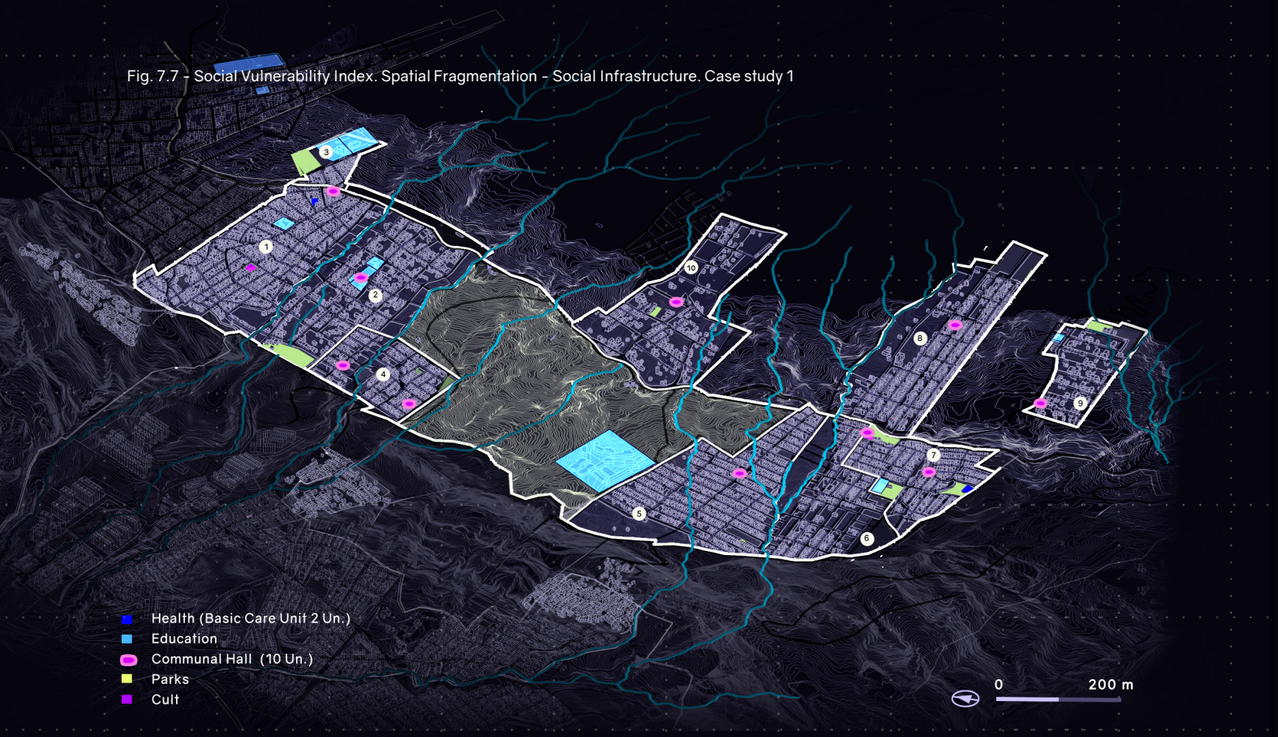


Social Vulnerability Index
Spatial Fragmentation - Social Infrastructure

The social infrastructure in the area consists of 6 district schools, a basic health care unit in the southern area and a primary health care unit in the northern area, 10 community halls and 8 social cohesion areas.

The largest school in the sector, Gabriel Garcia Marquez School, is located in the urban expansion area and does not have an infrastructure for connectivity that is adequately articulated with the Planning Unit. In the public space indicator (parks) the unit has 1.54 m2 per inhabitant (Bogotá 2017 Multipurpose Survey. District Veeduria Document Conditions, Quality of Life, Health and Illness Location Santa Fe 2017) which shows a high deficit.

Fig. 7.7 - Social Vulnerability Index. Spatial Fragmentation - Social Infrastructure. Case study 1



Source: Map made by author. GIS data, extracted from Bogotá open data.

Neighborhoods

1. La Flora
2. La Cabaña
3. Ciudad Londres Rural
4. Doña Liliana
5. Villa Diana
6. Los Soches
7. Juan Jose Rondon
8. Tihuaque
9. Las Violetas rural
10. San Pedro Sur rural

Vulnerability Assessment
Spatial Fragmentation - Social Infrastructure



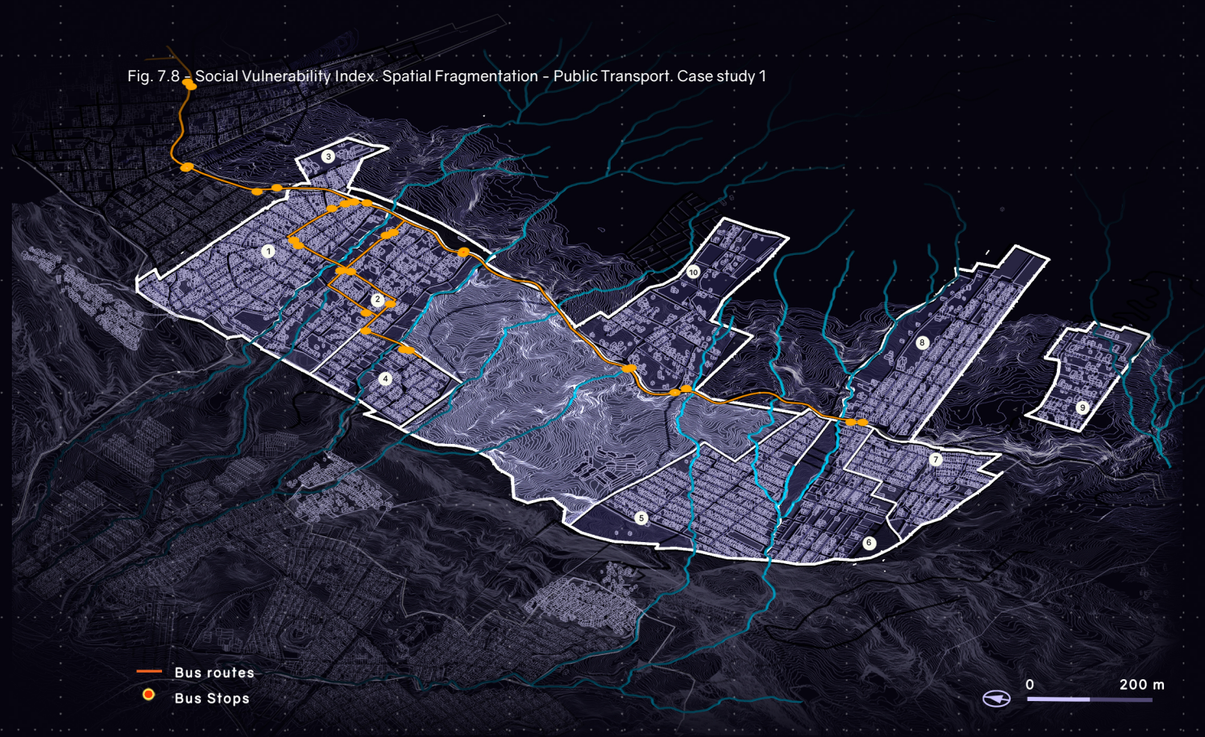
Social Vulnerability Index
Spatial Fragmentation - Public Transport

The planning unit has as its only means of access and transport the SITP bus system. As shown in the map, the public transport is structured along the axis and does not reach the last neighborhoods (Las Violetas y Juan Jose Rendon).

Regarding the transport system inside the urban structure, only some circuits are established in the neighborhoods of La Flora and La Cabana. The sector has high mobility problems where a large part of the population is far from the few established stations.

Once again, the disconnection between the eastern and western sectors is evident, where mobility and transport are concentrated in a single access route. The area does not have a cycling route system and a large part of the roads remain unpaved.

Fig. 7.8 - Social Vulnerability Index. Spatial Fragmentation - Public Transport. Case study 1



Source: Map made by author. GIS data, extracted from Bogotá open data.

Neighborhoods

1. La Flora
2. La Cabaña
3. Ciudad Londres Rural
4. Doña Liliana
5. Villa Diana
6. Los Soches
7. Juan Jose Rondon
8. Tihuaque
9. Las Violetas rural
10. San Pedro Sur rural

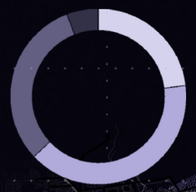
Vulnerability Assessment
Spatial Fragmentation - Public Transport



Social Vulnerability Index
Social Segregation

The sector is stratified into a low-bottom stratum, of which 98.5% of its population is within this classification in conditions of social and economic vulnerability and empowerment (Stratum 1). The 1.5% corresponds to the population without stratification. (Local Government of Usme, 2017). This UPZ does not have safe buildings, since at first sight prefabricated houses have been found, made of wood, tiles, plastic and cardboard. Likewise, sectors of population invasion were identified in forest protection areas.

Number of homes: 4.713
Population Density: 128 Inb/Ha
Neighborhoods: 10



Total Population (2015): **20.433 inh.**

- **Population under 5 years old:** 4.699 Inh. (22.9%)
- **Population between 5 and 15 years old** : 8.180 Inh. (40,3%)
- **Population between 15 and 59 years old:** 6.362 Inh. (31%)
- **Population over 60 years old:** 1.192 Inh. (5,8%)

The majority of the population consists of children and young people.



Fig. 7.9 - Social Vulnerability Index. Social Segregation - Stratification System. Case study 1

Neighborhoods

1. La Flora
2. La Cabaña
3. Ciudad Londres Rural
4. Doña Liliana
5. Villa Diana
6. Los Soches
7. Juan Jose Rondon
8. Tihuaque
9. Las Violetas rural
10. San Pedro Sur rural

Vulnerability Assessment
Social Segregation - Stratification



Average person per household: 3,36
Average monthly income per household: 330.340 Colombian pesos - 87 euro (Average income in Bogotá is 1,063,177 COP - 281 Euro)
General unemployment rate: 20.3% (Highest in Bogotá)

Bogota 2017 Multipurpose Survey. District Veeduria

Document Conditions, Quality of Life, Health and Illness Location Santa Fe 2017

Displaced population

According to data from the High Council for Victims through the Information System (SIVIC), in the period September 2010 to April 30, 2017, in the locality of Usme live 17,713 people Victims of the Armed Conflict. and La Flora houses 5.2% (924 Inh.). The population in displacement situation settles in this territory due to the proximity with the rural productive practices, the disposition of empty lands or the possibility of appropriating a space. The indigenous, Afro and displaced population has an unemployment rate of 35.5% (higher than the national rate which was 10.2% in 2012). Women represent 56.1% of the unemployed displaced population.
35.4% of the population does not have access to food due to lack of money. These same economic difficulties have led to the formation of gangs and criminal groups

Source: Local health diagnosis with social participation Location of Usme. 2009-2010. Municipality of Bogotá.

Source: Executive Report of the Analysis of Conditions, Quality of Life, Health and Illness Location of Usme. (2017, Municipality of Bogotá)

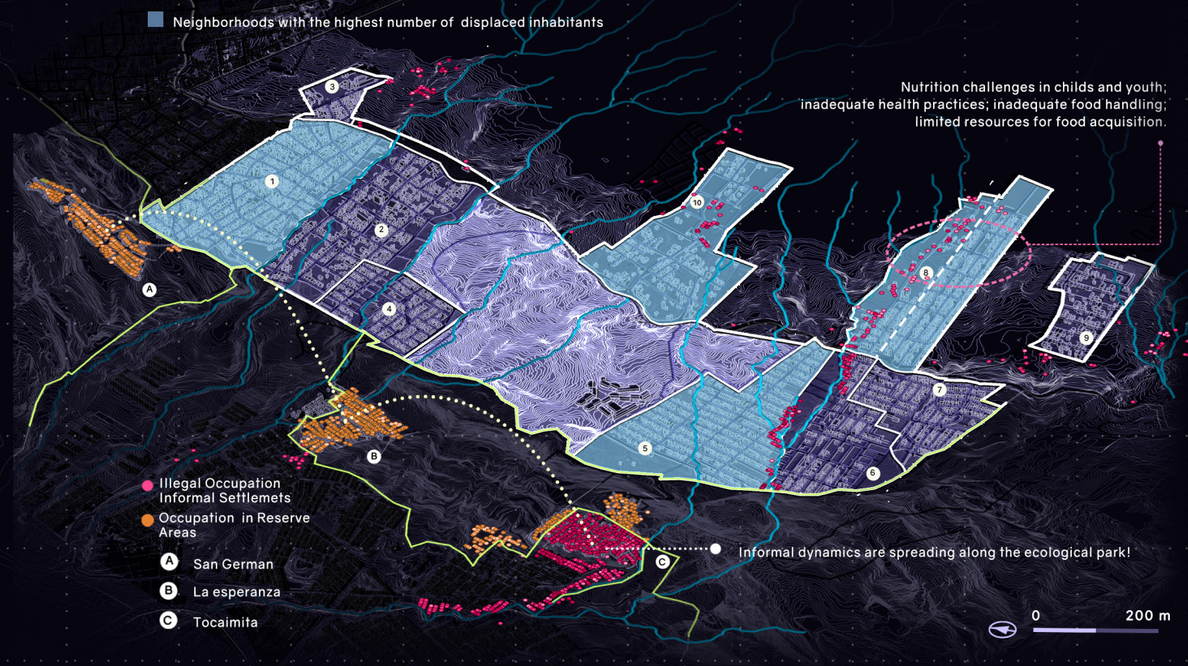
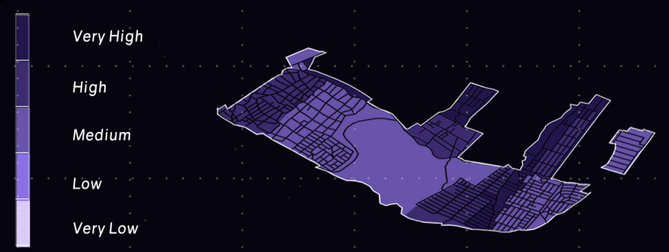


Fig. 7.10 - Social Vulnerability Index. Social Segregation - Social Challenges and displacement rates. Case study 1

Neighborhoods	Displaced Inhabitants
1. La Flora	1. 176 Inh.
2. La Cabaña	2. 73 Inh.
3. Ciudad Londres Rural	3. 25 Inh.
4. Doña Liliana	4. 31 Inh.
5. Villa Diana	5. 145 Inh.
6. Los Soches	6. 41 Inh.
7. Juan Jose Rondon	7. 45 Inh.
8. Tihuaque	8. 111 Inh.
9. Las Violetas rural	9. 2 Inh.
10. San Pedro Sur rural	10. 89 Inh.

Vulnerability Assessment
Social Segregation - Social composition, Displacement and challenges



Illegal Informal Settlements - Context of Case study 1

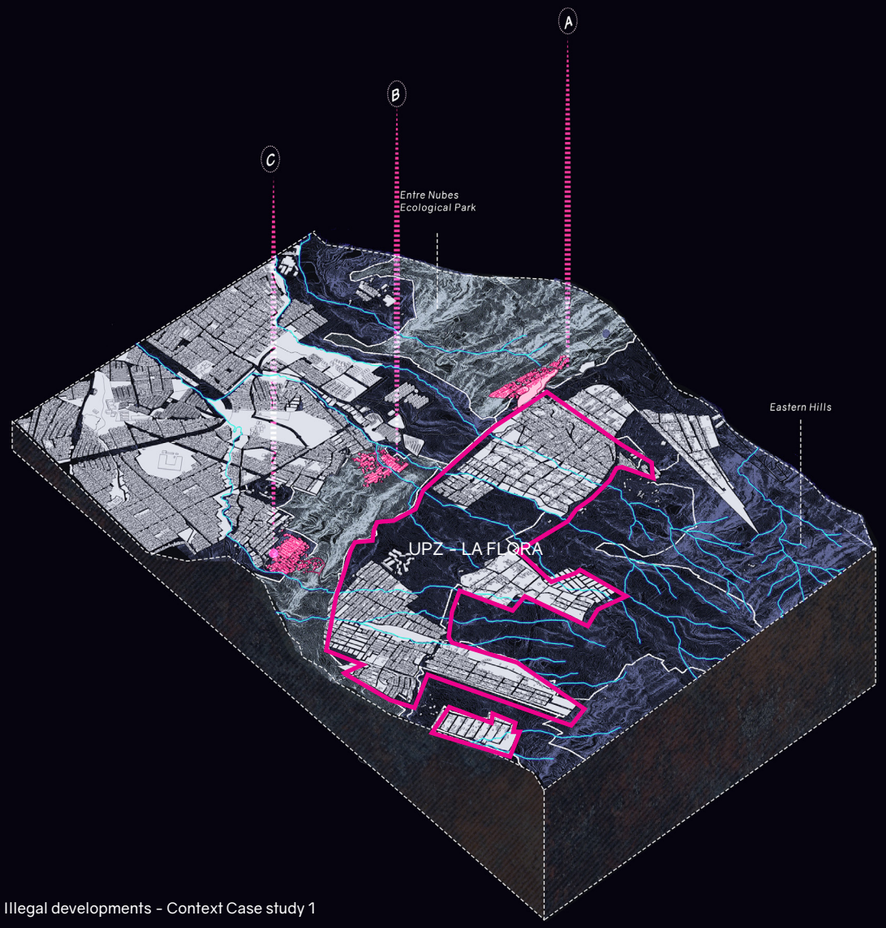


Fig. 7.11 - Illegal developments - Context Case study 1

San German, La Esperanza and Tocaimita are located in a complex geography defined by steep slopes and are located in ecological reserve areas. The following section will go through the three informal settlement that are bordering the Planning unit La Flora.

A. San German settlement

B. La Esperanza settlement

C. Tocaimita settlement

Fig. 7.13 - Illegal Settlement Tocaimita



Source: Street View - Google Maps (2020)

Informal Settlement: San German

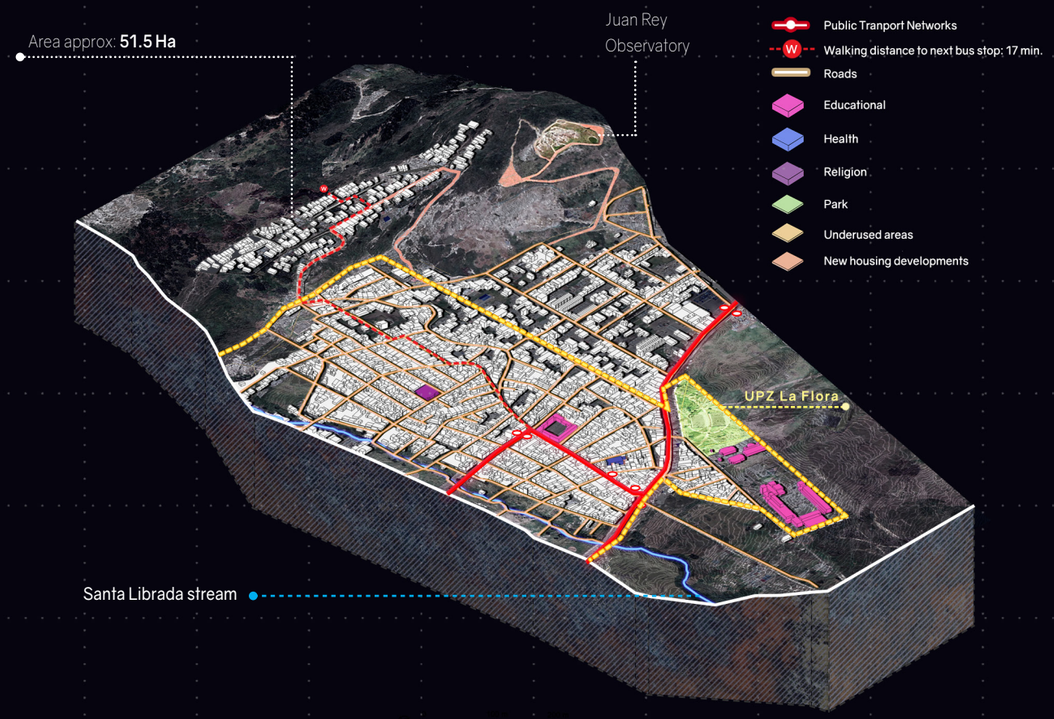


Fig. 7.14 - Location of the Informal Settlement San German

Foundation Year: 1985
Name: San German
Population: Approx. 350 Families
(More than 50% of the inhabitants are displaced from other regions due to the armed conflict in the country)
Public Services: Yes (Illegal)

Source: Techo Colombia.

Most of the population of the San Germán are victims of forced displacement. It is estimated that the population of the neighborhood is divided into more than 350 families, almost all with children, older adults and people with physical disabilities. As the population increases, the social balance that previously existed in the community begins to shift. New arrivals come with false land claims and drugs begin to be a problem. (Anderson, 2018) San Germán as an area of high social conflict because of the settlements that already existed, but at the same time as an area of high social value for the Park, and there is talk of controlling new settlements and buying land, but not necessarily resettling the entire neighborhood (Guerrero, 2016). The neighborhood does not have any type of public space or equipment.

The neighborhood is characterized by houses made of tin sheets and non-perishable materials, and therefore there is no type of economic activity inside the houses, as seen usually in the lower strata areas in Bogotá, where families usually have an informal business in their home. There is a strong relationship between informal neighborhoods, the concentration of poverty and the number of people with informal jobs.

In this context of the informal economy, it contributes to the subsistence of the inhabitants of informal neighborhoods. The informal economic activities of settlements (activities carried out by individuals to generate economic income and meet their needs, usually based on the exchange of products, goods and services) are closely related to the city's formal and informal economy. According to information provided by the referents, most inhabitants of Informal Settlements have income from informal sector activities located within or outside the settlement. In the town of Usme, 21% of the economic activities in the informal settlements are considered rural. (Techo, 2015)

As seen in Figure 7.62 the informal settlement of San German is disconnected from the urban dynamics of the city. The entrance to the neighborhood is from two uncovered roads on steep slopes that lead to the settlement. Most of the houses do not have basic services such as electricity or water. The settlement has no paved roads. Most of the houses are built with materials such as cans, cardboard, wood. (Guerrero, 2016) The settlement does not have any kind of facilities or public space. The surrounding context has only one park that corresponds to the San Cayetano educational institute, where a police station is located. The area has a small health station, a church and another school of smaller scale. The area has several unused lots, the Santa Librada stream basin is beginning to be invaded and in the San German settlement an area is not fully developed

1.Sliding Risk:

The areas at greatest risk from landslides are on the edges of the neighborhood, especially in the area along the Juan Rey viewpoint and in the access area to the settlement, as shown in Figure 7.61 and in the images a. and b.. Most of the houses are located in a lower risk area but considering the rapid growth of the neighborhood in recent years on the north side, the dwellings that have been located near the viewpoint are at high risk of landslides.

1. Flooding Risk:

The area of the informal settlement has no major flood risks except for the overflow of the water body on the western side of the neighborhood. The humidity is almost permanent in San Germán, due to the altitude. There are seven water basins of the Entrenubes Park that feed the Bogotá River, an extremely vulnerable ecosystem due to its proximity to human settlements that do not have sanitation, irrigation or waste management systems. (Anderson, 2018). Close to the settlement, as shown in Figure 7.61, is the stream called Santa Librada, which has invasions on its water course. This area is threatened by flooding.

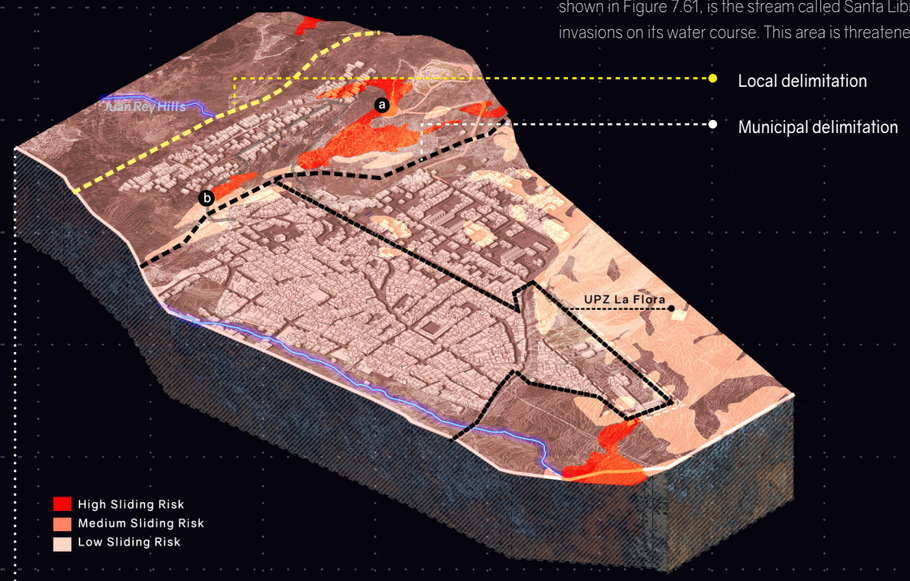


Fig. 7.15 - Sliding Risk in the Informal Settlement San German

Legal Situation

The settlement, as stated above, suffered two eviction attempts by the Enrique Peñalosa administration in 2016. The legal situation of the settlement is uncertain where on the one hand the administration claims that they are located in an ecological reserve zone and on the other hand the population claims that the settlement started to consolidate before this delimitation was determined, and that many of them have legal papers over the ownership of their plot.

Local version of the problem:
The neighborhood is not within the Entrenubes Park. The neighborhood belonged to a private property and it started to developed long before the park was declared a reserve area (1985). The territory where the settlement is located is in the limit and not inside the park. (Imagina Bogotá, 2016)

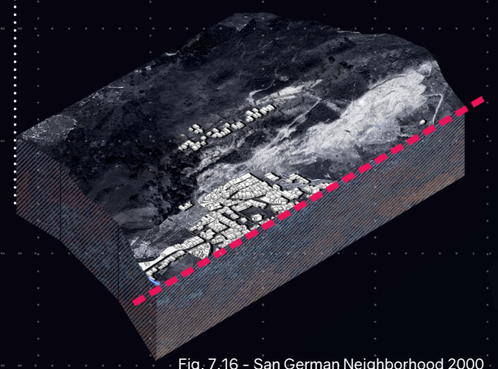


Fig. 7.16 - San German Neighborhood 2000

In the administration led by former mayor Gustavo Petro (2012 - 2014), a process to legalize the San Germán neighborhood was initiated, and he was eventually stopped after his term of government. This process proposed a flexibility in the norm, where this neighborhood could be restructured in a sustainable and ecological approach towards the park.

Municipal Version of the problem:
The settlement is inside the Limit of Ecological Reserve Zone, decreed by Peñalosa in the POT (Territorial Management Plan) of 2000.

Ecological Degradation:

The mountainous areas of the sector have been losing their vegetation cover and forests. As informal settlement has grown in recent years, trees have been removed and vegetation removed in order to build houses. In turn, this sector is an extremely vulnerable ecosystem due to its proximity to human settlements that have no sanitation, irrigation or waste management systems (Anderson, 2018). The area is at risk from areas where garbage is dumped, where there is no control over the contamination of water bodies and where vegetation cover has been lost.

Informal Settlement: La esperanza

Area approx: **57.5 Ha**

Foundation Year: 1972
Population: 1200 Families
(Less than 50% of the inhabitants are displaced from other regions due to the armed conflict in the country)
Public Services: Yes

Source: Techo Colombia.

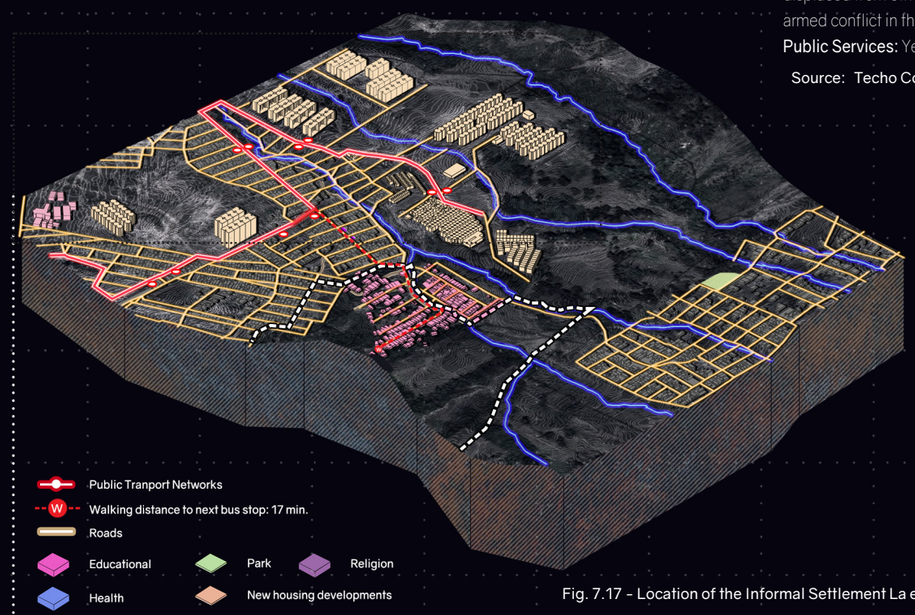
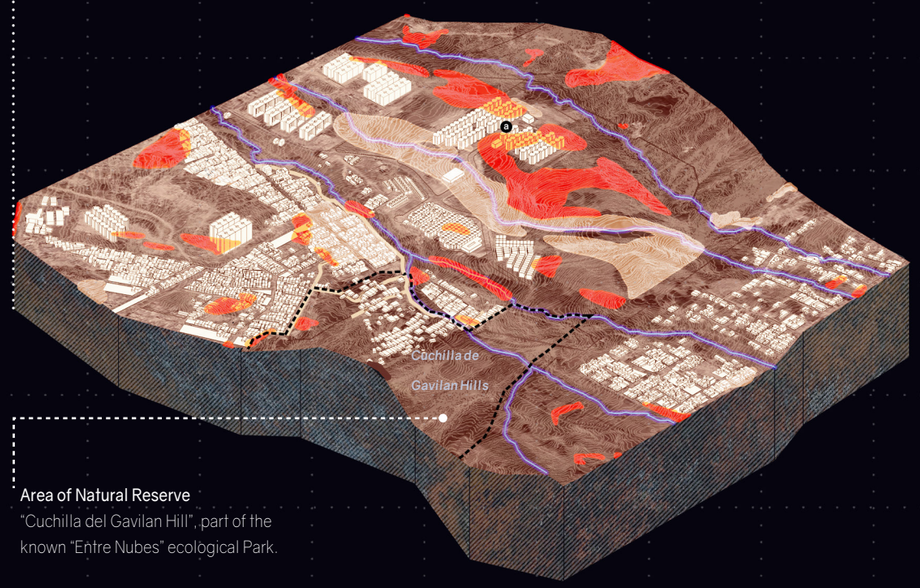


Fig. 7.17 - Location of the Informal Settlement La esperanza

The settlement has only one main access road, the 80 Bis South Street. This road is the only one that crosses the city from west to east in this area. To access the settlement, there are only 4 entry points and the roads are not paved. Public transport buses arrive at a station far from the neighborhood, where the resident population has to walk for approximately 15 minutes on a steep slope to get around.

The sector is characterized by new real estate development projects, as shown in orange in figure X. These new developments are not related to the context and are fenced. In terms of facilities and public space, the sector surrounding the settlement has a school on the west side and a local park on the east side. The settlement does not have any public space or communal equipment.



Area of Natural Reserve
"Cuchilla del Gavilan Hill", part of the known "Entre Nubes" ecological Park.

Fig. 7.18 - Sliding Risk in the Informal Settlement La esperanza

Informal Settlement: Tocaimita

Area approx: **75.5 Ha**

Foundation Year: 1972
Name: La Esperanza
Population: 1200 Families
(Less than 50% of the inhabitants are displaced from other regions due to the armed conflict in the country)
Public Services: Yes

Source: Techo Colombia.

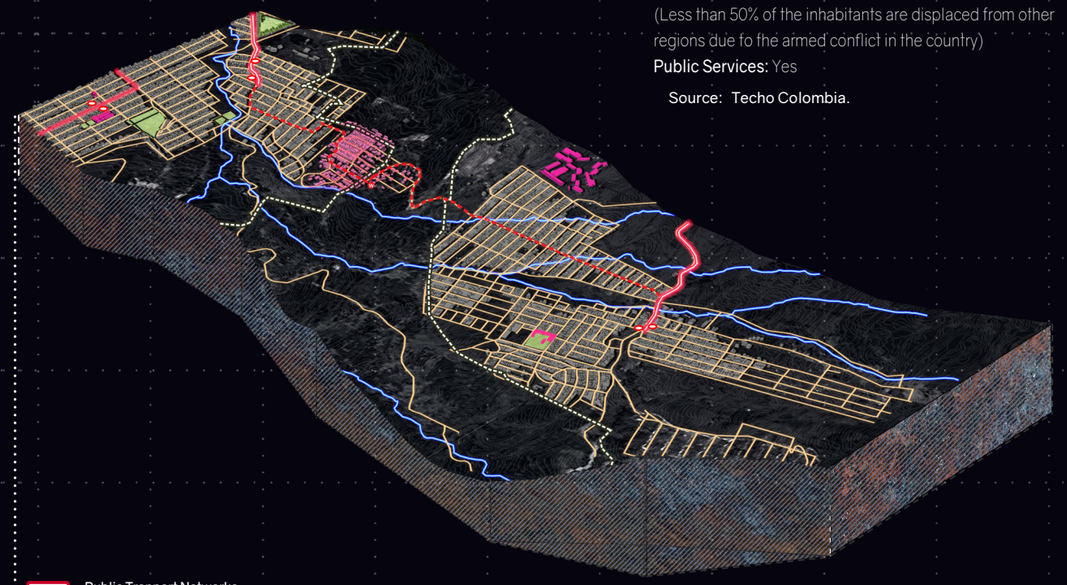


Fig. 7.19 - Location of the Informal Settlement Tocaimita

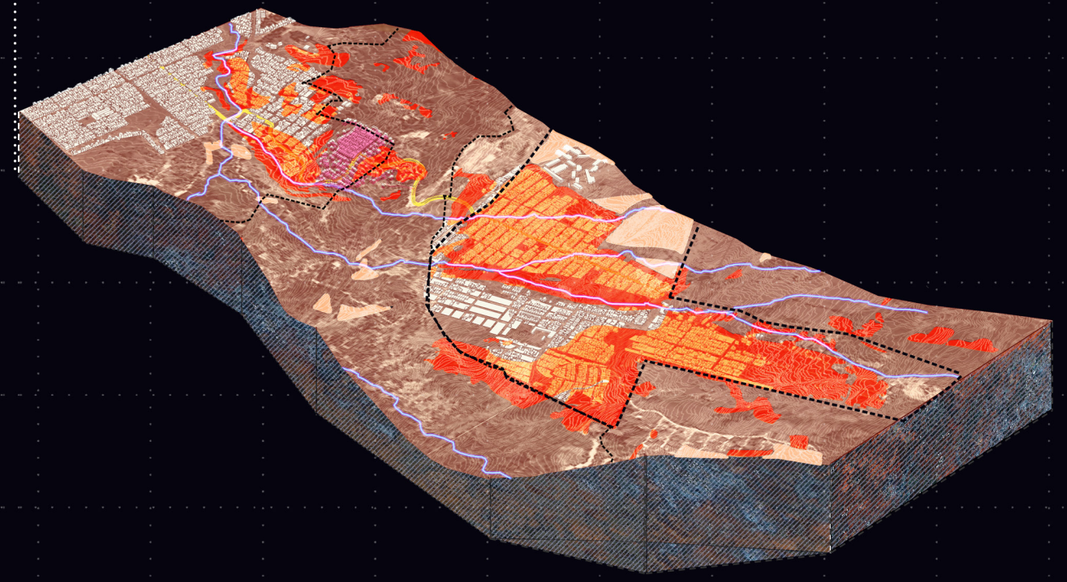


Fig. 7.20 - Sliding Risk in the Informal Settlement Tocaimita

Ecological Vulnerability Index
Ecological Risk - Flooding and Sliding

Both the pronounced topography, composed of the eastern hills of the city and the hills of the ecological park "Entre nubes", the informal housing construction process, and the large variety of water bodies in the area, brings a high risk and vulnerability with respect to landslides and floods. These floods are caused by prolonged rainfall, overflowing rivers, construction of informal buildings in river and streams below the level of the river (as evidenced mainly in the Yomasa stream), deforestation, lack of adequate sewage systems, clogging of drains, lack of mitigation works such as dikes, dams and canals or construction in wetlands.

As shown in orange on the map, the neighborhoods of San Pedro, Tihuaque, Santa Rosita, Juan Jose Rendon and Villa Diana are located in areas at high risk of landslides. The high-risk zones are associated with tectonic faults, whose effects are intensified by the alteration of vegetation. At the same time, the informal dynamics continue to occur in the water courses. Both the southern zone and the informal developments on the western side are susceptible to landslides and require mitigation strategies and articulation with the natural environment.

Fig. 7.21 - Ecological Vulnerability Index. Risk - Flooding and Sliding Risk. Case study 1



Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Neighborhoods

1. La Flora
2. La Cabaña
3. Ciudad Londres Rural
4. Doña Liliana
5. Villa Diana
6. Los Soches
7. Juan Jose Rondon
8. Tihuaque
9. Las Violetas rural
10. San Pedro Sur rural

Vulnerability Assessment

Risk - Flooding and Sliding Risk

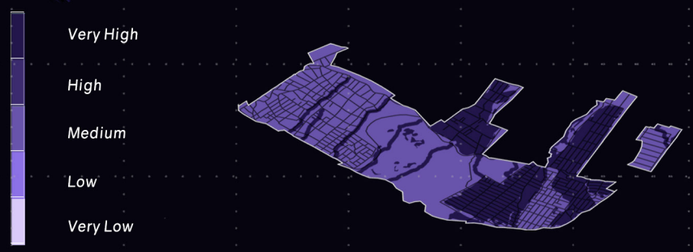
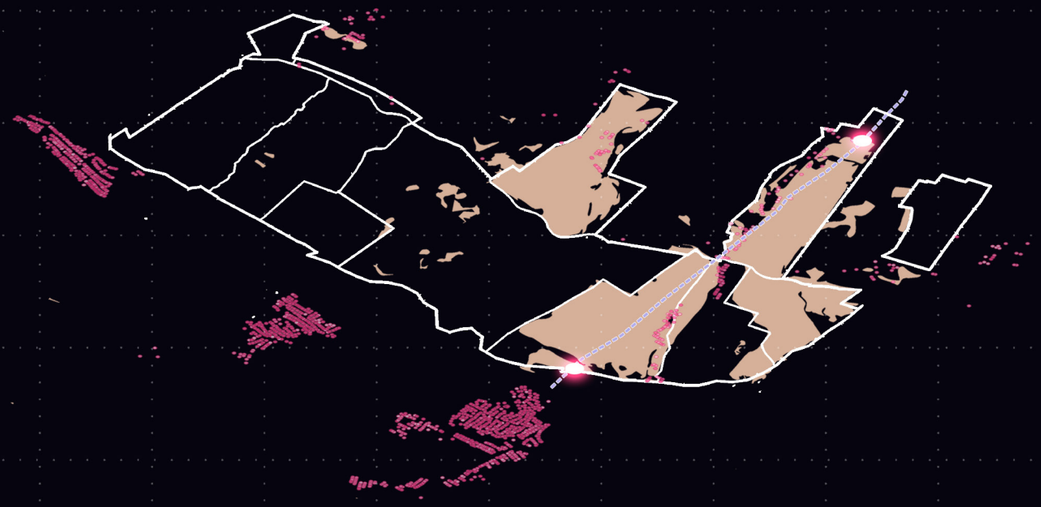
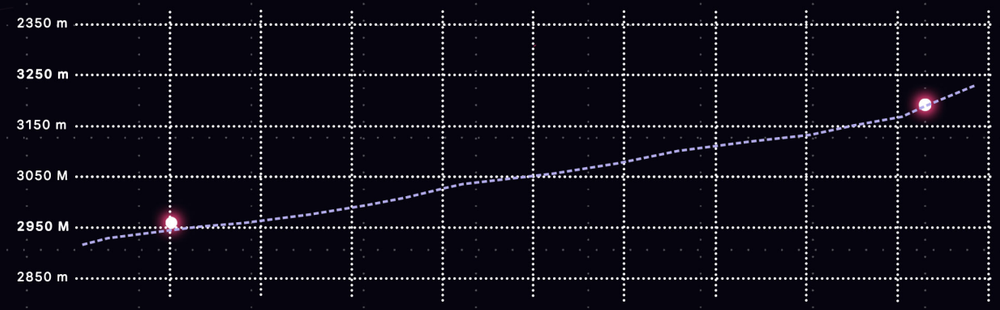
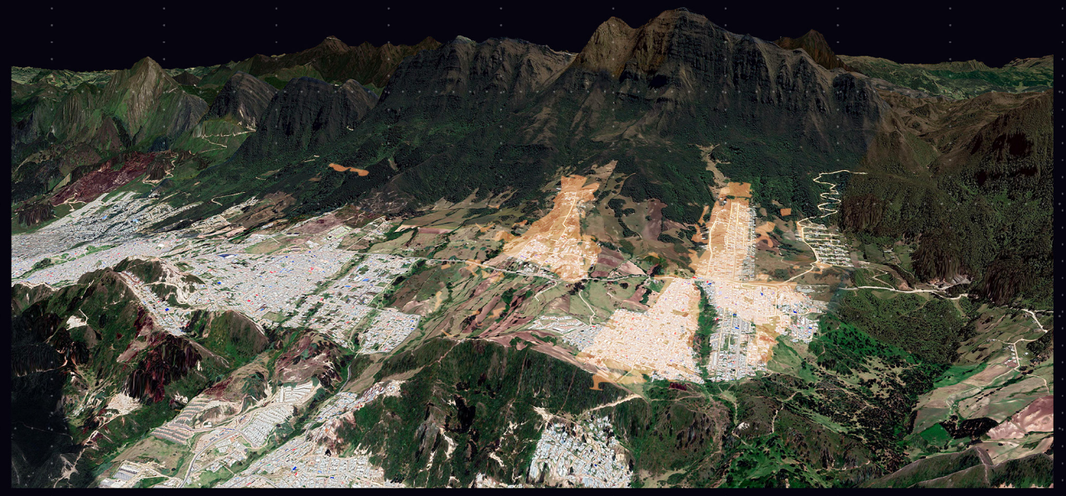


Fig. 7.22 - Topography. Case study 1





The areas of greatest ecological risk are located in a range of 2900 m and 3200 m altitude.



Source: Google Earth. Aerial View and Elevation Profile data.

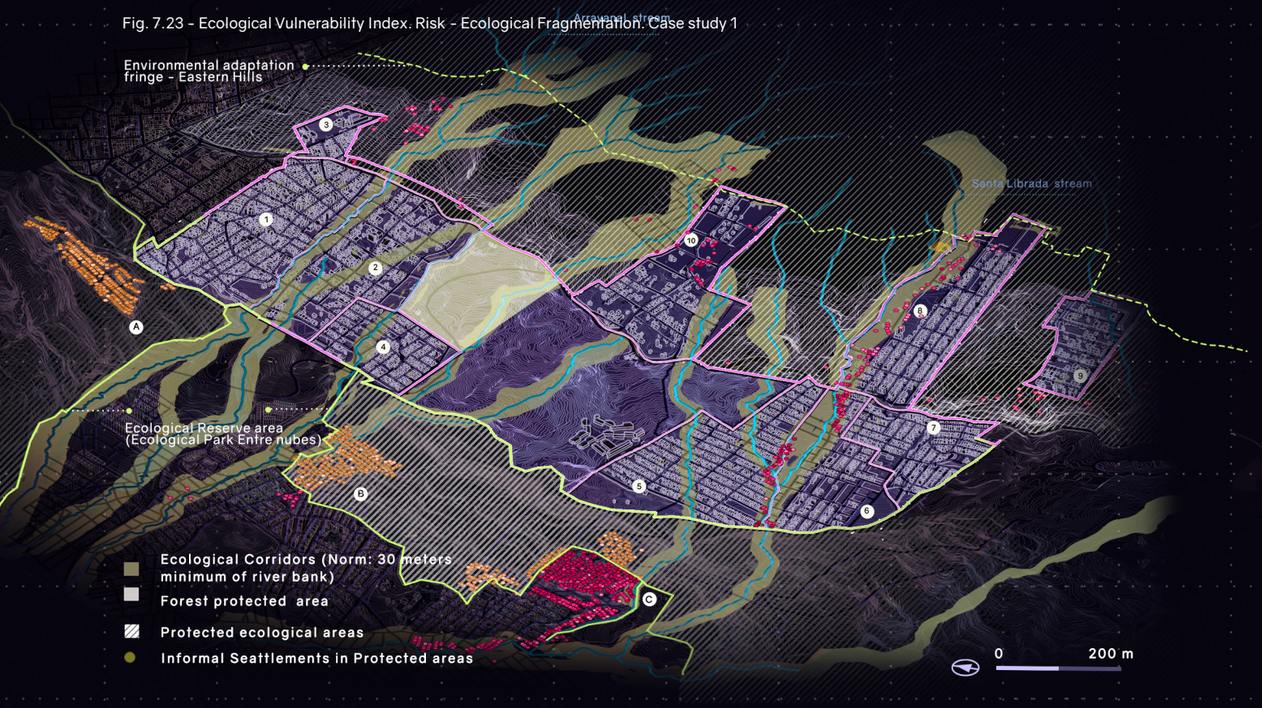
Ecological Vulnerability Index
Ecological Fragmentation

Ecological fragmentation is revealed by two types of disconnection. The first one is the disarticulation between the built system and the ecosystem, where informality continues to develop in ecological areas increasing their vulnerability and the environmental degradation. Since many areas are in disuse, informal dynamics are still spreading and the fragmentation in the accessibility and mobility is higher. The disarticulation between the population and its environment is increasing.

The second disconnection is evident in the disarticulation of the ecosystems in the area. In spite of the high potential of ecological corridors that could articulate forest reserve areas, the eastern hills and the "Entre nubes" park, the elements are fragmented and there are no clear actions or objectives when it comes to establishing the same structuring and functioning ecological and recreational system.

The central area, determined for the future development of housing, can generate a great vulnerability in the disarticulation of ecological elements if it is not developed according to the determinants of the context.

Fig. 7.23 - Ecological Vulnerability Index. Risk - Ecological Fragmentation. Case study 1



Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Neighborhoods

1. La Flora
2. La Cabaña
3. Ciudad Londres Rural
4. Doña Liliana
5. Villa Diana
6. Los Soches
7. Juan Jose Rondon
8. Tihuaque
9. Las Violetas rural
10. San Pedro Sur rural

Vulnerability Assessment
Ecological Fragmentation

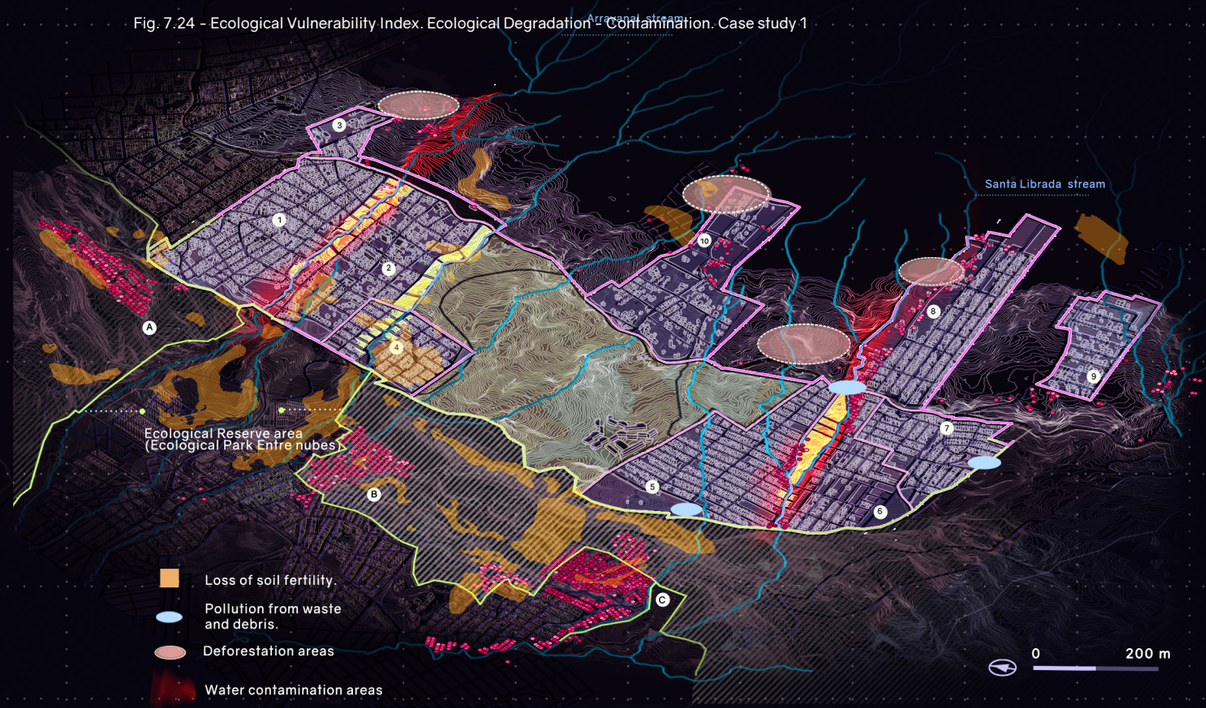


Ecological Vulnerability Index
Ecological Degradation

Inadequate waste disposal, burning, deforestation, temporary crops, dumping and informal urban settlements are the main activities with respect to environmental degradation in the planning unit. Deforestation occurs in the eastern hills of the city due to agricultural activities and the development of urban settlements. These shortcomings in agricultural activities may be due, among other causes, to the lack of appropriate technical advice and training and the inadequate management of animals.

The unplanned urbanization processes generated problems such as invasion of ravines, lack of public services, including sewage, which causes contamination of water sources with domestic and industrial discharges, proliferation of vectors, generation of odors, lack of drinking water, accessibility difficulties and housing construction without application of technical standards. The contamination of water bodies occurs mainly in the Yomasa and Santa Librada streams. As shown in the map, the alteration of the protective plant cover has also generated a loss of soil fertility.

Fig. 7.24 - Ecological Vulnerability Index. Ecological Degradation - Contamination. Case study 1

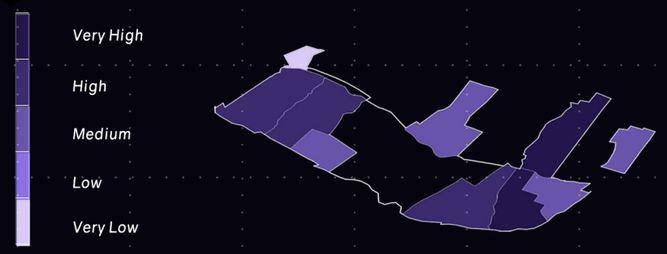


Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Neighborhoods

1. La Flora
2. La Cabaña
3. Ciudad Londres Rural
4. Doña Liliana
5. Villa Diana
6. Los Soches
7. Juan Jose Rondon
8. Tihuaque
9. Las Violetas rural
10. San Pedro Sur rural

Vulnerability Assessment
Ecological Degradation - Contamination



Ecological Vulnerability Index

Ecological Risk - Flooding and Sliding

The following diagram shows the information set out in the previous section, where the driving causes of both landslides and flooding are determined by natural and man-made elements. The following section will show which of these driving causes are evident in the Flora and later also in the UPZ Lourdes.

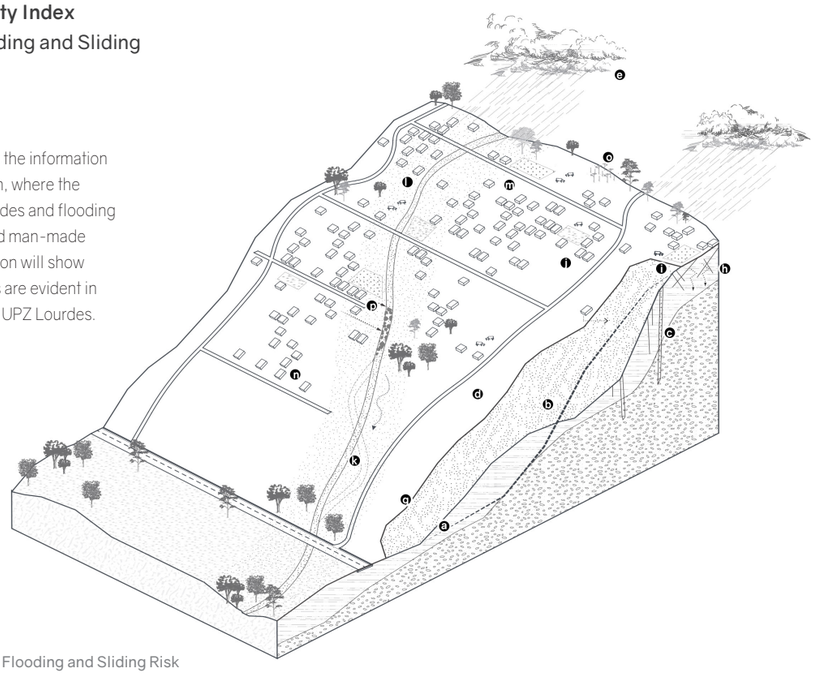
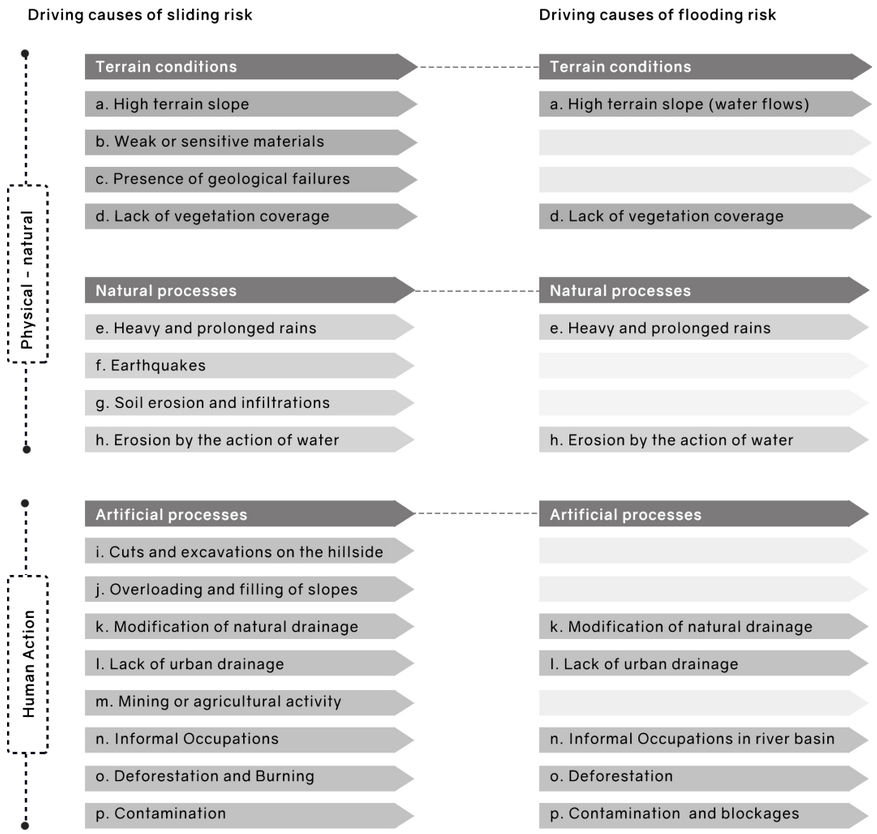


Fig. 7.25 - Driving Causes of Flooding and Sliding Risk



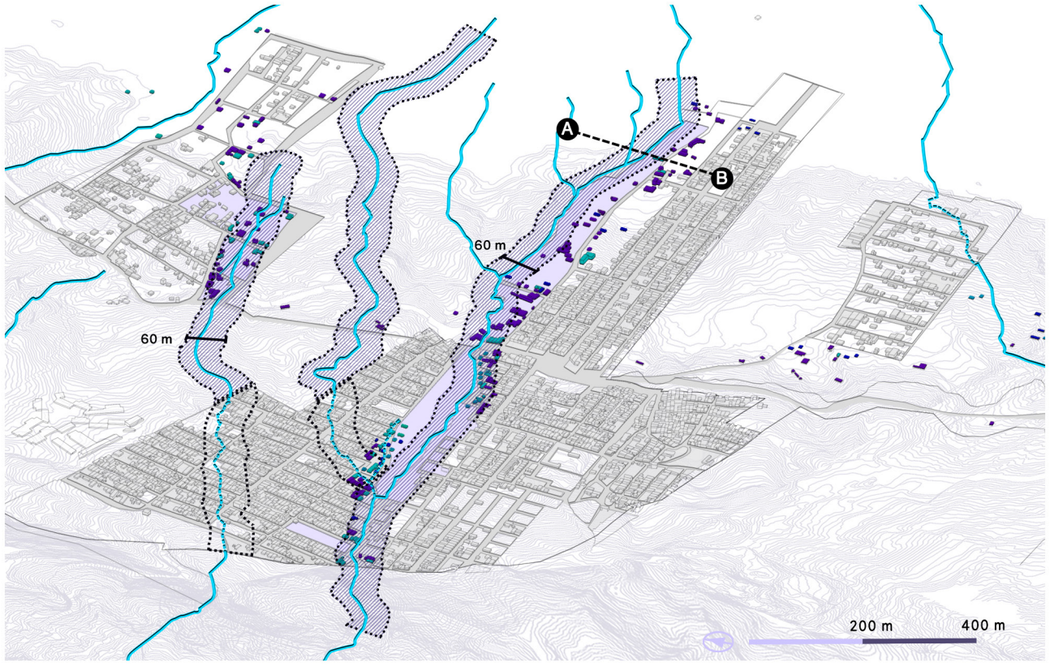
Source: IDIGER, (2019, 12 20). Riesgo por Movimientos en Masa. Caracterización General del Escenario de Riesgo. Retrieved from IDIGER: https://www.idiger.gov.co/rmovmasa. Drawing and Scheme by author.
Source: IDIGER, (2016). Amenaza por movimientos en masa en perspectiva de cambio climatico . Bogota : Alcaldia Mayor de Bogotá.

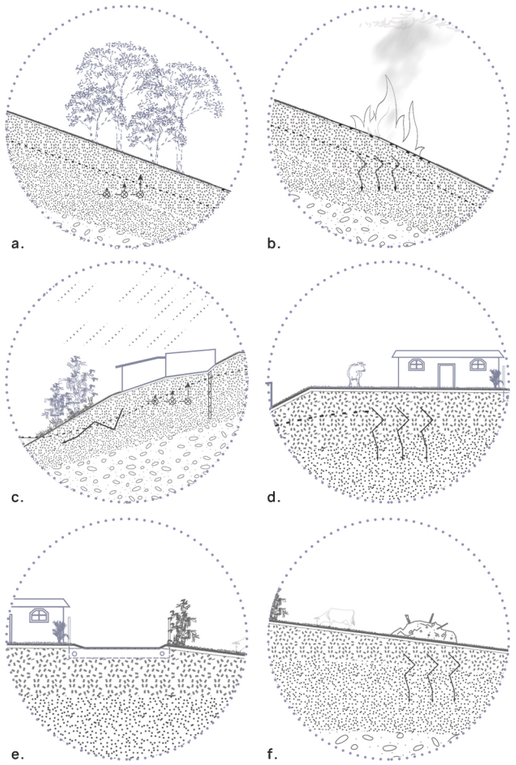
Fig. 7.26 - Topographic Landscape. Context of UPZ La Flora
Source: Google Earth, 2020

Ecological Vulnerability Index

The following section will evaluate which of the above mentioned variables are present in the territory of the Flora. In order to visualize the current situation of vulnerability and risk, both in terms of flooding and landslides, a strategic section was developed.

Fig. 7.27 - UPZ La Flora. Reference Map, Section through Water Stream.





Driving causes of Flooding Risk and Vulnerability

a.
- Lack of vegetation
- High slopes

b.
- Burning activities and contamination
- Deforestation

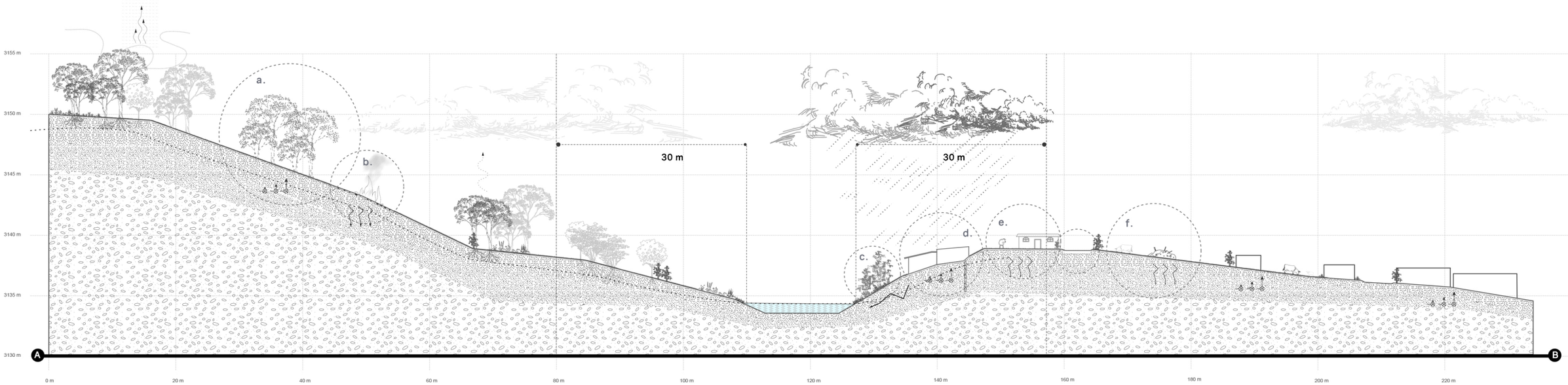
c.
- Informal development on river basin
- Deforestation and lack of vegetation
- Lack of drainage
- Geological failures

d.
- Overloading slopes
- Informal Ocupations (weak structures)
- Agricultural activities
- Deforestation

e.
- Lack of Urban drainage
- Infiltrations

f.
- Lack of vegetation
- Soil erosion and Infilitration
- Contamination

Fig. 7.28 - UPZ La Flora. Section through Water Stream.




- Agricultural activities
- Deforestation
Source: Google Street View, 2020.


- High slopes
- Contamination
Source: Google Street View, 2020.


- Informal development on river basin
- Deforestation and brunings
- Lack of drainage
Source: Google Street View, 2020.


- Lack of vegetation
- Soil erosion
- Informal development (weak structures)
Source: Google Street View, 2020.

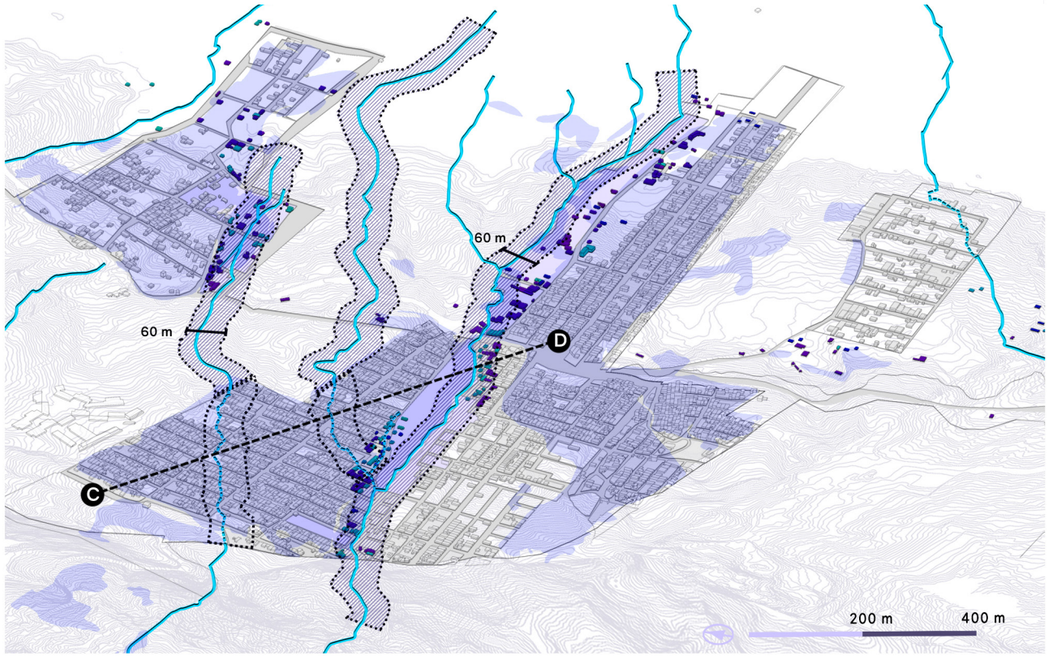

- Agricultural activities in river basin
- Informal development in river basin
Source: Google Street View, 2020.

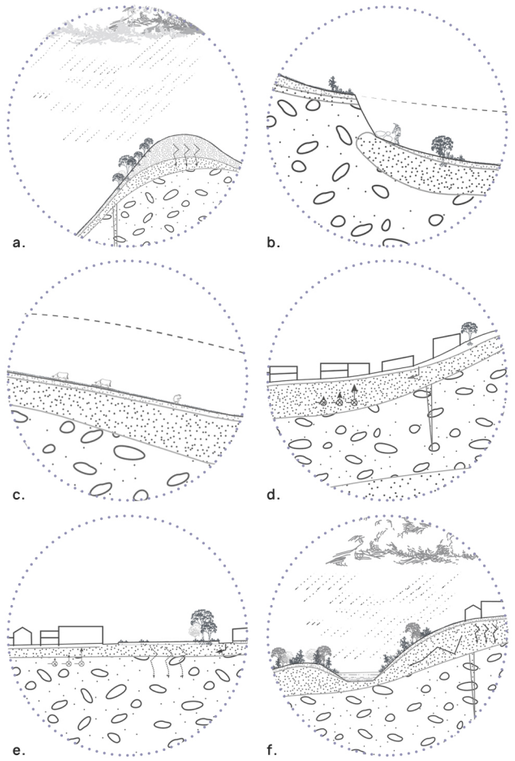

- Lack of Urban drainage
- Weak informal structures
- Lack of vegetation
Source: Google Street View, 2020.

Ecological Vulnerability Index

Regarding the visualization of the influencing variables in the landslide scenario, a section was developed in accordance with the highest risk area, as shown in the map below. Again, the circles in the section are identifying the variables that are present and have an impact on the vulnerability and hazard.

Fig. 7.29 - UPZ La Flora. Reference Map, Section through Landslide Risk area





Driving causes of Sliding Risk and Vulnerability

a.
- Erosion by action of water
- Lack of vegetation
- Presence of geological failures
- High slopes
- Cuts and excavations on hillside

b.
- Cuts and excavations on the hillside
- Mining activities and contamination
- Deforestation

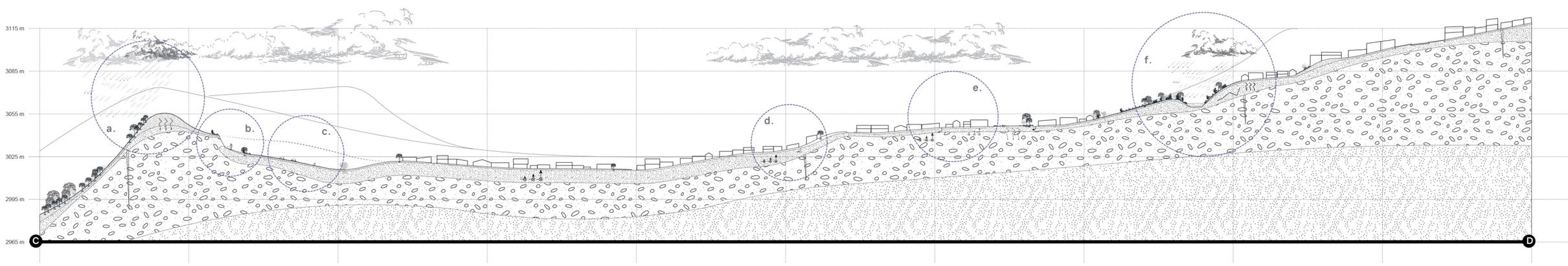
c.
- Agricultural activities
- Deforestation

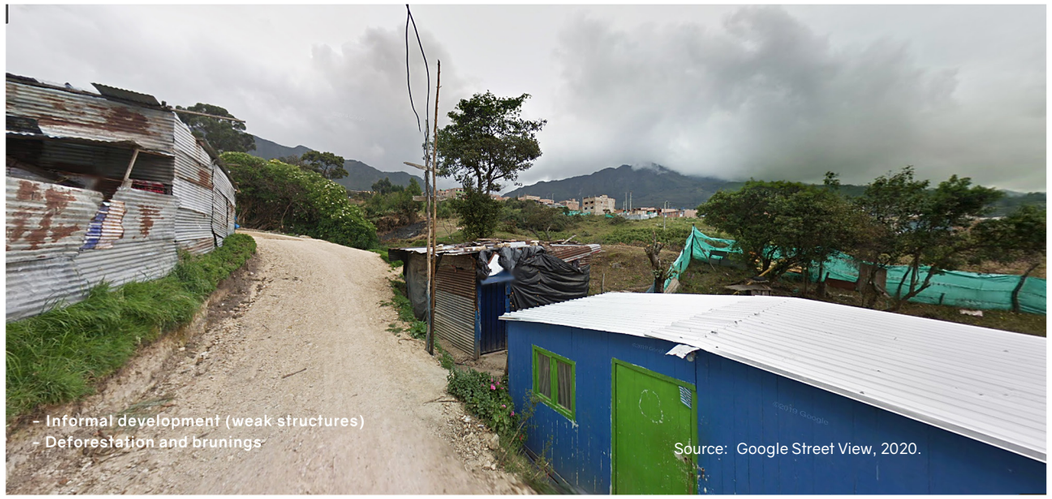
d.
- Overloading slopes
- Informal Ocupations (weak structures)
- Geological failures
- Lack of Urban drainage

e.
- Lack of Urban drainage
- Weak structures and Overloading slopes
- Infiltrations

f.
- Informal Occupatiosn in river basin
- Lack of vegetation
- Soil erosion and Infilitration
- Lack of urban drainage
- Modification of natural course
- Contamination

Fig. 7.30 - UPZ La Flora. Section through Landslide Risk area




- Informal development (weak structures)
- Deforestation and brunings
Source: Google Street View, 2020.


- High slopes
- Contamination
- Deforestation and brunings
Source: Google Street View, 2020.


- Deforestation
- Soil erosion
Source: Google Street View, 2020.


- Informal development (weak structures)
- Lack of Urban drainage
- High slopes
- Overload slopes
Source: Google Street View, 2020.


- Agricultural activities in river basin
- Informal development in river basin
- Soil erosion
Source: Google Street View, 2020.


- Lack of Urban drainage
- Weak informal structures
- Lack of vegetation
Source: Google Street View, 2020.

Socio Economic Vulnerability Index
Formal and Informal economic infrastructures

- Main economic activity: Informal Commerce (Itinerant sales and establishments that do not comply with all legal requirements (chamber and commerce and payment of social benefits):
62.7% informality rate.

- Recycling, partly derived from rubble and waste
- Household labor in the commercial area of the town of Usme and UPZ.

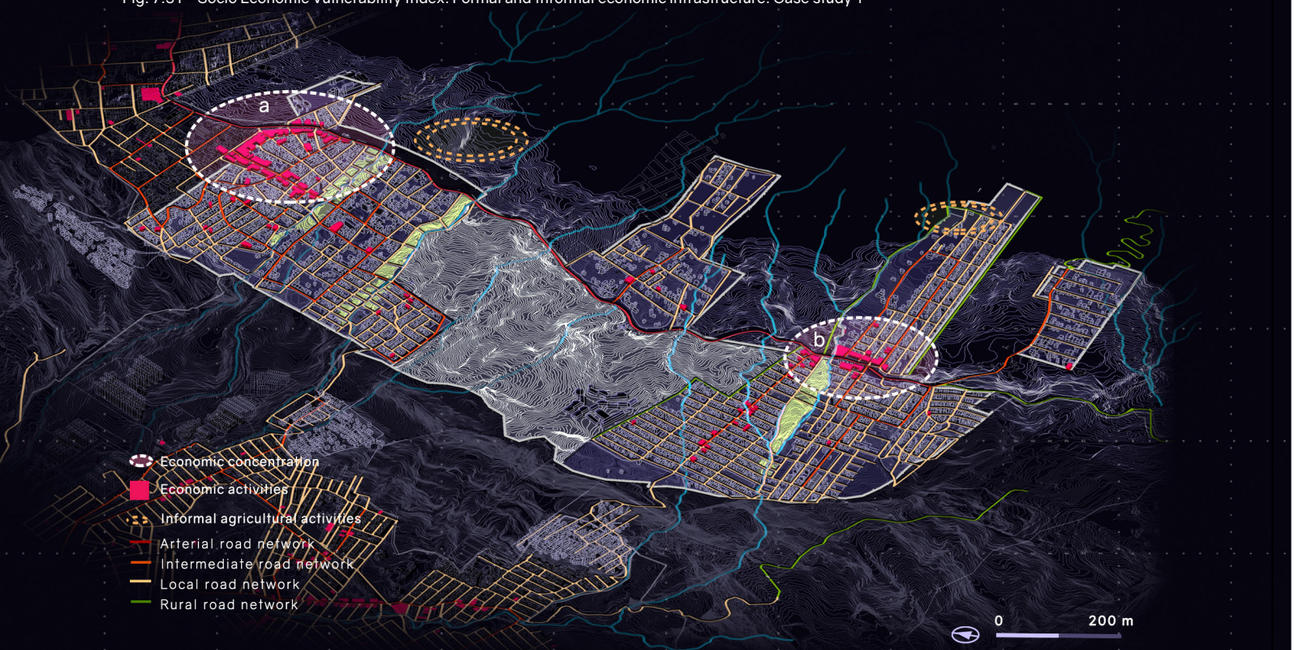
- Average monthly income per household:
330.340 Colombian pesos - 87 euro, Lowest in Bogotá.
(Average income in Bogotá is 1,063,177 COL - 281 Euro)

Main processes of entrepreneurship:

Services that are characterized by being commercial establishments such as supermarkets, butchers, bakeries, supermarkets, hairdressers, miscellaneous and shops.
(Managed by inhabitants of the sector for the same inhabitants, equable dynamic of supply and demand)

- Average of 20% of total income for transportation purposes.
General unemployment rate: 20,3% (Highest in Bogotá)
35.4% of the population does not have access to food due to lack of money.

Fig. 7.31 - Socio Economic Vulnerability Index. Formal and Informal economic infrastructure. Case study 1



Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Neighborhoods

1. La Flora
2. La Cabaña
3. Ciudad Londres Rural
4. Doña Liliana
5. Villa Diana
6. Los Soches
7. Juan Jose Rondon
8. Tihuaque
9. Las Violetas rural
10. San Pedro Sur rural

Vulnerability Assessment
Fromal and Informal Economic Infrastructure



The planning unit La Flora is characterized as an urban area where rural activities like agricultural and farming activities are performed. The border between the rural and the urban becomes blurred, largely because its resident population are farmers and displaced populations due to the country's armed conflict. The economic infrastructure is made up of two cores of services and commercial activities, located on the structuring road axis.

The two economic centers answer to local demands, showing a process of endogenous development. One of the nodes is articulated within the La Flora neighborhood, and the other, despite having a strong concentration on the road axis, has begun to expand on one of the main axes of the Villa Diana neighborhood.

Economic Nodes

a.









b.







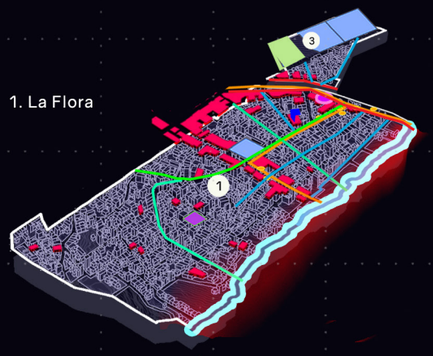


Vulnerability Assessment - Summary of each neighborhood

The assessment is categorized per neighborhood regarding the vulnerability gradient for each variable, assessing from very low to very high the findings in the place. The understanding the variables that define the vulnerability gradient for each neighborhood provides a correlated understanding of the assessment

Fig. 7.32 - Multidimensional Vulnerability assessment

1. La Flora



Social, ecologial and socio economic Vulnerability

- Spatial Fragmentation
- Social Infrastructure
- Social Segregation
- Slidind and Flooding Risk
- Ecological Fragmentation
- Ecological Degradation
- Economic Infrastructure

2. La Cabaña



Social, ecologial and socio economic Vulnerability

- Spatial Fragmentation
- Social Infrastructure
- Social Segregation
- Slidind and Flooding Risk
- Ecological Fragmentation
- Ecological Degradation
- Economic Infrastructure

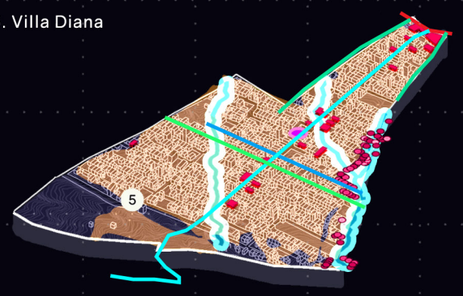
4. Doña Liliana



Social, ecologial and socio economic Vulnerability

- Spatial Fragmentation
- Social Infrastructure
- Social Segregation
- Slidind and Flooding Risk
- Ecological Fragmentation
- Ecological Degradation
- Economic Infrastructure

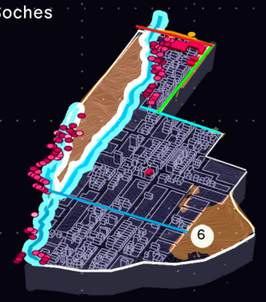
5. Villa Diana



Social, ecologial and socio economic Vulnerability

- Spatial Fragmentation
- Social Infrastructure
- Social Segregation
- Slidind and Flooding Risk
- Ecological Fragmentation
- Ecological Degradation
- Economic Infrastructure

6. Los Soches



Social, ecologial and socio economic Vulnerability

- Spatial Fragmentation
- Social Infrastructure
- Social Segregation
- Slidind and Flooding Risk
- Ecological Fragmentation
- Ecological Degradation
- Economic Infrastructure

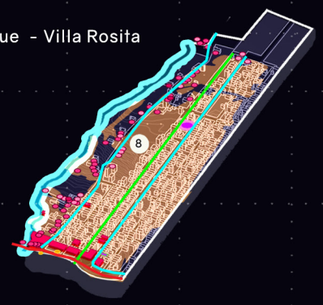
7. Juan Jose Rondon



Social, ecologial and socio economic Vulnerability

- Spatial Fragmentation
- Social Infrastructure
- Social Segregation
- Slidind and Flooding Risk
- Ecological Fragmentation
- Ecological Degradation
- Economic Infrastructure

8. Tihuaque - Villa Rosita



Social, ecologial and socio economic Vulnerability

- Spatial Fragmentation
- Social Infrastructure
- Social Segregation
- Slidind and Flooding Risk
- Ecological Fragmentation
- Ecological Degradation
- Economic Infrastructure

9. Las Violetas rural



Social, ecologial and socio economic Vulnerability

- Spatial Fragmentation
- Social Infrastructure
- Social Segregation
- Slidind and Flooding Risk
- Ecological Fragmentation
- Ecological Degradation
- Economic Infrastructure

10. San Pedro Sur rural



Social, ecologial and socio economic Vulnerability

- Spatial Fragmentation
- Social Infrastructure
- Social Segregation
- Slidind and Flooding Risk
- Ecological Fragmentation
- Ecological Degradation
- Economic Infrastructure

Vulnerability Assessment - Spatial Logic of the Planning Unit

Discovering the spatial logic through the reading of the proposed framework.

The vulnerability variables need to be related and translated into spatial terms in order to propose an urban Reconstruction. Each variable of analysis is influenced and determined by the structure, distribution and interrelation of the different spatial systems.

Structural dimension: Connectivity, Accessibility, Mobility, integration
Functional dimension: Uses and activities
Distributional dimension: distribution of collective uses.

a The area is structured by a main connection line which concentrates two commercial nodes. The first node has a structural connection with the facilities of the area, and it is better related to the context. Public transport is better distributed in this sector than in the southern area. The improvement strategies were given under the same project and the impact and operation of the sector shows a more articulated dynamics.

b As there is only one access road, the planning unit is disconnected from the western side of the city. The barrier, the ecological park, has not been permeated in an articulated manner with the environment and the sector. It is in this same boundary area that informal dynamics have been developing in recent years.

c The planning unit has a large part of its central area determined as a development area, which remains empty and which fragments the space into a northern and southern sector. These areas belong to private persons and are determined to housing developments.

d The neighborhoods that have been developed on the eastern side of the access road, and that have been legalized and part of the Eco-neighborhoods initiative in past administrations, are isolated and have no connection to the context. Informal developments continue to take place in the sectors of greatest ecological vulnerability.

e The second commercial node concentrates activities and services on a local scale, and because of the commercial establishments that have been developed due to the improvement of the structural axis of one of the neighborhoods, a commercial dynamic is beginning to develop within one of the neighborhoods, towards the western section.

f The facilities developed in different administrations are isolated and do not have a good connection with the other functions of the sector.



Fig. 7.33 - General Diagnosis of the Planning Unit La Flora

c. Critical exemplifying area 2: Zonal Planning Unit Lourdes

Vulnerability assessment:

The following section will analyses the critical case of Lourdes, applying the vulnerability index variables. The Vulnerability Index will analyze from a social point of view in relation to the fragmentation and segregation gradients in relation to the physical space and infrastructure as well as the demographic composition of the sector. From the environmental point of view, the aim is to analyze the different challenges around the risks, degradation and disconnection of ecological bodies, and from the economic point of view, to analyze the dynamics, potentialities and challenges of the economic structures present in the sector.

The locality of Santa Fe, and the planning unit Lourdes within it, are located in the central area of the city, where the economic, commercial, cultural and political core of the Capital District has been traditionally developed since colonial times. Today the floating population, the great commercial offer and the social conditions have generated environmental impacts, informal developments in areas of high risk of flooding and landslides and an inadequate water management. (District administrative department, 2011)



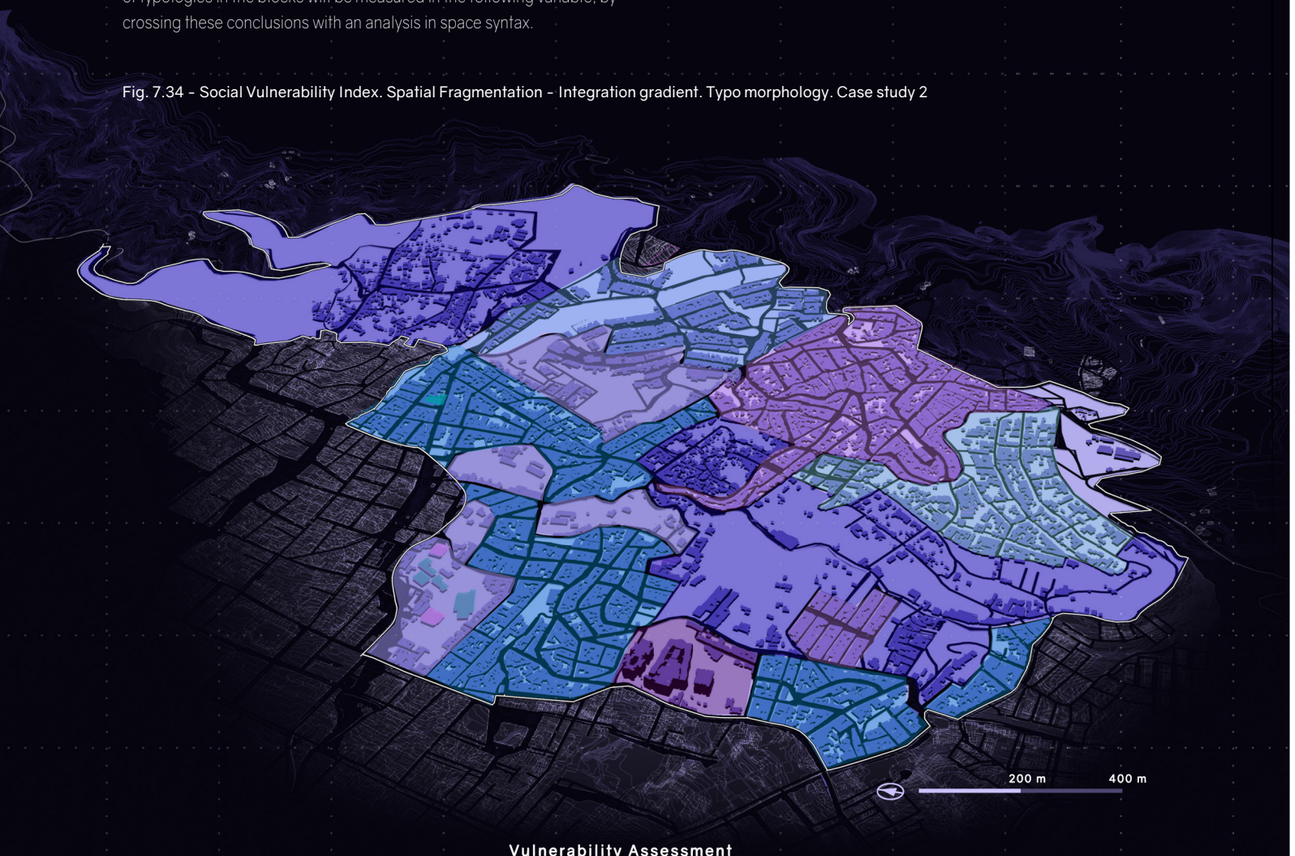
Source: Google Earth View, 2020.

Social Vulnerability Index

Typo-morphological analysis (Fragmentation gradient)

The analysis showed eight types of configurations. As shown in the following images, This area, in contrast to the flora, has more consolidated areas. The most irregular blocks are in the area closest to the hills, while the areas closest to the center of the city have more regular frames. Likewise, the large empty spaces have a high incidence in the fragmentation of the areas. Through the categorization of these spaces it is evident to see how the composition in the local mobility infrastructure, the size of the blocks, the unused space, and the amount of connectivity elements has a great incidence in the fragmentation of the space. The understanding of the fragmentation caused by this type of typologies in the blocks will be measured in the following variable, by crossing these conclusions with an analysis in space syntax.

Fig. 7.34 - Social Vulnerability Index. Spatial Fragmentation - Integration gradient. Typo morphology. Case study 2



Vulnerability Assessment

Neighborhoods:

1. Laches
2. San Dionisio
3. Balcones del triunfo
4. El Triunfo
5. El Guavio
6. Egipto alto
7. Rocio Centro Oriental
8. Fabrica de Loza
9. Lourdes
10. El Consuelo
11. El Dorado
12. Santa Rosa de Lima
13. Atanasio Girardot
14. Ramirez
15. Santa Barbara
16. El Mirador
17. Gran Colombia
18. Cartagena
19. El Rocio Bajo
20. La Peña

Very High
High
Medium
Low
Very Low



1 Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Gated buildings





Consolidation rate:medium
Available space: low

Less consolidated and empty space





Consolidation rate: low
Available space: very high

Rectangular Plots
Consolidation process





Average Size: 115x28m
Average Area: 3.220 m2
Consolidation rate: high
Available space: low

Facilities -
irregular development process





Consolidation rate: low
Available space: low

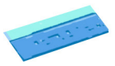
Irregular grit





Consolidation rate: medium high
Available space: low

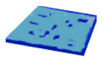
Regular Plot - ecological





Average Size: 120x40m
Average Area: 4800 m2
Consolidation rate: medium high
Available space: medium

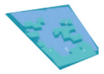
Consolidated





Consolidation rate: high
Available space: low

Consolidation process





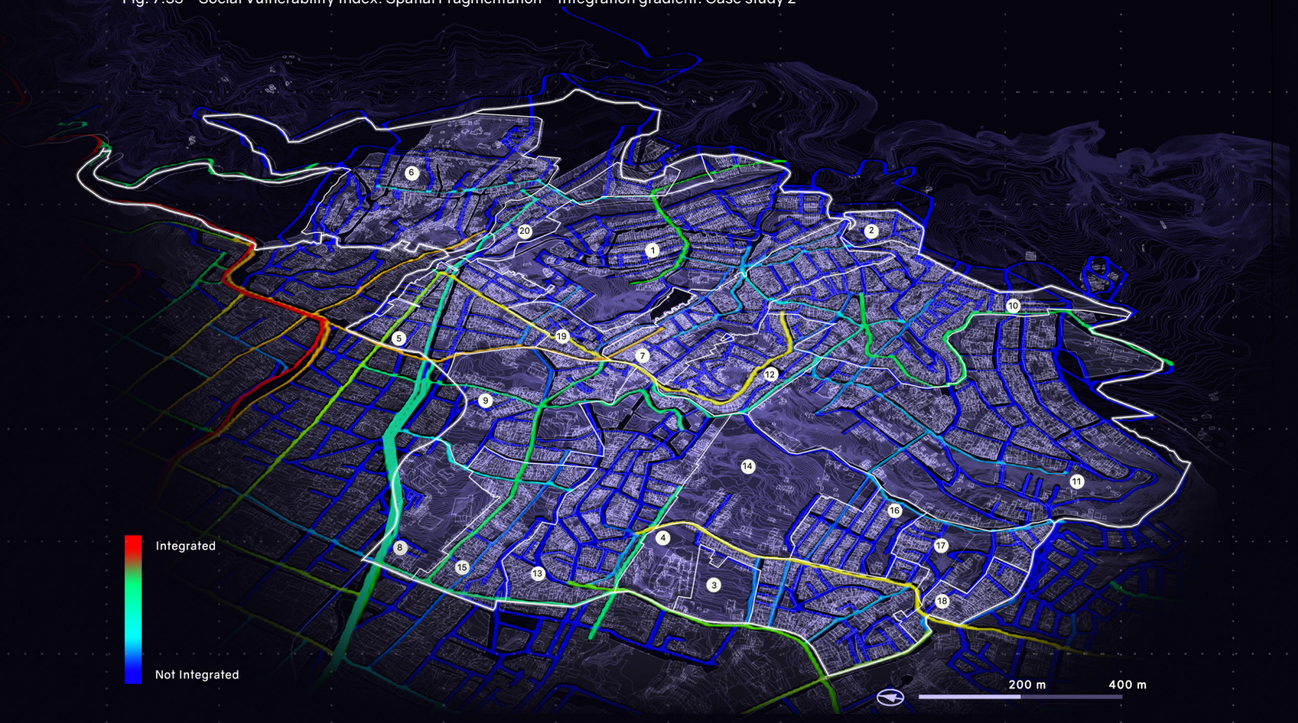
A
Consolidation rate: low
Available space: high

Social Vulnerability Index
Integration gradient

The Social Vulnerability Index regarding the local integration measure of the Planning Unit shows that a large part of the neighborhoods have a very low integration rate in relation to their context. Taking into account the proximity to the city center, the best connected axes within the neighborhood are structured according to the linkages with the context. The road network on a metropolitan scale does not have a direct relationship with the planning unit, as can be seen in the image.



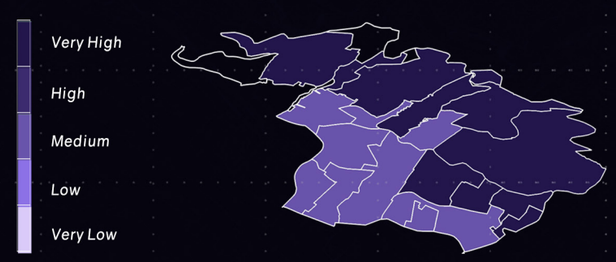
Fig. 7.35 - Social Vulnerability Index. Spatial Fragmentation - Integration gradient. Case study 2



Vulnerability Assessment
Spatial Fragmentation Integration gradient

Neighborhoods:

1. Laches
2. San Dionisio
3. Balcones del triunfo
4. El Triunfo
5. El Guavio
6. Egipto alto
7. Rocio Centro Oriental
8. Fabrica de Loza
9. Lourdes
10. El Consuelo
11. El Dorado
12. Santa Rosa de Lima
13. Atanasio Girardot
14. Ramirez
15. Santa Barbara
16. El Mirador
17. Gran Colombia
18. Cartagena
19. El Rocio Bajo
20. La Peña



1 Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Public Transport Systems

The public transport system in the sector is structured by two rings, one in the eastern zone and the other in the western zone. The large empty areas in the center of the planning unit are dividing the continuity of the mobility system. Despite being better connected than the upz la Flora, there are several sectors that are not connected to these transport systems.

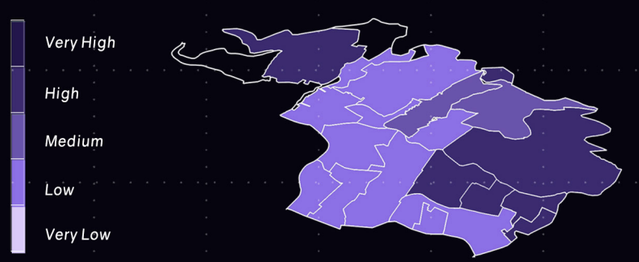
Fig. 7.36 - Social Vulnerability Index. Spatial Fragmentation - Public Transport. Case study 2



Vulnerability Assessment
Spatial Fragmentation - Public Transport

Neighborhoods:

1. Laches
2. San Dionisio
3. Balcones del triunfo
4. El Triunfo
5. El Guavio
6. Egipto alto
7. Rocio Centro Oriental
8. Fabrica de Loza
9. Lourdes
10. El Consuelo
11. El Dorado
12. Santa Rosa de Lima
13. Atanasio Girardot
14. Ramirez
15. Santa Barbara
16. El Mirador
17. Gran Colombia
18. Cartagena
19. El Rocio Bajo
20. La Peña



1 Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Social Vulnerability Index
Social Infrastructure

The Planning Unit has 4 institutes providing first level health care (1 CAMI and 3 UPA) and 130 allocations for the development and promotion of social welfare of which 127 are related to basic assistance, 1 with administration, information and reception to specific social groups, 1 with comprehensive basic assistance, 1 with disability assistance.

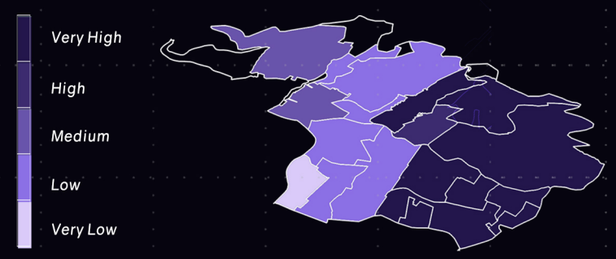
The area has the highest number of official educational establishments, with 8. but has the lowest number of facilities in relation to its population, with 38 facilities per 10,000 residents, The public space rate in the area is 2.6 m2 per inhabitant.

Fig. 7.37 - Social Vulnerability Index. Spatial Fragmentation - Social Infrastructure. Case study 2



Vulnerability Assessment
Spatial Fragmentation - Social Infrastructure

Neighborhoods:
1. Laches
2. San Dionisio
3. Balcones del triunfo
4. El Triunfo
5. El Guavio
6. Egipto alto
7. Rocio Centro Oriental
8. Fabrica de Loza
9. Lourdes
10. El Consuelo
11. El Dorado
12. Santa Rosa de Lima
13. Atanasio Girardot
14. Ramirez
15. Santa Barbara
16. El Mirador
17. Gran Colombia
18. Cartagena
19. El Rocio Bajo
20. La Peña



1 Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Stratification System

- Number of homes 13.428 UN.
- Population Density: 233 Inh/Ha
- Neighborhoods: 20
- Average person per household: 3.5
- Average family per house: 1.81
- Average monthly income per household: 436,476 Colombian pesos - 115 euro
(Average income in Bogotá is 1,063,177 COL - 281 Euro)
- General unemployment rate: 16.82% (Bogotá is 9.8%)
- Public space indicator: 2.6 m2

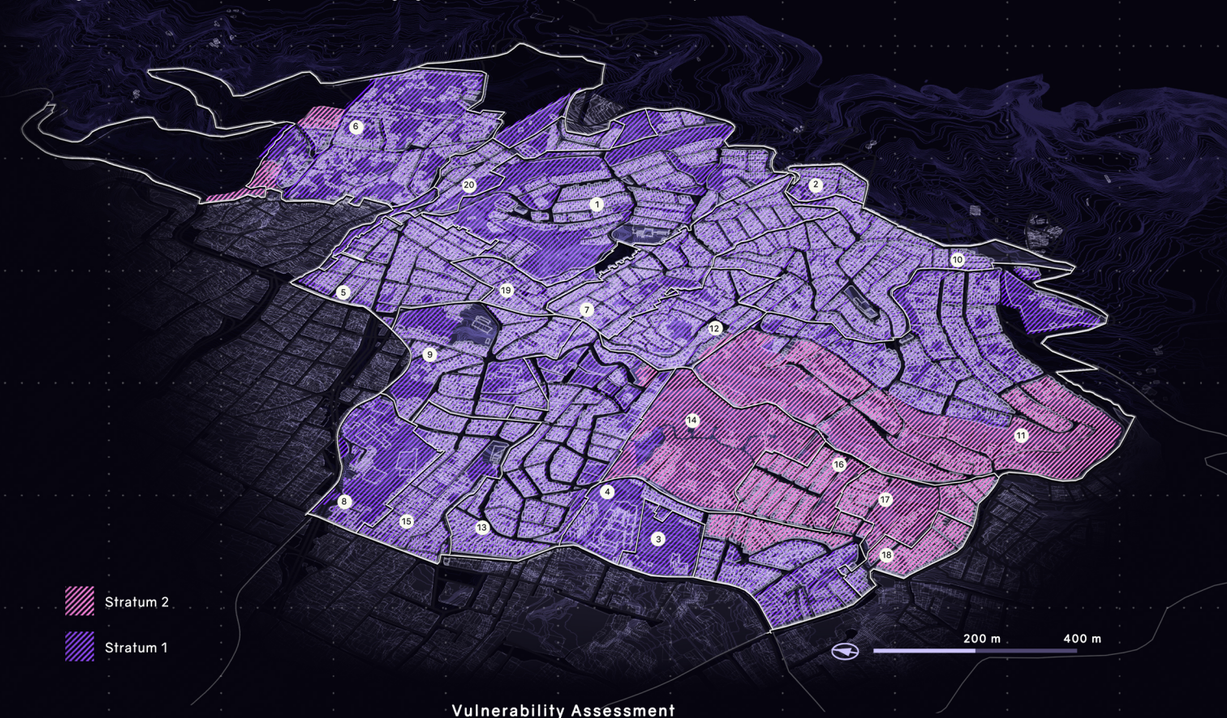
Bogotá 2017 Multipurpose Survey. District Verdure
Document Conditions, Quality of Life, Health and Illness Location Santa Fe 2017

UPZ 96 Lourdes is an unconsolidated residential sector of strata 1 and 2. Some neighborhoods are located in areas of the hills, originated by pirate invasions and urbanizations. It is characterized by being a priority UPZ The intervention plan of the subprogram for integral improvement is based on human settlements of illegal origin with serious deficiencies in infrastructure, accessibility, equipment and public space (Chamber of Commerce, 2007, p. 28)



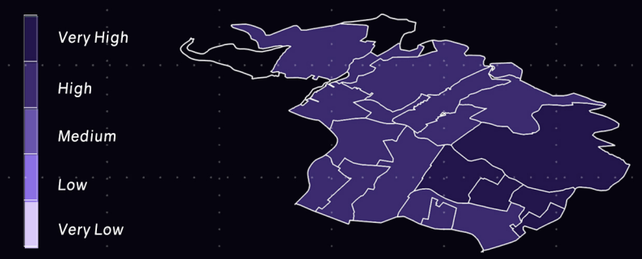
86.2% of the inhabitants of this UPZ were found in stratum 2.
12.7% live in the lowest stratum 1.

Fig. 7.38 - Social Vulnerability Index. Social Segregation. Stratification System. Case study 2



Vulnerability Assessment
Social Segregation Stratification System

Neighborhoods:
1. Laches
2. San Dionisio
3. Balcones del triunfo
4. El Triunfo
5. El Guavio
6. Egipto alto
7. Rocio Centro Oriental
8. Fabrica de Loza
9. Lourdes
10. El Consuelo
11. El Dorado
12. Santa Rosa de Lima
13. Atanasio Girardot
14. Ramirez
15. Santa Barbara
16. El Mirador
17. Gran Colombia
18. Cartagena
19. El Rocio Bajo
20. La Peña



1 Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Social Vulnerability Index
Social Segregation - Insecurity rates

The areas with the most inadequate disposal of waste are in the Ramirez neighborhood (14) in Lajas Creek and in the eastern zone near Charreron and Manzanares Creek. The Ramirez neighborhood, which includes the Triunfo and Mirador micro territories, showed a strong problem of inadequate waste disposal, which is derived from the economic activity of recycling, taking into account that this work basically comes from the collection of materials, substances and objects of consumption by the population of the town or district. In this sector there is a great concentration of informal settlements where the great majority of the houses are made of wood, tiles and recycling elements such as cardboard and bricks that are collected in their daily activity.

The sale of substances generates the presence of street inhabitants and insecurity. Organized groups operate in the area that manage illicit psychoactive substance sales sites, controlling sectors in neighborhoods such as Ramirez, where it is common to find large groups of street inhabitants selling the garbage they recover or the objects obtained almost always illegally to consume psychoactive substances.

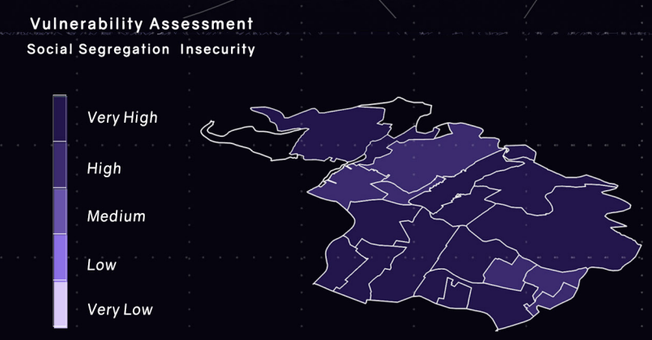
Fig. 7.39 - Social Vulnerability Index. Social Segregation. Insecurity. Case study 2



Vulnerability Assessment
Social Segregation Insecurity

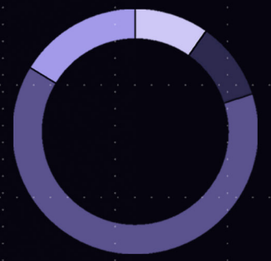
Neighborhoods:

1. Laches
2. San Dionisio
3. Balcones del triunfo
4. El Triunfo
5. El Guavio
6. Egipto alto
7. Rocio Centro Oriental
8. Fabrica de Loza
9. Lourdes
10. El Consuelo
11. El Dorado
12. Santa Rosa de Lima
13. Atanasio Girardot
14. Ramirez
15. Santa Barbara
16. El Mirador
17. Gran Colombia
18. Cartagena
19. El Rocio Bajo
20. La Peña



1 Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Social Vulnerability Index
Social composition and Displacement rates



Total Population (2015): **46.999 inh.**

- Population under 5 years old: 4,582 Inh. (9.75%)
- Population between 5 and 15 years old : 7,633 Inh. (16.24%)
- Population between 15 and 59 years old: 29,938 Inh. (63.7%)
- Population over 60 years old: 4,846 Inh. (10.31%)

For every 100 women there are 102 men

(Source: ideca – infraestructura de datos especiales para el distrito capital. Informe Salud capital 2015)

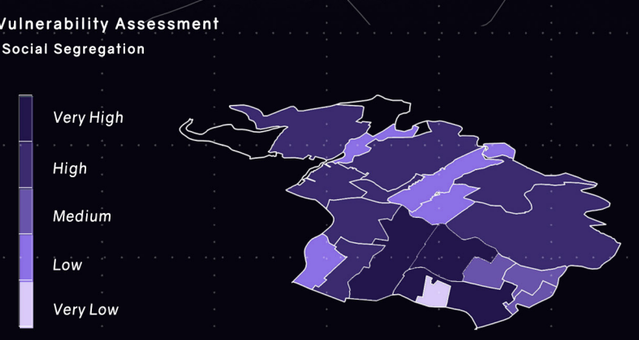


Fig. 7.40 - Social Vulnerability Index. Social Segregation. Social challenges and displacement rates. Case study 2

Vulnerability Assessment
Social Segregation

Neighborhoods:

1. Laches
2. San Dionisio
3. Balcones del triunfo
4. El Triunfo
5. El Guavio
6. Egipto alto
7. Rocio Centro Oriental
8. Fabrica de Loza
9. Lourdes
10. El Consuelo
11. El Dorado
12. Santa Rosa de Lima
13. Atanasio Girardot
14. Ramirez
15. Santa Barbara
16. El Mirador
17. Gran Colombia
18. Cartagena
19. El Rocio Bajo
20. La Peña

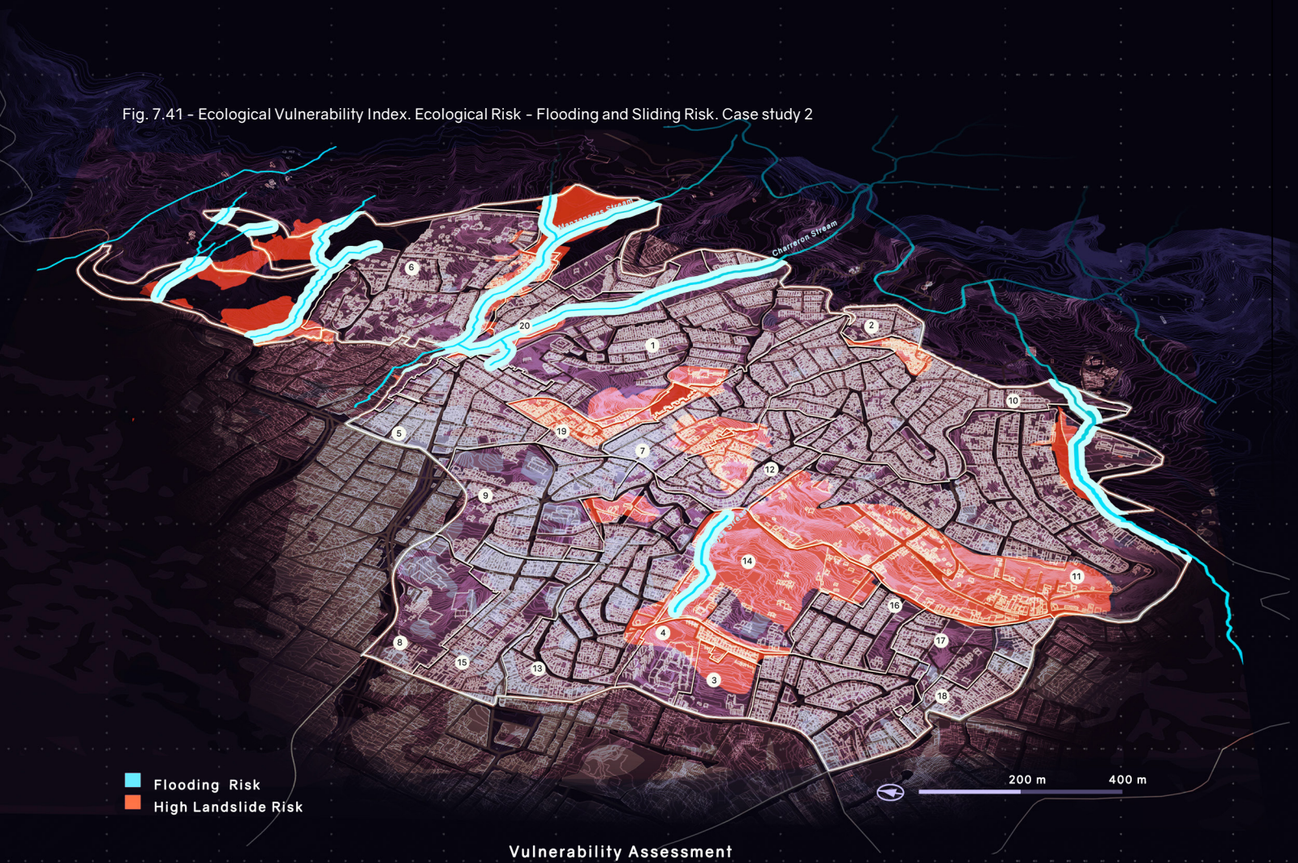


1 Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Ecological Vulnerability Index
Risk - Flooding and Sliding

The Lourdes Zonal Planning Unit is located on the edge of the eastern hills. As shown in the image, the orange zones are those marked by high landslide risk. These areas, in turn, have undergone impacts due to deforestation and informal developments. The weak structures of this dwellings and the lack of vegetation are increase the vulnerability of the population. This area, in contrast to the flora, does not have many water bodies. In the upper part consolidated settlements are located in the basin of the principal stream of the area.

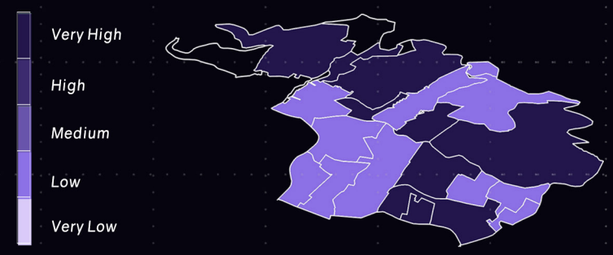
Fig. 7.41 - Ecological Vulnerability Index. Ecological Risk - Flooding and Sliding Risk. Case study 2



Vulnerability Assessment
Risk - Flooding and Sliding Risk

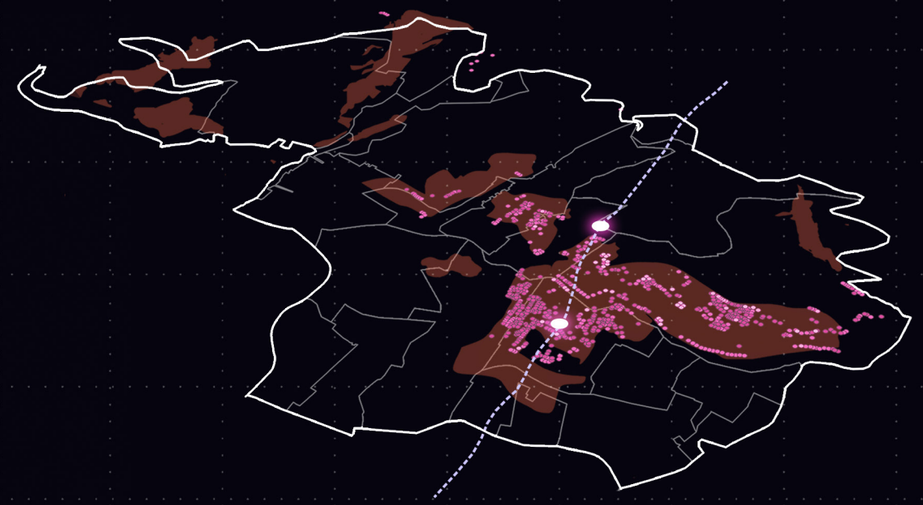
Neighborhoods:

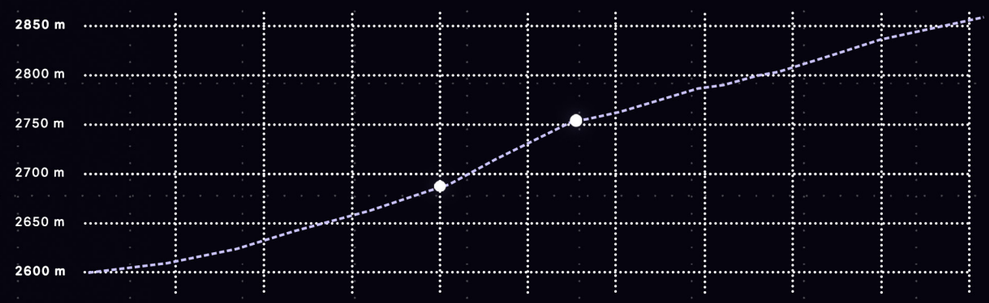
1. Laches
2. San Dionisio
3. Balcones del triunfo
4. El Triunfo
5. El Guavio
6. Egipto alto
7. Rocio Centro Oriental
8. Fabrica de Loza
9. Lourdes
10. El Consuelo
11. El Dorado
12. Santa Rosa de Lima
13. Atanasio Girardot
14. Ramirez
15. Santa Barbara
16. El Mirador
17. Gran Colombia
18. Cartagena
19. El Rocio Bajo
20. La Peña



1 Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Fig. 7.42 - Topography. Critical Case 2





The areas of greatest ecological risk are located in a range of 2600 m and 2800 m altitude.

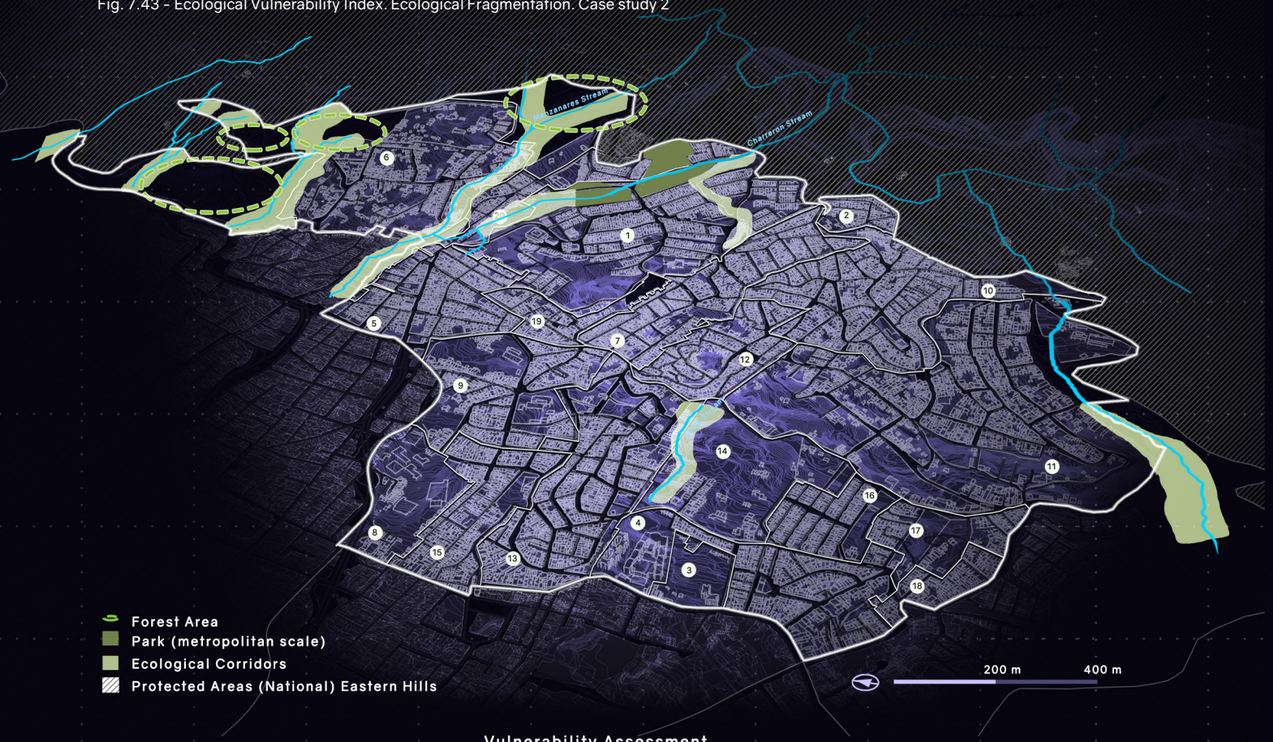


Source: Google Earth. Aerial View and Elevation Profile data.

Ecological Vulnerability Index
Ecological Fragmentation - Natural Disconnections

Ecological fragmentation is visible through the disconnection between the built environment and the ecosystem, where informality continues to develop in ecological areas increasing their vulnerability and the environmental degradation due to deforestation and inadequate waste disposal. Since high risk areas are in disuse, informal dynamics are still spreading and the fragmentation in the accessibility and mobility is higher. The disarticulation between the population and its environment is increasing. As seen in in the following two maps, the informal development happens inside the river basin and water has high contamination rates.

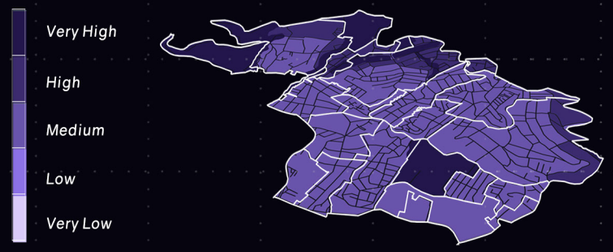
Fig. 7.43 - Ecological Vulnerability Index. Ecological Fragmentation. Case study 2



Vulnerability Assessment
Ecological Fragmentation - Disconnections

Neighborhoods:

1. Laches
2. San Dionisio
3. Balcones del triunfo
4. El Triunfo
5. El Guavio
6. Egipto alto
7. Rocio Centro Oriental
8. Fabrica de Loza
9. Lourdes
10. El Consuelo
11. El Dorado
12. Santa Rosa de Lima
13. Atanasio Girardot
14. Ramirez
15. Santa Barbara
16. El Mirador
17. Gran Colombia
18. Cartagena
19. El Rocio Bajo
20. La Peña



1 Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Ecological Vulnerability Index
Ecological Degradation - Contamination

The upz has characteristic parts due to the inadequate waste and debris disposal. The Ramirez neighborhood has a great problem of contamination and inadequate waste disposal near the Lajas canal, generating plagues and water contamination. Also, this neighborhood has problems with the inadequate handling of animals, whether horses or cows. In the upper zone, near the Charreron and Manzanares streams, there are also high levels of contamination and inadequate waste disposal that are affecting the quality of the water bodies that will later cross the city and flow into the Bogotá river.

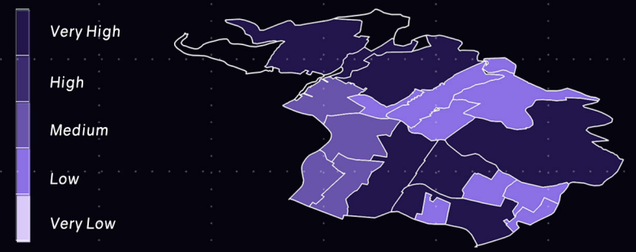
Fig. 7.44 - Ecological Vulnerability Index. Ecological degradation - Contamination. Case study 2



Vulnerability Assessment
Ecological Degradation Contamination

Neighborhoods:

1. Laches
2. San Dionisio
3. Balcones del triunfo
4. El Triunfo
5. El Guavio
6. Egipto alto
7. Rocio Centro Oriental
8. Fabrica de Loza
9. Lourdes
10. El Consuelo
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12. Santa Rosa de Lima
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20. La Peña

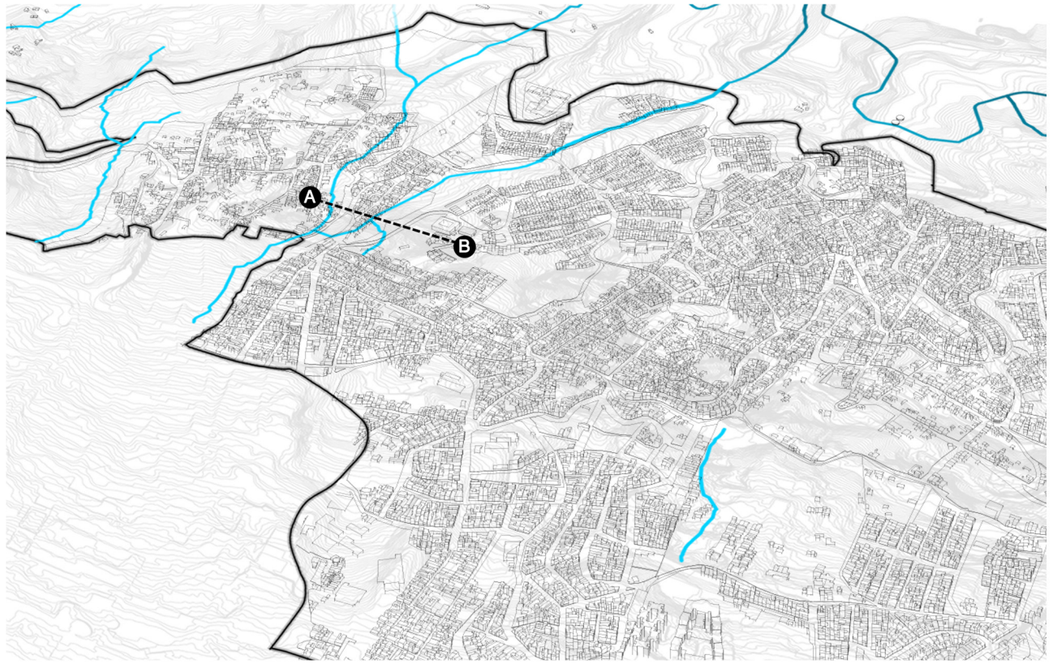


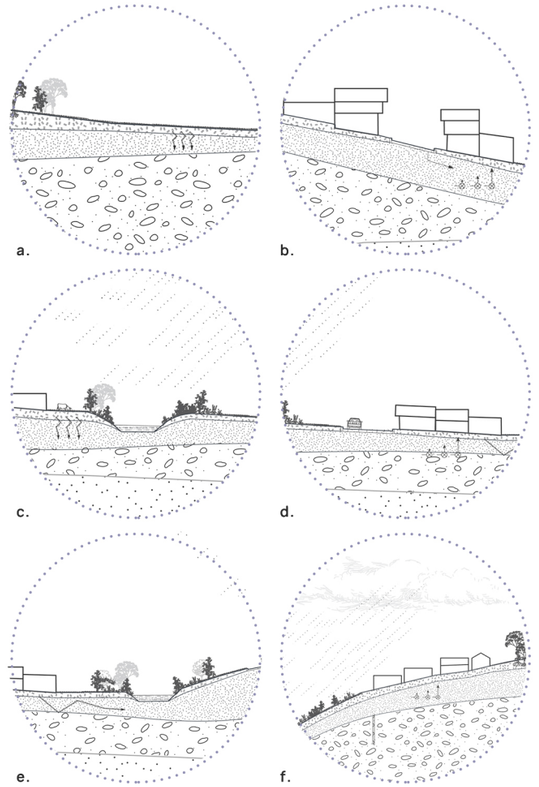
1 Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

Ecological Vulnerability Index

The following section will evaluate, like in the case of La Flora, which variables regarding the landslide and flooding risk analysis, are present in the territory of Lourdes. The following strategic sections were developed in order to visualize the current situation of vulnerability and risk, and in order to identify the most problematic areas.

Fig. 7.46 - UPZ Lourdes. Reference Map, Section through Landslide Risk area





a.
- Erosion by action of water
- Lack of vegetation
- Lack of Urban drainage

b.
- High slopes
- Lack of Urban drainage
- Overloading slopes
- Informal Ocupations (weak structures)

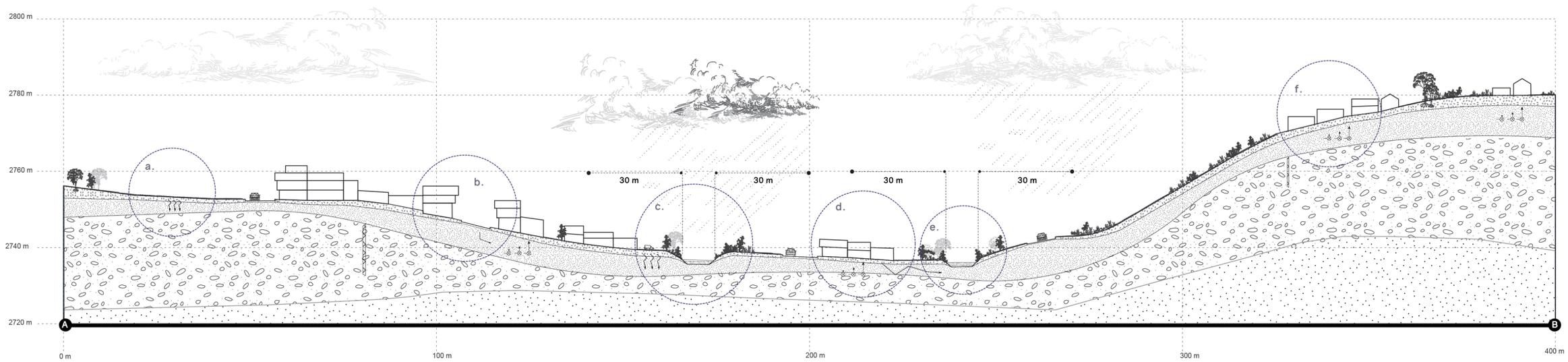
c.
- Agricultural activities
- Deforestation
- Informal Occupatiosn in river basin
- Soil erosion and Infilitration
- Lack of urban drainage

d.
- Informal Occupatiosn in river basin
- Contamination

e.
- Lack of Urban drainage
- Infiltrations
- Lack of vegetation

f.
- High slopes
- Lack of Urban drainage
- Overloading slopes
- Deforestation

Fig. 7.45 - UPZ La Flora. Section through Landslide Risk area




- Informal development in river basin
- Agricultural activities in river basin
Source: Google Street View, 2020.


- Informal development in river basin
- High slopes
Source: Google Street View, 2020.


- Informal development (weak structures)
- Informal development in river basin
Source: Google Street View, 2020.


- High slopes
- Informal development (weak structures)
Source: Google Street View, 2020.


- Lack of Urban drainage
- High slopes
- Contamination
Source: Google Street View, 2020.


- High slopes
- Overload slopes
Source: Google Street View, 2020.

Ecological Vulnerability Index

The following section will evaluate, like in the case of La Flora, which variables regarding the landslide and flooding risk analisis, are present in the territory of Lourdes. The following strategic sections were developed in order to visualize the current situation of vulnerability and risk, and in order to identify the most problematic areas.

Fig. 7.48 - UPZ Lourdes. Reference Map, Section through Landslide Risk area

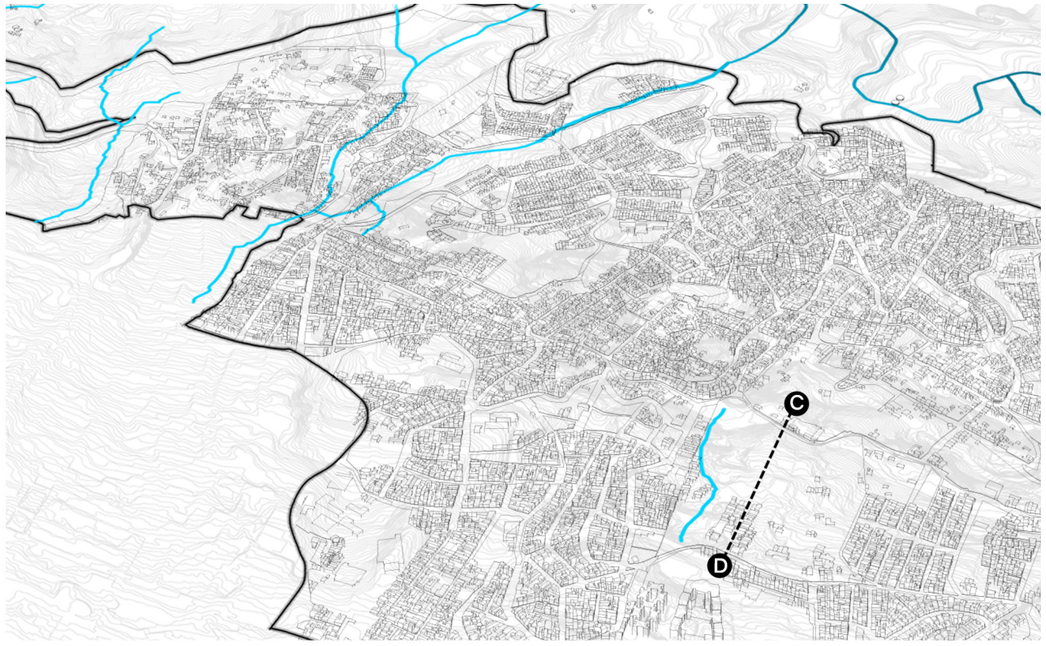
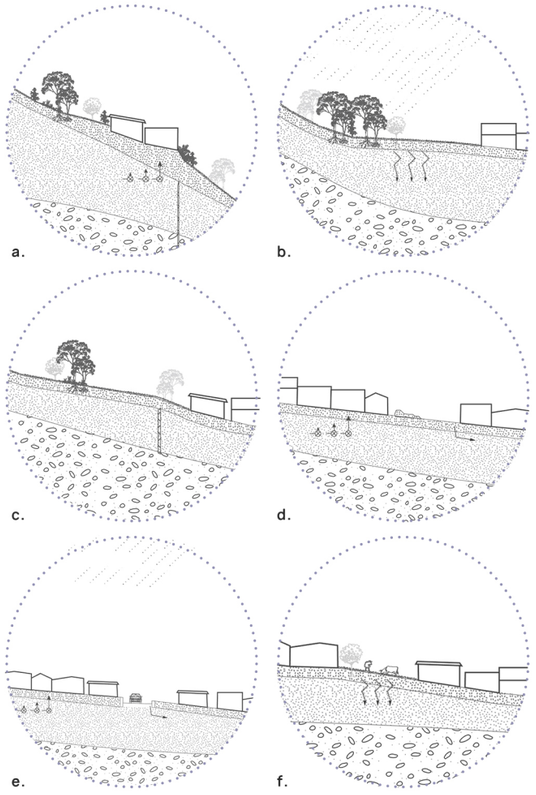


Fig. 7.47 - UPZ Lourdes. Section through Landslide Risk area



a.
- Lack of vegetation
- Presence of geological failures
- High slopes
- Overloading slopes
- Informal Ocupations (weak structures)

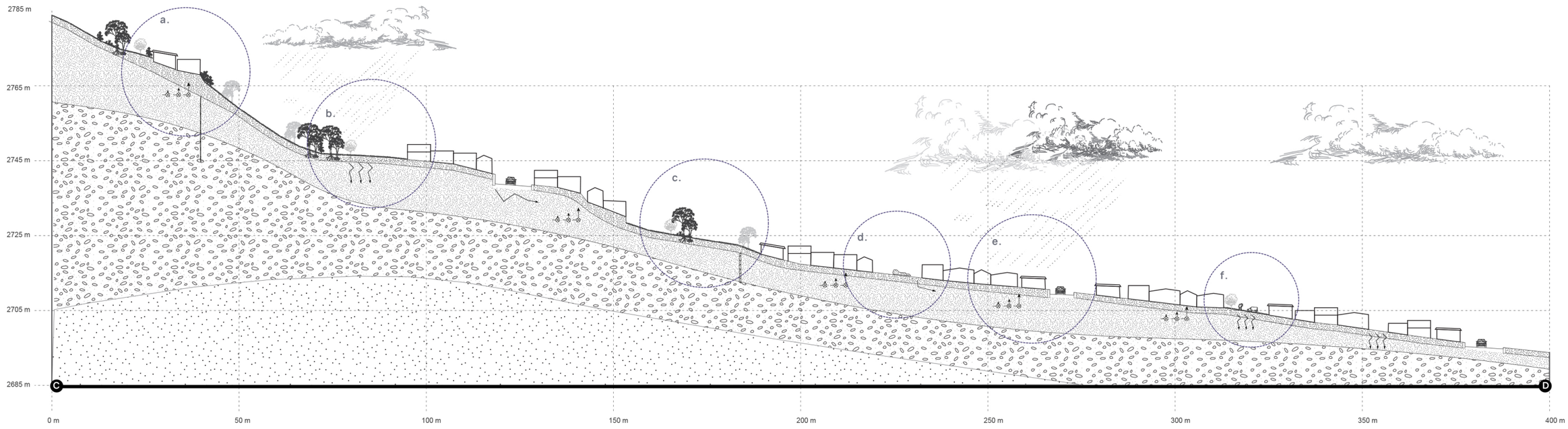
b.
- Deforestation
- Soil erosion and Infilitration
- Contamination

c.
- Agricultural activities
- Deforestation
- High slopes

d.
- Overloading slopes
- Informal Ocupations (weak structures)
- Lack of Urban drainage
- High Contamination

e.
- Lack of Urban drainage
- Weak structures and Overloading slopes
- Infiltrations

f.
- Lack of vegetation
- Soil erosion and Infilitration
- Lack of urban drainage
- Contamination




- Informal development (weak structures)
- Deforestation
- Lack of urban drainage
- Soil erosion
Source: Google Street View, 2020.


- High slopes
- Contamination
- Deforestation and brunings
Source: Google Street View, 2020.


- Informal development (weak structures)
- Lack of urban drainage
Source: Google Street View, 2020.


- High slopes
- Overload slopes
- Weak structures
- Contamination
Source: Google Street View, 2020.


- High slopes
- Contamination
- Overload of slopes
Source: Google Street View, 2020.


- Overload of Slopes
- Lack of vegetation
Source: Google Street View, 2020.

Socio Economic Vulnerability Index
Economic formal and informal dynamics.

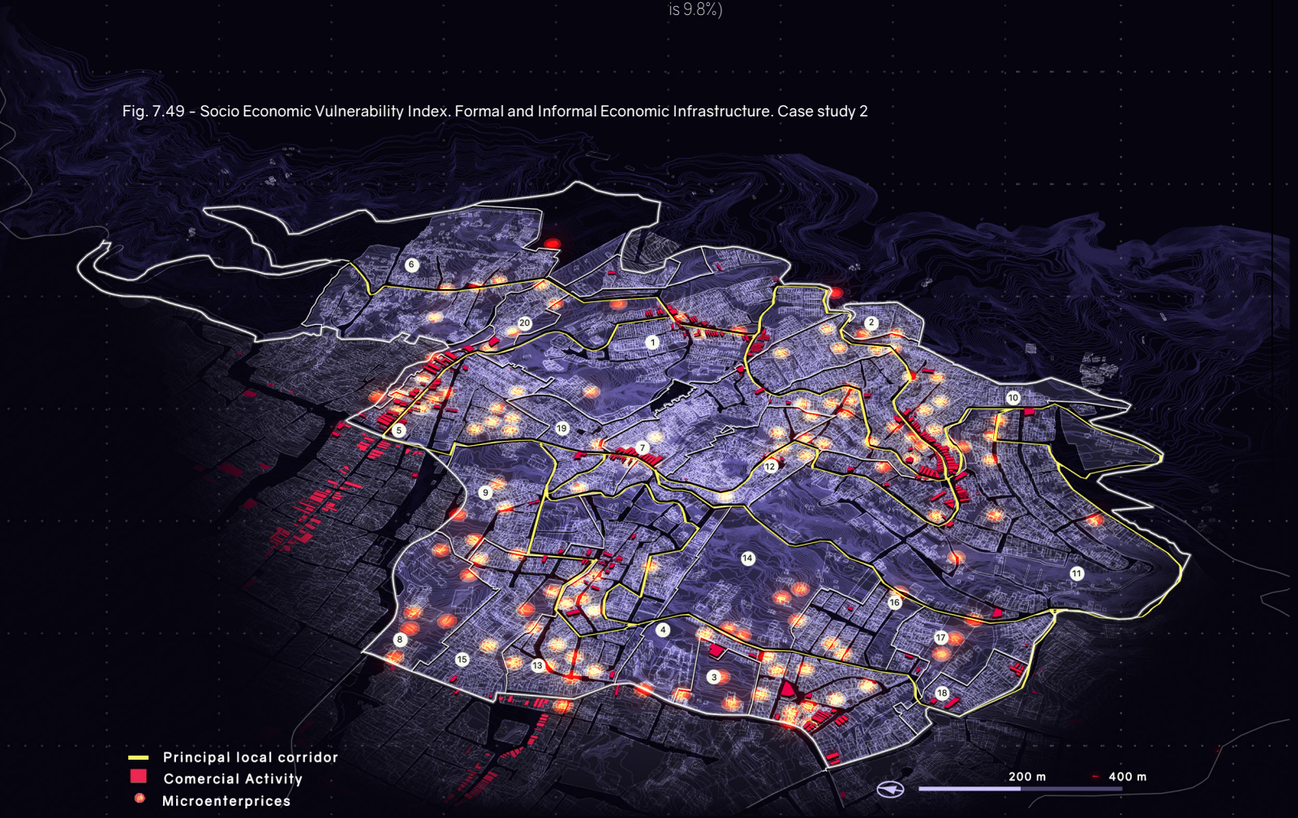
Of the UPZ associated with the locality of Santa Fe that execute their economic activity inside the house, Lourdes represents 30.9%, with a total of 422 units and 466 units as commercial establishments (Total of 888 Units).

Economic activity is predominant, followed by services and industry. At UPZ 96, commercial activity is based on micro-commerce. The focus is on informal activity, micro-businesses, family businesses, street sales, informal work; recycling, commerce, domestic service and construction. (Chamber of Commerce 2007)

27% of the population has a business, that in view of the weakness of the economic and employment policies, the informal ways in the productive thing allow to generate the minimum sustenance for the survival. (Segovia, 2012)

- Average monthly income per household: 436,476 Colombian pesos - 115 euro (Average income in Bogotá is 1,063,177 COL - 281 Euro)
- General unemployment rate: 16.82% (Bogotá is 9.8%)

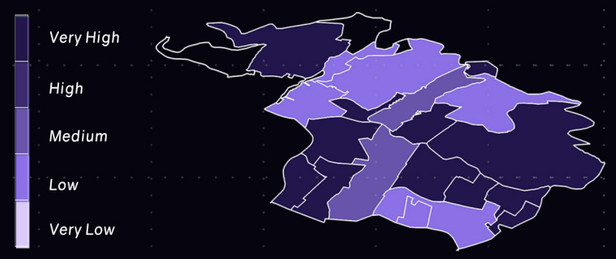
Fig. 7.49 - Socio Economic Vulnerability Index. Formal and Informal Economic Infrastructure. Case study 2



Vulnerability Assessment
Formal and Informal Economic Infrastructure

Neighborhoods:

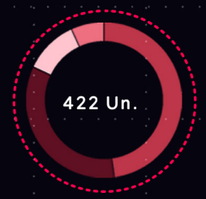
1. Laches
2. San Dionisio
3. Balcones del triunfo
4. El Triunfo
5. El Guavio
6. Egipto alto
7. Rocio Centro Oriental
8. Fabrica de Loza
9. Lourdes
10. El Consuelo
11. El Dorado
12. Santa Rosa de Lima
13. Atanasio Girardot
14. Ramirez
15. Santa Barbara
16. El Mirador
17. Gran Colombia
18. Cartagena
19. El Rocio Bajo
20. La Peña



1 Source: Map made by author. GIS data, extracted from Bogotá open data. Drawing made by author

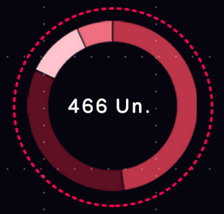
Economic formal and informal dynamics.

Businesses associated with housing.



- Comercial activity: **202 Un. (47,9%)**
- Services: **144 Un. (34,1%)**
- Industrial activity: **47 Un. (11,2%)**
- **Others: 29 Un. (6,8%)**

Establishments by economic activity



- Comercial activity: **231 Un. (49,6%)**
- Services: **190 Un. (40,8%)**
- Industrial activity: **26 Un. (5,6%)**
- **Others: 19 Un. (4%)**



Microenterprises

27% of the population lives with relatives who have a business (Interviews Neighborhood reviews - FUNPROFES. Julio 2007. Source: Segovia, 2012)

- **41%** Single microenterprises (1 person)
- **59%** Familiy Business (two or more relatives)

Source: Segovia A. (2012) Family business dynamics and its impact on socio-economic development, a rights and gender perspective: case study of UPZ 96, Santa Fe. National University of Colombia. Drawing made by author

Source: Source. Economic profile of the locality of Santa Fe. Bogotá Commerce Department. 2007. Diagnosis of the physical, demographic and socioeconomic aspects of the town of Santa Fe 2009 Municipality of Bogotá.

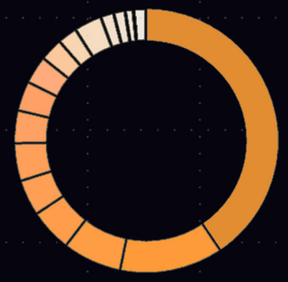
Fig. 7.50 - Socio Economic Vulnerability Index. Activities. Formal and Informal Economic Infrastructure. Case study 2

Single Microenterprises



- Food (108 Un. - 33%)
- Textiles (46 Un. - 14%)
- Various (23 Un. - 7%)
- Stores (16 Un. - 5%)
- Housing and fix up (16 Un. - 5%)
- Miscellaneous (15 Un. - 5%)
- Leather and footwear (14 Un. - 4%)
- Transport (12 Un. - 4%)
- Telecommunications (10 Un. - 3%)
- Recycling and scrap metal (10 Un. - 3%)
- Beauty (9 Un. - 3%) Liquors (8 Un. - 2%)
- Recreation (7 Un. - 2%)
- Crafts (jewelry) (6 Un - 2%)
- Computers and electronics (6 Un. - 2%)
- Carpentry (5 Un. - 2%)
- Child Care (5 Un. - 2%)

Family Microenterprises



- Food (202 Un - 41%)
- Textiles (63 Un - 13%)
- Miscellaneous (36 Un - 7%)
- Various (26 Un - 5%)
- Stores (22 Un - 4%)
- Recycling and scrap metal (23 Un - 5%)
- Crafts (jewelry) (20 Un - 4%)
- Leather and footwear (18 Un. - 4%)
- Transport (17 Un. - 3%)
- Recreation (14 Un. - 3%)
- Telecommunications (12 Un. - 2%)
- Housing and fix up (17 Un. - 3%)
- Carpentry (8 Un. - 2%)
- Liquors (7 Un. - 1%)
- Beauty (5 Un. - 1%)
- Computers and electronics (8 Un. - 2%)

Single Microenterprises

Participation:

Mother	Father	Grandparent
42%	30%	16%

- 88% do not have a name

How do they operate?

1. Inside the house with closed doors **(10%)**
2. Inside the house with store or room open to the public. **(21%)**
3. Outside the house paying store. **(18%)**
4. Ambulatory. **(50%)**

Family busines

- 90% of the workers are family members
- Number of workers:

1 - 2	3	4	6	8
15%	39%	22%	7%	2%

- 73% do not have a name
- 65% do not have rut or nit (not formally registered)

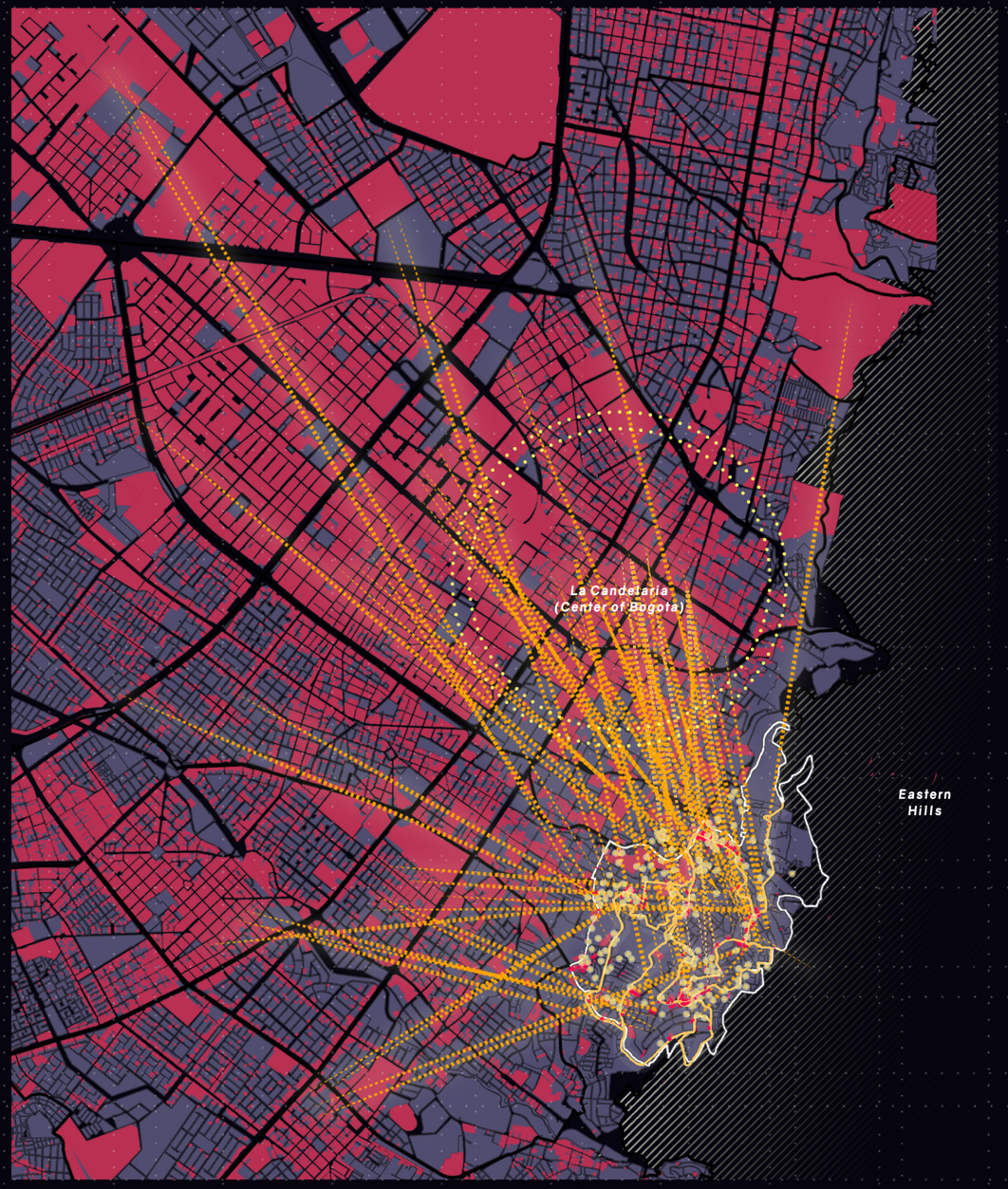
They support economically mostly 4 to 5 people 10% support 10 or more people. Therefore, the Family enterprises are very important production units for self-employment.

How do they operate?

1. Inside the house with closed doors **(33%)**
2. Inside the house with store or room open to the public. **(11%)**
3. Outside the house paying store. **(29%)**
4. Ambulatory. **(27%)**

Source: Segovia A. (2012) Family business dynamics and its impact on socio-economic development, a rights and gender perspective: case study of UPZ 96, Santa Fe. National University of Colombia. Drawing made by author

Fig. 7.51 - Informal Business Network Map. Case Study 2



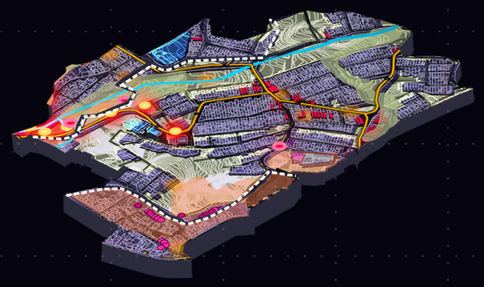
Source: Segovia A. (2012) Family business dynamics and its impact on socio-economic development, a rights and gender perspective: case study of UPZ 96, Santa Fe. National University of Colombia. Drawing made by author

Vulnerability Assessment - Summary of each neighborhood

The assessment is categorized per neighborhood regarding the vulnerability gradient for each variable, assessing from very low to very high the findings in the place. The understanding the variables that define the vulnerability gradient for each neighborhood provides a correlated understanding of the assessment

Fig. 7.52 - Multidimensional Vulnerability assessment. UPZ Lourdes

1. Laches
Constructions: 1.220
Population (aprox.) : 4.270



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

19. El Rocio Bajo.
Constructions: 230
Population aprox. : 805

20. La Peña
Constructions: 340
Population aprox. : 1.190

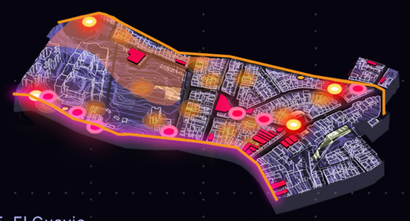
2. San Dionisio
Constructions: 150
Population (aprox.) : 525



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

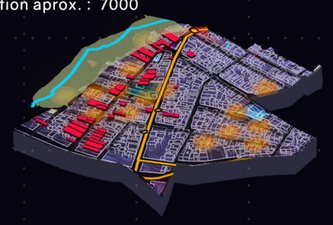
3 / 4. Balcones del triunfo
Constructions: 735
Population aprox. : 2.572



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

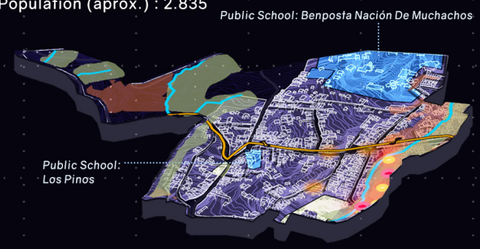
5. El Guavio
Constructions: 2000
Population aprox. : 7000



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

6. Egipto Alto
Constructions: 810
Population (aprox.) : 2.835

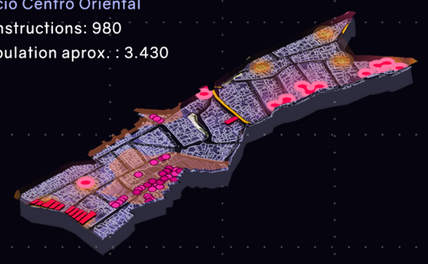


Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

Unemployment - women who are heads of low-income households
Older adults without activities.

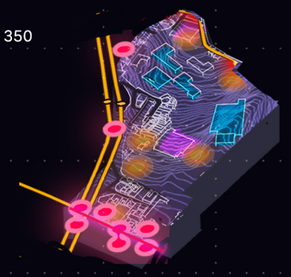
7. Rocio Centro Oriental
Constructions: 980
Population aprox. : 3.430



Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

8. Fabrica de Loza
Constructions: 100
Population aprox. : 350



Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

9. Lourdes
Constructions: 640
Population aprox. : 2.240



Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

10. El Consuelo
Constructions: 1500
Population aprox. : 5.250



Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

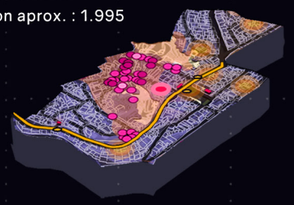
11. El Dorado
Constructions: 1700
Population aprox. : 5.950



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

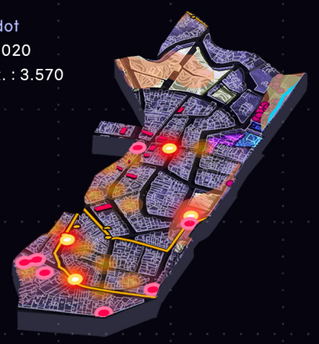
12. Santa Rosa de Lima
Constructions: 570
Population aprox. : 1.995



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

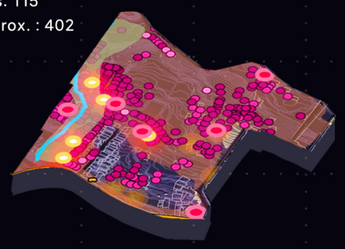
13. Atanasio Girardot
Constructions: 1.020
Population aprox. : 3.570



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

14. Ramirez
Constructions: 115
Population aprox. : 402



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

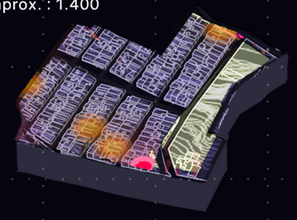
15. Santa Barbara
Constructions: 520
Population aprox. : 1.820



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

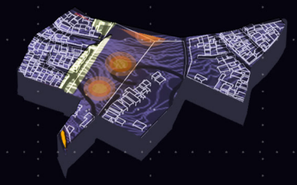
16. El Mirador
Constructions: 400
Population aprox. : 1.400



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

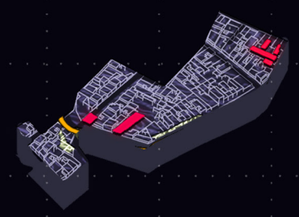
17. Gran Colombia
Constructions: 208
Population aprox. : 708



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

18. Cartagena
Constructions: 190
Population aprox. : 665



Social, ecologial and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Slidind and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

Fig. 7.53 - Multidimensional Vulnerability assessment. UPZ Lourdes

Vulnerability Assessment - Spatial Logic of the Planning Unit

Discovering the spatial logic through the reading of the proposed framework.

The vulnerability variables need to be related and translated into spatial terms in order to propose an urban Reconstruction. Each variable of analysis is influenced and determined by the structure, distribution and interrelation of the different spatial systems.

Structural dimension: Connectivity, Accessibility, Mobility, integration
Functional dimension: Uses and activities
Distributional dimension: distribution of collective uses.

a Linked to the strong economic activities of the city center, two commercial rings are structured within the planning unit, which in turn largely articulate the sector's facilities and parks.

b The road that borders the planning unit on its western side has become a barrier because of high rates of insecurity and drug consumption. The dwellings on this side are residential units with fences, and despite the fact that there is a great amount of economic activity based on micro-enterprises, there is no clear connection between this sector and the structural elements of the planning unit or the city center.

c It is evident that where less commercial activity takes place, more problems arise. The road in the eastern zone that is part of the system and has a commercial agglomeration and is one of the critical points of consumption and sale of drugs and narcotics.

d A second core area is formed by one of the areas with the highest risk of landslides and least accessibility, where, despite the efforts of relocation in past administrations, informal developments continue to take place.

e The two largest schools in the sector are disjointed from the commercial and equipment systems, and are bordered by water bodies.



Fig. 7.54 - General Diagnosis of the Planning Unit Lourdes

d. Normative Assessment

Planning Operability in Bogotá

The objective regarding the improvement of these areas is not a new issue in the urban planning policy in Colombia. In the case of the city of Bogotá, the mechanism through which the District Administration orients and promotes the complementation, reordering and/or improvement actions in the housing units as well as in the informal urban space, is compiled in an upgrading program carry out by the district department of habitat.

Therefore, it is imperative, on the one hand, to redefine the analytical and assessment methodology regarding the particular needs and conditions of each settlement and, on the other hand, to articulate such an assessment to the existing planning structures. This, in order to guide a proposal that synchronizes and therefore restructures the current strategic planning platforms into an adaptive and evolutionary framework

The understanding of the actions, approaches and strategic actors that are part of the current program is the basis for reformulating roles, reformulating strategic power relations and management roles, and proposing co-production and co-design strategies to empower local actors and expand the current capacities of the program in the long term of implementation, constant evaluation and evolutionary transformation.

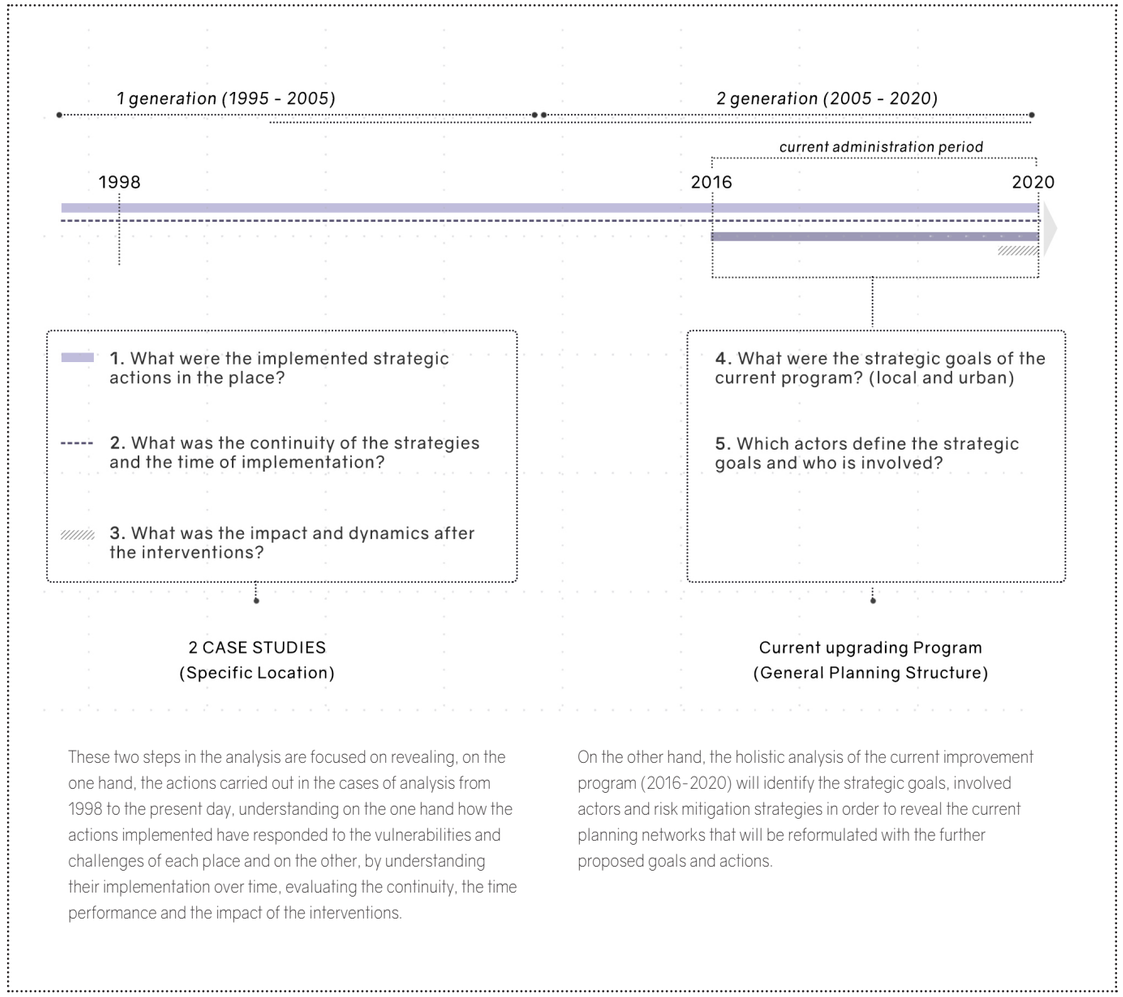


Fig. 7.55 - Proposed Assessment Framework. Planning Operability in Bogotá

Normative assessment

Zonal Planning Unit 52 La Flora.



Neighborhoods

1. La Flora
2. La Cabaña
3. Ciudad Londres Rural
4. Doña Liliana
5. Villa Diana
6. Los Soches
7. Juan Jose Rondon
8. Tihuaque
9. Las Violetas rural
10. San Pedro Sur rural

Informal Seattlements

- A San German
- B La esperanza
- C Tocaimita

- New Roads
- Housing Improvement Program
- Legalized (1990-2010)
- Legalized (1975-1990)
- Relocation Program
- Water Treatment
- Informal Illegal Settlements
- Eco - Neighborhoods
- Health (Basic Care Unit 2 Un.)
- Education
- Communal Hall (10 Un.)
- Parks

Vulnerability variables			Strategic actions
Social Vulnerability	Spatial Fragmentation *Integration - Fragmentation gradient*	**Typo morphology:** Size of the plot, gated or closed (barriers), Use of the plot (empty space)	
		Accessibility: Public transport, space syntax (Local Integration), Social Infrastructure and Public space	Local infrastructure (Sanitation, roads and public services)
	Social Segregation *Integration - Segregation gradient*	**Demographic composition:** Age, gender, Skills and educational level, Stratum.	Public space (Parks and Facilities)
		Social Challenges: Displacement rates, insecurity, tenure.	Social dimension (Legalization, housing improvement)
Ecological Vulnerability	Risk	Flooding and Sliding risk	
	Ecological Fragmentation	Natural disconnections	Eco neighborhood initiative
	Ecological Degradation	Contamination rates	
Economic Vulnerability	Economic formal and informal dynamics	Income rates	
		Unemployment rates	
		Local Economic structures	
		Working population	

Fig. 7.56 - Executed Planning strategies. Case study 1

Conclusions

3. What is happening after?

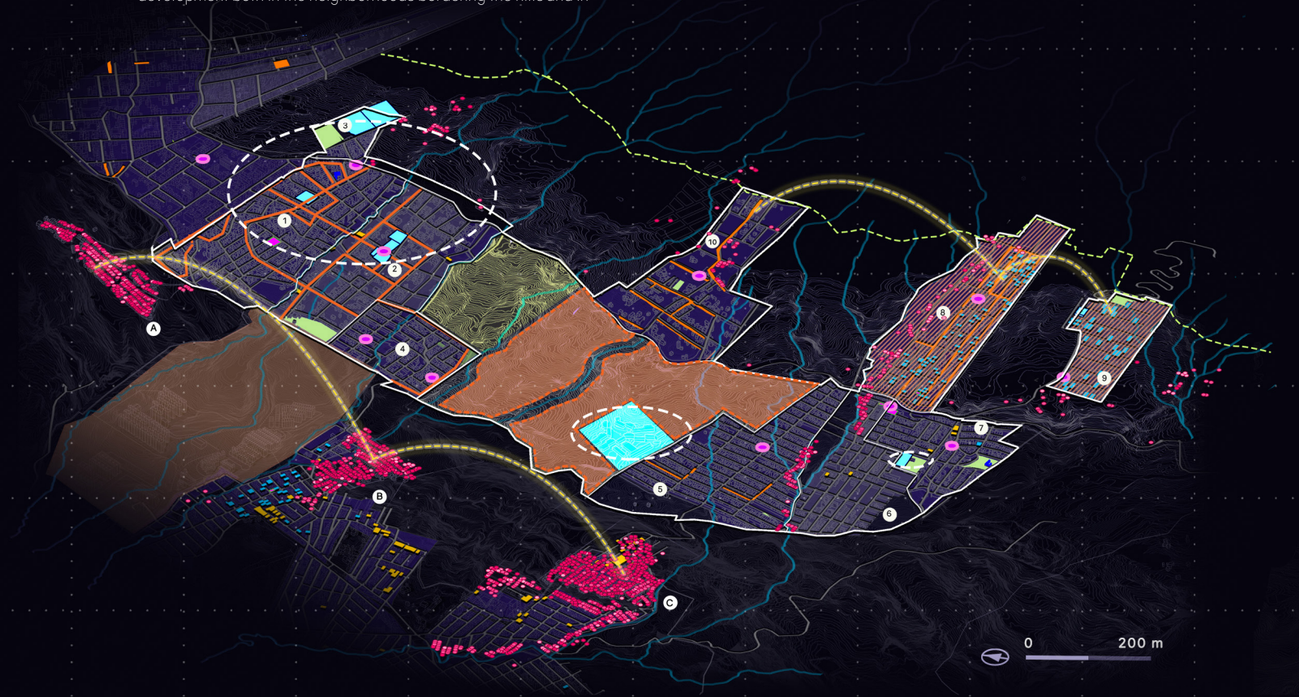
1.Structural Dimension: Biggest efforts and impacts were concentrated in the norther area
Improvement in local infrastructure but not a clear connection with metropolitan systems

2. Functional dimension: eastern neighborhoods have a lack of facilities and economic development tools, but a potential in the Eco program initiative. The area has a lack of recreational and parks, has six schools provided by different periods.

3. Distributional dimension: northern and southern systems are different. Distribution and functionality in one are works better than in the other, due to the distribution of the facilities in the programs.

After the analysis of the sector based on the variables that conform the vulnerability index, a general conclusion about the sector is drawn: The degrees of vulnerability are higher first in relation to the ecological dimension, since the area is determined by its difficult topography and its landslides problems, second with the integration degree with the context and city (very low), resulting therefore in high unemployment and poverty rates.

The UPZ La Flora has several hydric bodies that cross the sector in an east-west direction, which are framed in ecological corridors that are not taken into account in the structural composition and functioning of the sector, added to the several problems related to contamination and invasions. This sector is the only one that is bordered on one side by the eastern hills of the city and on the other by the ecological park "Entre nubes".. This brings with it great landslide risks, but great ecological and landscape potential to the sector. Since 2001, the municipality and the local community has been working on planning strategies related to the concept of Eco-neighborhoods. The communities have shown great interest in this initiative, which has great potential for development both in the neighborhoods bordering the hills and in the illegal neighborhoods located within the ecological park "Entre nubes" (which are considered illegal). In terms of the border location, this sector specifically has large plots of land in urban expansion and many undeveloped lots that are considered to have important potential when thinking about activation and development strategies. As for the high poverty and low income rates, this sector is cataloged as the only one that has a diffuse connotation between the rural and the urban where the local potential to generate endogenous economies and local economic networks are a great potential of the sector.



Source: Map made by author. GIS data, extracted from Bogotá open data.

Normative Assessment
Zonal Planning Unit 52 La Flora.

Fig. 7.57 - Development Strategies through time

Mayor: Enrique Peñalosa 1998 - 2000, Antanas Mockus 2001 - 2004, Luis Eduardo Garzon 2004 - 2008

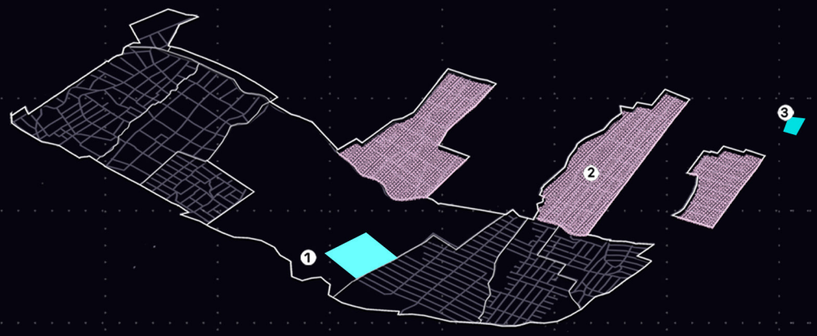


1. The SUR Project with Bogotá:. It was the second financial cooperation program between the governments of Colombia and Germany in the field of integral neighborhood improvement. The first was called the Comprehensive Program for the Improvement of Subnormal Neighborhoods in Medellin (PRIMED). The project made the first administrative steps in 1997 during the administration of Antanas Mockus and was advanced in the governments of Enrique Peñalosa, Antanas Mockus and Luis Eduardo Garzón. (11 years) (Torres, 2010)

2. Gabriel Garcia Marquez School. The work begins in 2004 and ends in 2010. Opens on October 2, 2010.

3. In 2001 the then Department of Community Action created the Eco barrios program, as a strategy to introduce cultural changes in the city's leaders and inhabitants, towards sustainable development practices from an ecological perspective. During the first Antanas Mockus administration (2001-2003), one hundred and ninety-three ecovillage initiatives were implemented with specific projects proposed by community organizations, which sought to develop the social, economic, and spiritual dimensions. Despite the initial objective, most of these Eco-neighborhood projects were not sustainable and ended as soon as institutional resources were over. (Torres, 2010)

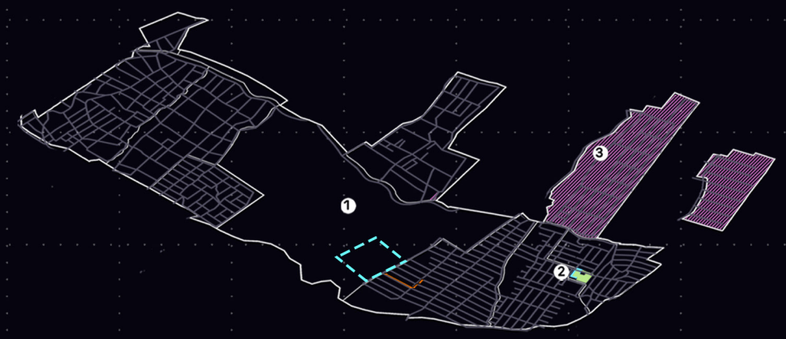
Mayor: Samuel Moreno 2008 - 2012



1. Gabriel Garcia Marquez School. The work begins in 2004 and ends in 2010. Opens on October 2, 2010.

2. Within the framework of the agreement with CAR (Corporacion Autonoma Regional) the first ecovillage project in Villa Rosita was developed, with three components: participatory, ecological-environmental and landscape. In the first one there were workshops with the purpose of promoting their belonging as part of the community and the territory. The workshops included techniques for the propagation of native species, monitoring of restored areas. The environmental education process has allowed the consolidation of a sustainable community garden center, beyond the institutional action, since it is in charge of the children with the support of Comabaquinta (Corporación Madres en Acción Barrios Altos de la Quinta).
The second component of the project included ecological actions, workshops on water management and rounds, reforestation and stone corridors to improve the environment and avoid invasive actions such as paving. Once the project is finished, the community has been promoting, the recovery of the San Pedrina stream, in addition to those already intervened, and proposing the recognition and declaration of the UPZ la Flora as an environmental space. (Quimbayo, 2016)

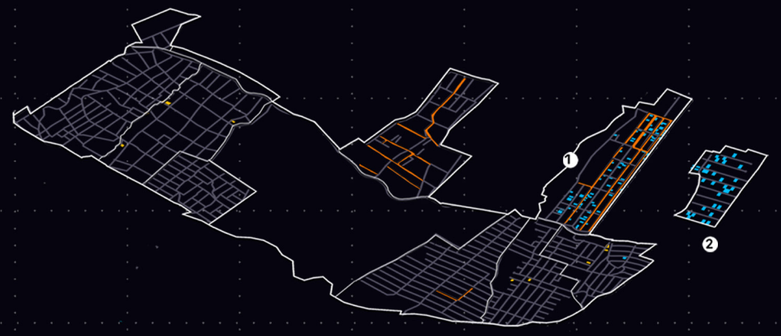
Mayor: Gustavo Petro 2012 - 2016



1. Provision of Classrooms to the Gabriel García Márquez school and Inclusion of three (3) road segments in order to improve mobility and provide safe access for children to the school.

2. New School Ced Fé y Alegría, and green area
3. Strategy of occupation of the Transition Stripes: To take up again the model of occupation type Eco-barrio, as a way to make a balanced transition between the urban environment and the natural environment, allowing at the same time, to focus the public resources towards an Integral Improvement of Neighborhoods with emphasis in sustainable technologies. The Pilot Projects are based on the Villa Rosita and Violetas neighborhoods (Quimbayo, 2016)

Mayor: Enrique Peñalosa 2016 - 2020



Housing improvement works:

1. Barrio Villa Rosita: 87 Un.
2. Barrio las violetas: 30 Un.

Relocation Program
Facilities
Housing Improvement Program
New Parks
New Roads
Eco neighborhood

Normative assessment

Zonal Planning Unit 96 Lourdes

Integration of Neighborhood Improvement Policies (Period 1998 - 2019)

The following map compiles the improvement actions that have been carried out at UPZ Lourdes. As shown in the table, the actions have been aimed at developing social infrastructure and mobility, legalization, relocation and improvement of housing. In the following section these actions will be decomposed in time, to visualize the continuity of the actions during different times and municipal administrations.

Vulnerability variables			Strategic actions
Social Vulnerability	Spatial Fragmentation *Integration - Fragmentation gradient*	**Typo morphology:** Size of the plot, gated or closed (barriers), Use of the plot (empty space)	
		Accessibility: Public transport, space syntax (Local Integration), Social Infrastructure and Public space	Local infrastructure (Sanitation, roads and public services)
	Social Segregation *Integration - Segregation gradient*	**Demographic composition:** Age, gender, Skills and educational level, Stratum.	Public space (Parks and Facilities)
		Social Challenges: Displacement rates, insecurity, tenure.	Social dimension (Legalization, housing improvement)
Ecological Vulnerability	Risk	Flooding and Sliding risk	
	Ecological Fragmentation	Natural disconnections	Eco neighborhood initiative
	Ecological Degradation	Contamination rates	
Economic Vulnerability	Economic formal and informal dynamics	Income rates	
		Unemployment rates	
		Local Economic structures	
		Working population	



Fig. 7.58 - xxxxxxxxxxxxe

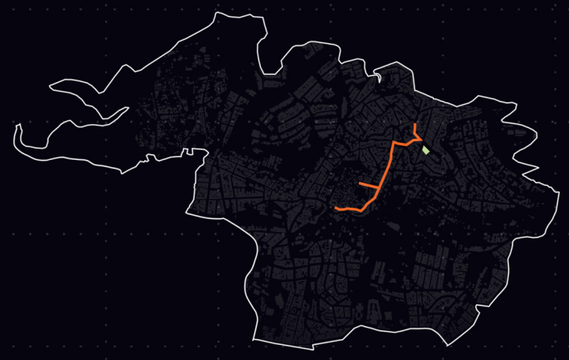
Source: Map made by author. GIS data, extracted from Bogotá open data.
Source: Challenges of the Integral Neighborhood Improvement Program in Bogotá, D.C. between 2000 and 2012. Cepeda, 2013.

Normative assessment

2. What was the continuity of the strategies and the time of implementation?

Neighborhood Improvement Policies (Period 1998 - 2019)

The interventions have been carried out in periods of municipal administration (4 years) during the last two decades. The continuity in the interventions is given by the theme or line of intervention, where the interventions are focused on issues of infrastructure, urban legalization, housing improvement and property titling, public space and relocation due to risk. It is necessary to focus actions on the areas with the greatest vulnerability, but at the same time seek a link in each of these interventions over time and thus comply with the progressive improvement of the neighborhood. Otherwise, the improvement actions in the territories become a sum of isolated actions and not coordinated and articulated actions based on the desired impacts on the improvement of the quality of life of the inhabitants. (Cepeda, 2013)



Mayor: Enrique Peñalosa 1998 - 2000

Demarginalization Program. Among the works; 17 new roads were built, which communicate the area with the Circunvalar Avenue. Parks were also built in the Santa Rosa de Lima, El Consuelo and Rocio Oriental neighborhoods. In turn, the Aqueduct Company invested 210 million pesos in the installation of networks. (Cepeda, 2013)



Mayor: Antanas Mockus 2001 - 2004

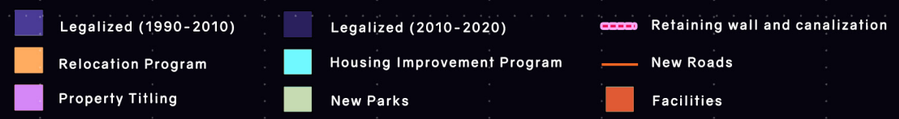
The works focused on new roads connecting the neighborhoods of El Guavio, Los Laches, Roció, El Consuelo and El Dorado; in addition to the land titling of blocks in the Los Laches neighborhood, resettlement of families in the El Dorado neighborhood to improve the living conditions of families located in unmitigated high risk areas, new parks in the Los Laches, El Consuelo and Cartagena neighborhoods. (Cepeda, 2013)



Mayor: Luis Eduardo Garzon 2004 - 2008

New roads and road corridors were built; new parks and the restoration of Las Lajas Creek began. It continued with the property titling in the neighborhoods of Lourdes and Gran Colombia, and with the resettlement of families in El Dorado. (Cepeda, 2013)

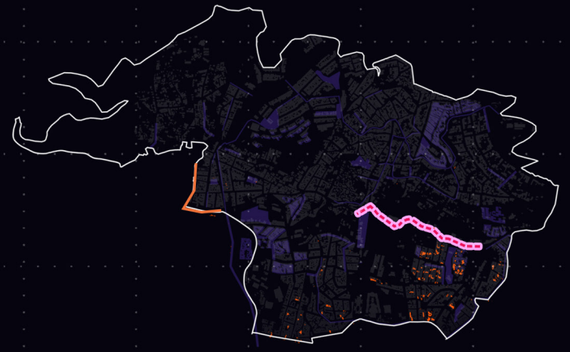
Fig. 7.59 - Improvement actions over time. UPZ Lourdes. Case Study 2





Mayor: Samuel Moreno 2008 - 2012

Land titling in the Lourdes and El Consuelo neighborhoods, in addition to ending the main road traffic that had been worked on in previous administrations. The construction of three facilities for the community started, including a second level hospital (El Guavio Hospital). (Cepeda, 2013)



Mayor: Gustavo Petro 2012 - 2016

Through the aqueduct a canalization and a retaining wall were built. Additionally three green areas and a road corridor were built. (Cepeda, 2013)



Mayor:Enrique Peñalosa 2016 - 2020

The resettlement of several families located in the central high-risk area of the planning unit took place, as well as the intervention of the facades of several houses through the habitarte program. (Cepeda, 2013)

Source: Map made by author. GIS data, extracted from Bogotá open data.
Source: Challenges of the Integral Neighborhood Improvement Program in Bogotá, D.C. between 2000 and 2012. Cepeda, 2013.

8. The Design of a Planning framework

Overview

The 'Planning Framework' defines the strategic goals and actions, that will guide the proposal of a 'Co-evolutionary Transformation', tested and illustrated in the following section as part of the construction of the 'evolutionary pathways'.

The vulnerability assessment, based on the spatial and functional knowledge of the different systems that interact in the territory and their possible transformation is the tool to define the co-evolutionary strategic goals of the proposal.

The following chapter will illustrate the construction process in the definition of the main strategic goals and the operability of their corresponding strategic actions, appropriating the current planning platforms and involved stakeholders. This, in order to reformulate the role and the interrelationship of local administration actors with the communities and guide an adaptive process over time.

Chapter Structure:

a. Co-evolutionary Transformation
- Definition of Co-evolutionary systems
- Proposed Strategic Goals
- Structuring variables for the Strategic actions

b. Strategic Goal: Collaborative transformation of informal and formal agency.
- Current planning platforms and stakeholders
- Proposed strategic actions
- Operability of strategic actions

c. Strategic Goal: Productive Ecology
- Current planning platforms and stakeholders
- Proposed strategic actions
- Operability of strategic actions

d. Strategic Goal: Systemic alignment through reprogramation
- Current planning platforms and stakeholders
- Proposed strategic actions
- Operability of strategic actions

e. Strategic Goal: Endogenous activation
- Current planning platforms and stakeholders
- Proposed strategic actions
- Operability of strategic actions

f. Spatial Framework

a. Co-evolutionary Transformation.

The pursuit of a resilient territorial systems is composed of two objectives. The first is focused on reducing multidimensional vulnerability, and the second is based on achieving a capacity to co-produce knowledge from the local to the institutional level in order to increase the adaptive and learning capacity (Brunetta, 2019). The correlation of these two objectives will guide a an evolutionary transformation to socio ecological resilience in informal settlements.

The approach in the reduction of multidimensional vulnerability needs to appropriate the correlation and co-evolution of social, economic and ecological systems in order to achieve a more resilient city. Co-evolution is understood as the progressive and evolutionary transformation between two or more interacting social and environmental subsystems and the Interdependent change comes between (1) humans' material practices, ideas and values, (2) the living and (3) the physical environment. (Kallis, 2009 Deforestation, eroded and contaminated land by informal development process).

The second objective requires a proactive process of collective actions at both local and urban scales, where each actor can adopt a role in the urban systemic operation. This interaction of (1) formal and informal agents and (2) interventions at local scale in relation to interventions at urban scale, will promote self-adaptation and capacity to be prepared and understand the evolution of the socio-ecological systems, since the resilient capacity to recover from events and impacts, and to adapt to an unpredictable scenario is higher. (Brunetta, 2019) (Davoudi, 2013)

Definition of Co evolutionary Systems

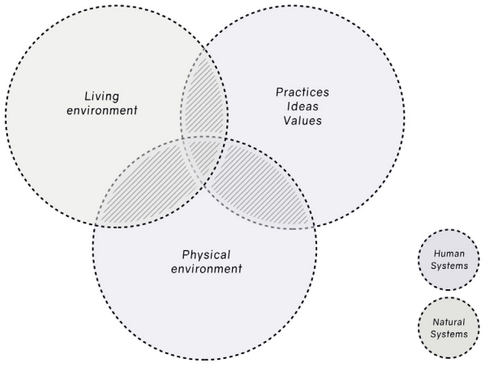
Addressing the Multidimensional Vulnerability through a Co-evolutionary transformation

The Multidimensional vulnerability is defined by the diverse relations and manifestations between social, economic and ecological issues that are analyzed and exposed in the areas of analysis. In order to address the multidimensional vulnerability, the methodology proposes multiple correlations between two or more of the identified systems, whose interaction will affect their evolution and guide the transformation.

Based on the definition of "co-evolution" proposed by Giorgos Kallis (2007), the variables of analysis are grouped into three evolving systems. The definition of these three systems, and the understanding of the possible relationships between them, leads to the identification of the co-evolutionary subsystems.

The first system is understood under human material practices, ideas and values that comprise the variables related to the socioeconomic analysis of the vulnerability index; the second system is that corresponding to the physical environment that comprises the variables related to the analysis of the socio-spatial system, and finally the third system is composed of the living and natural environment that comprises the variables related to the ecological vulnerability assessment. These systems and their possible interactions give rise to the approach of 4 co-evolutionary subsystems. As the evolution of cultural systems seems to have a negative impact on the natural environment, the links and co-evolution between cultural and ecological systems and processes should be explored. (Noorgard, 2010)

Co-evolutionary subsystems



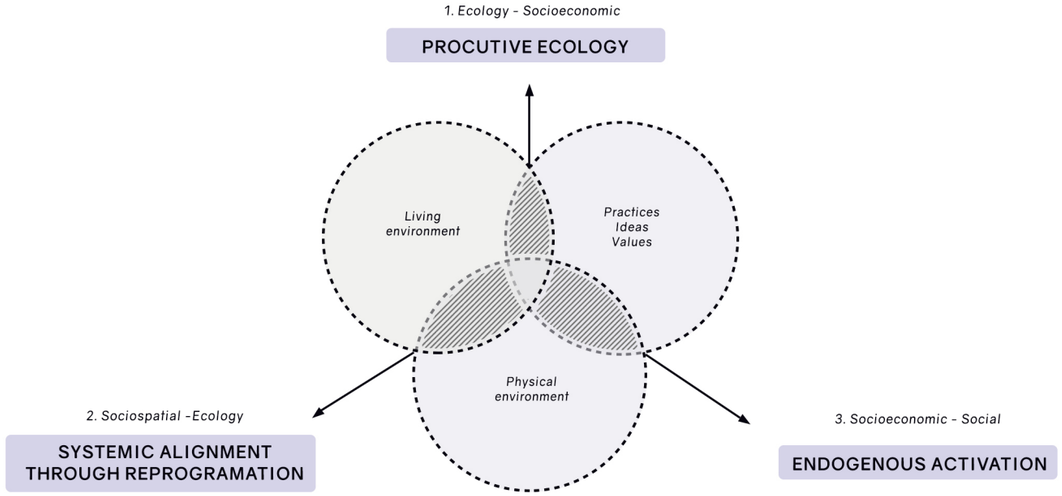
Proposed correlation between systems:

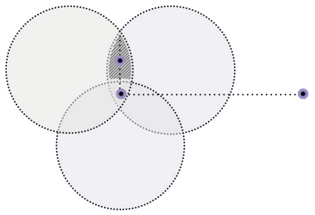
1. Ecology – Socioeconomic:
Systemic correlation between ecological vulnerability and risk with socioeconomic vulnerability.
2. Socio spatial - Ecology:
Systemic correlation between socio-spatial vulnerability and ecological vulnerability.
3. Socioeconomic – Social:
Systemic correlation between social-spatial and socioeconomic vulnerability.

Proposed Strategic Goals

The definition of the correlation between the systems is the first step in order to define the strategic goals in the proposed scheme. The three systemic relationships identified in the previous section were transformed into three strategic goals: Productive Ecology, Systemic alignment through reprogramation y Endogenous activation.

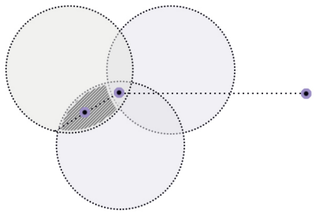
Fig. 8.1 - Co-evolutionary systems and Strategic Goals





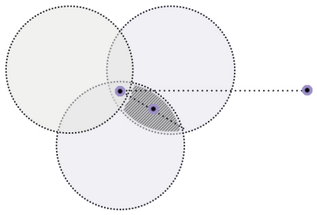
Strategic Goal: *PRODUCTIVE ECOLOGY*

Counteract Ecological risk and Poverty guiding an evolutionary transformation of vulnerable areas through nature based solutions in order to mitigate negative impacts on the ecosystem, reduce the ecological risk and activate sustainable local economies improving therefore the operability of local economic practices with ecological systems.



Strategic Goal: *SYSTEMIC ALIGNMENTTHROUGH REPROGRAMATION*

Counteract Spatial Fragmentation and social segregation through a Functional Reprogramation of physical elements in the environment in order to create conditions for new socio-spatial dynamics and align local, collective and urban systems with the ecological and cultural systems.

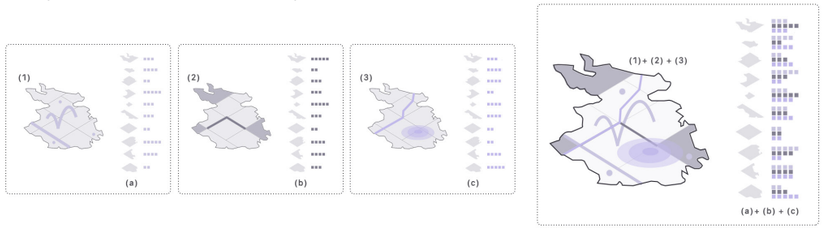


Strategic Goal: *ENDOGENOUS ACTIVATION*

Counteract social challenges and poverty by strengthen local capacities and providing tools to construct self sustaining production and social systems as part of the functional dynamics of the city.

The vulnerability assessment as the guiding force for the co-evolutionary transformation

Fig. 8.2 - Summary of the variables of the Vulnerability Index tool



As has been explained throughout the analysis, each informal area has different conditions and will produce a different result regarding the higher needs found in the environment. The elaboration of a summary of all the variables of the assessment classified by sector, explained in the last section, will be the basis in order to define which strategic goal applies to each place. If a sector presents high ecological vulnerability and high poverty rates, the strategic goal that will guide a possible transformation over time will be "Productive Ecology". The proposed intervention will be constructed with multiple actions regarding the goal in different times and scales, guiding therefore an evolution in time. The interaction with other areas and proposals will generate a systemic operability from different approaches in a long term perspective.

Structuring variables for the Strategic actions

The Construction of strategic actions and Operability variables

The following section will explain the general structure in the proposed set of actions. The proposed actions regarding each goal are classified according to the spatio/temporal scales of implementation, in which the evolution and correlation between the household level, the community level and the urban scale will guide an adaptive transformation, without an order, rigid plan and time of development.

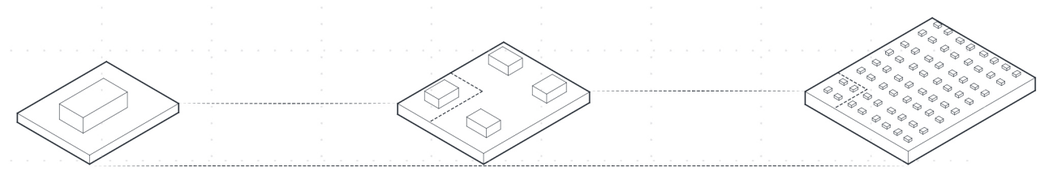
The actions to be implemented vary in their scale, time of implementation and complexity. However, the variability in their scale of implementation does not determine an order or specific plan of implementation. The possible combinations are determined by the needs of the context without a specific planning agenda or scale of the project. The process of Co-evolutionary transformation recognizes the importance of local groups as agents of change, and recognizes the cultural values and practices of a community as part of the guiding force of co-evolution between socio-environmental systems.

The progressive transformation involves local interventions and, according to the needs and the context, the possibilities to intervene will be increased to enter into more complex mitigation situations that require the involvement of actors from the municipal, regional or even the national sphere. Therefore, the local and self organized implementations could evolve into more complex systemic interventions.

The process of co-evolution is validated by the multiple transformations and variability of interventions in the spatial-temporal scale. Local scale interventions can be of great help in motivating the local community to recognize the values, practices and social dynamics underlying an issue, by means of nature based solutions. This can create a positive socio-ecological co-evolution, which can in turn have a positive impact on the economic and social environment. Such interventions can also be the basis for setting up a more structured and comprehensive system of risk mitigation. The combination of actions on multiple scales and integrating various actors can enhance the capacities and strength of the relevant systems.

The generation of changes and positive impacts regarding the identified vulnerabilities does not result in a lineal nature of the interventions. Several actors can intervene and different interventions can be carried out as long as the proposed strategic goals are pursued. In this way, the flexibility in relation to structure, the scale variability and the diversity of actors involved in the proposals breaks the paradigm of the strategic and specific planning. In this traditional approach, a single master plan is proposed, organized under fixed time frames and where the variability of actors involved and the variability of interventions both in time and space are not considered. This novel approach may be expanded in terms of time, considering the way in which actions co-evolve and how these systems are being intervened at their roots in order to attain structural improvements in the medium and long-term.

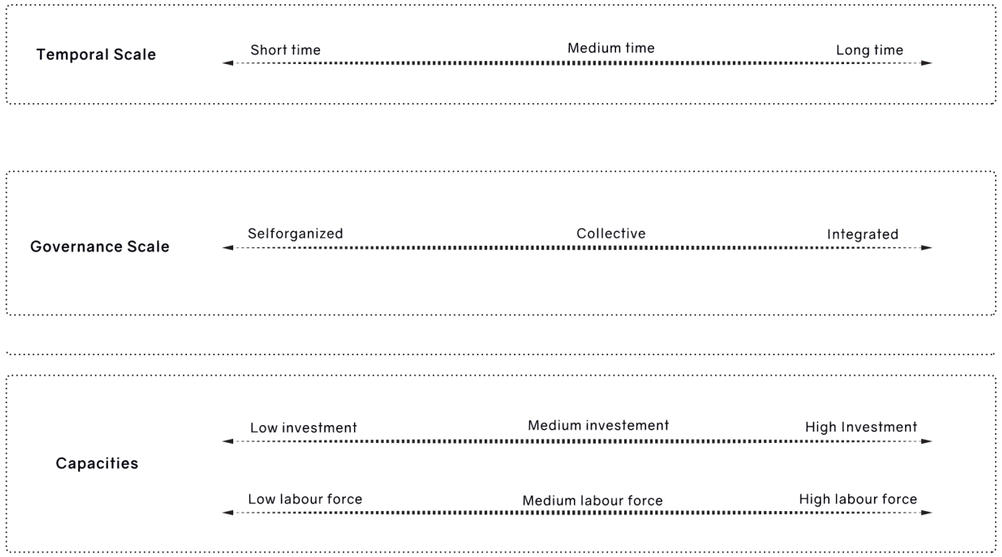
Fig. 8.3 - Scales of Implementation. Strategic Actions



Operability of the proposed actions

The operability of the actions are explained through a temporal scale, a governance scale going from self organized to an integration of different types of actors, and in terms of the needed capacities for the implementation. The proposed transformation will reveal the potential for implementing ecosystem measures to reduce ecological, but also socio spatial and socio economic vulnerabilities in informal settlements.

Fig. 8.4 - Operability Variables



The onion scheme

As one of the aims of the proposal is to work within the planning platforms of the municipality, each goals will evaluate the current planning platforms, actors and mitigation strategies and will appropriate them into a new propose reconfiguration in the current rolls in the adaptive process, The involved actors and the relations between them will be defined in the first instance in an onion scheme for each action. In subsequent steps the evolution of one action in another will enable a collaborative evaluation processes between one set of actors and another set of actors.

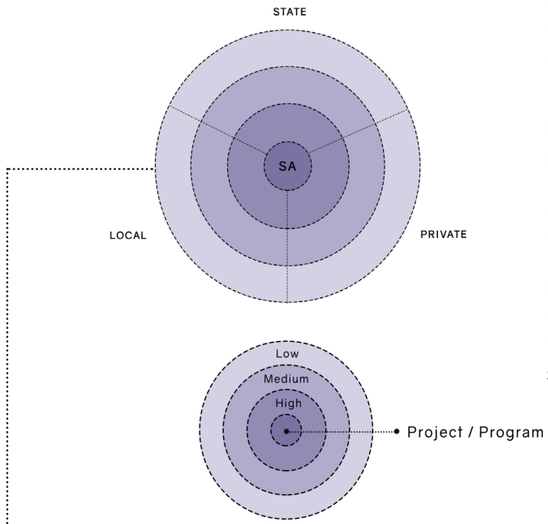
Czischke Ljubetic in her paper "Collaborative housing and housing providers towards an analytical framework of multi-stakeholder collaboration in housing co production" (Czischke Ljubetic, 2017), develops the onion scheme to visualize the relationships, roles and characterization of different actors in relation to a specific objective.

In this case, this scheme has been adapted to understand and explore the power, responsibility and management relationships of the actors in relation to the different development scenarios that will be developed from the design proposal. The diagram clearly visualizes the degree of importance in relation to the center. This means that depending on the closeness the actor is located in relation to the center, it is determined whether there is a high, medium or low degree of power, management or responsibility. This in turn is divided into the three types of actors explained in the previous section: the public sector, the private sector and civil society. Each actor can play an important role depending on the phase of the project .

Having determined their degree of power, responsibility and management in the interventions, it is also intended to determine the relationship of each of the actors within the scheme. In this case, the relationships between actors are determined by whether they have (1) a strong correlation, whether (2) their relationship is limited or whether they have an (3) indirect relationship in the development process. This type of visualization gives the possibilities to explore the variations and adaptations that the relationships and interactions could have depending on the power, responsibility or management degree that is granted to each sector in multiple projects or phases of development.

Involved actors

Fig. 8.6 - Onion Scheme



Public Sphere:
From the public sphere, it will be taken into account the actors and institutions that are immersed and have an influence on the implementation of the upgrading and risk mitigation programs.

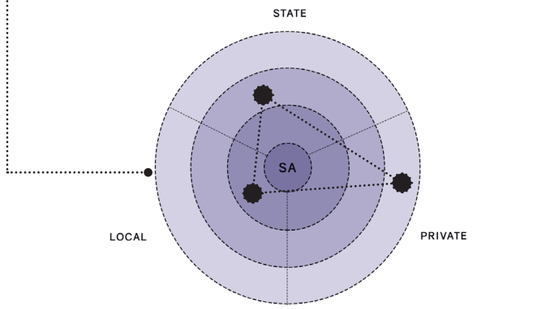
Private sphere:
From the private sphere, the real state market plays an important role in future development policies. This sector is composed of small, medium and large companies focused on the development and construction of housing complexes in the city of Bogotá.

Local Sphere:
Actors from the local sphere are identified as individuals, the community and community organizations.

SA: Proposed Strategic Action

Operability chart

Fig. 8.5 - Operability Chart of the proposed strategic actions



Scale of Implementation:
Time:
Actors:
Capacities:

Each action, whether proposed at the local, community or urban level, will be structured with an Operability chart. The first step is to define the time it takes for the action to be implemented (short, medium and long term). Secondly, based on an analysis of the current actors involved in the area of application, the interaction networks will be reformulated and some other actors will be maybe added regarding the development of the proposed action. This will be defined through an onion scheme, which will be explained in the following section.

As a last step, the operability chart will briefly seek into the possible investment needs, whether a little, medium or high inversion is needed to carry out the action, and on the other hand, the needed labor force in order to have a general understanding of the needed capacities and viability of each one of the actions in time.

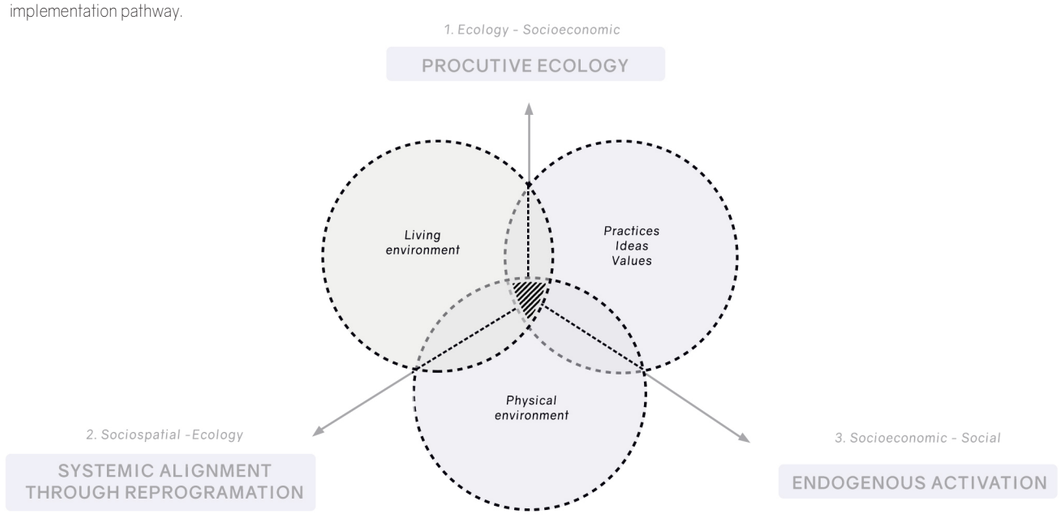
Collaborative planning process

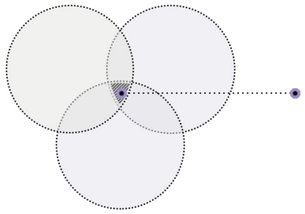
The methodology that guides an evolutionary transformation over time, represented by adaptive pathway allows visualizing an ensemble of scenarios depending on the desirable future at different stages over the development time, and determines when the adaption and resilience process needs a different rout or action in order to fulfill the guiding objective. The proposed approach is a useful tool in order to reveal the possible uncertainties and challenges in the adaptive process, and therefore to explore the multiple possibilities and alternatives to reach a desired path over time. Therefore, the design becomes a research by his own, in which the constant reflection of possible elements that are part of the proposed scenario could adapt and transform in order to guide the transformation in a long term perspective. (Kwadijk, 2010) (Haasnoot, 2013) (Stojanovic,2014).

The integration of different actions will create a collaborative process in which the co-interaction between scales of implementation, times, power relations, management and actors can varies in time but is always guided by a specific strategic goal.

b. Strategic Goal: Collaborative transformation of informal and formal agency

Having defined the structuring variables for the future proposed actions in each goal, a fourth element is defined that will guide the implementation pathway.





Core: *Collaborative transformation of formal and informal agencies*

The co-production between formal and informal agents in the development of adaptive and evolutionary intervention strategies activates a path that allows an evolutionary transformation in the local agency. The collaborative process is not only applied to the development of a specific intervention, but to the evolutionary transformation of the role and interpretation of informal communities as agents of change in their environment. A spatial action can respond in a co-evolutionary way to social and ecological problems, and on the other hand it must recognize the knowhow of the community.

Each of the goals is aimed to recognize and appropriate the local agency as a structuring core of the physical and functional transformation of the territory, turning potential problems in potential lines of development. This will expand the current planning scope and redefine the interrelation between space, formal and informal agents.

The following section will demonstrate the need to transform and expand the planning scope of the current improvement program, where the attention is centered on infrastructure, public space and equipment, leaving the social dimension as an effect of these interventions. Without a comprehensive vision of the living conditions, daily life systems and social structures, the Program become an end and not a vehicle to strengthen the communities and increase their autonomy.

Current Planning scope in Bogotá upgrading program

Socio Spatial Characterization in the Upgrading Program

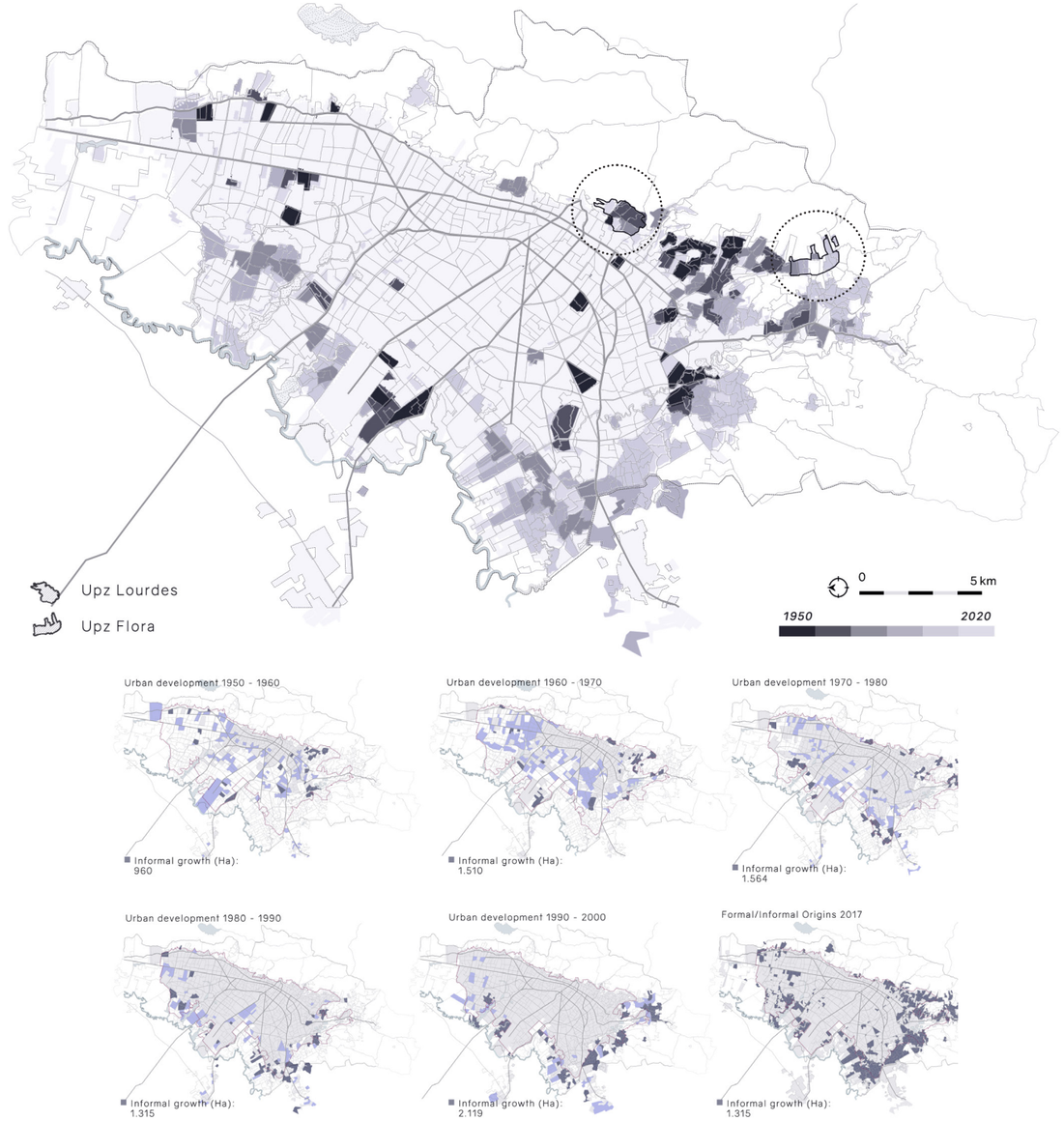
Informal settlements are complex systems, which have been developing in a particular and diverse evolutionary process. In the particular case of Bogotá, internal displacement and the lack of opportunities has generated multicultural and multifaceted environments.

The different processes of urban consolidation, social development and socioeconomic organization require different interventions and have different potentialities. Therefore, the expansion of the informal structures, evident in a spatio temporal scale, need to be considered in a more tailor made characterization.

The daily life systems, according to the socio-cultural composition, can vary drastically and require therefore, a more integral approach to the potentialities and demands in the spatial, economic and social dimensions. For instance, displaced or migrant populations have a different perception, sensitivity and use of space, as do groups in different ages, economic capacity or genders.

For this reason, it is imperative to recognize that the different social structures, economic capacities and socio-cultural values are the determining factors when it comes to evaluating and intervening on the built environment, and not the other way around. Consequently, interventions in public space, public infrastructure and social facilities must be on one hand determined by the needs and potential of the people who will use the space, and on the other hand interrelated with larger urban systems in order to guide the evolution of the interventions in a correlated and integrated path with other urban structures and environments.

The understanding of diverse daily life systems will determine on the one hand the activation, reconstruction or the possible generation of new flows, uses and spatial structures, and on the other hand the human resource will add a powerful value and identity to the proposals. These interventions will not be imposed on the territory, but will rather use and recognize the people as an indispensable resource in a comprehensive manner. Additionally, this multi scalar interrelation between space and people will enable the expansion of the daily life systems and gradually integrate them with various urban systems and larger structures over time.



The socio-spatial characterization of the program starts from the socioeconomic stratification in the city. Strata 1 and 2 are classified in the urban treatment of integral improvement and are therefore part of the upgrading program.

The socioeconomic stratification is the mechanism that classifies the population in different groups with similar social and economic characteristics, through the examination of the physical characteristics of their dwellings, the immediate environment and its context. Municipalities and districts are divided between stratas one and six, depending on the economic and social heterogeneity of their dwellings. (Yunda, 2019)

This expenditure targeting tool is used to collect household public services at differential rates according to the strata and to allocate subsidies and contributions to households in this area. In this way, those with greater economic capacity pay more for public services and contribute so that households in lower strata can pay their rates.

Strata 1: Low-Low
Strata 2: Low

This wrongly assumes that the evaluation of the dwelling is a source of social and economic information. The Upgrading Programs centers the attention on infrastructure, public space and equipment, leaving the housing improvement and social dimension as an effect of these interventions. Without a comprehensive vision of the living conditions, daily life systems and social structures, the Programs become an end and not a vehicle to strengthen the communities and increase their autonomy.

Both the intervention models and the urban and architectural design processes, are ignoring the particularities of the settlements, forcing and imposing generic interventions.

As is demonstrated in the analysis of the planning units of flora and Lourdes (Figure 8.15), the developed strategies were focused on mobility infrastructure, services, housing improvement, parks, among others, without any differentiation between one sector and the other, despite that the environments are different in its location, development time, consolidation, population structure among others.

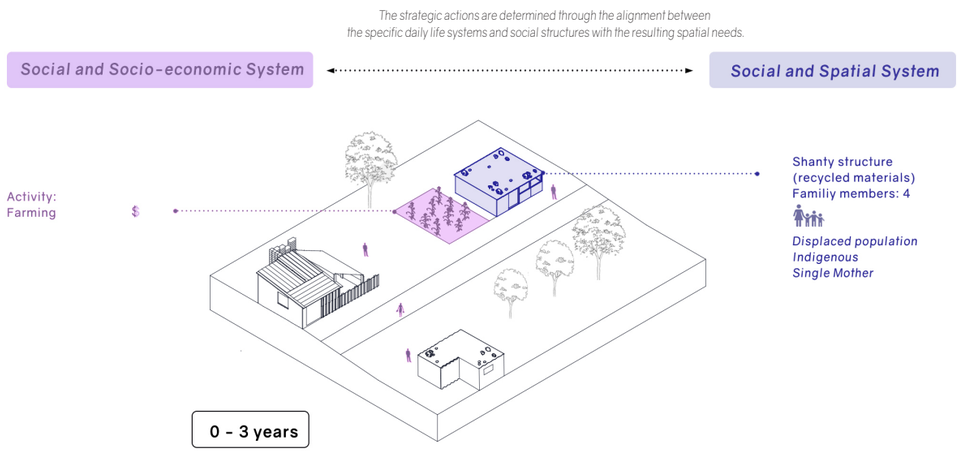
While on the one hand La Flora is an area of much higher ecological risk, located in the periphery, with less consolidated social and spatial structures, and with high rates of displaced population, on the other hand Lourdes is located in the center of the city, with a more consolidated urban environment and with social structures more integrated to the urban dynamics of the city. The Program fails in recognizing the particularity of each sector, the needs and the social potentialities as a tool in order to propose an intervention.

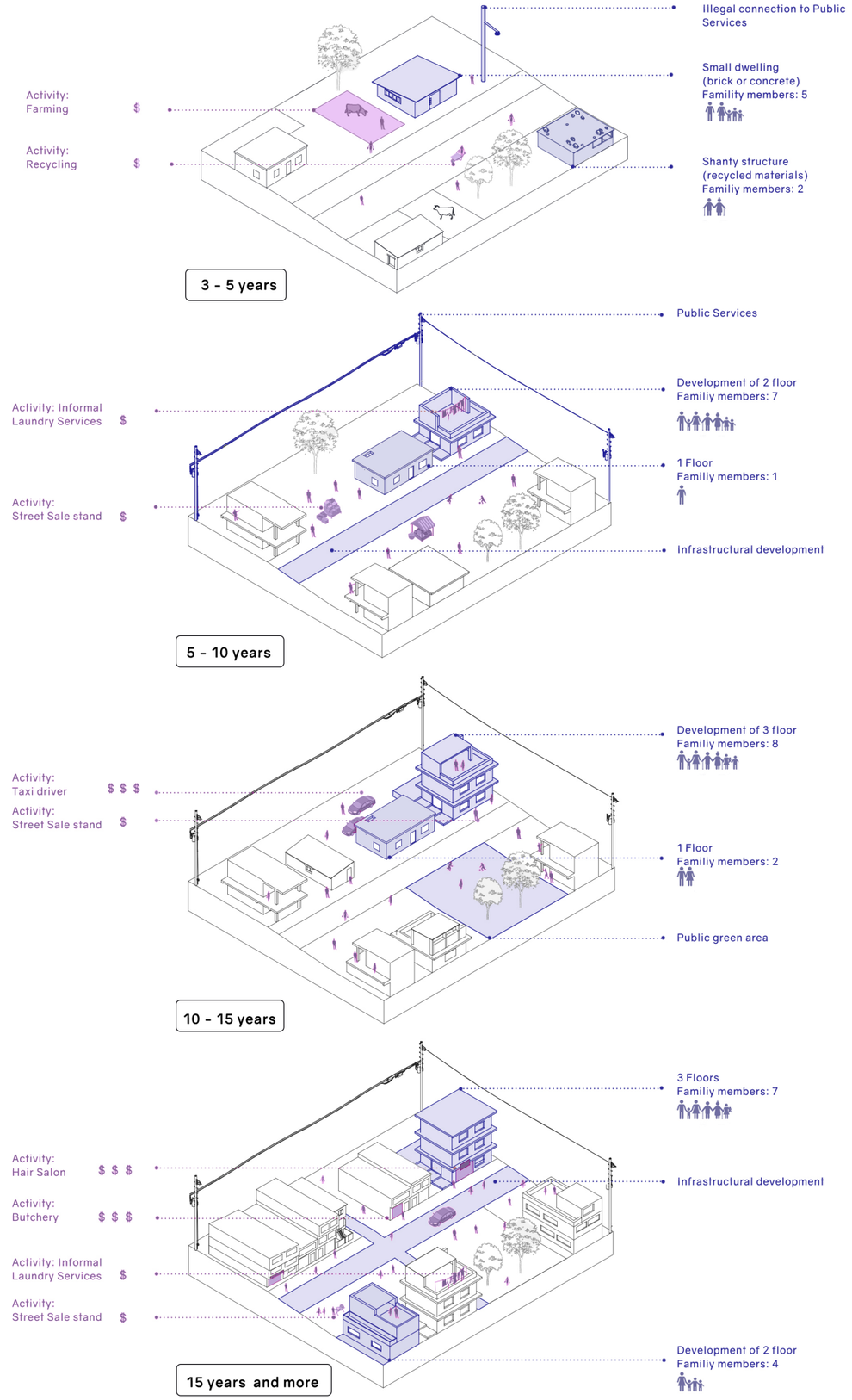
Exemplifying the socio-spatial and socio economic diversity of informal environments

The following diagrams are visualizing a possible scenario of the development phases of a settlement. The correlation between the social and spatial system is highlighted in blue and the possible socioeconomic systems linked to the environment are highlighted in red.

This example visualizes on the one hand, the diversity in the socio-spatial and socioeconomic dynamics in a same phase of development. On the other hand it reveals the wrong perception of the current approach in categorizing the social and economic conditions only according to the built space (Stratification system) and finally it illustrates the difference between the development phases of informal environments, which, given its possible diversity not only in the spatial-temporal scale of development, but also in its location and demographic composition, demands a more comprehensive approach.

Fig. 8.7 - Socio-spatial and Socio economic diversity of informal environments





c. Strategic Goal: Productive Ecology



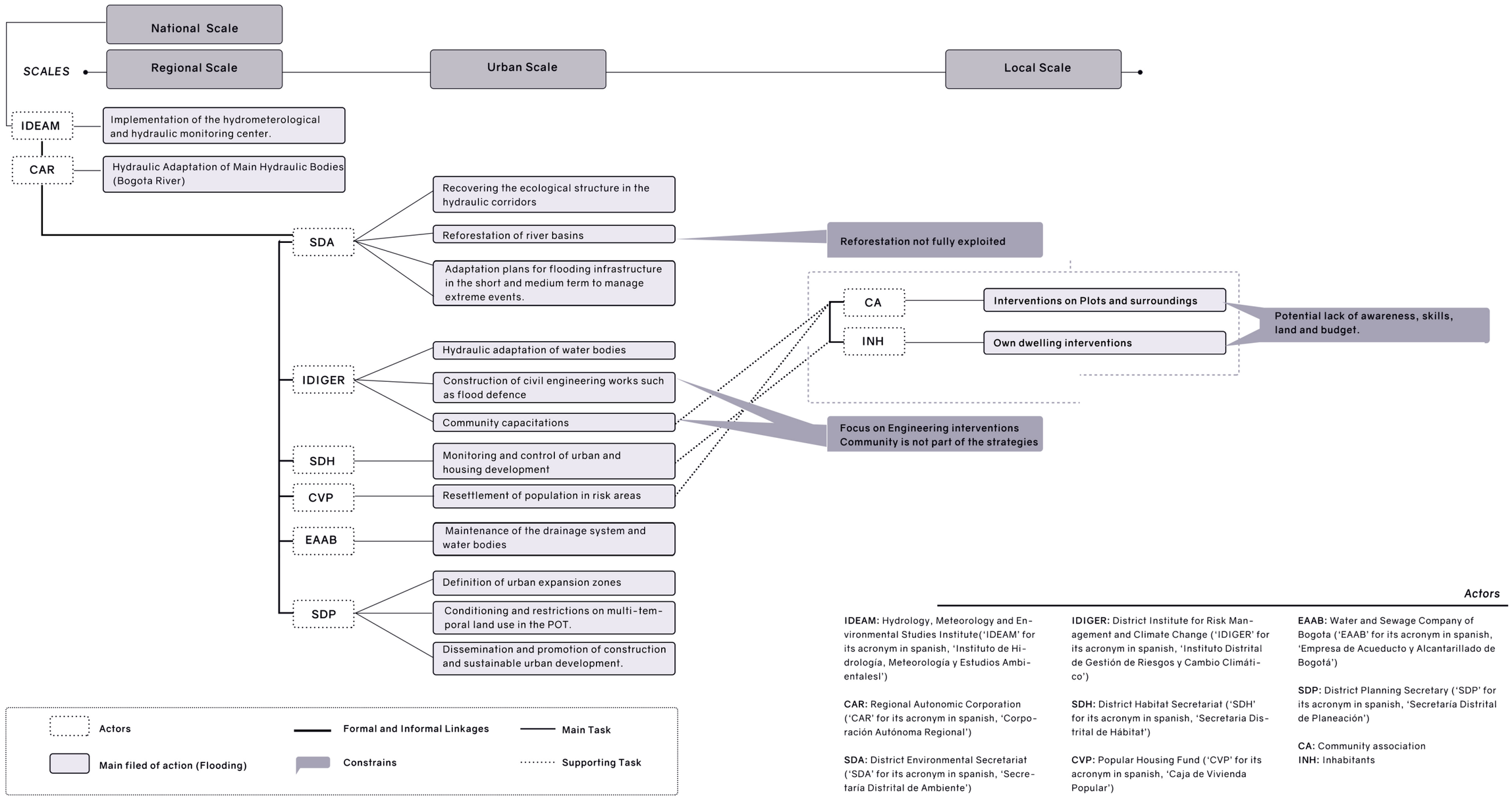
Fig. 8.8 - Planning Platform in Bogotá focused on Flooding Risk Mitigation

Flooding Risk

Current Planning Goals and Platforms in Bogotá

Intervention mechanisms for flood risk mitigation

The following figure illustrates the actors and their main fields of action regarding flooding risk in the city of Bogotá. These strategies are not part of the neighborhood upgrading agenda. The program only intervenes at the stage where informal development is monitored and controlled and where resettlement takes place. As can be seen, all actions are proposed to be carried out by formal entities, and do not contemplate the possibility of extending and complementing those with sociocultural or socioeconomic aims in order to guide resilient processes between society and ecology. Local actors have no role in the implementation of these actions despite being the most affected by and most vulnerable to this type of risk.



Actors

IDEAM: Hydrology, Meteorology and Environmental Studies Institute('IDEAM' for its acronym in spanish, 'Instituto de Hidrología, Meteorología y Estudios Ambientalesl')

CAR: Regional Autonomic Corporation ('CAR' for its acronym in spanish, 'Corporación Autónoma Regional')

SDA: District Environmental Secretariat ('SDA' for its acronym in spanish, 'Secretaría Distrital de Ambiente')

IDIGER: District Institute for Risk Management and Climate Change ('IDIGER' for its acronym in spanish, 'Instituto Distrital de Gestión de Riesgos y Cambio Climático')

SDH: District Habitat Secretariat ('SDH' for its acronym in spanish, 'Secretaría Distrital de Hábitat')

CVP: Popular Housing Fund ('CVP' for its acronym in spanish, 'Caja de Vivienda Popular')

EAAB: Water and Sewage Company of Bogota ('EAAB' for its acronym in spanish, 'Empresa de Acueducto y Alcantarillado de Bogotá')

SDP: District Planning Secretary ('SDP' for its acronym in spanish, 'Secretaría Distrital de Planeación')

CA: Community association
INH: Inhabitants

Flooding Risk

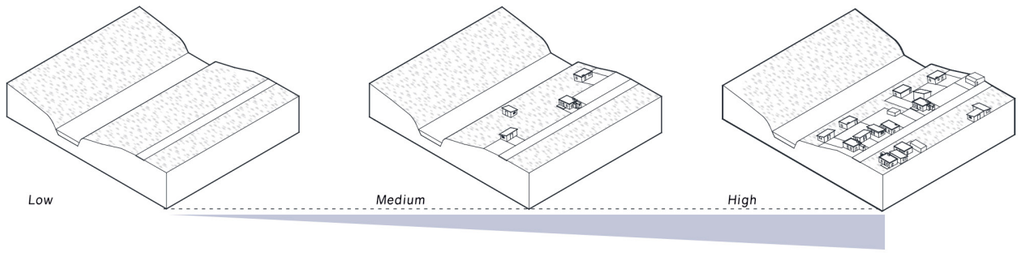
Proposed Strategic actions

The variables of the context are guiding the implementation of the proposed actions for each goal. The existing intensity in the occupation, vegetation cover and productive land uses in the context are determining the actions in order to counteract flooding risk, ecological degradation and poverty.

By using natural elements as active agents in risk prevention and reduction of vulnerability, both vegetation and water management will take an active role in the evolutionary process of transformation.

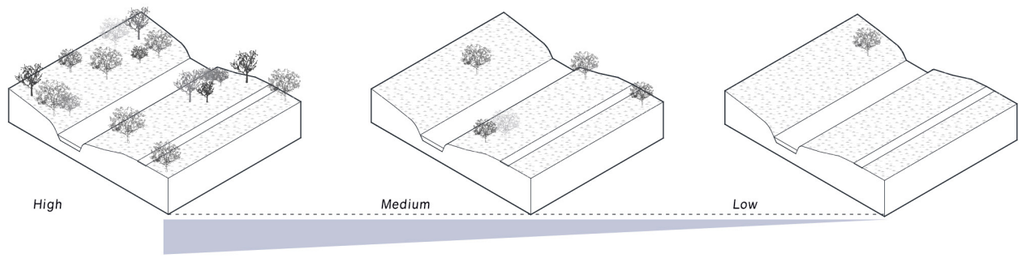
Fig. 8.9 - Context-determining variables when implementing strategic actions. (Productive ecology in flooding risk areas)

Intensity of occupation and ecological impact



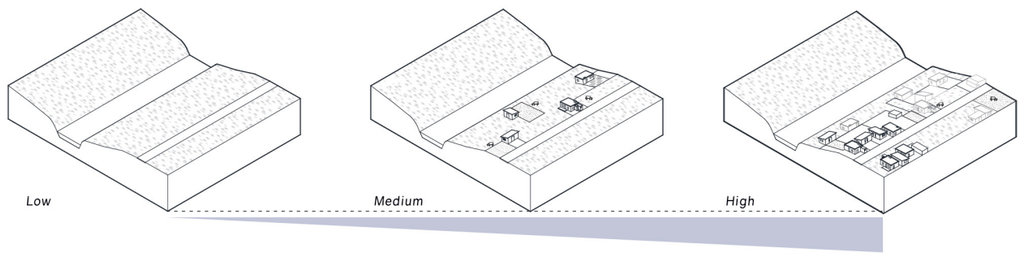
The intensity of the occupation and the ecological impact will determine the intensity of vegetation or strategic actions to be implemented and the role of the community from a local scale in the risk mitigation.

Intensity of vegetation cover and trees



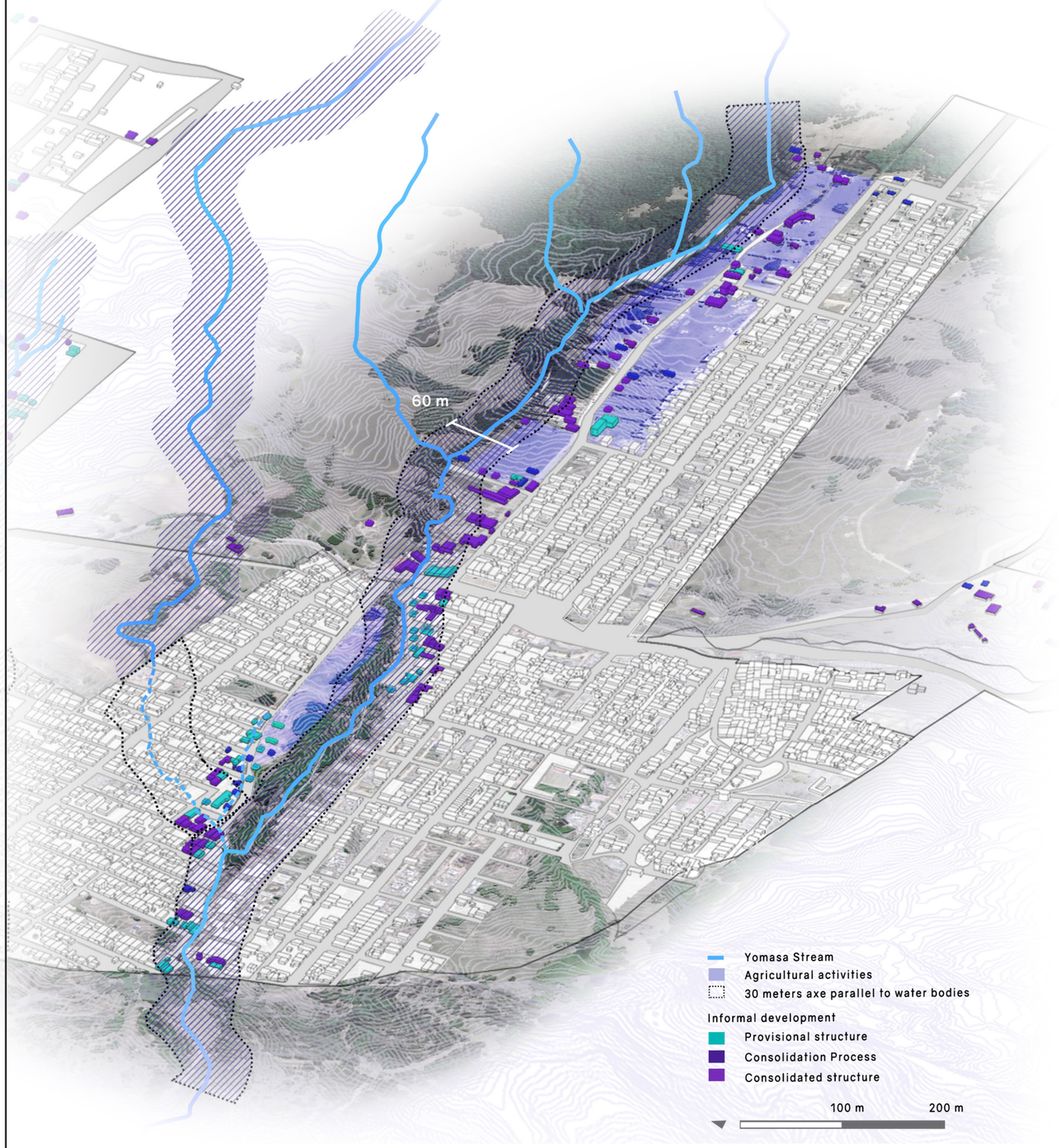
The intensity of the of the vegetation cover and trees will determine the needed nature based solutions and the complexity in the implemented strategic actions.

Intensity of productive land use and economic activities



The intensity of productive land use and economic activities will determine the active role of the community in activities that converge ecological and economic systems and will determine from a socio-cultural perspective the type of activity to which the intervention should be directed.

Fig. 8.10 - Planning Unit La Flora. Exemplification of the intensity of the determined variables

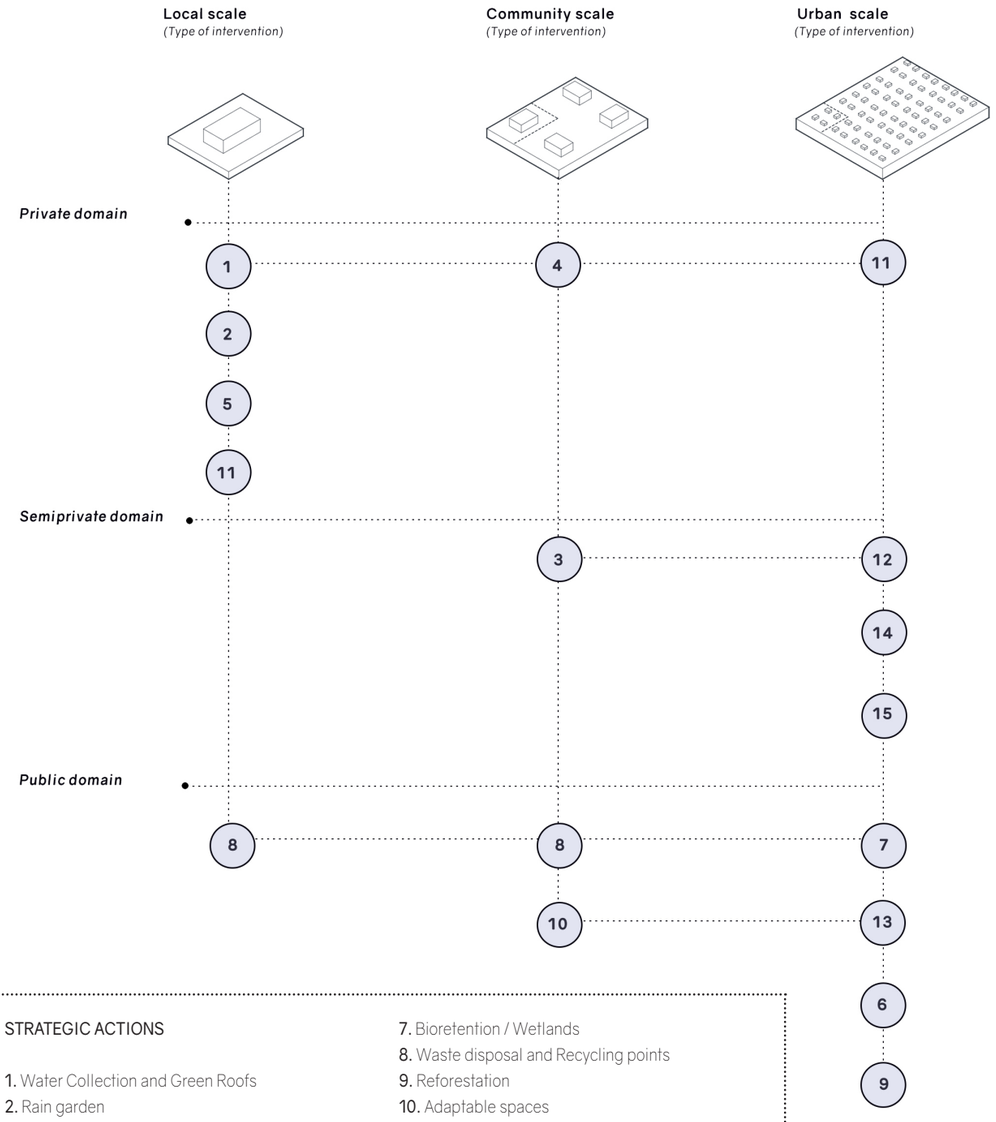


Proposed Strategic Actions - Water as an active agent

The proposed actions are classified in a spatio-temporal scale of implementation that recognizes the importance of actions in the a household level, to community and urban level in order to construct a co evolving strategy that counteracts flooding risk, ecological degradation and poverty and integrates the community since the beginning in order to prepare them for the uncertain future.

As explained above, each action is defined with an operability chart, which determines the time, scale, and capabilities needed for implementation. The proposed actions involve the current stakeholders responsible for the flood risk mitigation strategies in Bogotá, reconfiguring their role and relationships to a collaborative process with the community.

Fig. 8.11 - Strategic Actions. Productive Ecology applied in Flooding Risk areas. Scales of Implementation



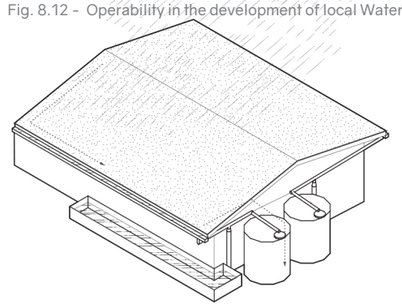
STRATEGIC ACTIONS

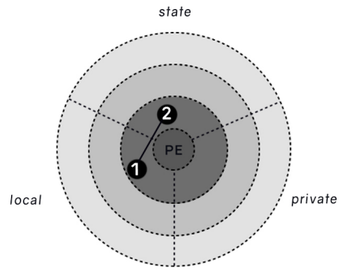
1. Water Collection and Green Roofs
2. Rain garden
3. Re vegetation (Garden)
4. Agroforestry
5. Urban Agriculture
6. Permeabilization and Infiltration
7. Bioretention / Wetlands
8. Waste disposal and Recycling points
9. Reforestation
10. Adaptable spaces
11. Relocation
12. Water Treatment Plants
13. Drainage Infrastructure
14. Capacitation Centers

Operability of the Proposed Strategic Actions

1. Water Collection - Green Roofs

Fig. 8.12 - Operability in the development of local Water Collection systems

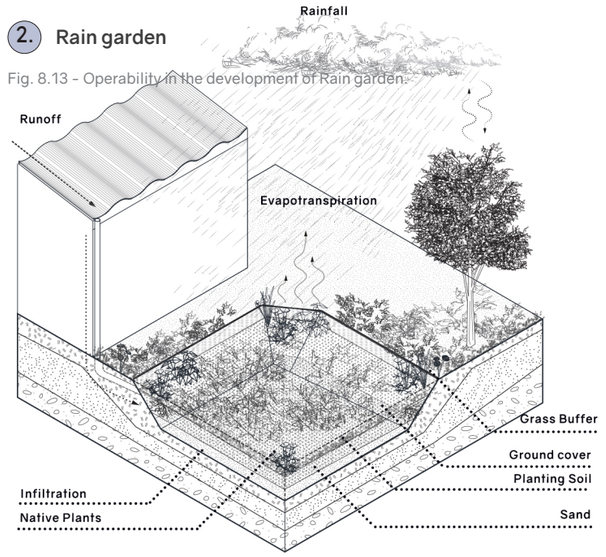


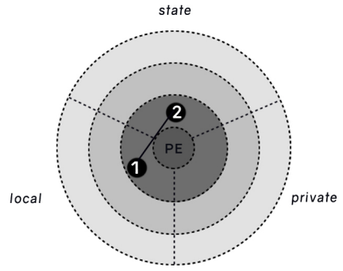


Scale of Implementation: Local
Time: Short term
Actors: (1) Inhabitant, (2) EAAB
Capacities: Low Investment, Low labour force

2. Rain garden

Fig. 8.13 - Operability in the development of Rain garden.

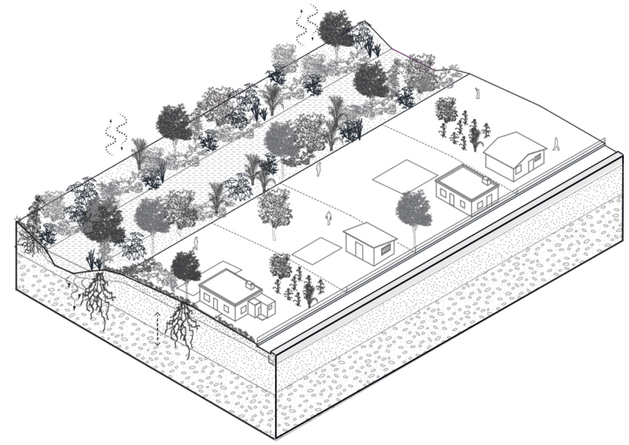


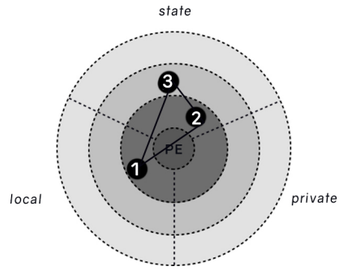


Scale of Implementation: Local
Time: Short term
Actors: (1) Inhabitant, (2) SDA
Capacities: Low Investemt, Low labour force

3. Re vegetation and Community gardens

Fig. 8.14 - Operability in the development of Re vegetation and community gardens

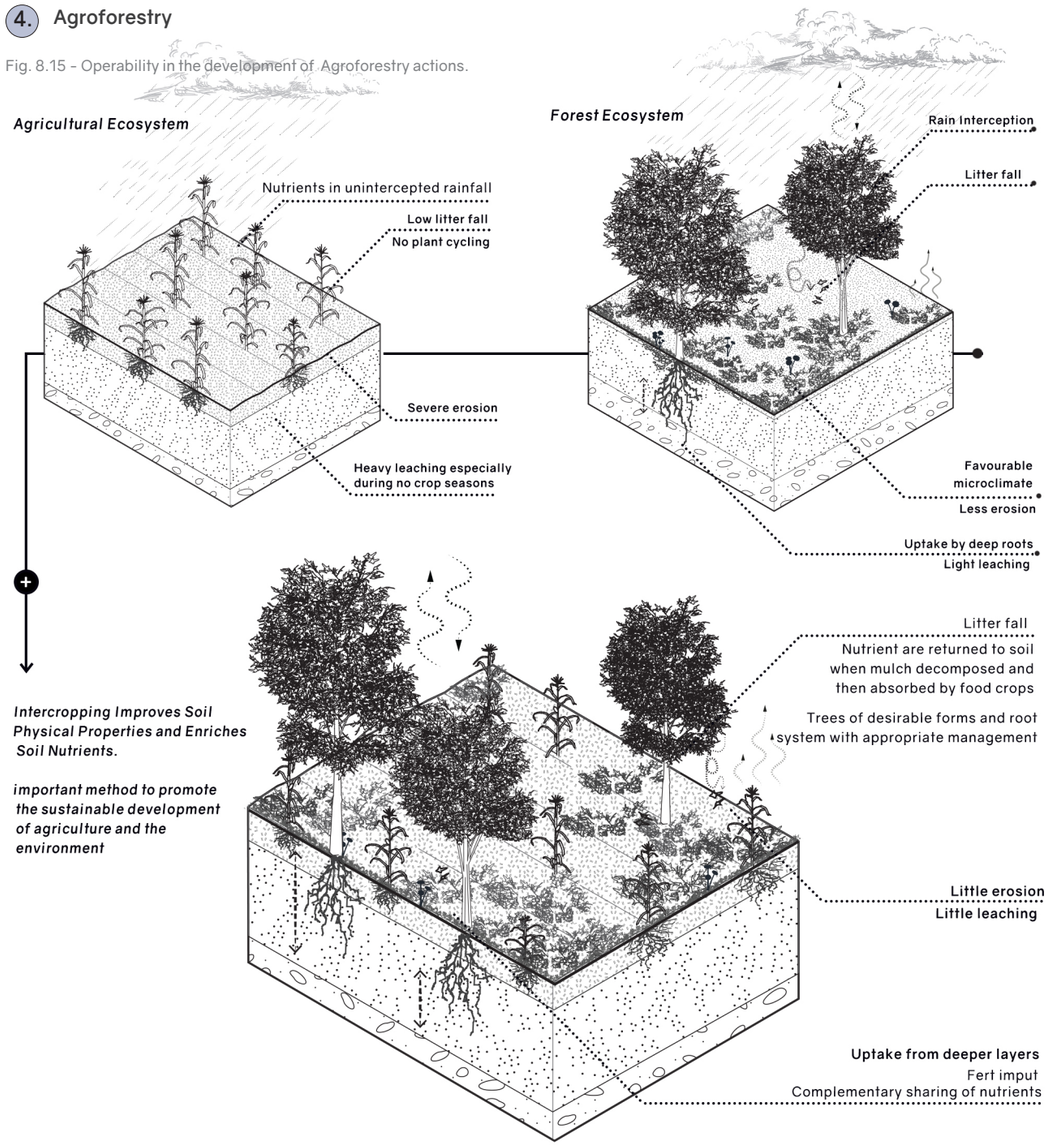




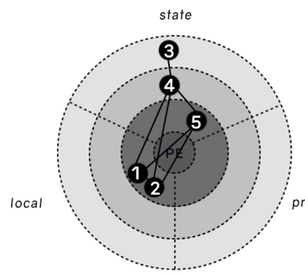
Scale of Implementation: Local - Collective
Time: Short term
Actors: (1) Inhabitant, (2) SDA (3) IDIGER
Capacities: Low Investemt, Low labour force

4. Agroforestry

Fig. 8.15 - Operability in the development of Agroforestry actions.



Agroforestry becomes an important action when combining ecological and economical systems. This action is carried out by combining agricultural activities with trees, understanding that apart from the ecological benefits, these same trees can give fruits, wood, etc and have a great impact on the crops. This reinterpretation of forest and agricultural activities brings great benefits and ecosystem services, brings benefits to agricultural changes and benefits the local population economically.



Scale of Implementation: Collective
Time: Long term
Actors: (1) Inhabitant, (2) Community (3) IDIGER, (4) SDA, (5) SDDE
Capacities: Low Investemt, Medium labour force

5. Urban Agriculture

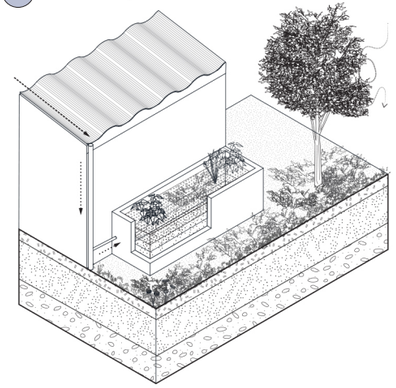
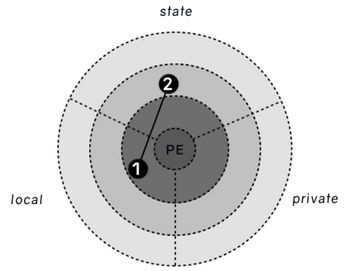


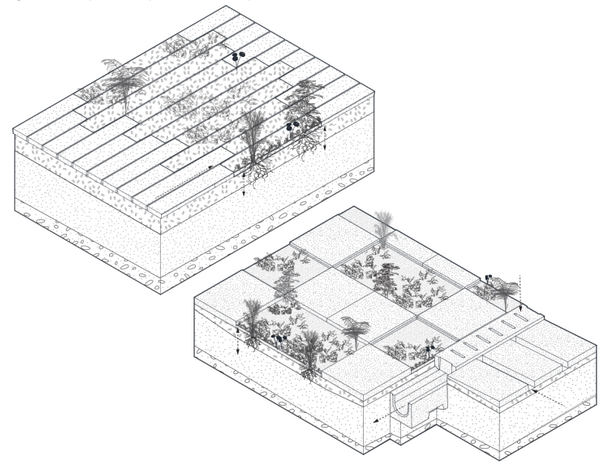
Fig. 8.16 - Operability in the development of Urban Agriculture.

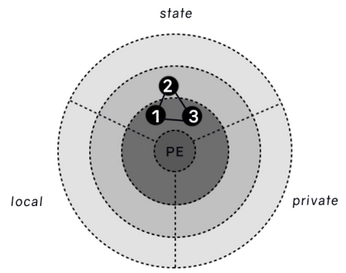


Scale of Implementation: Local
Time: Short term
Actors: (1) Inhabitan (2) SDA
Capacities: Low Invesment, Low labour force

6. Permeabilization

Fig. 8.17 - Operability in the development of Permeabilization.

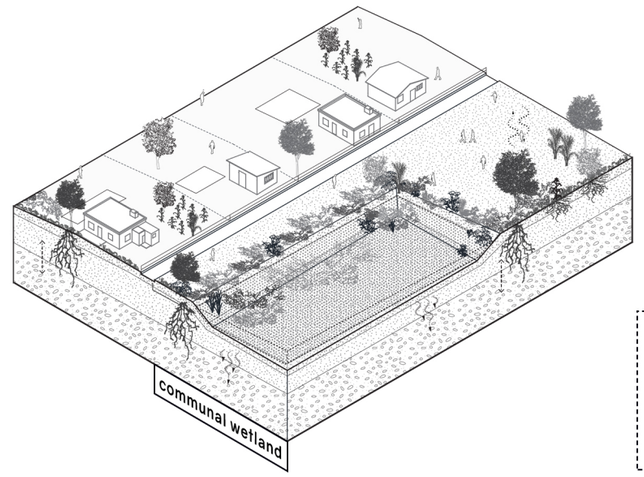


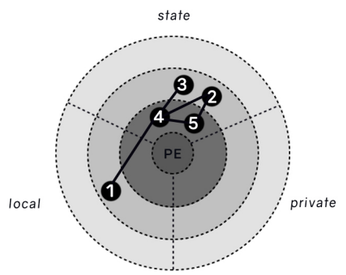


Scale of Implementation: Collective - Urban
Time: Medium term
Actors: (1) SDP (2) EAAB + (3) IDU
Capacities: Medium Investment, Medium labour force

7. Wetlands

Fig. 8.18 - Operability in the development of Wetlands.

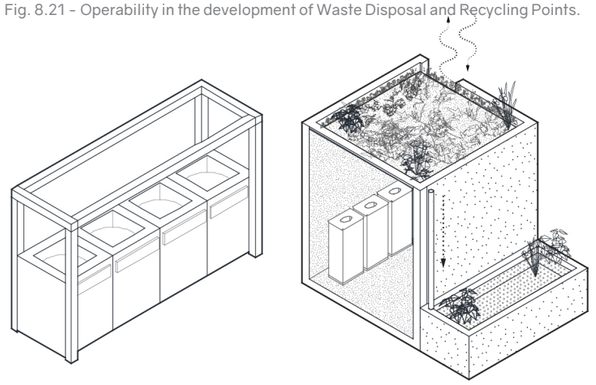


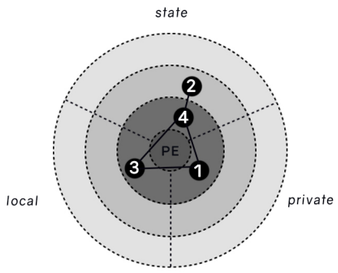


Scale of Implementation: Collective - Urban
Time: Medium term
Actors: (1) Community, (2) JBB (3) SDP (4) SDA (5) EAAB
Capacities: Medium Investemt, Low labour force

8. Waste disposal and recycling points

Fig. 8.21 - Operability in the development of Waste Disposal and Recycling Points.

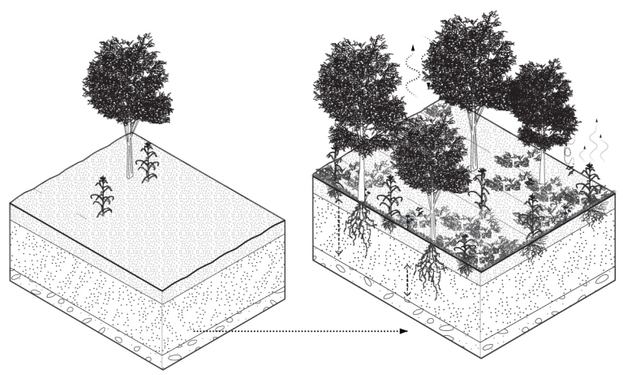


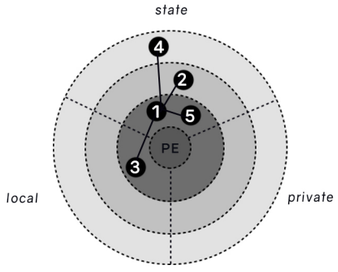


Scale of Implementation: Collective
Time: Short Term
Actors: + (1) PA, (2) SDA, (3) Community, (4) SDP
Capacities: Low investment, Low labour force

8. Reforestation

Fig. 8.20 - Operability in the development of Reforestation actions

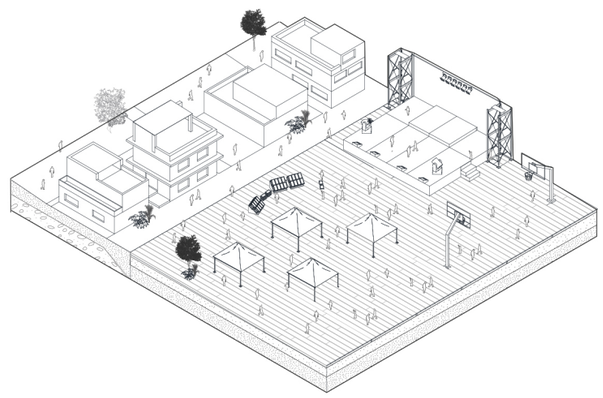


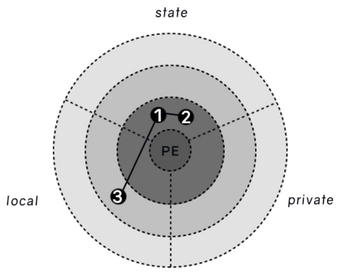


Scale of Implementation: Collective - Urban
Time: Long Term
Actors: (1) SDA + (2) JBB (3) Community (4) IDIGER (5) SDP
Capacities: Low Investment, Medium Labour force

10. Multifunctional Public areas

Fig. 8.19 - Operability in the development of Multifunctional Public areas

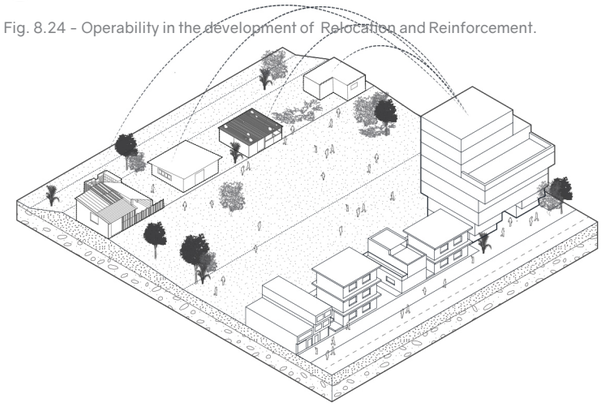


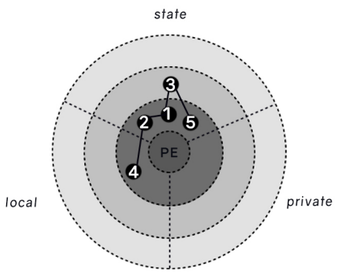


Scale of Implementation: Collective
Time: Medium term
Actors: (1) SDP + (2) IDU (3) Community
Capacities: Medium Investment, Medium labour force

11. Relocation

Fig. 8.24 - Operability in the development of Relocation and Reinforcement.

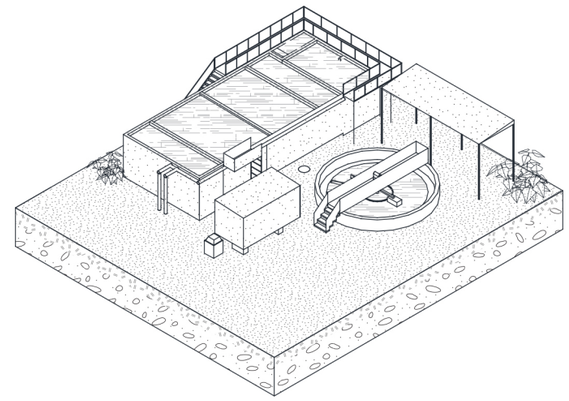


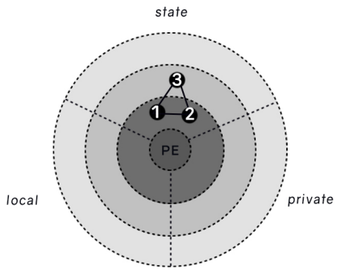


Scale of Implementation: Local - Collective
Time: Short (Reinforcement) Long term (Relocation)
Actors: (1) CVP + (2) SDH (3) SDP (4) Inh. (5) IDIGER
Capacities: High Investment, High labour force

12. Water treatment Plant

Fig. 8.23 - Operability in the development of Water treatment Plant .

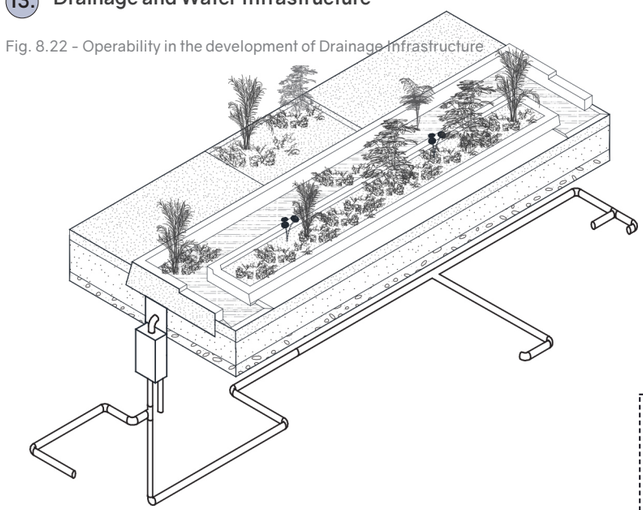


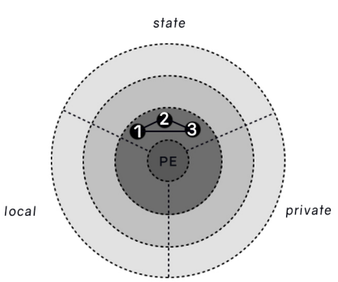


Scale of Implementation: Collective - Urban
Time: Long Term
Actors: (1) EAAB (2) SDP (3) SDA
Capacities: High Investment, High labour force

13. Drainage and Water Infrastructure

Fig. 8.22 - Operability in the development of Drainage Infrastructure





Scale of Implementation: Collective - Urban
Time: Long Term
Actors: (1) EAAB (2) SDP (3) IDU
Capacities: High Investment, High labour force

Current Planning Goals and Platforms in Bogotá

Intervention mechanisms for landslide risk mitigation

The following figure illustrates the actors and their main fields of action regarding flooding risk in the city of Bogotá. These strategies are not part of the neighborhood upgrading agenda.

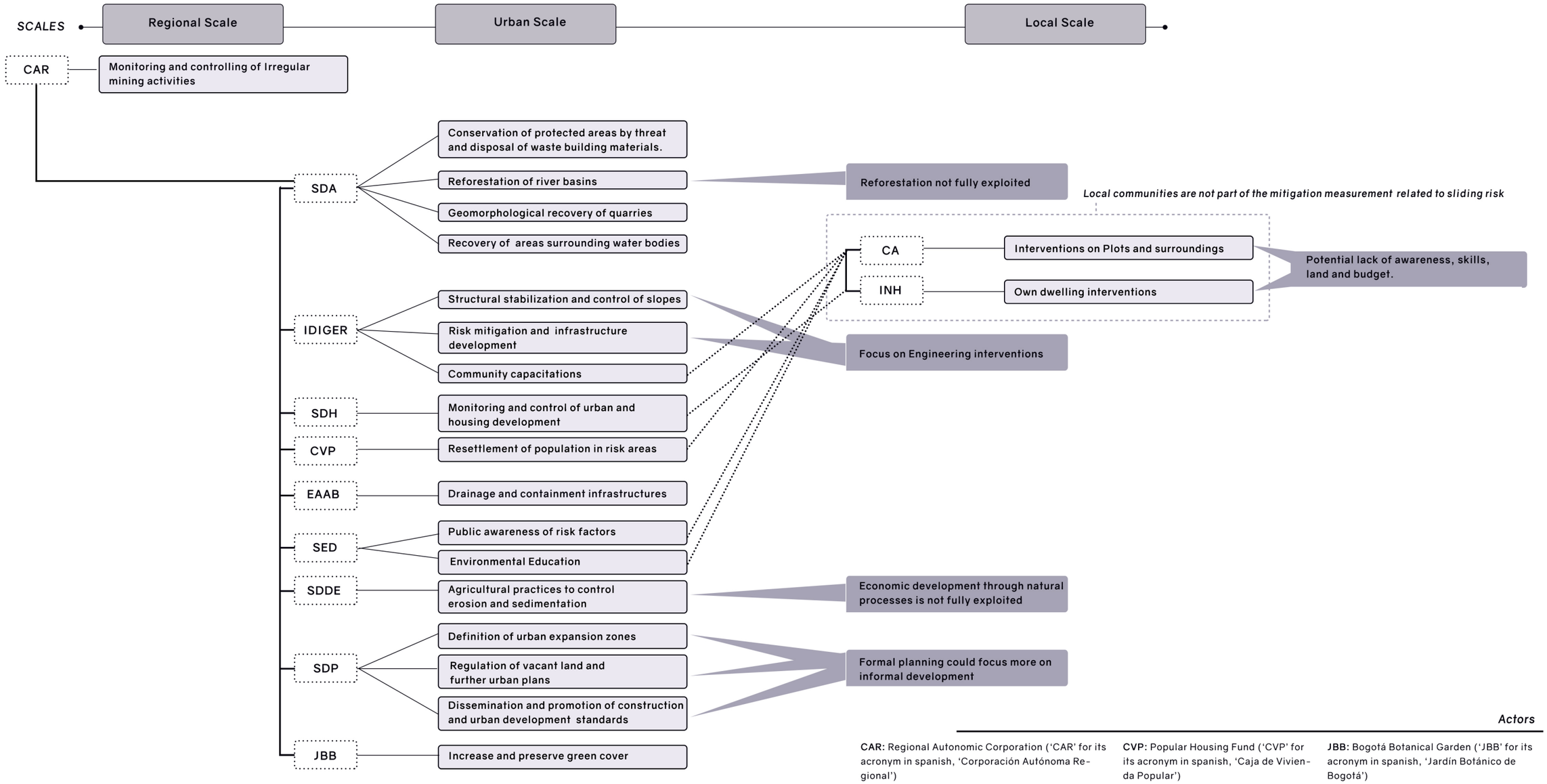


Fig. 8.25 - Planning Platform in Bogotá focused on Landslide Risk Mitigation

Actors

CAR: Regional Autonomic Corporation ('CAR' for its acronym in spanish, 'Corporación Autónoma Regional')

SDA: District Environmental Secretariat ('SDA' for its acronym in spanish, 'Secretaría Distrital de Ambiente')

IDIGER: District Institute for Risk Management and Climate Change ('IDIGER' for its acronym in spanish, 'Instituto Distrital de Gestión de Riesgos y Cambio Climático')

SDH: District Habitat Secretariat ('SDH' for its acronym in spanish, 'Secretaria Distrital de Hábitat')

CVP: Popular Housing Fund ('CVP' for its acronym in spanish, 'Caja de Vivienda Popular')

EAAB: Water and Sewage Company of Bogota ('EAAB' for its acronym in spanish, 'Empresa de Acueducto y Alcantarillado de Bogotá')

SED: District Education Secretariat ('SED' for its acronym in spanish, 'Secretaría de Educación Distrital').

SDP: District Planning Secretary ('SDP' for its acronym in spanish, 'Secretaría Distrital de Planeación')

JBB: Bogotá Botanical Garden ('JBB' for its acronym in spanish, 'Jardín Botánico de Bogotá')

IDU: Urban Development Institute ('IDU' for its acronym in spanish, 'Instituto de Desarrollo Urbano').

SDDE: District Economic Development Secretariat ('SDDE' for its acronym in spanish, 'Secretaría Distrital de Desarrollo Económico')

CA: Community association
INH: Inhabitants

Landslide Risk

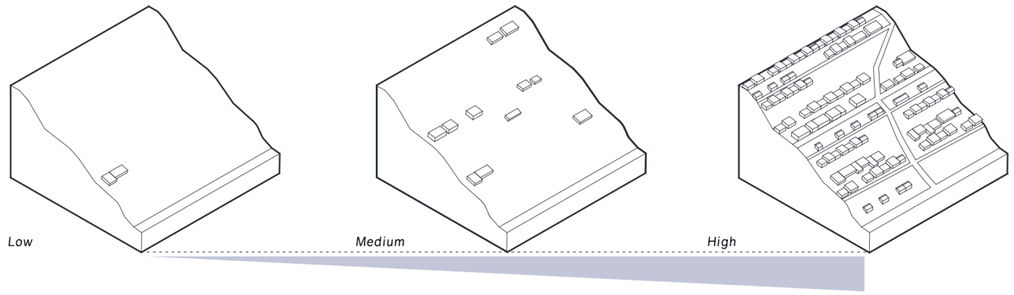
Proposed Strategic actions

The variables of the context are guiding the implementation of the proposed actions for each goal. Again the same variables regarding the intensity of the occupation and ecological impact, the intensity in the vegetation cover and tress and the intensity in the economic activities and land uses will determine the implementation of the strategic actions regarding landslide.

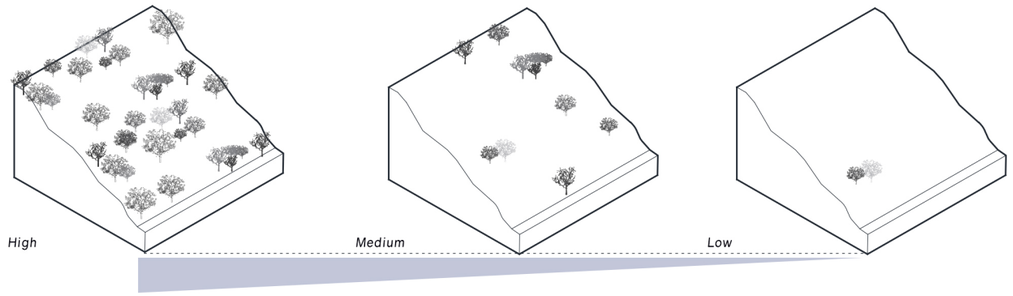
Considering landslides as the major natural hazards in the pronounced topographic region, the required measures in order to reduce risk should be based on hybrid solutions including ecosystem measures. (Lange, 2014)

Fig. 8.26 - Context-determining variables when implementing strategic actions. (Productive ecology in sliding risk areas)

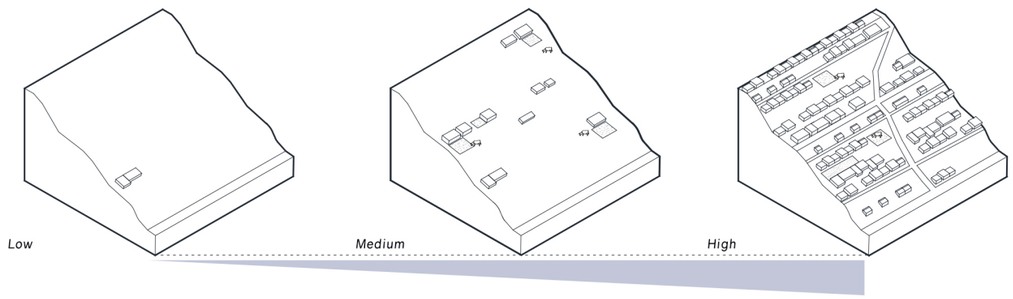
Intensity of occupation and of the ecological impact



Intensity of vegetation cover and trees



Intensity of productive land use and economic activities



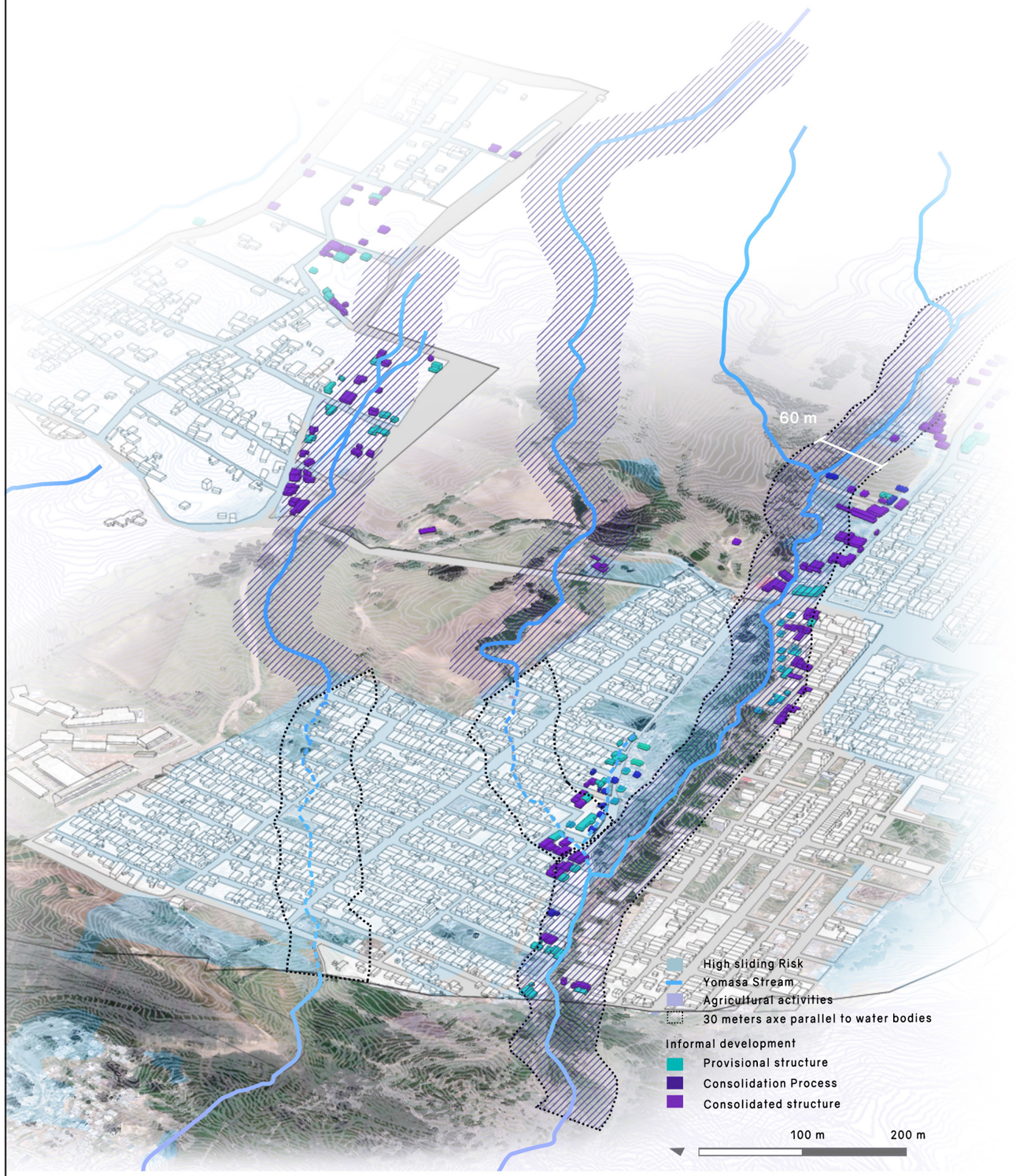


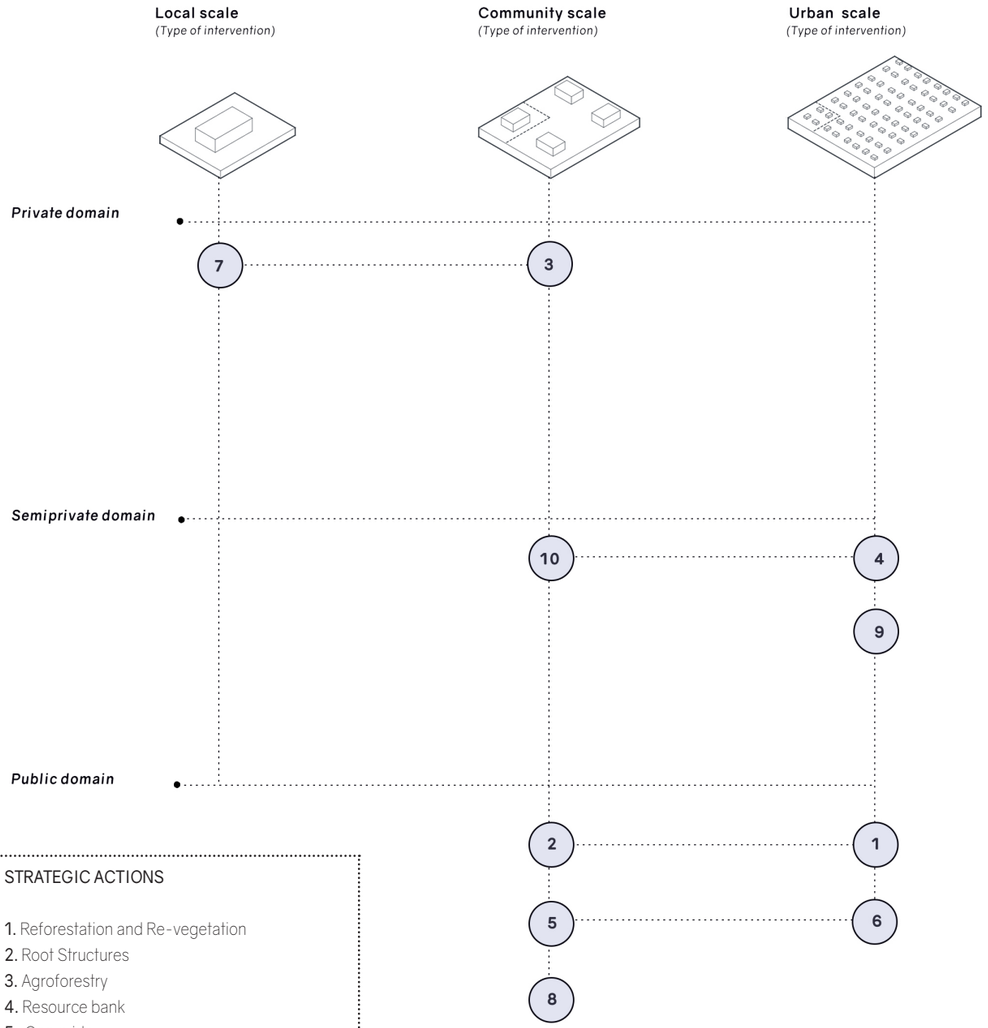
Fig. 8.27 - Planning Unit La Flora. Exemplification of the intensity of the determined variables

Proposed Strategic Actions - Sliding mitigation. Vegetation and Soil as an active agent

The proposed actions are classified in a spatio-temporal scale of implementation that recognizes the importance of actions in the a household level, to community and urban level in order to construct a co evolving strategy that counteracts landslide risk, ecological degradation and poverty and integrates the community since the beginning in order to prepare them for the uncertain future.

As explained above, each action is defined with an operability chart, which determines the time, scale, and capabilities needed for implementation. The proposed actions involve the current stakeholders responsible for the landslide risk mitigation strategies in Bogotá, reconfiguring their role and relationships to a collaborative process with the community.

Fig. 8.28 - Strategic Actions. Productive Ecology applied in Sliding Risk areas. Scales of Implementation

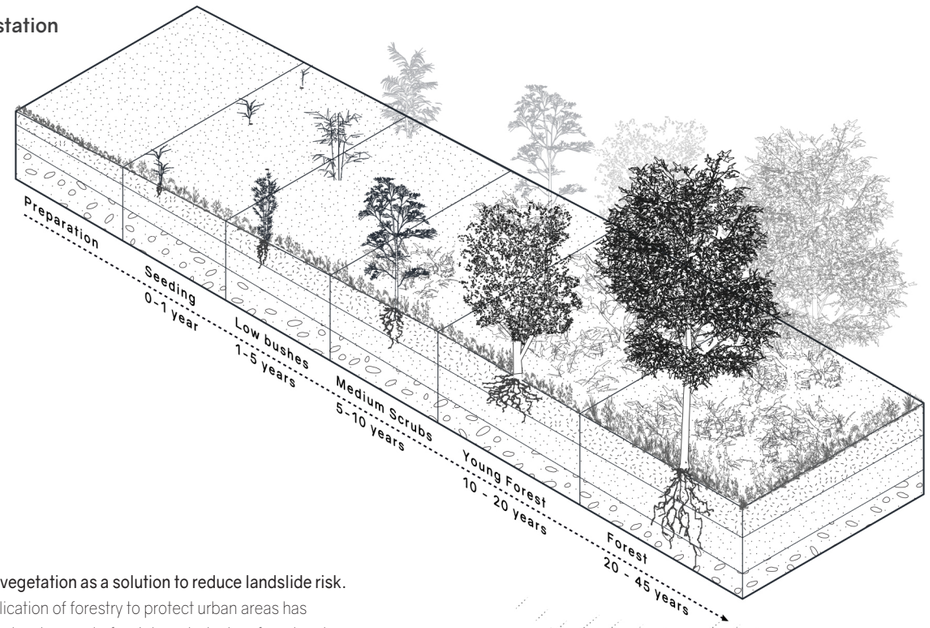


STRATEGIC ACTIONS

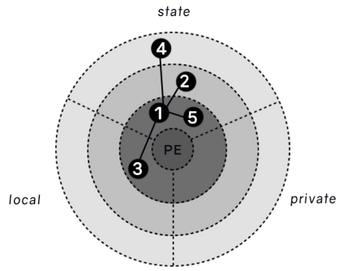
1. Reforestation and Re-vegetation
2. Root Structures
3. Agroforestry
4. Resource bank
5. Geo grids
6. Retaining walls and Slope reinforcement
7. Structural reinforcement
8. Adaptive areas
9. Capacitation Centers
10. Composting Area

Operability of the Proposed Strategic Actions

1. Reforestation



The potential of vegetation as a solution to reduce landslide risk. Large-scale application of forestry to protect urban areas has been limited. The development of an integrated urban forestry plan specifically focused on landslide risk reduction can be a sound and inexpensive alternative for building resilience in urban areas with high landslide vulnerability. Figure 8.26 illustrates the reasons why reforestation can be an effective tool.



Scale of Implementation: Collective - Urban
Time: Long Term
Actors: (1) SDA + (2) JBB (3) Community
(4) IDIGER (5) SDP
Capacities: Low Investment, Medium Labour force

1.Evapotranspiration: Evapotranspiration is defined as the loss of humidity from a surface by direct evaporation along with the loss of water by transpiration from vegetation.(Fitts, 2013)

2. Barrier against strong winds and rain: Plants with abundant smaller or medium size leaves are more suitable to mitigate the impact force of rain since they cover larger surfaces absorbing the impulse of water at low altitudes. These plants also absorb moisture from the soil and release excess moisture from the subsoil and release it into the environment by evapotranspiration. (Raut, 2018)

3. Reduction of erosion due to vegetation cover: Part of the water is trapped by leaves, stems and roots, thus reducing runoff, which is the cause of greater rain erosion. (Raut, 2018)

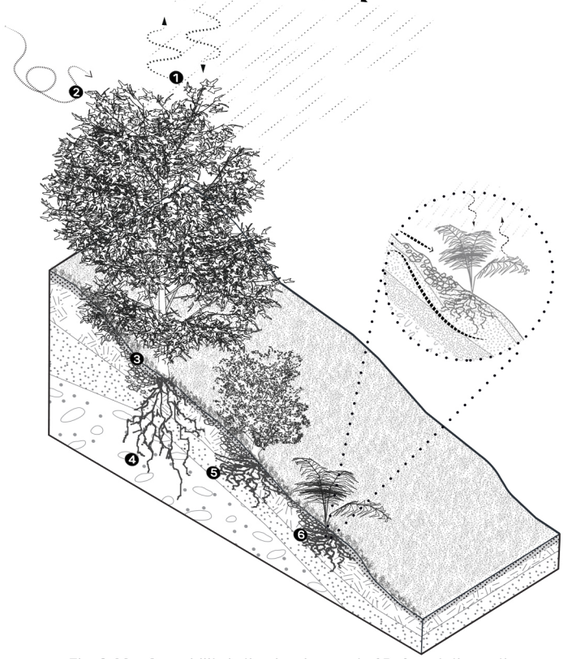


Fig. 8.29 - Operability in the development of Reforestation actions

4. Deep roots: The deep and thick roots serve as an anchorage to deeper soils and to extract moisture from the soil to avoid landslides. (Raut, 2018)

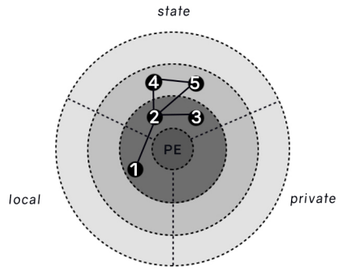
5 - 6. Smaller Roots: The smaller and more superficial roots serve to retain water, infiltrate water and stop the release of particles, thus preventing further landslides. The vegetation functions as a water filter by facilitating the sedimentation of soil particles that have been transported by this water flow, preventing further slides and stabilizing the surface levels of the soil.(Raut, 2018)

2. Root structures

A. Deep Vertical Roots. The growth of the vertical roots as a ground mooring and as a source of moisture extraction.

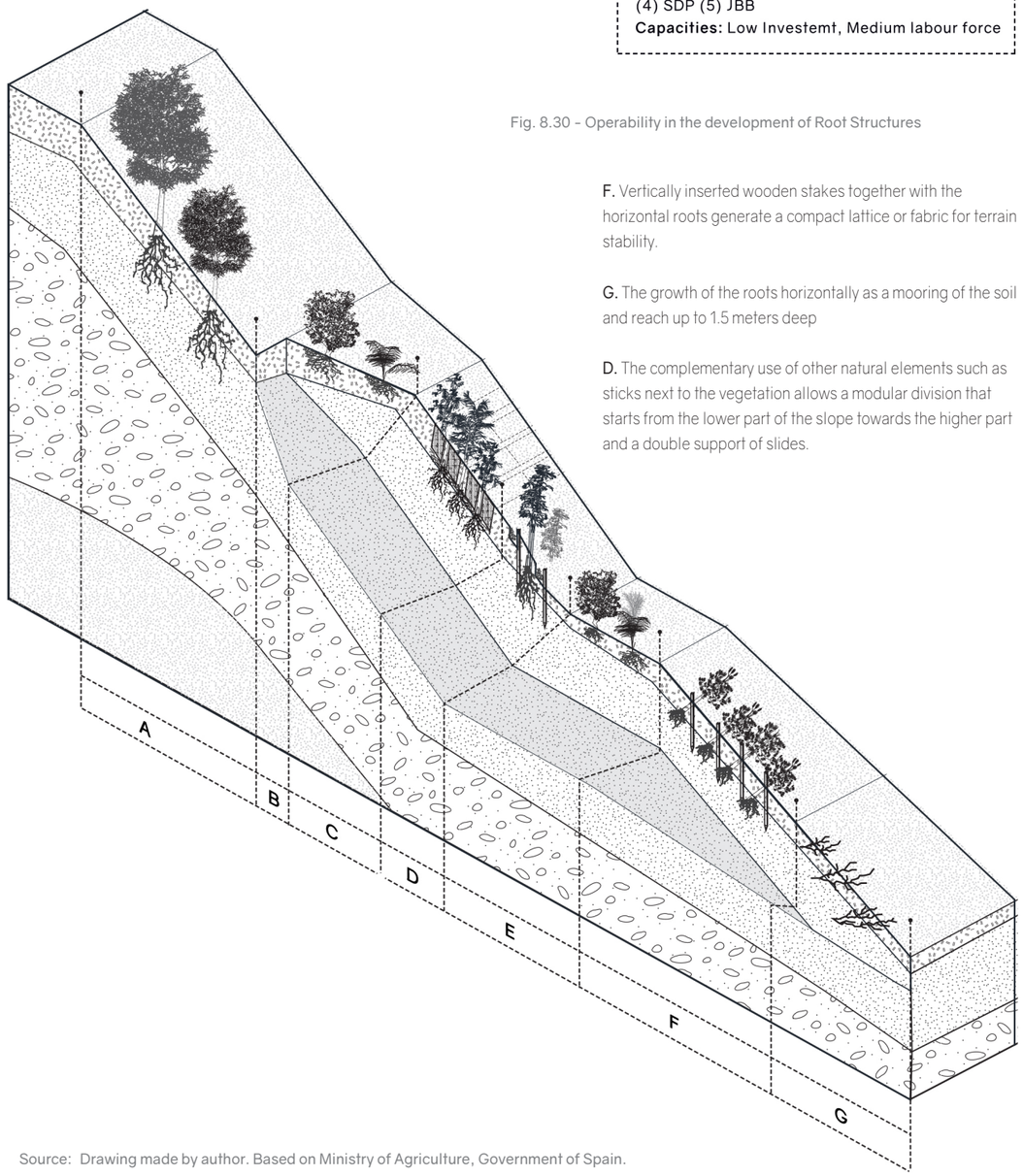
B. E. Superficial vertical roots. Water retention, water infiltration, stopping runoff and particle detachment, avoiding major slides. The vegetation works as a water filter by facilitating the sedimentation of soil particles that have been transported by this flow, avoiding major slides and stabilizing the surface levels of the soil.

C. Vegetation in combination of soil or stone modules present a greater stability for the slope, completing the functionality of the vegetation with other natural elements.



Scale of Implementation: Collective - Urban
Time: Long term
Actors: (1) Community (2) SDA (3) IDIGER (4) SDP (5) JBB
Capacities: Low Investemt, Medium labour force

Fig. 8.30 - Operability in the development of Root Structures



F. Vertically inserted wooden stakes together with the horizontal roots generate a compact lattice or fabric for terrain stability.

G. The growth of the roots horizontally as a mooring of the soil and reach up to 1.5 meters deep

D. The complementary use of other natural elements such as sticks next to the vegetation allows a modular division that starts from the lower part of the slope towards the higher part and a double support of slides.

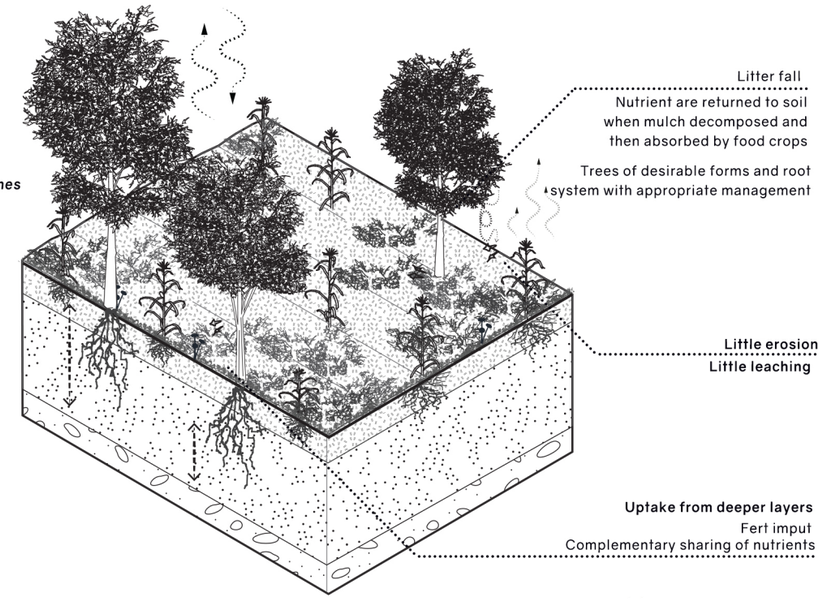
Source: Drawing made by author. Based on Ministry of Agriculture, Government of Spain.

3. Agroforestry

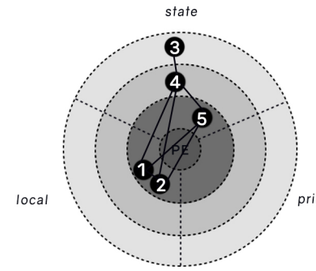
Fig. 8.31 - Operability in the development of Agroforestry

Intercropping Improves Soil Physical Properties and Enriches Soil Nutrients.

important method to promote the sustainable development of agriculture and the environment



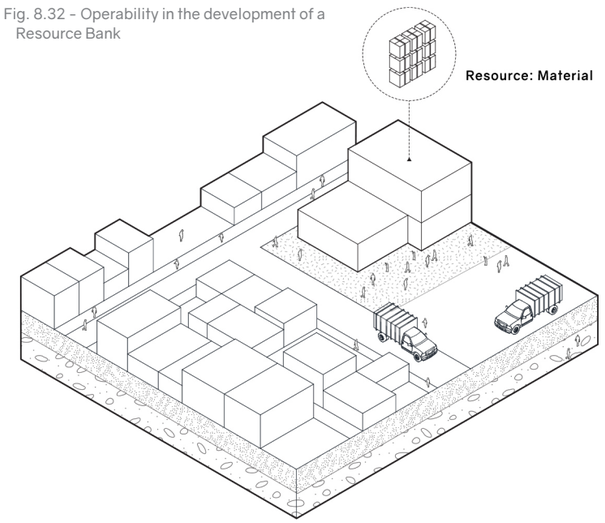
As explained in the previous goal, the action of agroforestry has benefits both in water retention, soil improvement and nourishment of crops. In turn, this action incorporates the benefits of roots as land ties and natural systems as barriers for landslides.

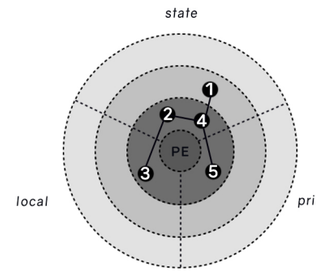


Scale of Implementation: Collective
Time: Long term
Actors: (1) Inhabitant, (2) Community (3) IDIGER, (4) SDA, (5) SDDE
Capacities: Low Investemt, Medium labour force

4. Resource Bank

Fig. 8.32 - Operability in the development of a Resource Bank

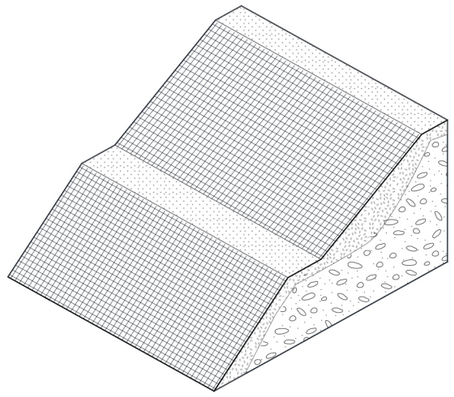


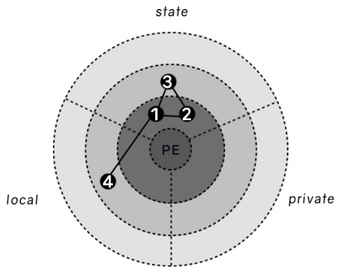


Scale of Implementation: Urban
Time: Medium Term
Actors: + (1) SDDE (2) SDA (3) Community (4) SDP (5) Medium enterprices
Capacities: .High Investment,Medium labour force

5. Geo grids

Fig. 8.33 - Operability in the development of Geogrids

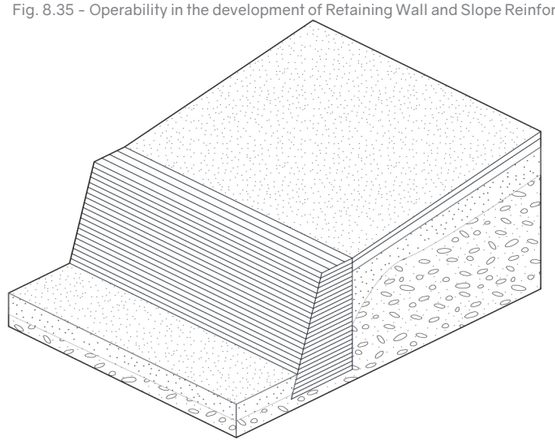


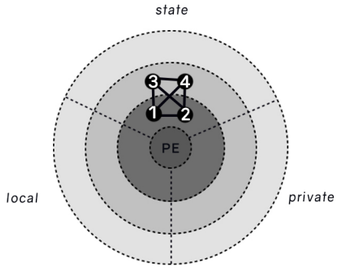


Scale of Implementation: Collective
Time: Long term
Actors: (1) IDIGER (2) IDU (3) SDP
(4) Community
Capacities: Medium Investment, High labour force

6. Retaining Wall and Slope Reinforcement

Fig. 8.35 - Operability in the development of Retaining Wall and Slope Reinforcement

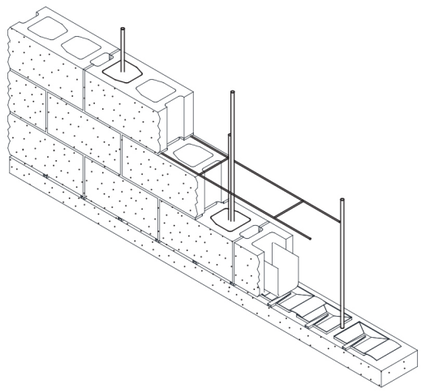


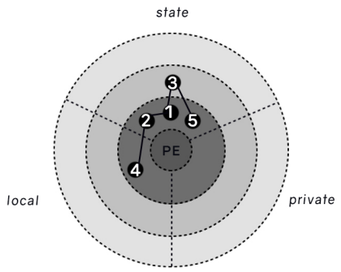


Scale of Implementation: Collective
Time: Long term
Actors: (1) IDIGER (2) IDU (3) SDP (4) EAAB
Capacities: High Investemt, High labour force

7. Structural Reinforcement or Relocation

Fig. 8.34 - Operability in the development of a Structural Reinforcement and Relocation

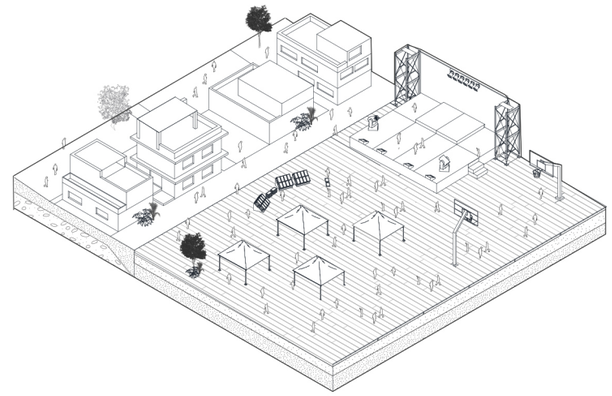


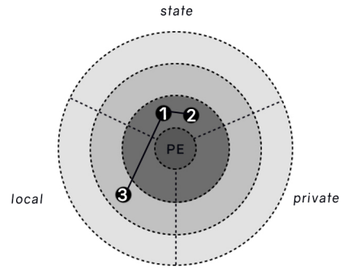


Scale of Implementation: Local - Collective
Time: Short (Reinforcement) Long term (Relocation)
Actors: (1) CVP + (2) SDH (3) SDP (4) Inh.
(5) IDIGER
Capacities: High Investment, High labour force

8. Multifunctional public areas

Fig. 8.36 - Operability in the development of Multifunctional public areas

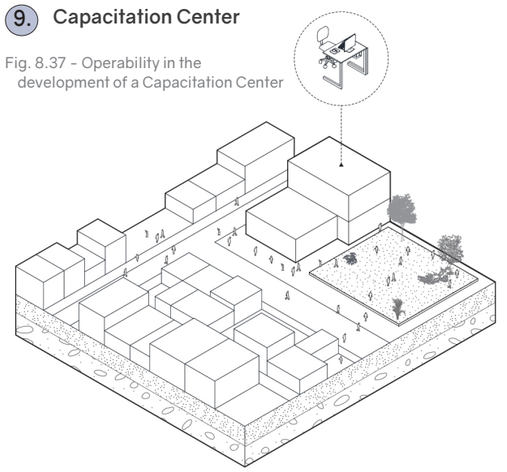


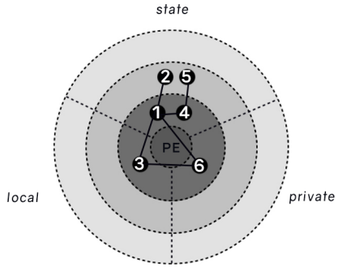


Scale of Implementation: Collective
Time: Medium term
Actors: (1) SDP + (2) IDU (3) Community
Capacities: Medium Investment, Medium labour force

9. Capacitation Center

Fig. 8.37 - Operability in the development of a Capacitation Center

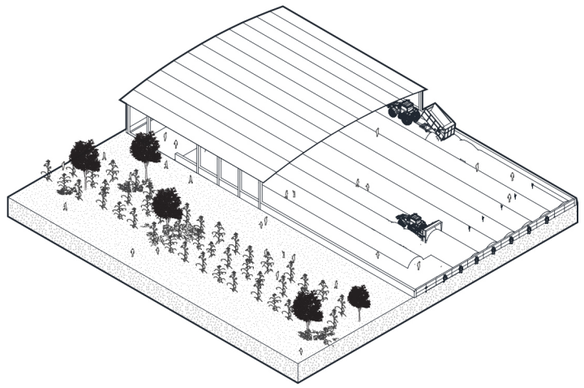


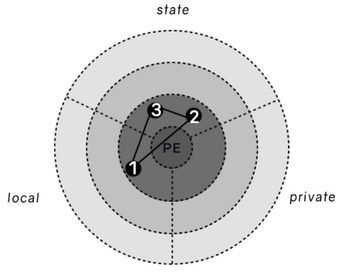


Scale of Implementation: Urban
Time: Medium Term
Actors: (1) IDIGER (2)SDA (3) Community
(4) SDP +(5) SDDE +(6) Universities
Capacities: Medium Investment, High labour force

10. Composting Area

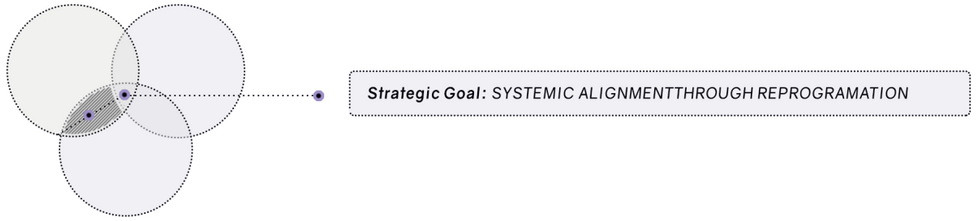
Fig. 8.38 - Operability in the development of a Composting area or recycling center





Scale of Implementation: Collective
Time: Medium term
Actors: (1) Community (2) SDA (3) SDDE
Capacities: Medium Investment, Medium labou force

d. Strategic Goal: Systemic alignment through reprogramation



Reprogramation of the operative process in which spatial strategies are currently implemented, by a systemic socio-spatial alignment.

The strategic goal defines a process that aims to reprogram the current way of approaching and intervening the spatial structure in informal neighborhoods carry out by the upgrading program, in order to propose a comprehensive alignment of the social and spatial systems.

To do this, it is essential in the first place to critically evaluate the relationship between the spatial interventions, in both public and private domain, and the social characterization of the different areas that where intervened.

Current Planning Goals and Platforms in Bogotá

The latest district administration of Bogotá (2016 - 2019), led by mayor Enrique Peñalosa, implemented a strategy called Demarginalzar, executed by the Habitat Secretariat.

This program developed a series of strategies with the aim of improving integral aspects of the most vulnerable neighborhoods in Bogotá (Habitat, 2019). Within these parameters, 'de-marginalization' represents the Mayor's response to unplanned development of the city, in which all of the public entities responsible, led by the Habitat Secretariat,, unify efforts to improve the urban environment and the housing in informal settlements.

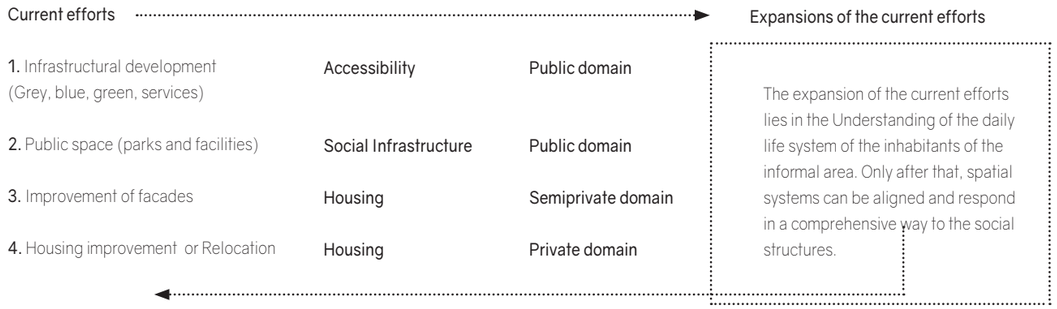
As explained in previous chapters, the intervention process starts with the legalization of informal settlements. From that point onwards the informal neighborhoods are introduced into the formal system of the city. Subsequently, these informal neighborhoods are connected to the public services networks i.e. sewage and water supply networks, energy, as well as roads, in addition to social investments and school facilities. As a next step, the facades of the houses are painted following community participation processes and afterwards, the Habitat Secretariat attends the housing of the poorest and provides repairs of roofs, floors, kitchens and bathrooms, through a program of 'housing upgrading'. At a final stage the property title is only provide to whoever proves ownership. The neighborhood can be included in the official plans of Bogotá, but formal law still does not offer any guarantee or alternative for the ownership.

The Upgrading Programs centers the attention on infrastructure, public space and equipment, leaving the housing improvement and social dimension as an effect of these interventions. Without a comprehensive vision of the living conditions, daily life systems and social structures, the Programs become an end and not a vehicle to strengthen the communities and increase their autonomy.

Both the intervention models and the urban and architectural design processes, are ignoring the particularities of the settlements, forcing and imposing generic interventions. As is demonstrated in the analysis of the planning units of flora and Lourdes (Figure 8.15), the developed strategies were focused on mobility infrastructure, services, housing improvement, parks, among others, without any differentiation between one sector and the other, despite that the environments are different in its location, development time, consolidation, population structure among others.

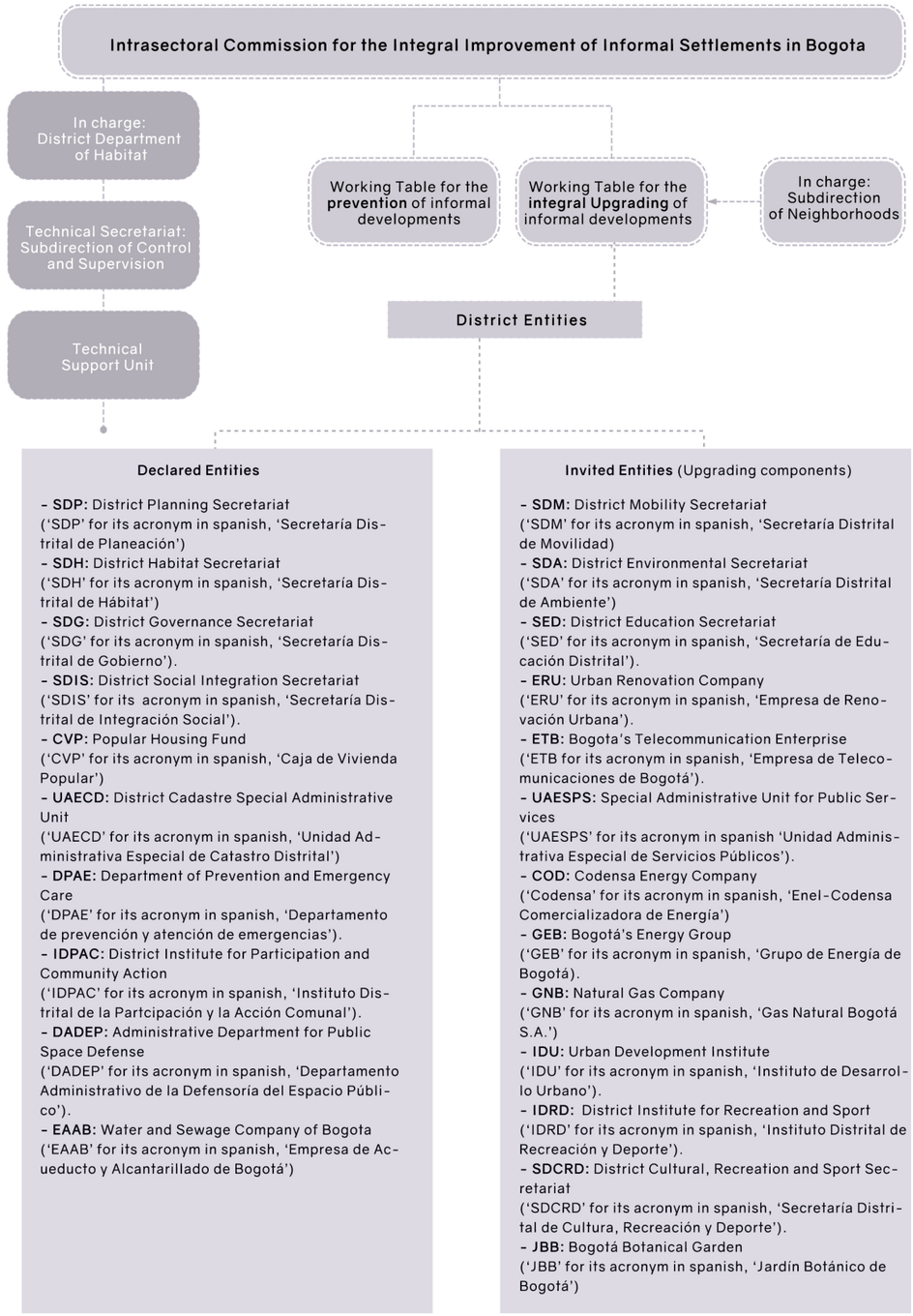
While on the one hand La Flora is an area of much higher ecological risk, located in the periphery, with less consolidated social and spatial structures, and with high rates of displaced population, on the other hand Lourdes is located in the center of the city, with a more consolidated urban environment and with social structures more integrated to the urban dynamics of the city. The Program fails in recognizing the particularity of each sector, the needs and the social potentialities as a tool in order to propose an intervention.

General Socio-spatial interventions



The actors involved in the Neighborhood Improvement Program are listed in the following, which shows the main entities in charge of developing the projects and the entities with which they work together to cover different program objectives. These groups are focused both on neighborhood upgrading and in controlling the development and propagation of informal settlements in the city of Bogotá.

Fig. 8.39 - Intrasectoral Commission for the Integral Improvement of Informal Settlements in Bogotá. (Decree 546 of 2007 modified by Decree 023 of 2011)Control Areas to prevent Informal development.



Source: Habitat District Secretariat. Management Report and Results 2018. Sub-direction of Neighborhoods

Fig. 8.40 - Evaluation of the interrelation between the current goals and programs related to informal upgrading strategies.

Development Plan 2016 2020 (The Mayor's Office of Bogota)

Structured

Main Pillars

1) Equality in quality of life
2) Urban Democracy
3) Building community and citizen culture.

Transversal axes

I) New Territorial Regulation
II) Economic Development
III) Environmental sustainability (energy efficiency)
IV) Legitimate government and local strengthening

Strategic programs
(Implemented and conducted by the relevant departments and entities)

Municipal Department of Habitat
Definition of **investment projects** to be managed by the department (2016 - 2020)

2. Urban Democracy Pillar:
The department developed six investment projects whose purpose is to improve the city's urban infrastructure by increasing public and pedestrian spaces.

I) New Territorial Regulation
One investment project which seeks to regulate urban growth.

IV) Legitimate government
Four investment projects with the purpose of consolidate a more transparent and efficient public management.

The district department of habitat structured the investment projects and they are framed in different themes

Strategic Upgrading Program

1. Integrated Habitat Interventions Program. Interventions on informal settlements, identified with a high urban deficit, where accessibility, mobility, public space and facilities are prioritized.

Demarginalisation strategy

1.1) Legalization
1.2) Regularization. Improving the environment, prioritizing actions of accessibility, mobility, public services, public space and facilities.
1.3) Habitarte program: Local and municipal participation process in the painting of facades with the purpose of achieving coexistence, security and improvement of the environment.
1.4) Housing improvement program
1.5) Property Titling. (Who proved to be owners of the property)

2. Recovery, incorporation, urban life and control of illegality

2.1 Monitoring and Control Polygons. Control of Informality

2.2 Financing for territorial development. Spatial identification and economic analysis of areas with opportunities for the development of integrated habitat interventions.

3. Urban Development

3.1 Housing Construction
According to the Multipurpose Survey for Bogotá, the city has a housing deficit of 9.1%.
To reduce this deficit, it is expected that the city will begin construction of 150,000 homes (60,000 will be Social Interest Housing).

3.2 Qualified hectares
Regulation and implementation of management, financial and planning instruments to promote the development of integral projects with public and private actors, through associated management agreements, in order to provide the land required for construction of housing and the required physical and support structure. (Master Plans)

3.3 Construction support: facilitate the management of the construction process
-"Ventanilla Única de la Construcción - VUC". Facilitate the establishment and monitoring of procedures generated in the construction of housing.
- Solutions Desk: Optimization of procedures.

General Strategic goals
(framed under the Municipal Development Plan 2016-2020)

1. Contribute to the access to adequate and affordable housing for households in Bogotá.

2. Contribute to the improvement of the environment.

3. Control the sale, the rental, the urbanization and the construction of housing

4. Strengthen the transparent management of public action.

Specific Strategic Goals

A. Promote housing construction through land management in order to mitigate the housing deficit.

B. Simplification of planning and construction procedures.

C. Implementation of financial instruments to support the land management and to promote the development of social housing projects.

D. Promotion the efficient provision of public water service.

E. Formulation and coordination of integral interventions and actions in order to improve urban and rural environments to foster security conditions and citizen coexistence, accompanied by community participation strategies.

F. To inform the corresponding authorities in a timely manner about the areas susceptible to possible occupations of informal origin.

G. Increase and strengthen citizens' knowledge about the management of the habitat department

H. Strengthen the management of the entity by monitoring investment projects.

I. Generation of information in accordance with open government standards, in order to foster trust and ensure compliance with the rules related to transparency and the fight against corruption.

Evaluation of the interrelation between strategic Goals and the proposed programs

Disarticulation between social housing development strategies and neighborhood improvement strategies. Issues such as the construction of VIS and VIP, the use and distribution of urban land cannot be disarticulated from the actions of the improvement program.

The interventions are focused on public infrastructure, which ,in spite of bringing improvements, should be tied to social dynamics and local realities in order to generate structural changes.

The control of the land does not guarantee that the informal dynamic will cease, since the root of the problem is not being intervened.

There are no clear actions for follow-up, evaluation, monitoring of the interventions as they are thought to be short term. The involvement of citizens and other actors must go beyond making them active agents of change.

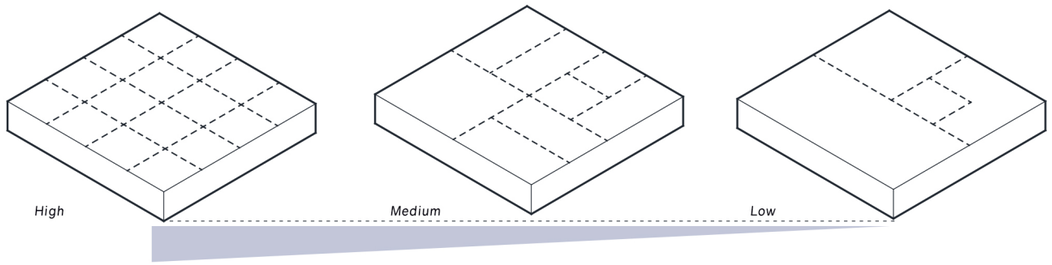
The tendency to adjust the dynamics of the neighborhood to the aspirations of the program turns evident through the exploration of the proposed goals and the structural operability of the programs. The institutional intervention model makes no distinction of location, according to whether the informal area is in a central location and more consolidated, in an intermediate or peripheral location. It does not emphasis on the need to incorporate variables as the origin, the size, the environment, social and cultural context or topography. The same strategies and intervention, participation, management and implementation mechanisms are applied to all the areas as equal, without recognizing the specificity of each on. The current goals are not focused in recognizing and empowering the cultural and social value behind different informal settings eater. This will be exemplified through the comparison of the developed actions in the two case studies, as seen in figure 8.15.

Proposed Strategic Actions - Socio Spatial development

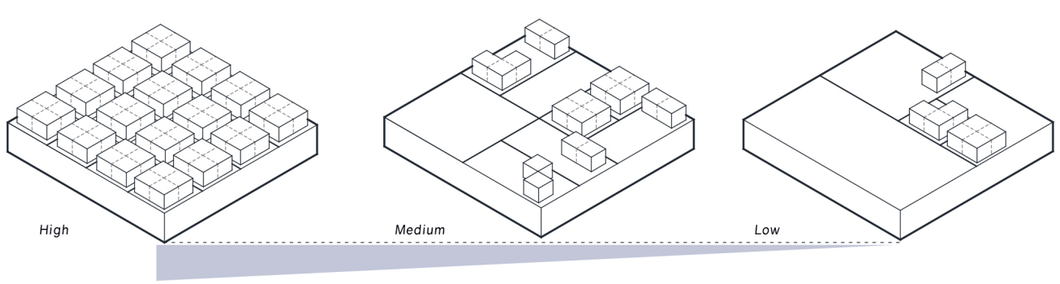
The variables of the context are guiding the implementation of the proposed actions in the proposed goal. In this case the spatial configuration in relation to accessibility and the type of connection, again the intensity of occupation, the consolidation degree of the neighborhood and the types of land use will determine together with the socio-spatial characterization, the scale and type pf intervention needed in the specific area. These existing conditions, as evidenced in the analyses corresponding to the two planning units, will determine the implementation and development of interventions that responds in a comprehensive manner to the daily life systems of the local communities.

Fig. 8.41 - Context-determining variables when implementing strategic actions. (Systemic alignment through reprogramation)

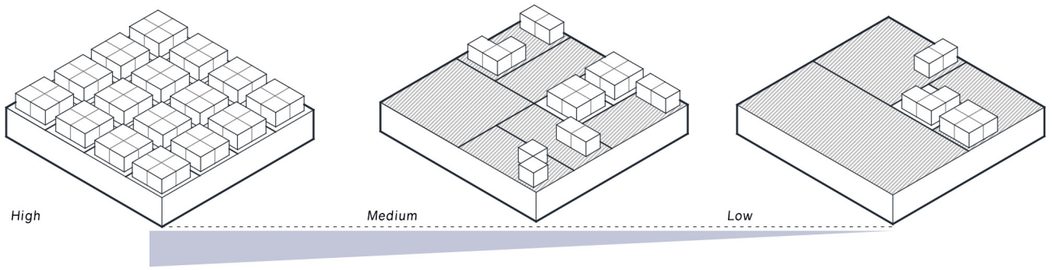
Intensity of Accessibility and Connections



Intensity of Occupation



Type of Land Uses

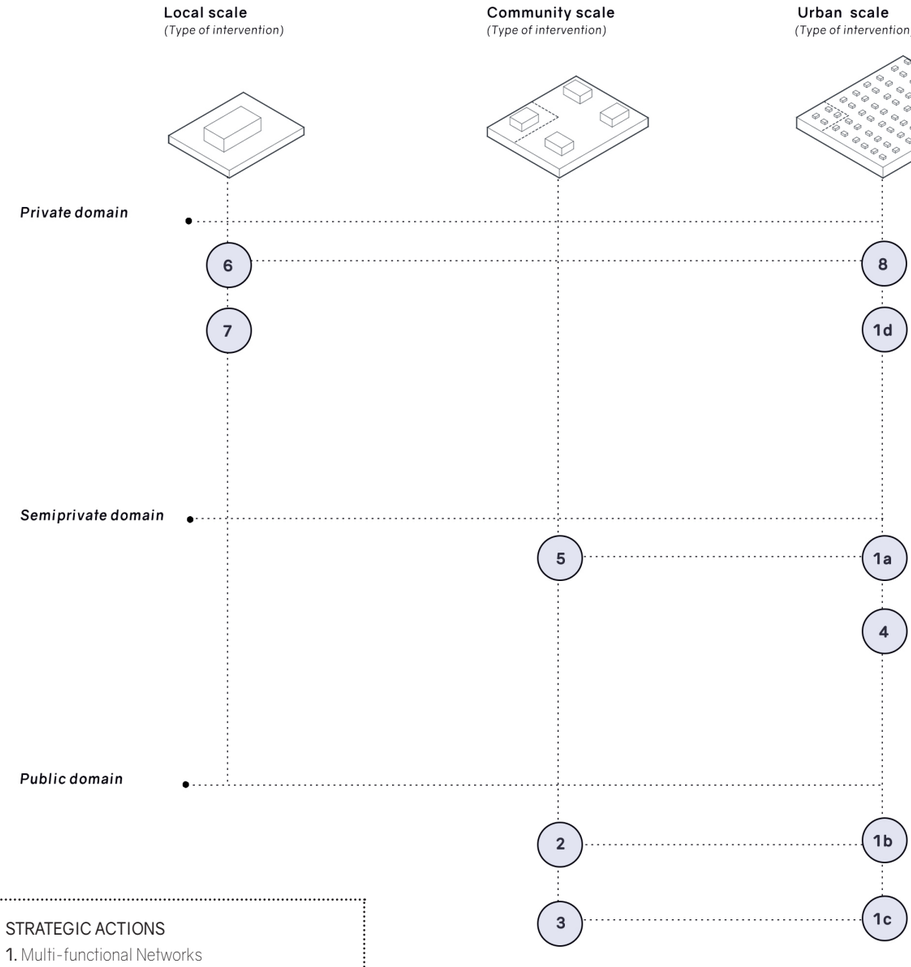


Proposed Strategic Actions - Socio Spatial development

The proposed actions are classified in a spatio-temporal scale of implementation that recognizes the importance of actions in the a household level, to community and urban level in order to construct a co evolving strategy that counteracts spatial fragmentation, social segregation and therefore integrates the community in the development process in order to by able to by part of the monitoring, maintenance and further development of the proposed actions.

As explained above, each action is defined with an operability chart, which determines the time, scale, and capabilities needed for implementation. The proposed actions involve the current stakeholders responsible for the spatial improvements in Bogotá, reconfiguring their role and relationships to a collaborative process with the community.

Fig. 8.42 - Strategic Actions. Systemic alignment through reprogramation. Scales of Implementation



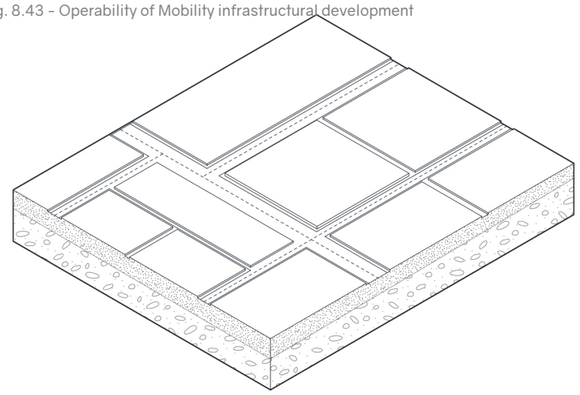
STRATEGIC ACTIONS

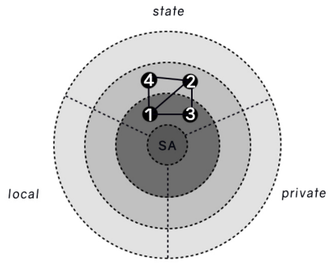
1. Multi-functional Networks
   a. Grey Infrastructure
   b. Blue Infrastructure
   c. Green Networks
   d. Public Services
2. Green Collective Space
3. Multi-functional Public areas
4. Facilities
5. Improvement of facades (Habitarte) and enforcement of cultural appropriation of space
6. Housing improvement
7. Relocation
8. Multi functional Densification

Operability of the Proposed Strategic Actions

1a Grey Infrastructure

Fig. 8.43 - Operability of Mobility infrastructural development

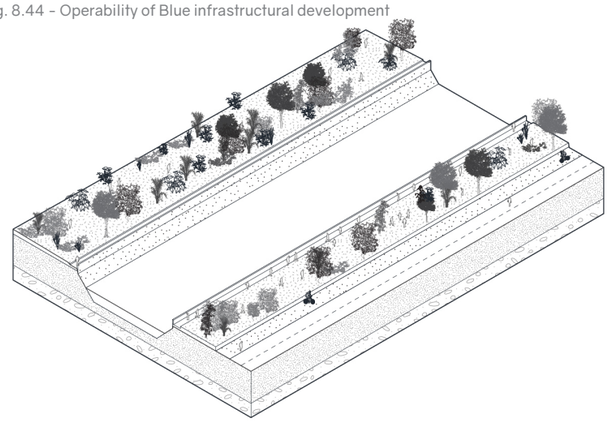


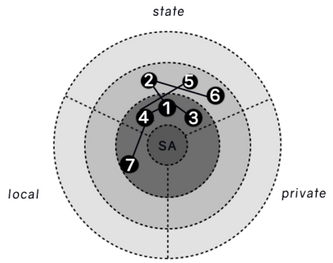


Scale of Implementation: Local - Urban
Time: Medium term
Actors: (1) SDM (2) SDP (3) IDU (4) EAAB
Capacities: Medium Investemt, Medium labour force

1b Blue Infrastructure

Fig. 8.44 - Operability of Blue infrastructural development

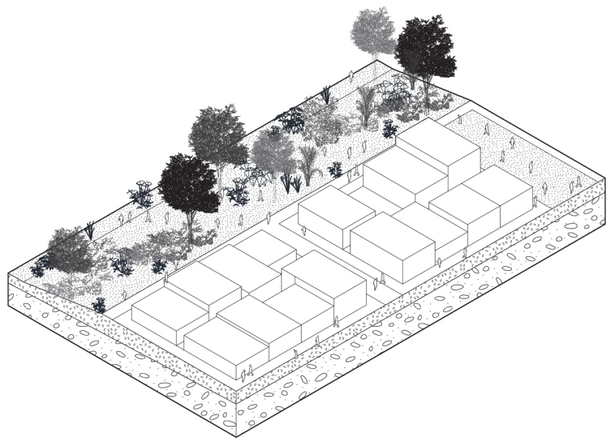


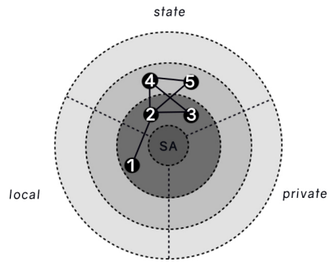


Scale of Implementation: Urban
Time: Long Term
Actors: (1) EAAB (2) SDP (3) IDIGER (4) SDA (5) JBB (6) IDU (7) Community
Capacities: High Investemt, High labour force

1c Green Networks

Fig. 8.45 - Operability of Green infrastructural development

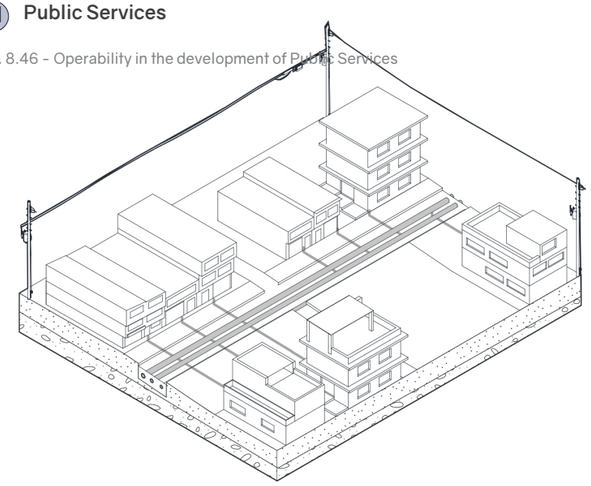


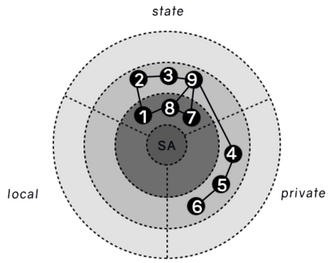


Scale of Implementation: Urban
Time: Long term
Actors: (1) Community (2) SDA (3) DADEP (4) SDP (5) JBB
Capacities: Low Investemt, Medium labour force

1d Public Services

Fig. 8.46 - Operability in the development of Public Services

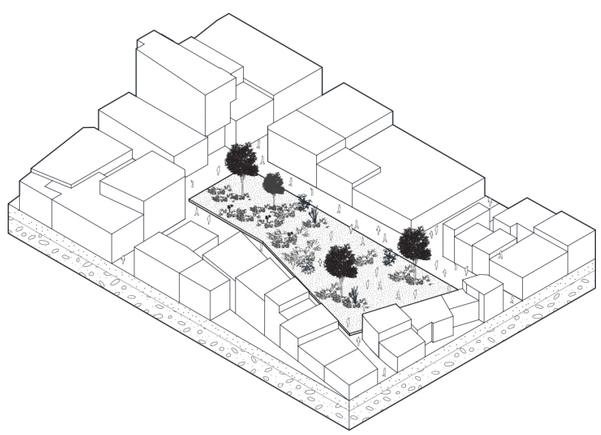


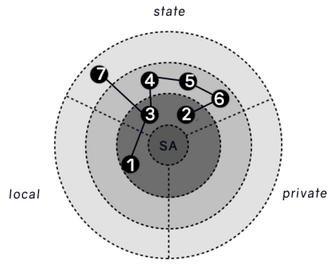


Scale of Implementation: Collective
Time: Medium term
Actors: (1) UAESPS (2) EAAB (3) ETB (4) COD (5) GEB (6) GNB (7) IDU (8) SDP (9) SDH
Capacities: Medium Investemt, Medium labour force

2 Green Collective Space

Fig. 8.48 - Operability in the development of green collective spaces

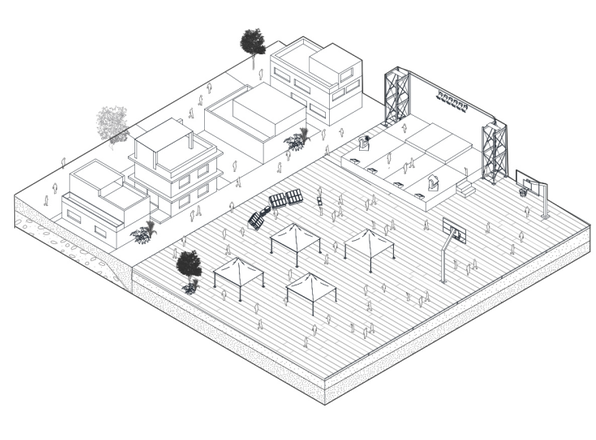


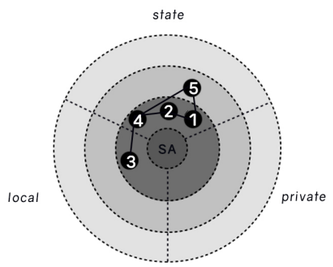


Scale of Implementation: Collective
Time: Medium term
Actors: (1) Community (2) DADEP (3) SDA (4) SDP (5) IDU (6) IDRD (7) SDIS
Capacities: Medium Investemt, Medium labour force

3 Multi-functional Public areas

Fig. 8.47 - Operability in the development of a multifunctional public areas

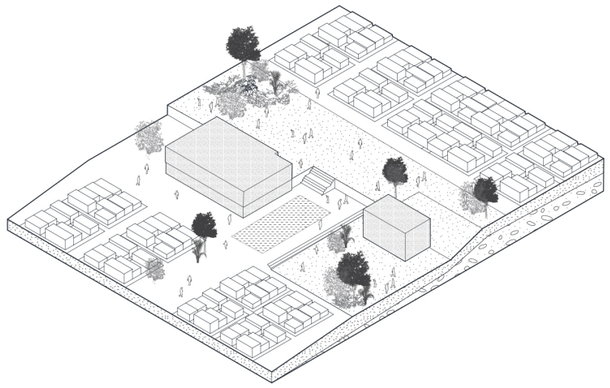


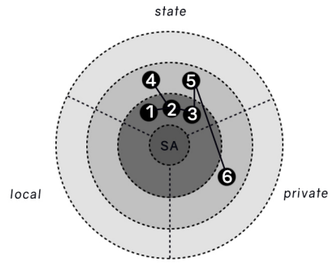


Scale of Implementation: Collective
Time: Medium term
Actors: (1) SDCRD (2) IDRD (3) Community (4) SDP (5) IDU
Capacities: Medium Investment, Medium labour force

4 Facilities

Fig. 8.49 - Operability in the development of public facilities

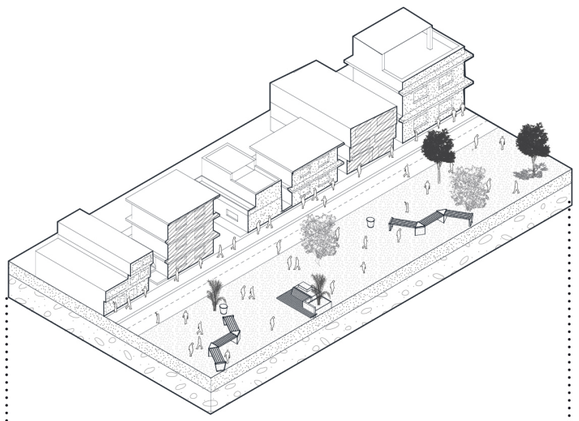


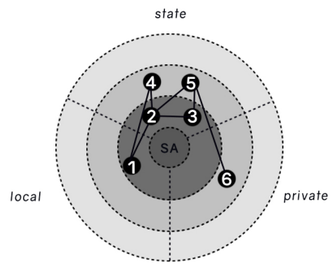


Scale of Implementation: Collective - Urban
Time: Long term
Actors: (1) SDCRD (2) IDRD (3) SDP (4) IDU (5) SDIS + (6)Universities
Capacities: High Investemt, High labour force

5 Facade and Environment improvement (Cultural appropriation)

Fig. 8.50 - Operability of facade and environment improvement

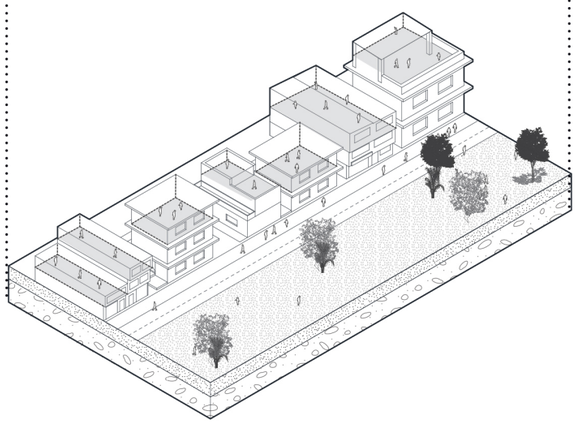


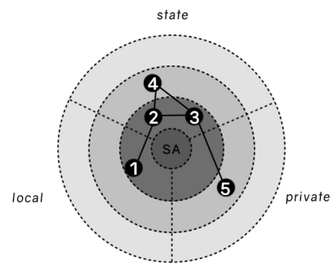


Scale of Implementation: Local
Time: Short term
Actors: (1) Community (2) SDH (3) CVP (4) SDIS (5) SDP + (6) Private enterprices
Capacities: Low Investemt, Medium labour force

6 Housing Improvement

Fig. 8.51 - Operability in housing imporvement

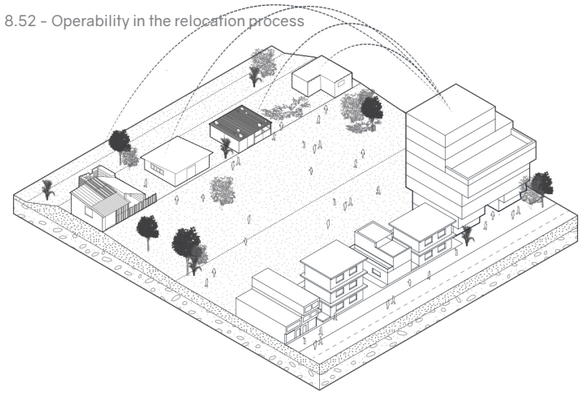


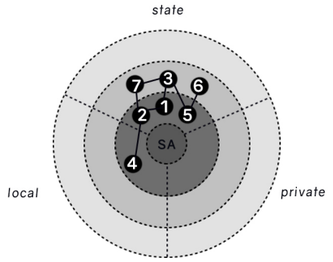


Scale of Implementation: Local
Time: Short term
Actors: (1) Community - Inhabitant (2) SDH (3) CVP (4) UASESPS + (5) Private enterprices
Capacities: Low Investemt, Medium labour force

7 Relocation

Fig. 8.52 - Operability in the relocation process

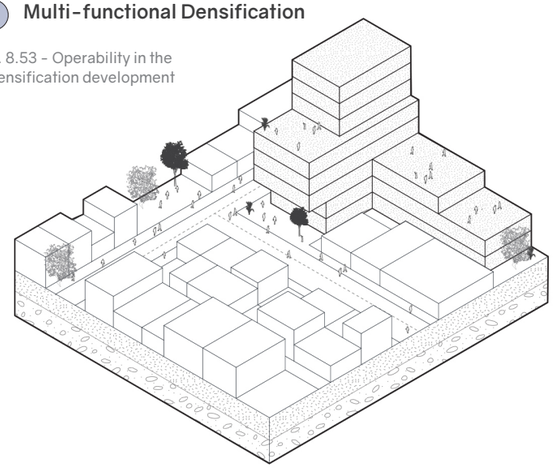


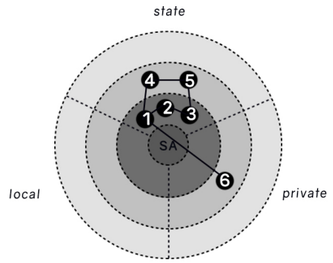


Scale of Implementation: Local - Collective
Time: Short (Reinforcement) Long term (Relocation)
Actors: (1) CVP + (2) SDH (3) SDP (4) Inh. (5) IDIGER (6) DPAE (7) IDU
Capacities: High Investment, High labour force

8 Multi-functional Densification

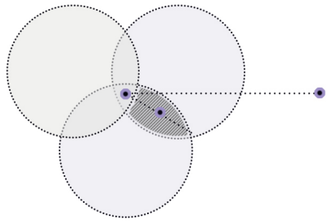
Fig. 8.53 - Operability in the densification development





Scale of Implementation: Collective
Time: Long term
Actors: (1) SDP (2) SDH (3) CVP (4) IDU (5) ERU + (6) Private construction companies
Capacities: High Investment, High labour force

e. Strategic Goal: Endogenous Activation



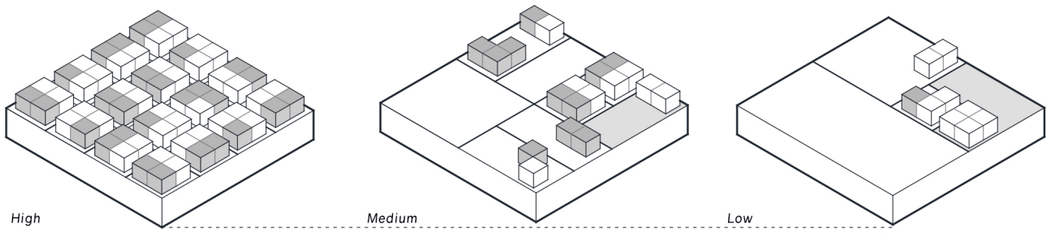
Strategic Goal: *ENDOGENOUS ACTIVATION*

STRATEGIC GOAL: Counteract social challenges and poverty by strengthen local capacities and providing tools to construct self sustaining production and social systems as part of the functional dynamics of the city.

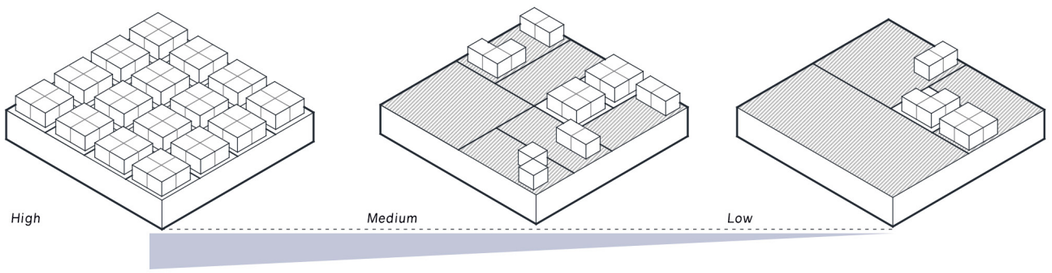
The variables of the context are guiding the implementation of the proposed actions in the proposed goal. In this case the spatial configuration in relation to accessibility and the type of connection, again the intensity of occupation, the consolidation degree of the neighborhood and the types of land use will determine together with the socio-spatial characterization, the scale and type pf intervention needed in the specific area. These existing conditions, as evidenced in the analyses corresponding to the two planning units, will determine the implementation and development of interventions that responds in a comprehensive manner to the daily life systems of the local communities.

Fig. 8.54 - Context-determining variables when implementing strategic actions. (Endogenous Activation)

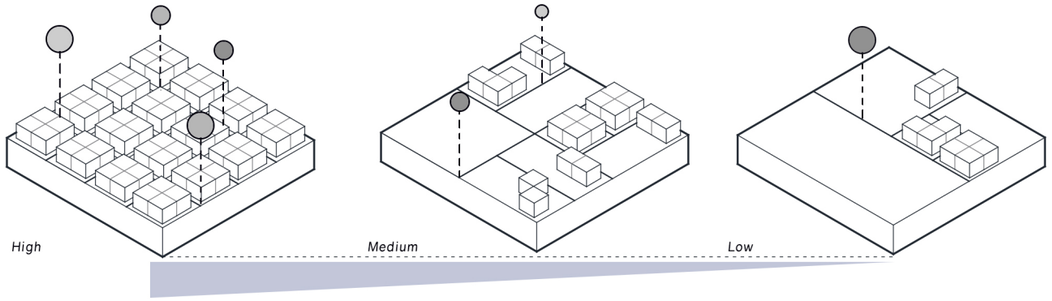
Intensity of Economic activities



Intensity of Occupation



Diversity in daily life systems and social composition

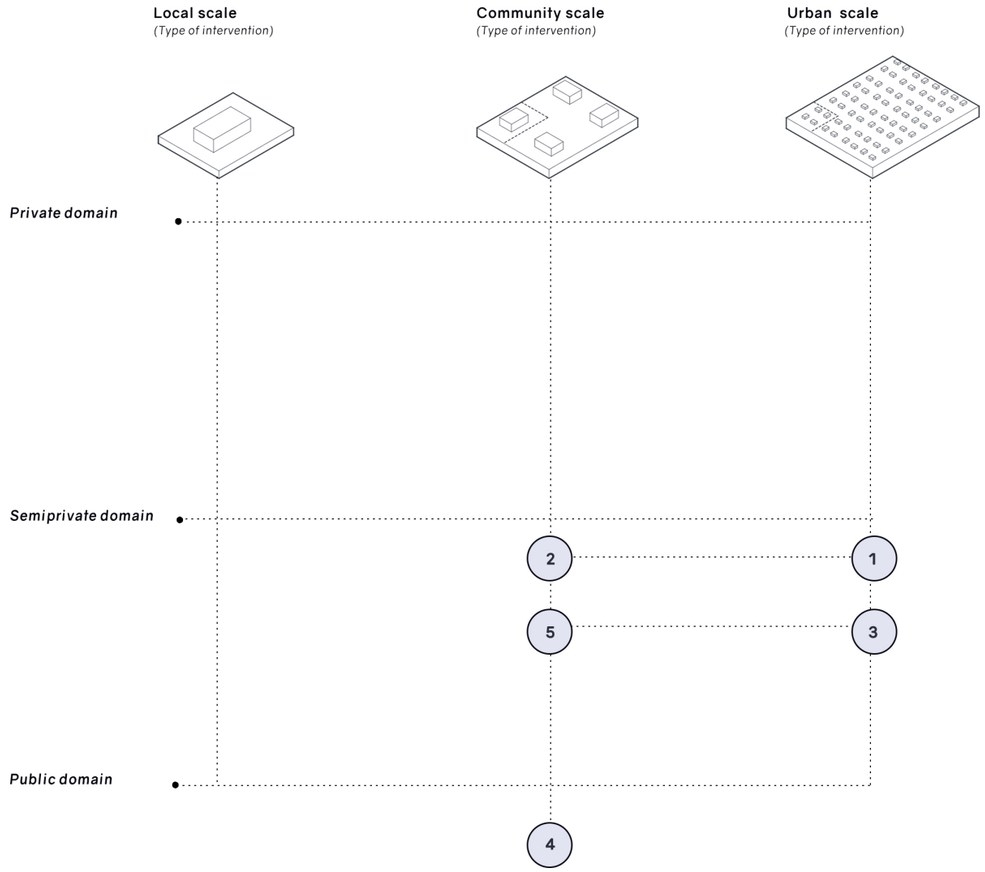


Proposed Strategic Actions - Endogenous activation

The proposed actions are classified in a spatio-temporal scale of implementation that recognizes the importance of actions in the a household level, to community and urban level in order to construct a co evolving strategy that reinforces community networks and local economies by a correlated strategy between economic systems, social challenges and the physical environment.

As explained above, each action is defined with an operability chart, which determines the time, scale, and capabilities needed for implementation. The proposed actions involve the current stakeholders responsible for the spatial improvements in Bogotá, reconfiguring their role and relationships to a collaborative process with the community.

Fig. 8.55 - Strategic Actions. Endogenous Activation.



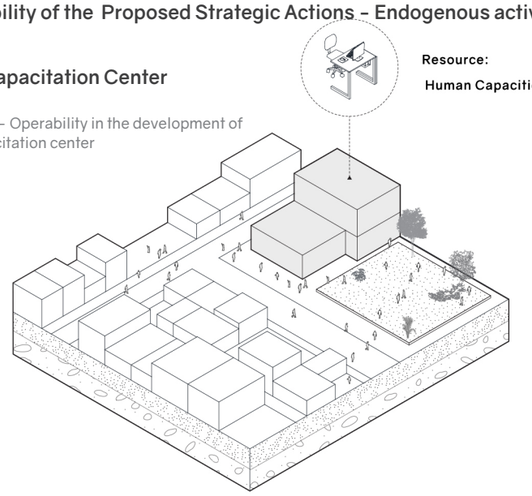
STRATEGIC ACTIONS

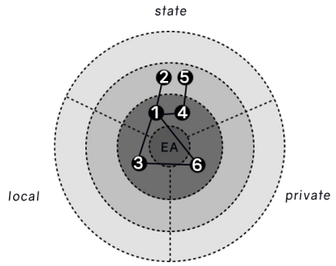
1. Capacitation centers
2. Care Units Resource Bank
3. Resource Bank
4. Multi-functional public areas
5. Community Center

Operability of the Proposed Strategic Actions - Endogenous activation

1 Capacitation Center

Fig. 8.56 - Operability in the development of a Capacitation center

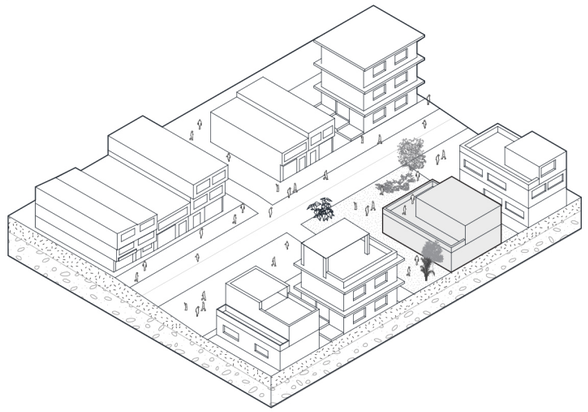


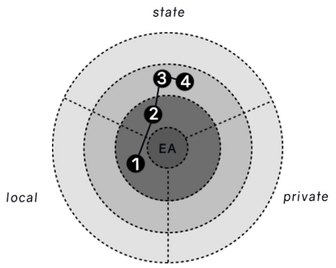


Scale of Implementation: Urban
Time: Medium Term
Actors: (1) IDIGER (2)SDA (3) Community (4) SDP +(5) SDDE +(6) Universities
Capacities: Medium Investment, High labour force

2 Care Units

Fig. 8.57 - Operability in the development of a Care Unit

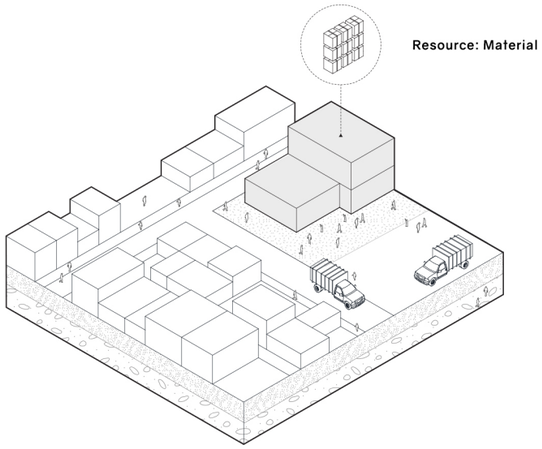


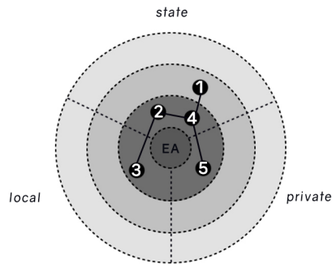


Scale of Implementation: Collective
Time: Medium Term
Actors: (1) Community (2)SDH (3) SDDE (4)SDIS
Capacities: Medium Investment, Medium labour force

3 Resource Bank

Fig. 8.58 - Operability in the development of a Resource Bank

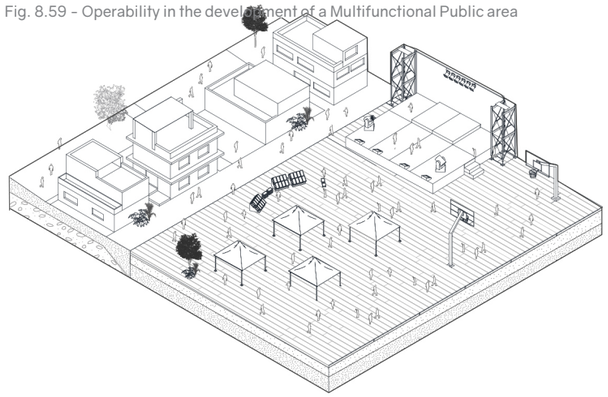


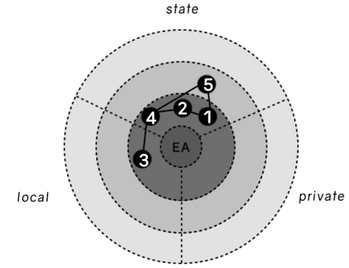


Scale of Implementation: Urban
Time: Medium Term
Actors: + (1) SDDE (2) SDA (3) Community (4) SDP (5) Medium enterprices
Capacities: .High Investment,Medium labour force

4 Multi-functional Public areas

Fig. 8.59 - Operability in the development of a Multifunctional Public area

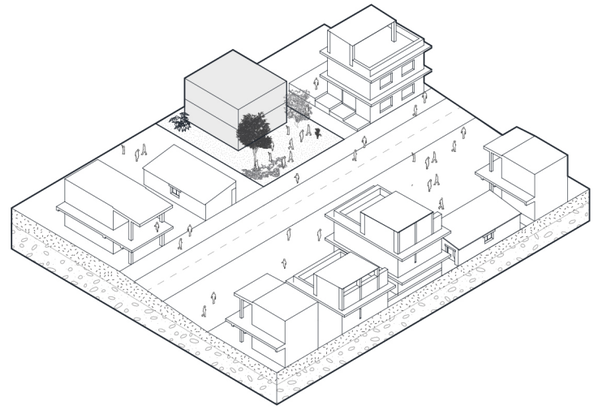


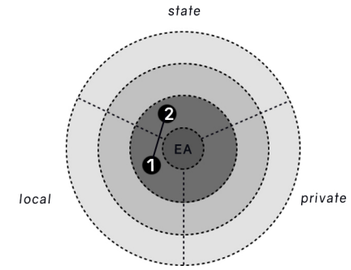


Scale of Implementation: Collective
Time: Medium term
Actors: (1) SDCRD (2) IDRD (3) Community (4) SDP (5) IDU
Capacities: Medium Investment, Medium labour force

5 Community Center

Fig. 8.60 - Operability in the development of a Community Center





Scale of Implementation: Collective
Time: Medium Term
Actors: (1) Community (2) SDP
Capacities: Low Investment, Medium labour force

Genealogy framework by scale and domain of action

Strategic Goal: Productive Ecology

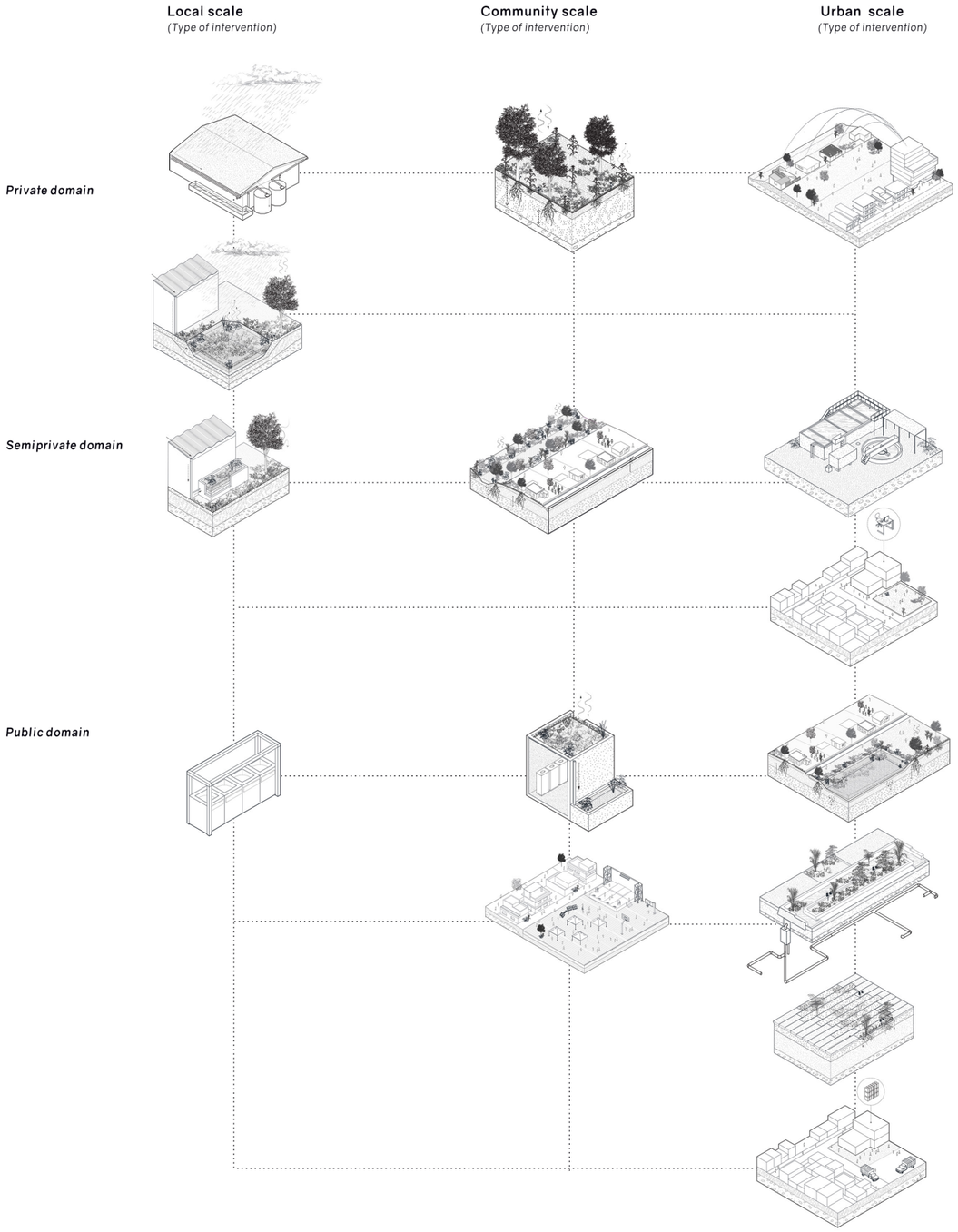


Fig. 8.61 - Genealogy framework by scale and domain of action. Productive ecology Goal - Flooding Risk Mitigation

Genealogy framework by scale and domain of action

Strategic Goal: Productive Ecology

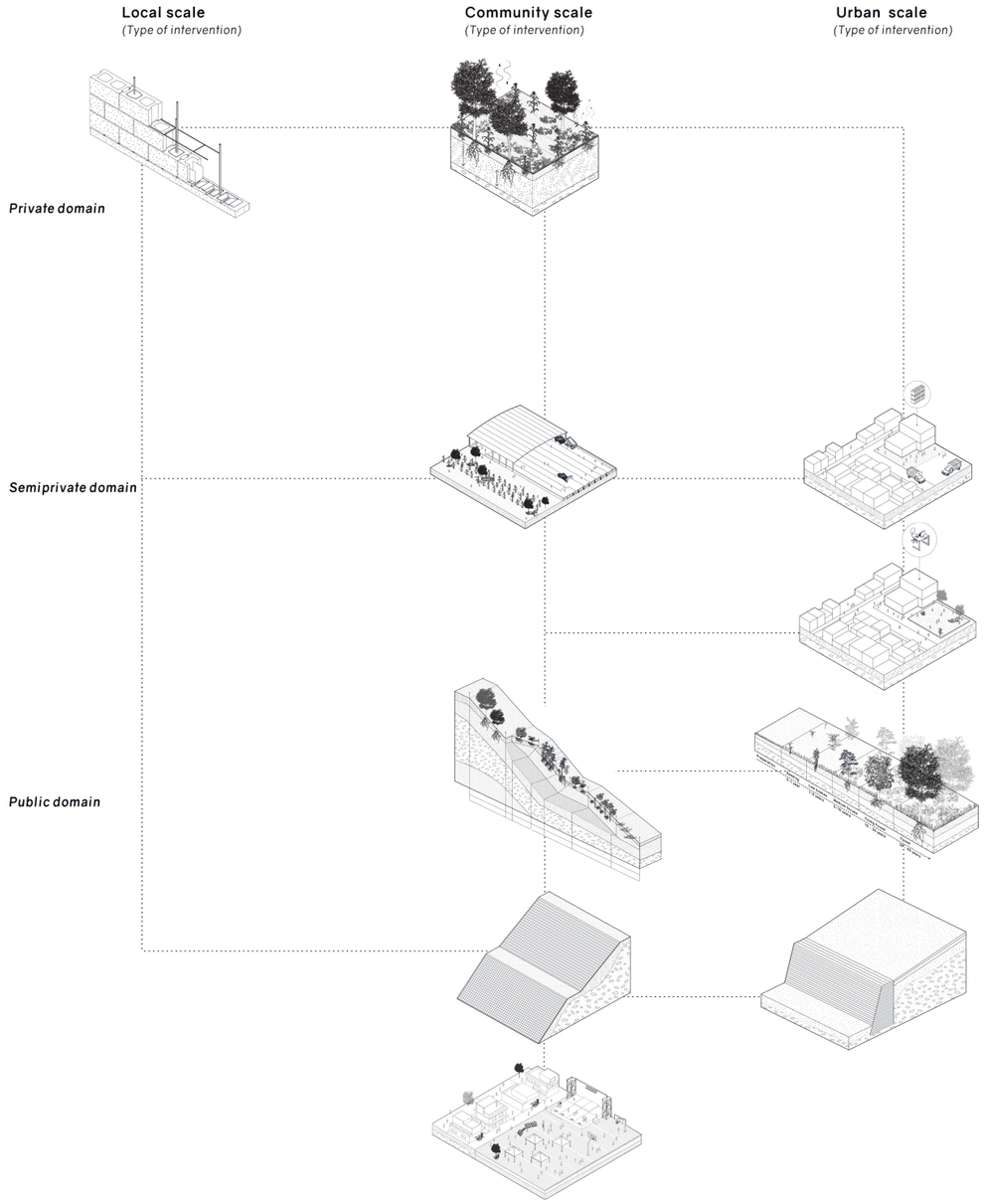


Fig. 8.62 - Genealogy framework by scale and domain of action. Productive ecology Goal - Sliding Risk Mitigation

Genealogy framework by scale and domain of action

Strategic Goal: Systemic alignment through reprogramation

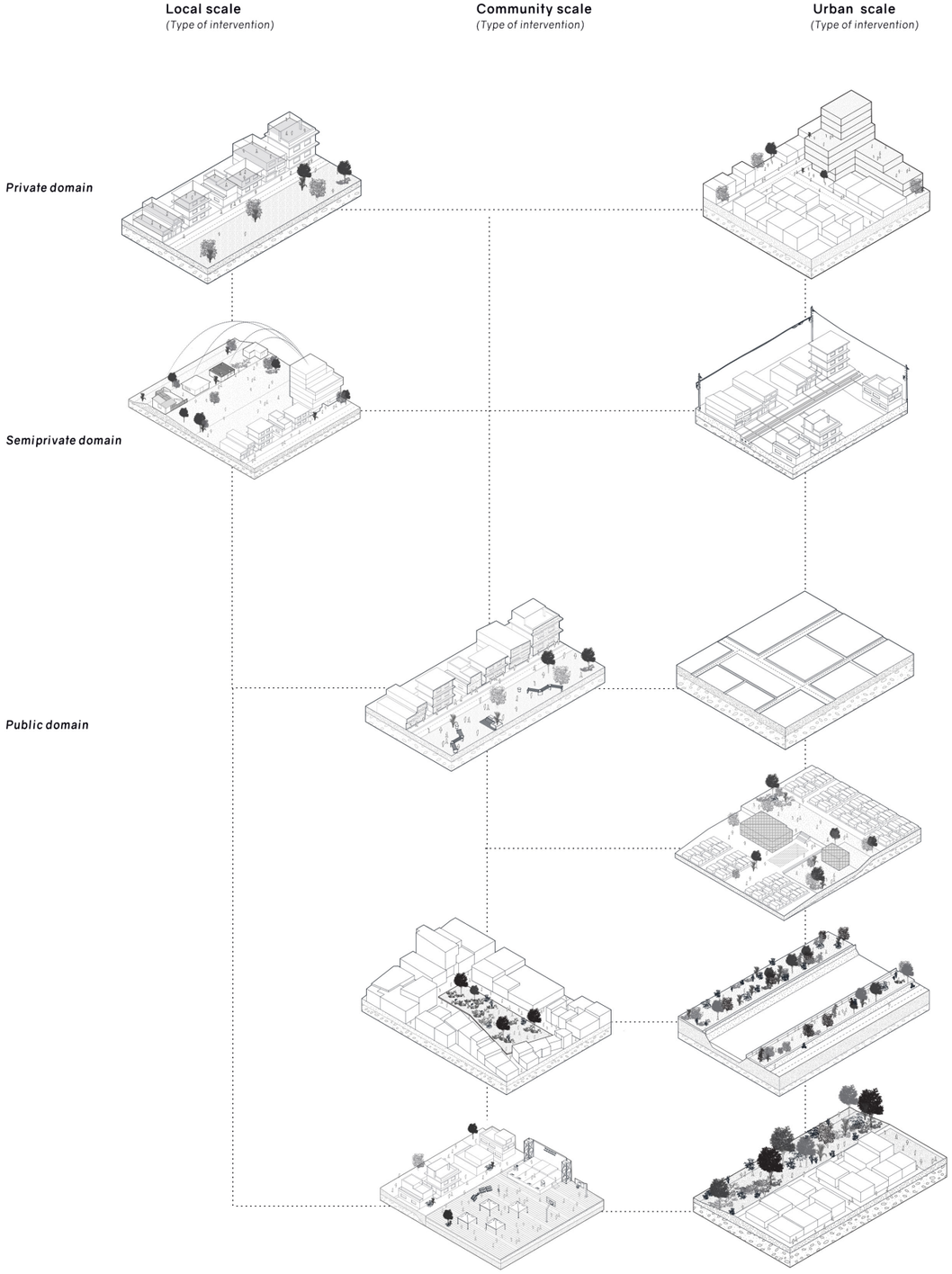


Fig. 8.63 - Genealogy framework by scale and domain of action. Systemic alignment through reprogramation Goal

Genealogy framework by scale and domain of action

Strategic Goal: Endogenous activation

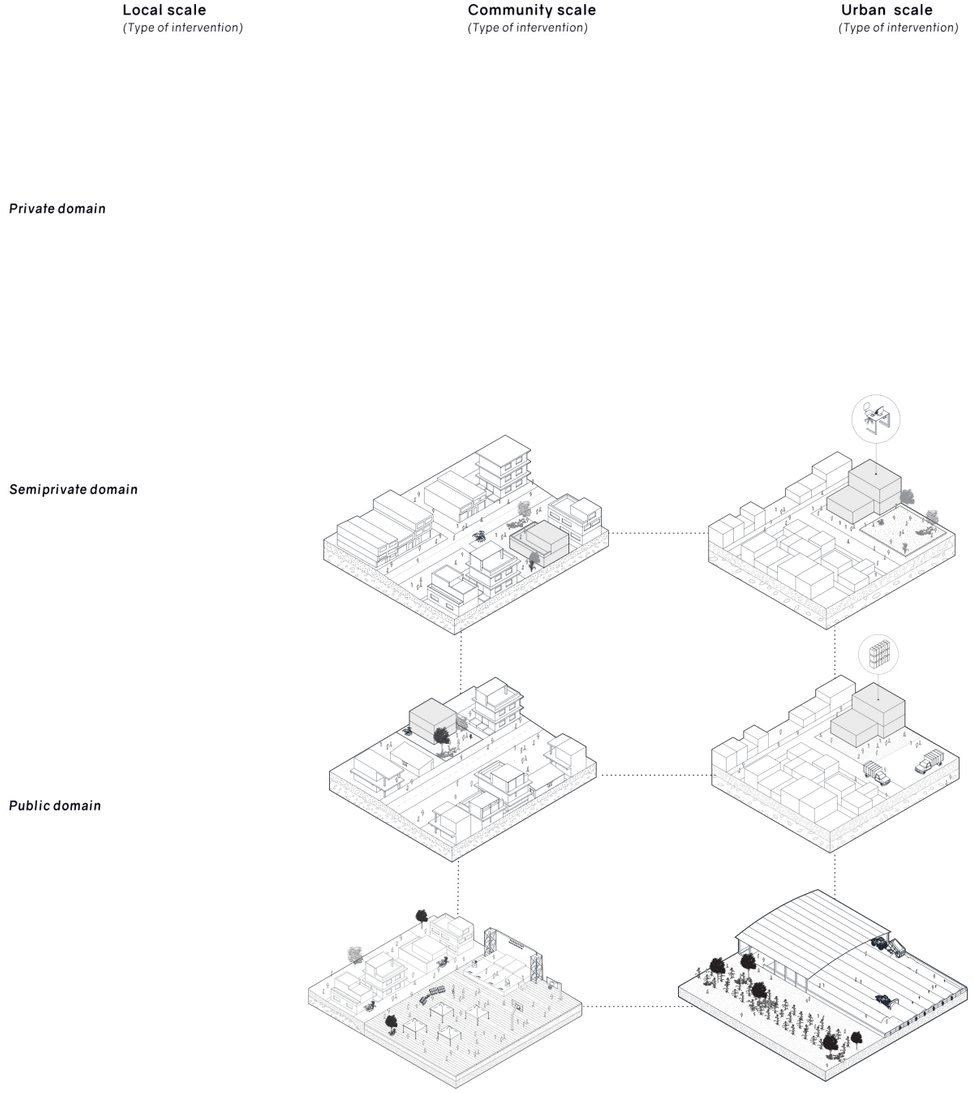
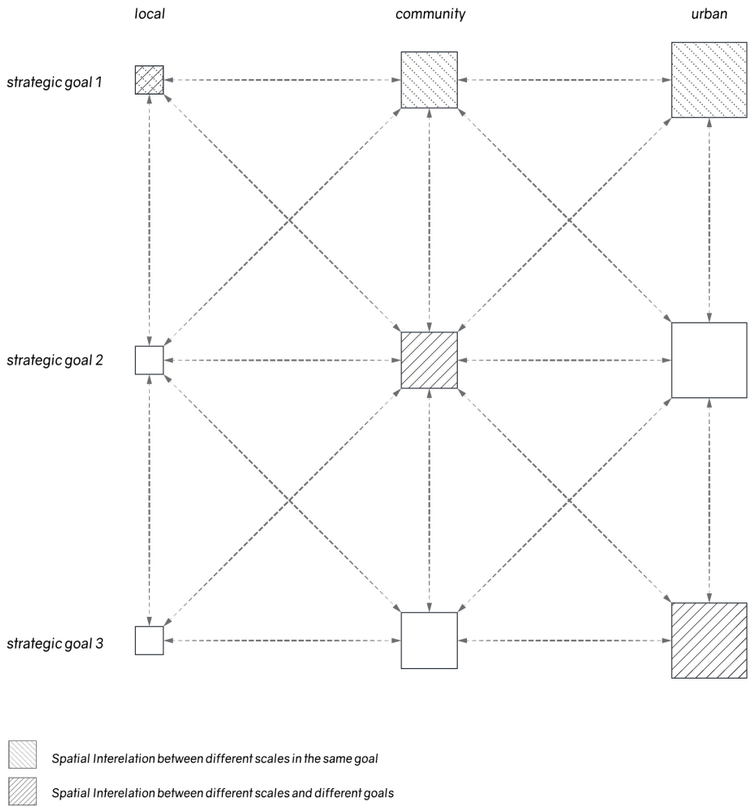


Fig. 8.64 - Genealogy framework by scale and domain of action. Endogenous activation Goa.

f. Proposed Spatial Framework

The strategic actions defined in the previous section require a spatial framework in order to ensure their continuity and coherence, both spatially and systemically. The implementation of an action, regardless of its spatial-temporal classification or in which strategic goal it is inscribed, needs to follow certain rules to ensure its relationship with the context and to ensure its relationship with other interventions. As shown in the following diagram, the spatial framework is a tool that guides and regulates the connectivity between the actions of the same goal at different scales, as well as the connectivity of different goals at different scales. This is relevant, since the rules must respond in a flexible way to the complex interrelations, by ensuring the continuity and coherence in the network.

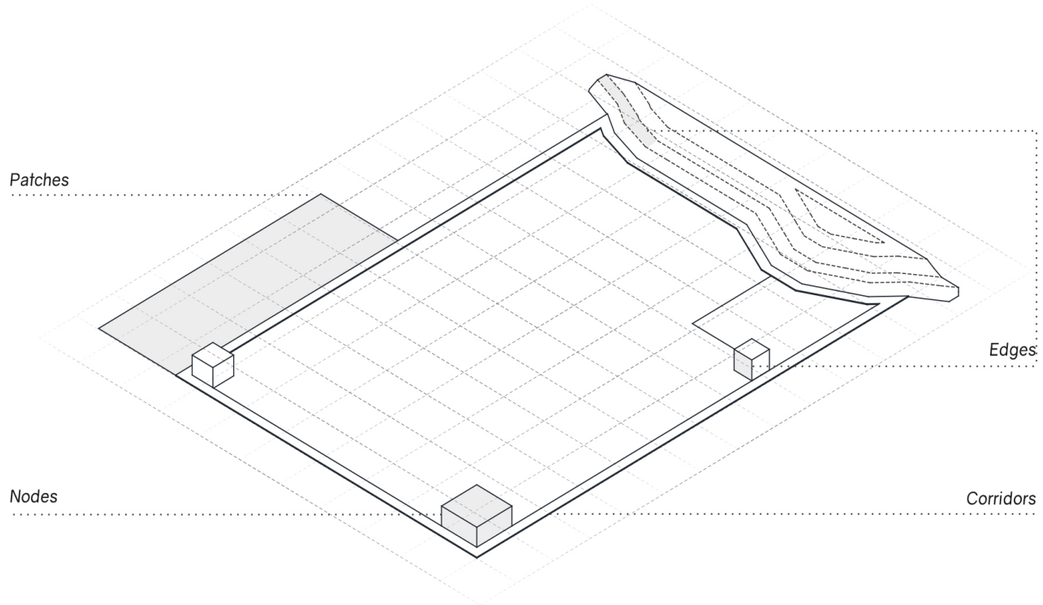
Fig. 8.65 - Spatial Interrelations between Strategic actions



Spatial Framework - Categorization

In order to visualize the spatial relationships between the proposed strategic actions, the following diagram displays the classification of all actions, regardless of their scale or strategic goal to which they correspond, under the understanding of four spatial elements: the node, the patch, the edge and the corridor. The node, corresponds to every action that defines a punctual space. The patch classifies the actions that are distributed in a surface and respond to ecological qualities. The edge corresponds to the actions that are part of the surface or respond to mediate the interrelations between a surface and another and the corridor are all the linear actions that respond to flows and connectivity. Classifying the actions in this way facilitates the determination of the flexible rules that must be determined when ensuring the interconnection between them in time.

Fig. 8.66 - Spatial Classification of the overall set of proposed strategic actions.





Nodes - focal points:

- Dwelling Water collection
- Recycling
- Water treatment plant
- Resource bank
- Capacitation
- Reinforcement
- Resource bank
- Housing improvement
- Densification
- Facilities
- Care unit
- Community center

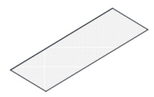


Corridors:

Green
- Gardens
- Green network

Blue:
- Collection networks
- Public services
- Water system

Gray:
- Public services
- Roads



Patches:

- Agroforestry
- Adaptive public spaces
- Raingarden
- Urban agriculture
- Bio retention
- Reforestation
- Composting
- Park



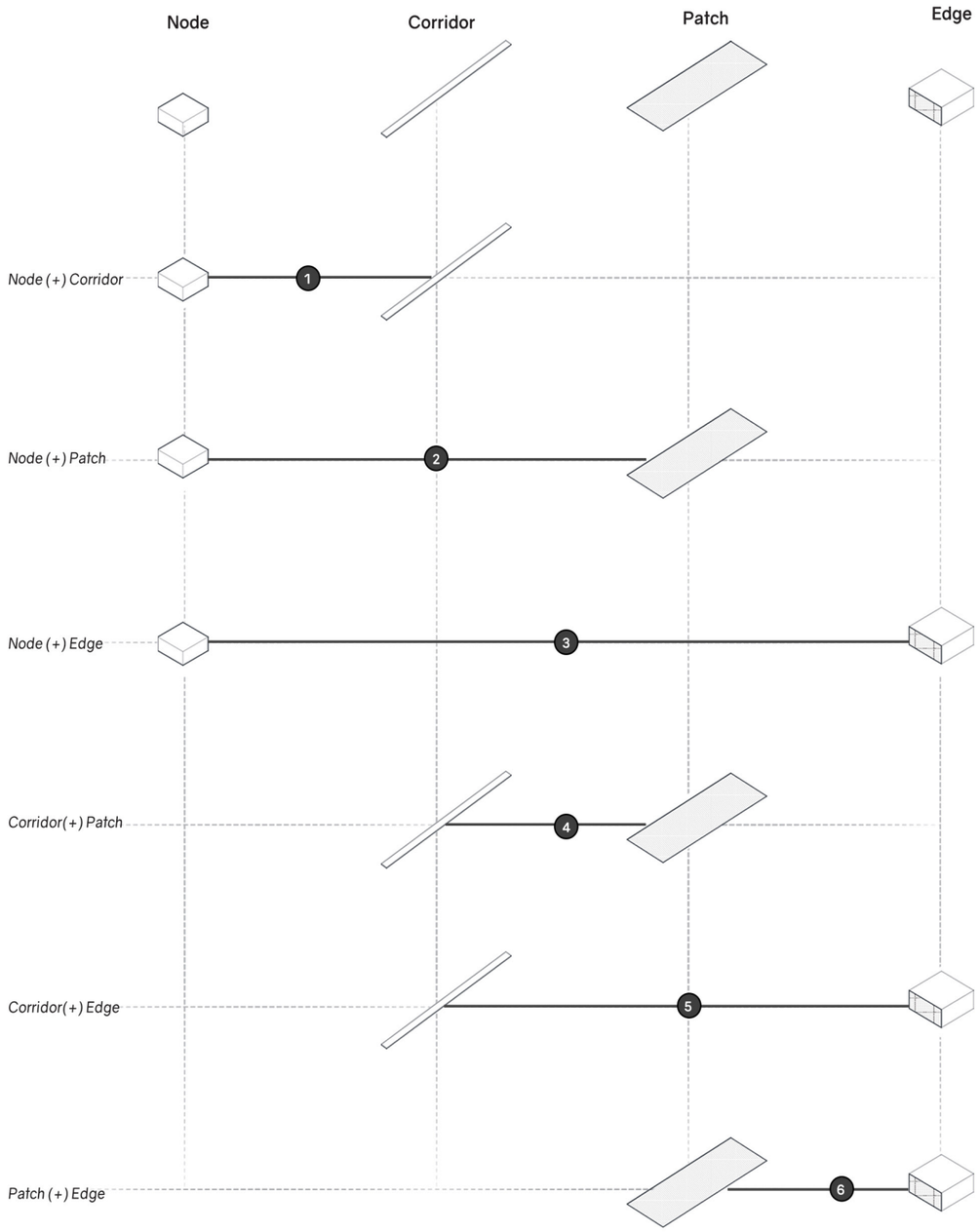
Edges:

- Permeable ground
- Root structure
- Contention wall
- Geogrid
- Façade

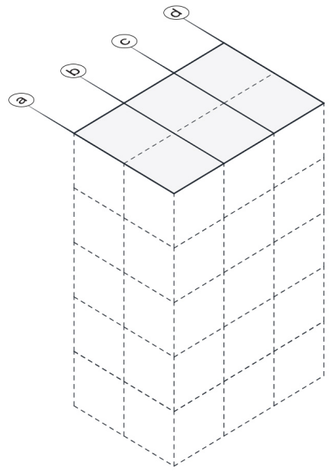
Interrelation between the categories

The classification into the four categories gives rise to six possible interrelations between the actions. The possible interrelations will be determined by the same variables, which materialize differently depending on the category of the actions being linked. The systemic and spatial continuity goal gives rise to three rules of the spatial planning framework explained on the following section.

Fig. 8.67 - Possible interrelations of the proposed spatial classifications.



Rules in the spatial Framework



Context
1. Anchoring:

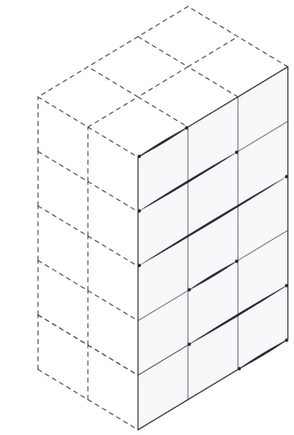
a. Connection to existing water systems

b. Connection to existing green structures

c. Activation of unused space

d. Reprogramation of space

The first rule, before talking about the interrelations between the proposed actions, focuses on the anchoring of the interventions to the context. It is essential that the proposed actions are linked to existing water systems and existing green systems to ensure the systemic relationship and multi-scalar capacity of the actions. Furthermore, this rule defines that the proposed actions must be designed to activate disused spaces and reprogram their current functions. By following these four points, it ensures that the proposed actions will be connected and anchored in a coherent manner with the territory and its systems.



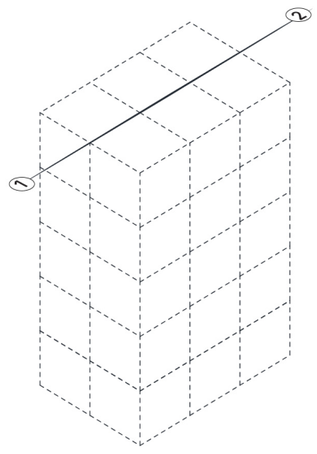
Interrelation of the proposed set of actions
2. Interrelating:

i. Blue infrastructure

ii. Green infrastructure

iii. Cultural and functional interrelation.

The second rule is focused on ensuring the interrelationship between the proposed actions. The connection between the strategic actions is determined by water infrastructure, green infrastructure and functional and cultural dynamics. Each action and the subsequent proposed one must be linked either by infrastructures that connect the water dynamics between them, vegetation or green infrastructures or must have a correlation between the functions or cultural dynamics that can be linked to the proposal.



Agency
3. Synchronizing:

Endogenous – exogenous synchronization

1. Endogenous agency

2. Exogenous agency

The third rule is determined by the synchronization between the endogenous and exogenous agency. The interrelations between the different actions must open the space so that both endogenous and exogenous forces manage to interact and have an important role in the adaptability of the proposal. The evolutionary character is ensured to the extent that the interventions start from an endogenous character and manage to synchronize in a coherent way both formal and informal actors in the co-evaluation, co-design and maintenance of the proposals.

Fig. 8.68 - Rules in the Spatial Framework.

9. Coevolutionary Pathways

Overview

The following chapter will test the implementation of different combinations of the strategic actions and their respective operability (defined according to the three static goals) in the zonal planning unit La Flora and Lourdes.

This implementation process will be performed as a dynamic scenario that evolves in time, where, when each action reaches a culmination point, a co-evaluation process opens up to the possibilities or needs of evolution, scaling up or complementing the intervention with further actions.

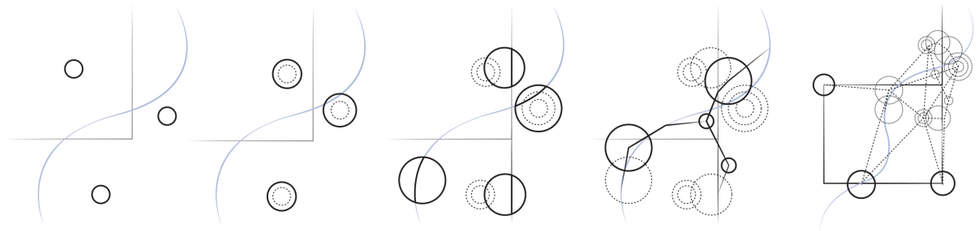
Chapter Structure:

a. Phases of transformation (General applied framework)

b. Co-evolutionary transformation scenario. UPZ La Flora
- Strategic approach. Scale: Planning unit
- Specific Case design. Scale: Neighborhood
- Systemic Operation in Bogotá. Scale: Urban

c. Co-evolutionary transformation scenario. UPZ Lourdes
- Strategic approach. Scale: Planning unit
- Specific Case design. Scale: Neighborhood
- Systemic Operation in Bogotá. Scale: Urban

a. Phases of transformation (General applied framework)



The framework for implementing the co-evolutionary pathway is divided into five stages or phases that are put forward as a basis for the operationalization of socio ecological resilience in practice. These phases are organized in order to progressively counteract multidimensional vulnerability at different scales, and generate an evolutionary process that ensures the participation and integration of local communities as active agents in both decision making and co-production of knowledge and therefore to strengthen the development of local capacities.

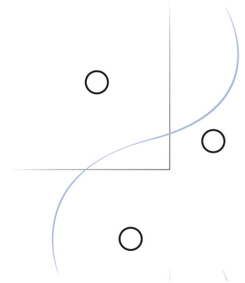
This progressive transformation will provide the necessary tools to deal with the change and uncertainty, where the strategic actions will transform the functionality and physicality of space, as well as the sociocultural capacities to face the change, to adapt in a sustainable way to possible impacts and to integrate informal areas to the social, functional and structural dynamics of the formal city.

This Co-evolutionary development process explores the correlation of social and ecological systems over time by proposing different actions that respond to different scales and different goals over time (Haasnoot, 2013). This process, as explained before, is a tool to expand the planning scope and redefine the interrelationship between formal and informal actors as agents of change regarding the adaptability of the cohabitation system, embedded in the physicality and functionality of space. This co-production and change in the cohabitation system, supported by a reinterpretation of the power and responsibility relations of those involved, aims to activate a path that allows an evolutionary transformation in the local agency, the role and the interpretation of the informal communities as agents of change in informal settlements.

The testing process starts with some general steps that will be applied to the two different cases (UPZ La Flora, UPZ Lourdes). The particularity of each area will adapt the strategies to the needs and potential of each sector, again highlighting the need to establish tailor-made processes for each settlement. In the following section the different phases of the general framework will be explained.

As such, the proposed planning framework has to consider and appropriate different processes of local recognition, co-participation and different scales when guiding a structural change and adaption. Starting from the conceptualization of “social equity in urban resilience planning” (Meerow, 2019), the stages are structured in the following way and will be explained in the following sections: Recognitional phase, procedural phase, structural phase, functional and distributional phase.

a. Phases of transformation



1. Recognitional and Social activation phase:

The socio-ecological approaches to resilience, defined also under the notion of 'evolutionary resilience', acknowledge that society and nature are interdependent systems. In the same vein, the limited focus on social processes in the stream of resilience has both positive and negative impacts on resilient processes. Which is certain and somehow disconcerting is that memories, local capacities, networks, and cooperative relationships [the intentionality of human action and intervention] have received little space at the time of devising strategies to foster resilience. In this regard, a phase of 'preparation' [as entitled by Simin Davoudi], must take a major place in the formulation of urban development strategies (Davoudi, 2013).

This preparation stage, complemented by Adger's arguments, should reinforce the systemic linkages between ecological and social processes and in turn provide communities with the ability, knowledge and capacity to deal with the uncertainty and potential challenges that could be encountered. This process starts for example by recognizing local and environmental-related economies as therefore the potential links between social and ecological resilience, but needs in parallel to guide an evolutionary reinforcement of social structures in order to ensure that they are not completely dependent on resources of the natural system and that they know how to react to an external environmental shock. (Adger, 2000). This transformative process could generate positive systemic interrelations, and would in turn be the source that reinforces social structures by encouraging innovation, adaptation and cooperation.

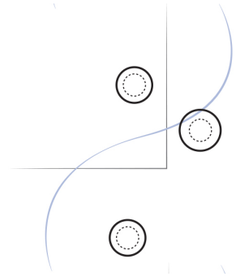
Social innovation is therefore based on an understanding of the specific interactions between territorial and social logics, where vulnerable communities not only learn to generate socioeconomic and socio-ecological links with the territory but also learn to know it and be prepared to face uncertainties and external eventualities from a specific socio-cultural perspective. This develops new tools and languages so that each community can progressively build socio ecological resilience in a long term perspective. (MacCallum, 2009)

Therefore, the first stage of the pathway is to recognize the groups that inhabit the territory and expose the socio-cultural conditions as a key element when formulating a spatial intervention. This approach identifies identity, socio-cultural structures, historical context and values as a starting point when evaluating both the ecological potentials in a particular area, and the possible socioeconomic networks related to the functional structure of the city. Therefore, the process develops and is defined by knowledge agency and context mediated variables, managed through reconfiguration in power relations and the recognition of cultural values. (Nightingale, 2012)

But, if we talk about an evolutionary process of transformation, this characterization and social activation cannot only occur in the first phase of transformation. The concept of "Social Urbanism" arises with the transformation of informal settlements (communes) in Medellín, where a new urban and social image of these environments was constructed from recognizing informal settlements as a representative element of the city. Street art interventions, large libraries and the telecable brought tourism and broke the great social segregation in the city. While approaches towards the redistribution of social infrastructure and tourism have had massive physical impacts on the urban structures of informal neighborhoods in Medellin, almost 15 years after they were implemented, violence and high poverty rates persist (Montoya, 2014). Vulnerabilities in these environments can become tools to strengthen the systemic operation of both natural elements and social structures, but need to provide tools for empowerment and endogenous development too. Understanding the groups in the first phases becomes indispensable, but the adaptation and evolution in the needs, knowledge and circumstances must inform each stage and strategy of intervention, appropriating the non-linear and dynamic character of this adaptive process.

That is why the possible strategic actions will be guided by an ex ante identification of socio-cultural variables that can influence, transform or guide the implementation, the program and the objective of them. Appropriating vulnerability and resilience as influential elements in spatial dynamics reconfigures the role of communities and their ability to adapt, recover and participate in the development and territorial configuration. Understanding the co-evolutionary interaction between local communities and the territory ensures the resilient capacity to preserve and transform systems dynamically in the long term (Brunetta, 2019).

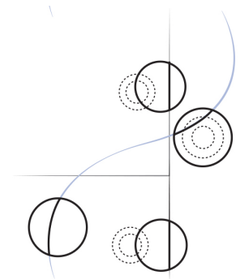
The identification of the current social networks, possible leaders, community rolls, local capacities, potential involved groups and the approach of the Local expectations and needs, influenced by the socio-cultural value given to space must be structuring elements in the approach and implementation of each action and its adaptation in time. Co-evaluation, co-monitoring and co-manteinance will reinforce the collaborative and participatory process between formal and informal agents, prepare communities for possible changes and risks, and generate a parallel process where social and ecological systems will adapt and correlate in a sustainable way in the long term.



2. Procedural phase

The procedural phase starts from the already recognized socio cultural values and social networks and informal actors. This phase introduces the need for an equitable participation in decision-making and knowledge building processes since the beginning of the transformation process (Meerow, 2019). Acupuncture Local scale interventions can be of great help in motivating the local community to recognize and learn and contribute to the counteraction of the root causes regarding risk and vulnerability, by means for example of nature based solutions.

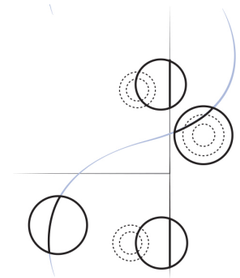
These type of actions are characterized by lower costs and facilitation in the implementation in the beginning. Also, the recognition of the long periods of time required for the stabilization of these actions (the growing of a forest for example) are a strong starting point to recognize the local input and knowledge regarding ecological risk mitigation strategies since the beginning, and could also be or the basis on which to set up more structured and complex risk mitigation intervention in further stages of development or the basis in the consolidation of socio ecological backbones. The progressive transformation involves local interventions and, according to the needs and the context, the possibilities to intervene will be increased into more complex mitigation interventions that require therefore a progressive involvement of actors from the municipal, regional or even the national sphere. Therefore, the local and self-organized implementations could evolve into more complex systemic interventions depending on the local context vulnerability gradient over time.



3. Structural phase

The next phase is based on the recognition, consolidation and integration of urban structural systems within the functional dynamics of the city. This recognition therefore implies the approach of an evolutionary interrelation of local strategies with more urban scale systems, evaluating both the possibilities and needs with regard to socio-spatial connectivity and accessibility, as well as the consolidation and transformation of ecological backbones.

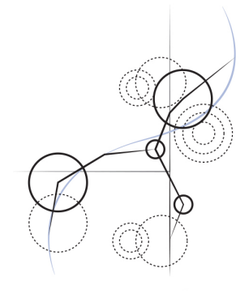
The structural phase starts from the physical as well as the systemic integration of the structuring elements, where possible strategic actions can be oriented to build a possible interrelation between the backbones, as well as a multi-scalar interrelation between the formal and informal city.



4. Functional and distributional phase

Following the consolidation of structuring systems, the distributive and functional phase is aimed at evaluating the distribution of services, opportunities and spatial interventions in relation to the possible links between structural elements, daily life systems and social networks.

The functionality of the intervened space is linked to the local needs and to the evolution of the overall strategies implemented in the previous phases. In turn, the functionality and distribution of possible actions could become an element of strategic connectivity between the formal city and the area of intervention.



5. Correlated stabilization phase

The pathway and first Co-evolutionary cycle ends with demonstrates the correlated stabilization between multiple scales and intervened social and ecological systems. The stabilization is based on the acknowledgment of the positive evolution of local, social, economic and urban structuring elements, in which the vulnerability gradient and the counteraction between formal informal agents and territory improved.

The stabilization phase ends with concrete actions that are needed in order to assure the accountability of the collaboration between formal and informal actors. At the same time the implementations of these strategic actions will assure the continuity from both sides. The formal actors, as supporting agents and the local community as active engaged actors in the further development of the stabilized system.

b. Co-evolutionary transformation scenario. UPZ La Flora

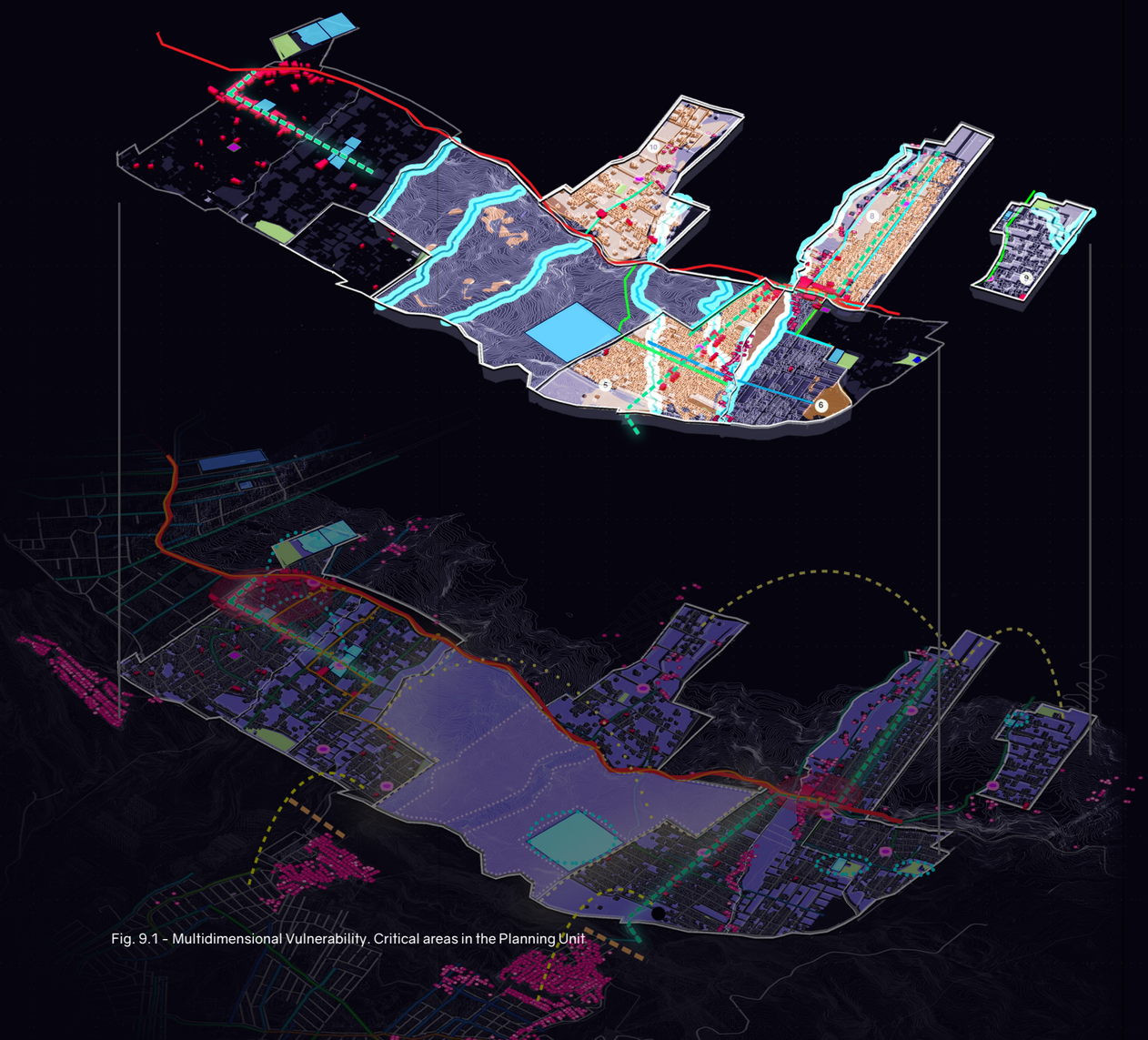


Fig. 9.1 - Multidimensional Vulnerability. Critical areas in the Planning Unit

b. Co-evolutionary transformation scenario. UPZ La Flora
Strategic approach. Scale: Planning unit

In order to start the implementation of the strategic actions in a scenario over time, the Multidimensional Vulnerability assessment, developed in the analytical framework, has two purposes. The first one is to identify the critical and/or strategic areas in order to reach the highest risk and vulnerability mitigation in the planning unit. The second is to identify the co-evolving systems that will establish the strategic goals in the long term and the implementation of the related actions.

In the case of the UPZ Flora, as has been demonstrated throughout the analysis, the areas of greatest vulnerability and strategic development potential are those shown in the following diagram. Once these neighborhoods and the co-evolutionary systems have been identified, the first phase of recognition is initiated.

Multidimensional Vulnerability assessment

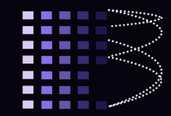
Strategic Goals

San Pedro Sur rural



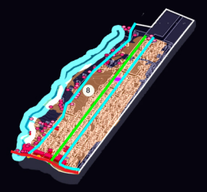
Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Sliding and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure



Ecology - Socio Economic
- Strategic Goal Productive Ecology
Sociospatial - Ecology
- Strategic Goal: Systemic alignment through reprogramation
Socioeconomic - Social
- Strategic Goal Endogenous activation

Tihuaque - Villa Rosita



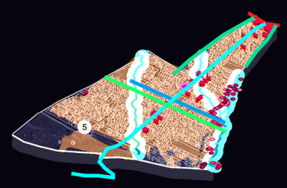
Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Sliding and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure



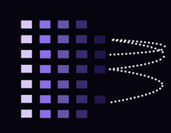
Ecology - Socio Economic
- Strategic Goal Productive Ecology
Sociospatial - Ecology
- Strategic Goal: Systemic alignment through reprogramation
Socioeconomic - Social
- Strategic Goal Endogenous activation

Villa Diana



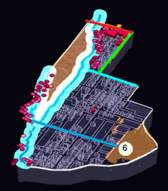
Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Sliding and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure



Ecology - Socio Economic
- Strategic Goal Productive Ecology
Sociospatial - Ecology
- Strategic Goal: Systemic alignment through reprogramation
Socioeconomic - Social
- Strategic Goal Endogenous activation

Los Soches



Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Sliding and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure



Ecology - Socio Economic
- Strategic Goal Productive Ecology
Sociospatial - Ecology
- Strategic Goal: Systemic alignment through reprogramation
Socioeconomic - Social
- Strategic Goal Endogenous activation

Las Violetas rural



Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Sliding and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure



Sociospatial - Ecology
- Strategic Goal: Systemic alignment through reprogramation
Socioeconomic - Social
- Strategic Goal Endogenous activation

1. Recognitional and Social activation Phase:

Fig. 9.3 - Implemented Strategic actions. Recognitional Phase. UPZ La Flora.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

S: Micro Participatory Strategies
(Social Activation)

- Workshops
- Brainstorming
- Surveys and interviews
- Cultural and artistic activities
- Community meetings

Social activation strategies are aimed towards the consolidation and reinforcement of local empowerment and community leadership. In order to start with the transformation process, it is essential to develop communication channels between the formal and informal agents to generate motivation and trust. Activities focused from the co-production of information and mapping, as well as recreational and artistic activities are sources of both demographic and territorial information, as well as tools to identify the social dynamics of the sector, identify the roles and leaders in the community, the capacities and local expectations.

Fig. 9.4 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Recognitional Phase. UPZ La Flora.

S

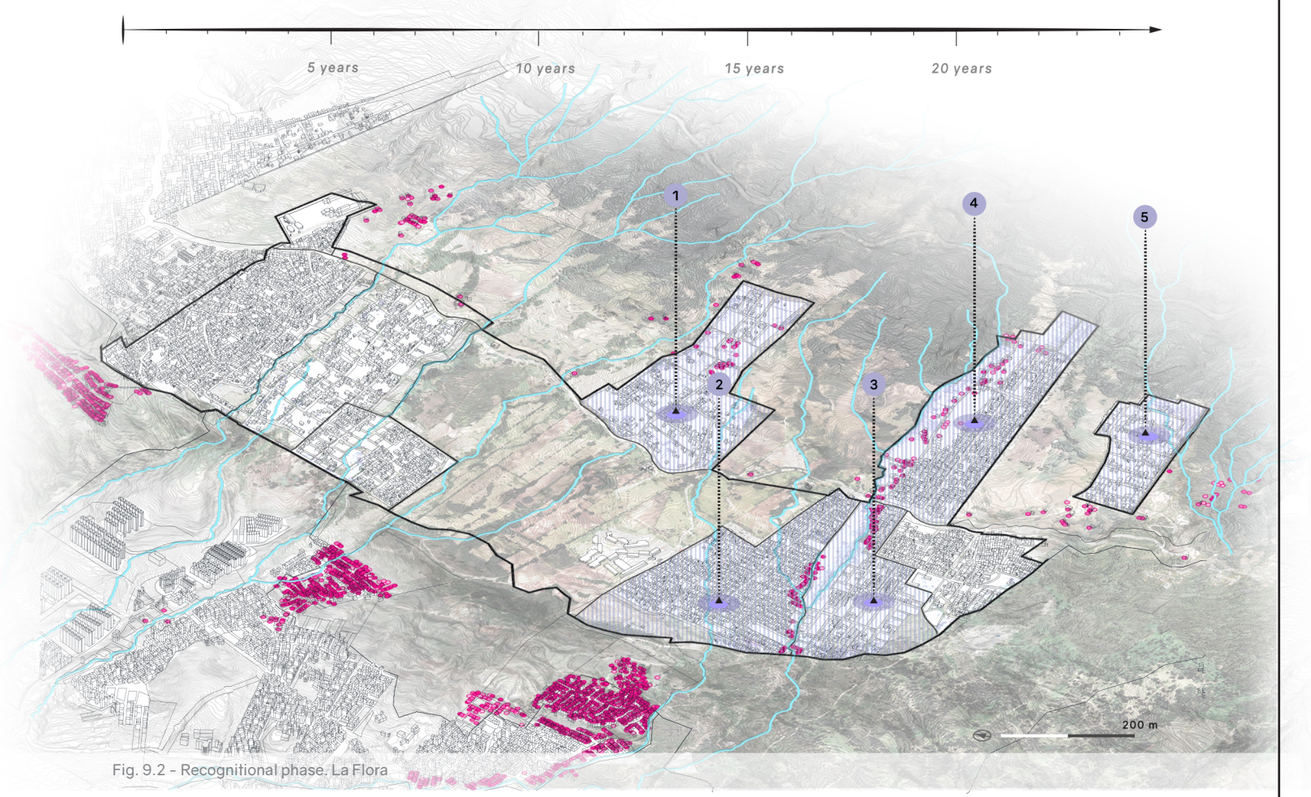
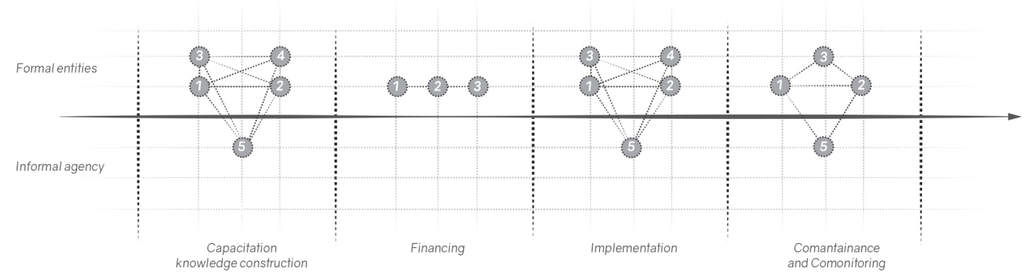


Fig. 9.2 - Recognitional phase. La Flora

Fig. 9.5 - Actors performance and rolls. Recognitional phase. UPZ La Flora.

(1) NGO + (2) SDIS + (3) SDH + (4) Universities + (5) Community



Local possible actors:

1 Barrio San Pedro Sur
- 350 dwellings
- DP: 89
56/89: Woman
51/89: children
- Informal growth
- Econeighborhood initiative

2 Barrio Villa Diana
- 1288 dwellings
- DP: 145
- Informal growth

3 Barrio Los Solches
- 1046 dwellings
- DP: 70

4 Barrio Villa Rosita
- 667 dwellings
- DP: 112
60/112: Woman
52/112: children
- Informal growth
- 35% does not have access to food.
- Econeighborhood initiative

5 Barrio Las Violetas
- 151 dwellings
- DP: 80
40/80: Woman
28/80: children
- Informal growth
- Econeighborhood initiative

DP: Displaced population

50.26% are woman: 10.271
Woman represent 56.1% of the unemployed displaced population. (Unemployment rate of the ares is 20.3% highest in Bogotá)

63.2% are 0 - 15 years: 12.879
School population: 500 students finish school each year and only 1% study higher degrees

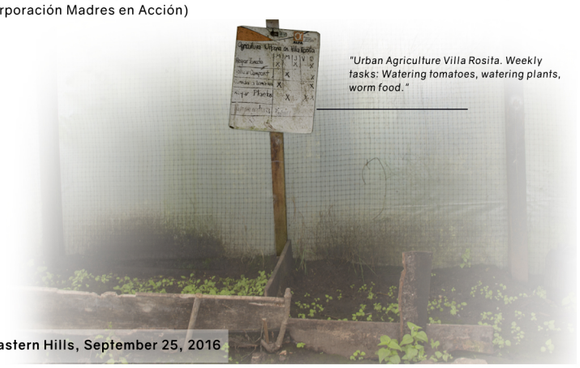
"The experience of Villa Rosita has been very interesting because when we started the development process of the idea of an eco-neighborhood, it was another forgotten and unknown neighborhood of the hills for the city and the government. With the group of women from Comabaquinta (Corporación Madres en Acción Barrios Altos de la Quinta) we gave ourselves the task of rethinking about improving our conditions and quality of life. We presented the proposal to the CAR and were supported with some resources, we knew that without the participation of the community, without improving mobility and without improving the issue of water and housing we would not be able to have bigger changes, and we are still in the process.

We want the administration to recognize the territory, to revitalize this land, and we want its inhabitants to do it, we have to defend this territory as a source of life and struggle. Our proposal with the new POT is that our UPZ (Zonal Planning Unit) 52 la Flora becomes a UPSA (Social Environmental Planning Unit). If the current district administration wants to work for the Eastern Hills, it must work with all the actors, including its inhabitants and settlers, who have been its defenders. We want to show the city the treasure they have in the hills."



Elizabeth Mosquera
Community leader, Comabaquinta

Comabaquinta: (Corporative of Mothers in Action Barrios Altos de la Quinta in Spanish Corporación Madres en Acción)



"Urban Agriculture Villa Rosita. Weekly tasks: Watering tomatoes, watering plants, worm food."

Journal Imagina Bogotá. Eco-neighbourhoods in the South of the Eastern Hills, September 25, 2016

Fig. 9.7 - Implemented Strategic actions. Procedural Phase. Stage 1. UPZ La Flora.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE
1. Reforestation
2. Root Structures

Fig. 9.8 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Procedural Phase. Stage 1 .UPZ La Flora.

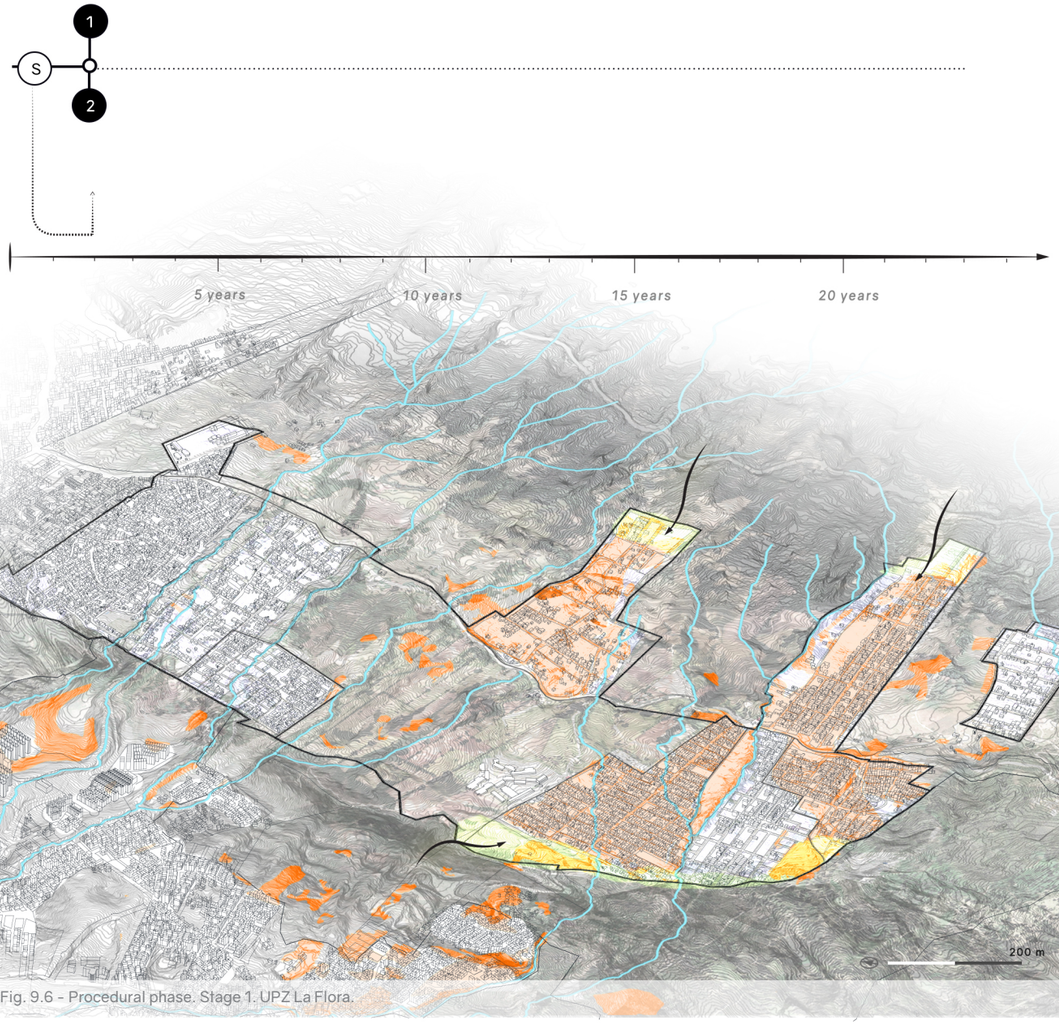
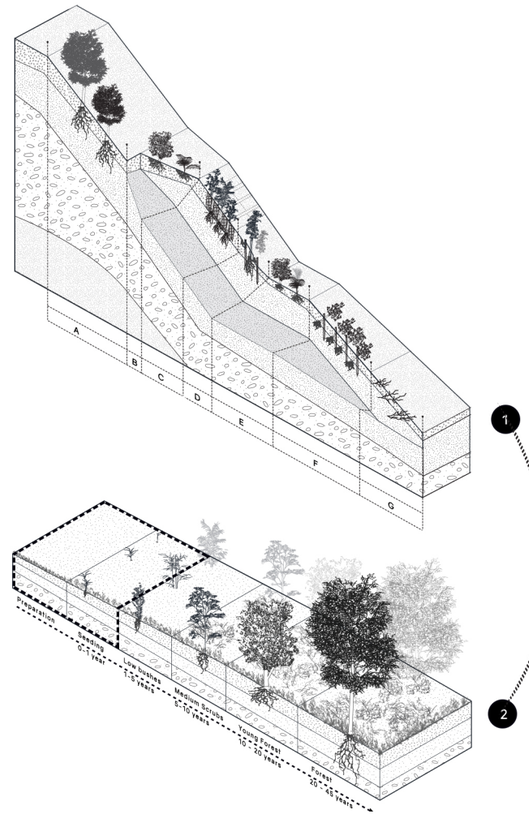


Fig. 9.6 - Procedural phase. Stage 1. UPZ La Flora.

Implemented strategic actions

The following interventions, as described in the procedural phase in the previous section, involve nature based solutions. This, due that working with nature requires a longer term of preparation and assessment and aimed to have lower costs in the implementation. In this case, the landslide risk and deforestation in the central core of the area leads to the implementation of reforestation and re vegetation actions as described below. Each action is defined through the actors already explained through the previous operability chart, and explores the possible interrelations with others in co-evaluation process at the end of the phase.



Risk Mitigation: Root Structures
SDA + JBB + Community + IDIGER + SDP

The first social activation startegies identified recycling communities as the population with highest vulenrability rates, in which already some community leaders have been working in the improvement of the neighborhood. Based on this identification collaborative efforst were initiated with this community leaders, other community organizations, children and formal municipal actors with high expertise in vegetation and land slide mitigation in order to start a reforestation of the pronounced topographies that are currently without trees. The capacitation and co-production of information between formal and informal actors regarding the benefits of nature as an active agent of change results in the correlated needed strategy regarding high contamination in specific areas due to waste disposal.

Reforestation
SDA + JBB + Community + IDIGER + SDP

The understanding about root structures and complementary actions to reinforce them like stakes and other natural materials, in order to reduce the landslides, starts with the preparation of the land, the seeding of native species with the community, and the natural reinforcements that in later stages will serve as support for the tree roots.

The following diagram shows the performance and role of the actors involved during this phase, where the construction of knowledge regarding reforestation and nature based solutions to counteract landslides, the seeding and construction of support systems, as well as the monitoring and maintenance of the crops, are developed in a collaborative process between formal and informal agents, empowering the communities in an evolutionary manner with respect to knowledge and concrete actions over time.

Fig. 9.9 - Actors performance and rolls. Procedural phase. Stage 1. UPZ La Flora.

(1) SDA + (2) JBB + (3) Community + (4) IDIGER + (5) SDP

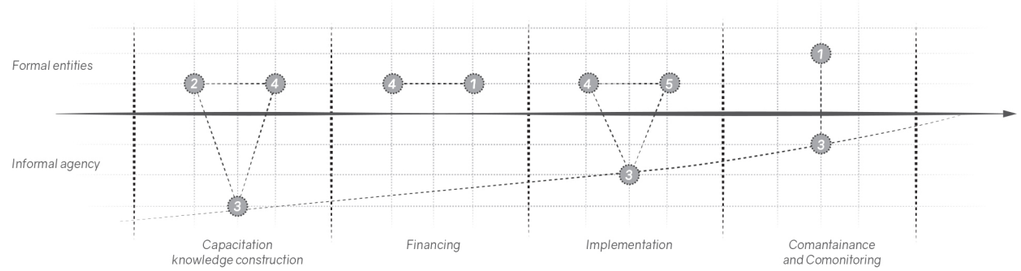


Fig. 9.12 - Implemented Strategic actions. Procedural Phase. Stage 2. UPZ La Flora.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE
- 7. Structural reinforcement
- 1. Water Collection
- 2. Rain garden
- 11. Relocation

Fig. 9.11 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Procedural Phase. Stage 2 . UPZ La Flora.

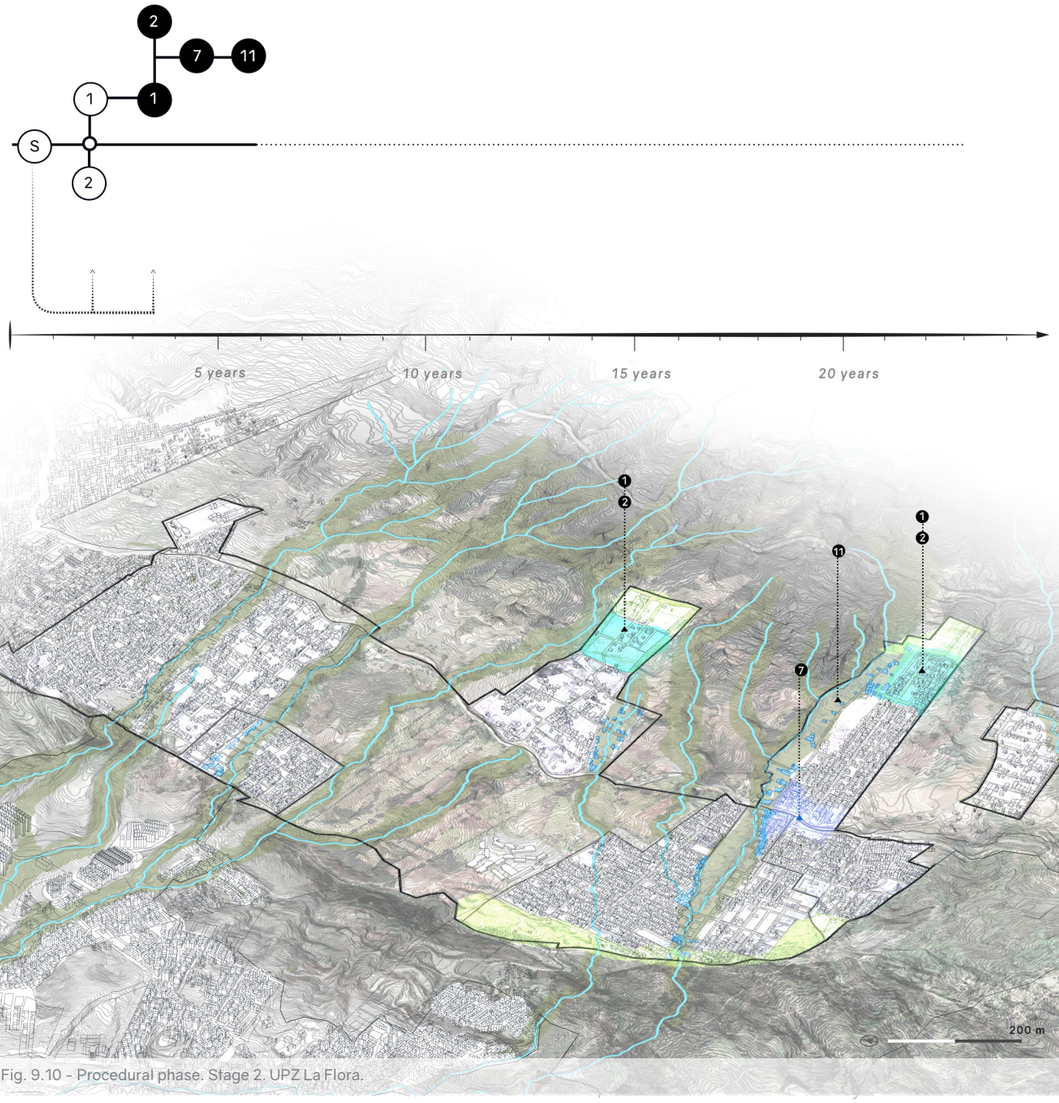
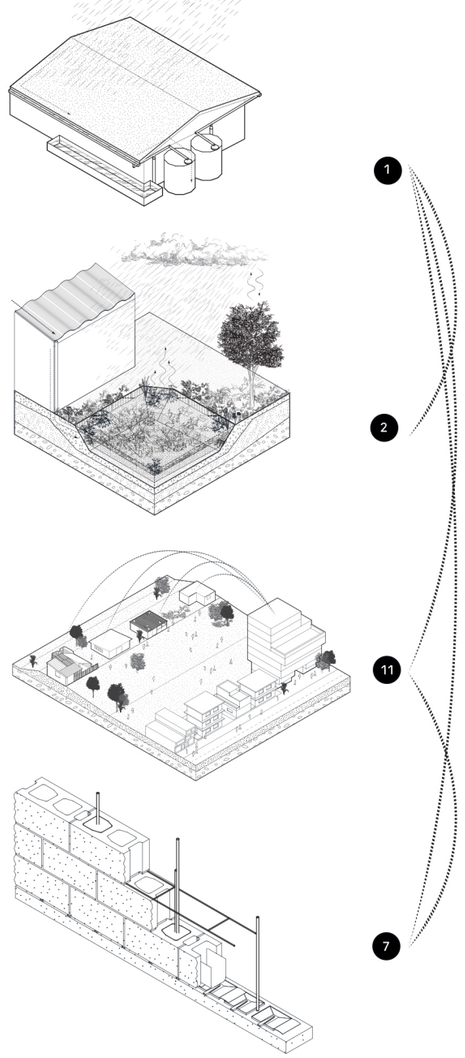


Fig. 9.10 - Procedural phase. Stage 2. UPZ La Flora.

Implemented strategic actions



Water Collection
Inh. + EAAB

After the first seeding and natural containment structures were implemented, complementary actions were taken in relation to soil erosion and water collection, which is a variable that affects and is related to the problem of landslides. For this, the installation of water collection elements are carried out with the community in the dwellings located on the upper part of the slopes, as well as courses on how the interventions work.

Rain Garden
Inh.+ SDA

After the installation of individual water collection systems, a complementary action would be the design and development of various gardens that will function as water collection spaces, interconnection nodes with the housing interventions and will have social and aesthetic impacts in the area. These projects require training about both the benefits and maintenance of the gardens, and can be implemented and managed by local leaders as well as young people.

Relocation
Inh. + CVP + SDH + SDP + IDIGER

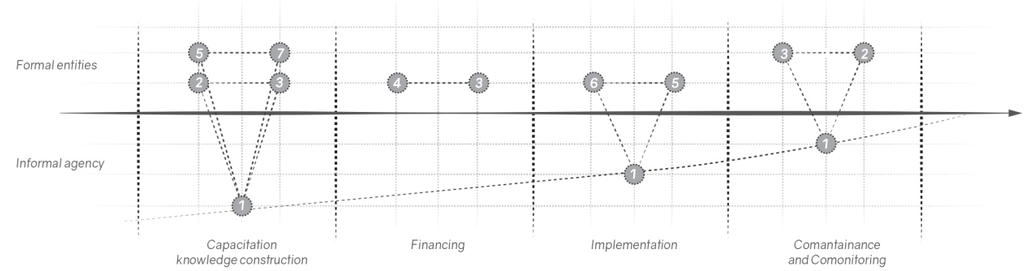
Relocation of dwellings in risk areas leads to two parallel processes. On the one hand the identification and characterization of the populations living in these higher risk areas, the training and provision of information about the relocation process, and on the other hand the evaluation of possible areas within the neighborhood where these populations can relocate without breaking the links and social ties with their community.

Structural Reinforcement
Inh. + CVP + SDH + SDP + IDIGER

The identification of consolidated dwellings that are not located in the river basin (due to the last strategic action), specifically located in the east/west separation of the main axis of mobility are reinforced and improved. These actions are aimed at consolidating the identified commercial core and transforming the area as a strong transitional node to enter and leave the city.

Fig. 9.13 - Actors performance and rolls. Procedural phase. Stage 2. UPZ La Flora.

(1) INH.+ (2) EAAB + (3) SDA + (4) CVP + (5) SDH + (6) SDP + (7) IDIGER



3.1 Structural Phase

Fig. 9.16 - Implemented Strategic actions. Structural Phase. UPZ La Flora.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE

11. Relocation

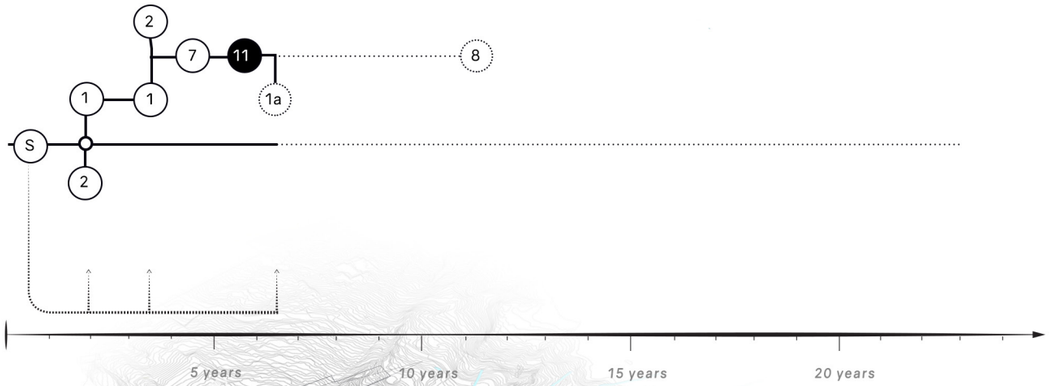
SA

1. Multifuntional Networks

a. Grey Infrastrcuture

8. Multifunctional Densification

Fig. 9.15 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Structural Phase. UPZ La Flora.



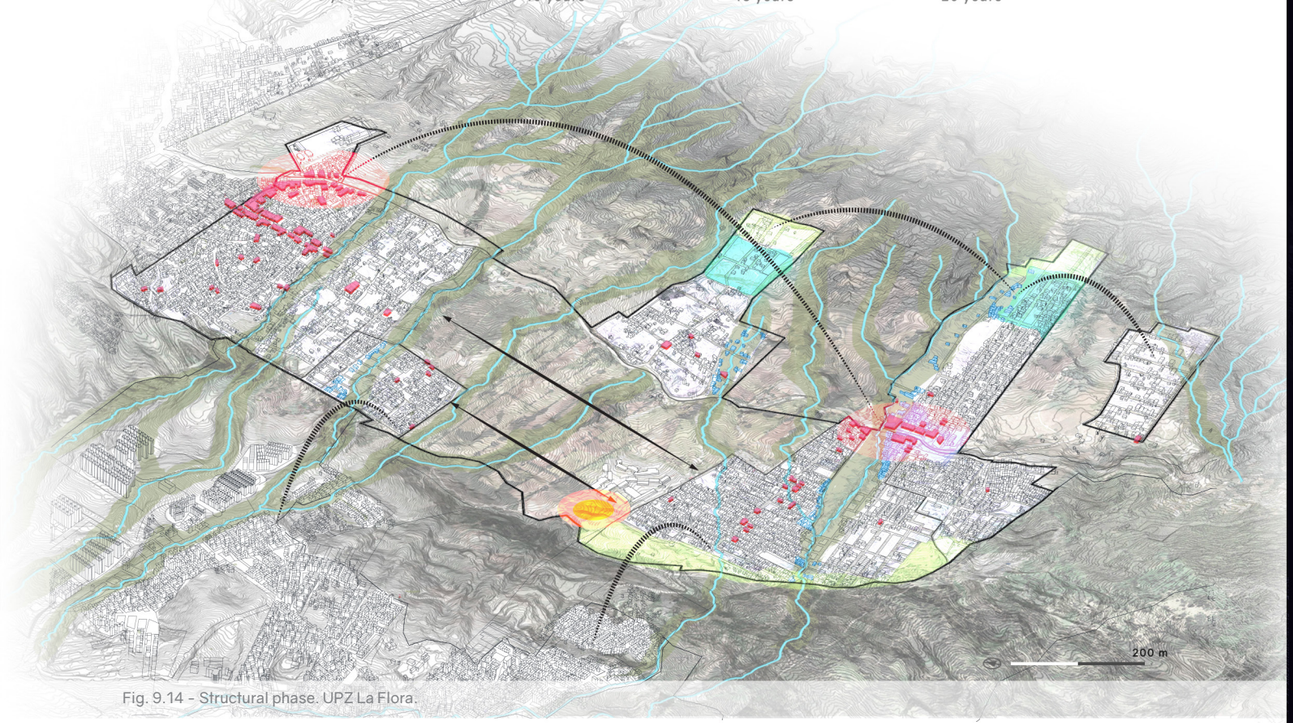


Fig. 9.14 - Structural phase. UPZ La Flora.

The preparation regarding the relocation of the population settled in the flood risk area will start with the evaluation of possible areas of relocation inside the planning unit. The possible development in the central area leads will counteract the fragmentation between the northern and southern neighborhoods and will possibly activate the educational institution, which is currently isolated from the context (Axes a and b). The evaluation of the current spatial fragmentation is leading to the proposal of connectivity roads between the three possible Eco-neighborhoods located on the eastern side (Axes c and d), as well as the connection of the planning unit with the rest of the city on the western side (Axes e and f). The analysis with space syntax shows the impact and integration degree with the intervention.

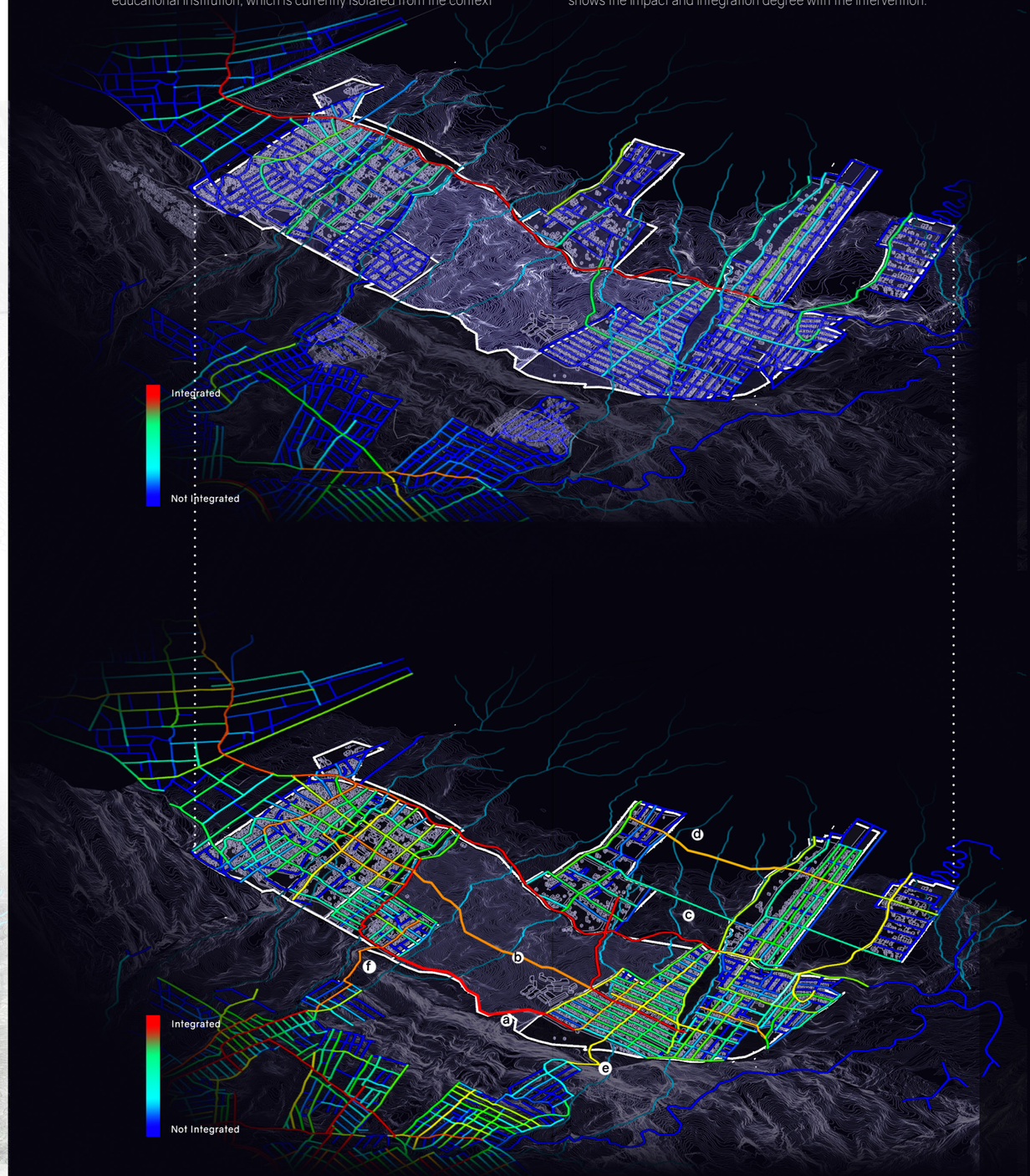
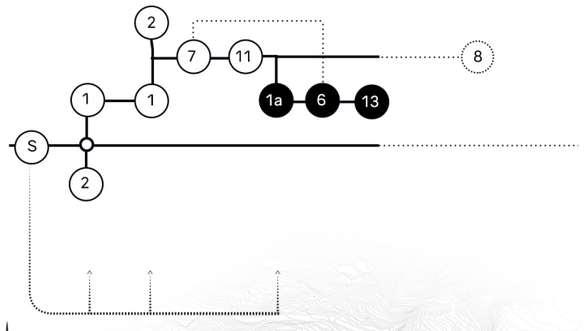


Fig. 9.19 - Implemented Strategic actions. Structural Phase. Stage 2. UPZ La Flora.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

SA
1. Multifuntional Networks
a. Gray Infrastrcuture
8. Multifunctional Densification
PE
6. Permeabilization
13. Drainage Infrastructure

Fig. 9.18 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Structural Phase. Stage 2. UPZ La Flora.



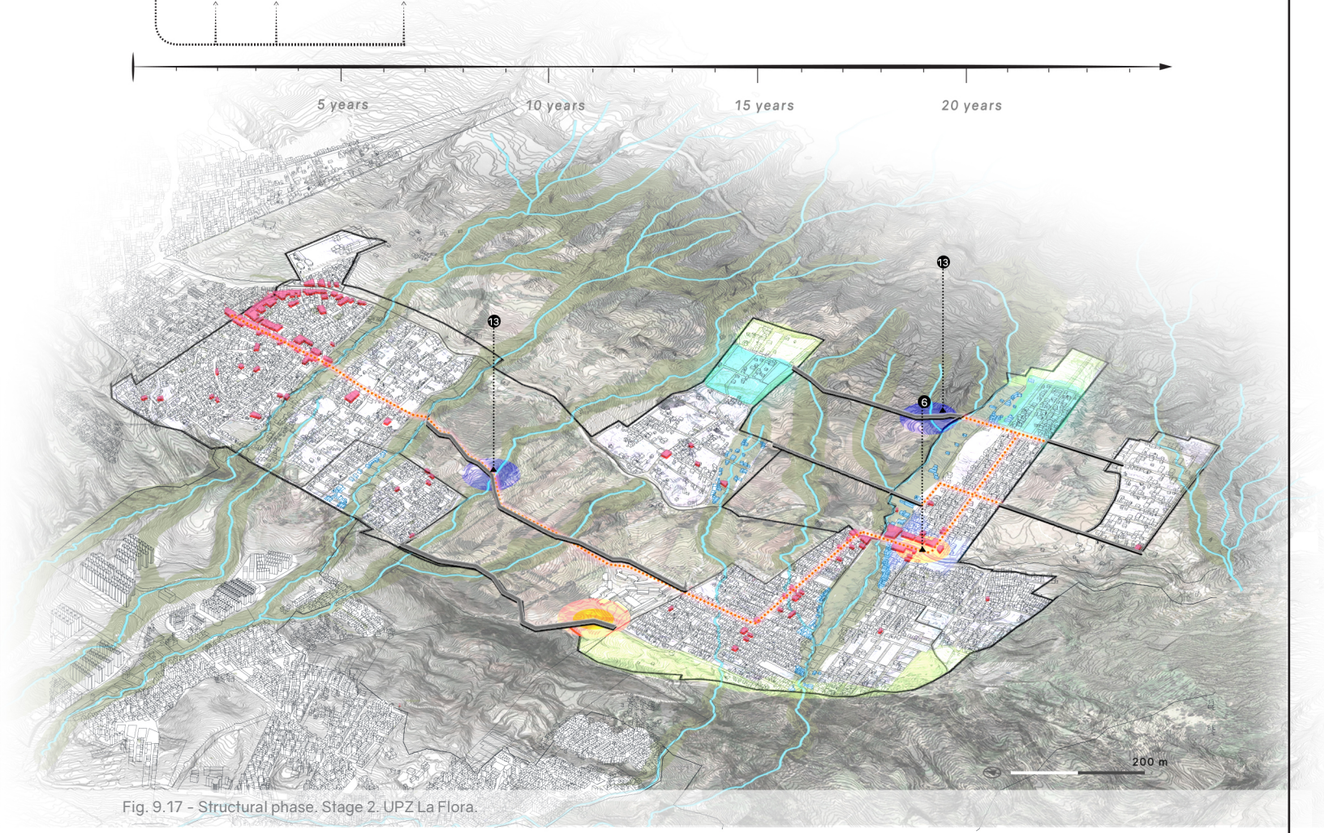
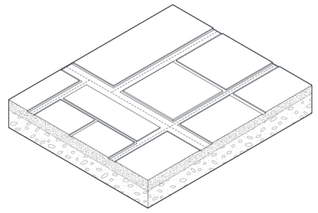


Fig. 9.17 - Structural phase. Stage 2. UPZ La Flora.

Implemented strategic actions

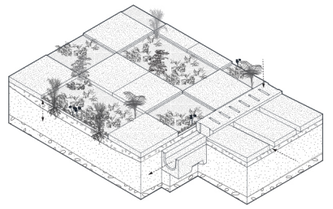


1a

Gray Infrastructure

SDM + SDP + IDU + EAAB

After evaluating the positive impacts of the proposed interconnections on a local and urban scale, the development of the roads is carried out through a collaborative process between the municipal entities in charge of mobility and services.



6

Permeabilization

SDP + EAAB + IDU + Community + JBB

The proposal of the road axes and the interconnection between the two commercial nodes leads to an extension of the strategies at the entrance of the city. The first interventions were to reinforce the dwellings, and after reaching this point and correlating the water, mobility and habitation system the second intervention is to permeate the area in order to achieve a better interconnection between the stream and the mobility axes. These strategies involve the population again in both development and training in the maintenance and operation of vegetation patches, which will reinforce the water collection system.

13

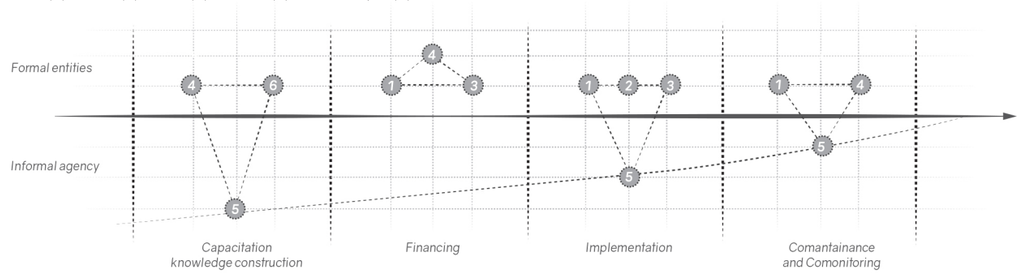
Drainage Infrastructure

EAAB + SDP + IDU + Community

The same concept of appropriating the mobility and collection of water as correlated activities, leads to the proposal of water collection and treatment strategic nodes where gray and blue infrastructures are crossed.

Fig. 9.20 - Actors performance and rolls. Structural phase. Stage 2. UPZ La Flora.

(1) SDM + (2) SDP + (3) IDU + (4) EAAB + (5) Community + (6) JBB



3.3 Structural Phase

Fig. 9.23 - Implemented Strategic actions. Structural Phase. Stage 3. UPZ La Flora.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

SA

1. Multifuntional Networks

b. Blue Infrastrcuture

8. Multifunctional Densification

PE

1. Reforestation

EA

4. Multifunctional public areas

Fig. 9.22 - Co- evolutionary pathway. Timeline and Interrelate strategic actions. Structural Phase. Stage 3. UPZ La Flora.

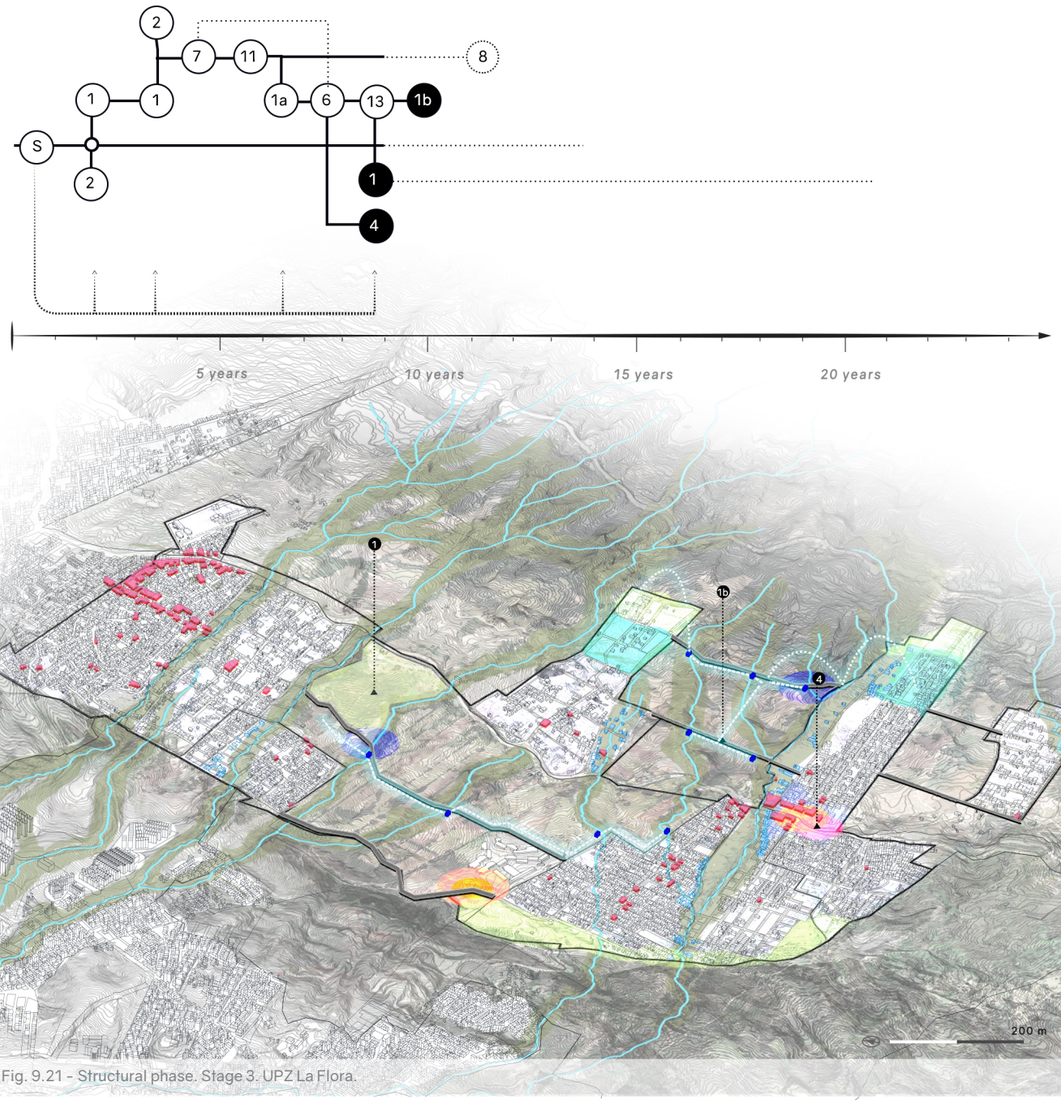
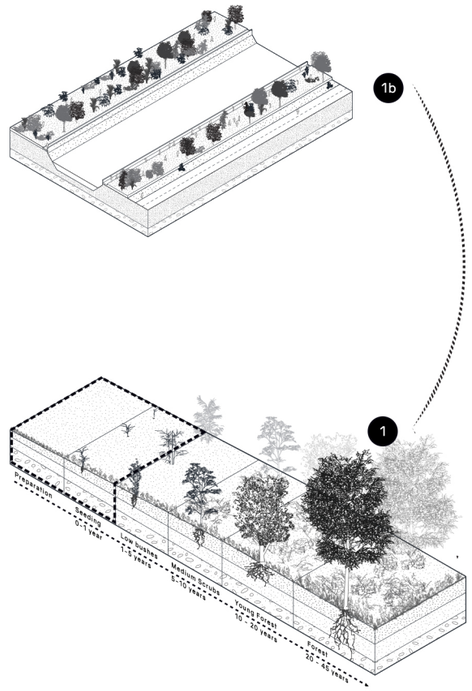
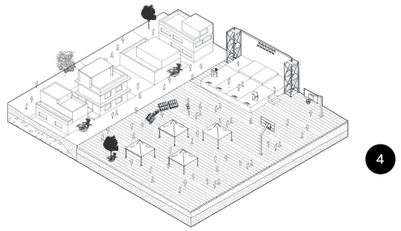


Fig. 9.21 - Structural phase. Stage 3. UPZ La Flora.

Implemented strategic actions





Blue Infrastructure

EAAB + SDP + IDIGER + SDA + JBB + IDU + Community

The proposal of the strategic cores leads to the subsequent strategy of generating a complementary water network that has the aim of managing, purifying and collecting water from the other streams that cross the planning unit. This same infrastructure will be interrelated with the first water collection stations in the homes and local gardens of the first stages of development.

Reforestation

SDA + JBB + Community + IDIGER + SDP

The correlation process between reforestation and water harvesting carried out in the early stages of development in the eastern zone is now carried out in the central zone of the planning unit. In this case, interventions related to the water system were initiated, which led to a complement to the strategy through a reforestation process in the existing environmental protection area.

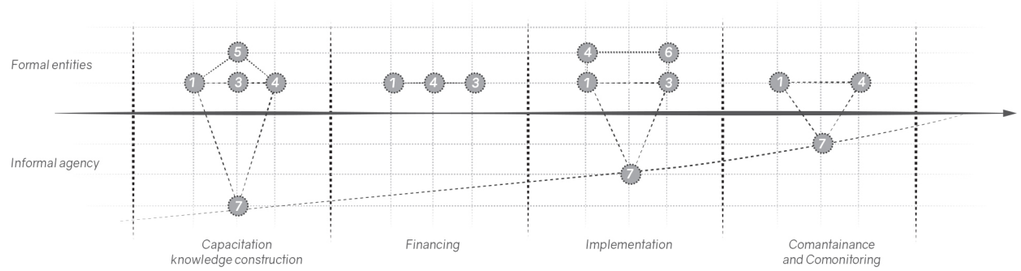
Multifunctional Public areas

SDCRD + IDRD + Community + SDP + IDU

Both the improvement and reinforcement of the constructions at the entrance to the city, as well as the subsequent permeability actions, give rise to the approach of a multifunctional public area that reinforces the economic and social activities that will have the capacity to adapt to the possible floods of the water stream.

Fig. 9.24 - Actors performance and rolls. Structural phase. Stage 3. UPZ La Flora.

(1) EAAB + (2) SDP + (3) IDIGER + (4) SDA + (5) JBB + (6) IDU + (7) Community



3.4 Structural Phase

Fig. 9.27 - Implemented Strategic actions. Structural Phase. Stage 4. UPZ La Flora.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE

3. Agroforestry

SA

1. Multifuntional Networks

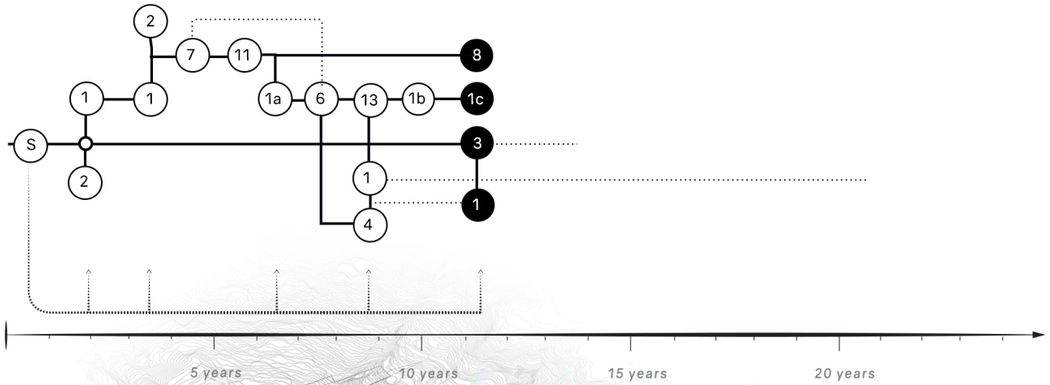
c. Green Networks

8. Multifunctional Densification

EA

1. Capacitation centers

Fig. 9.26 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Structural Phase. Stage 4. UPZ La Flora.



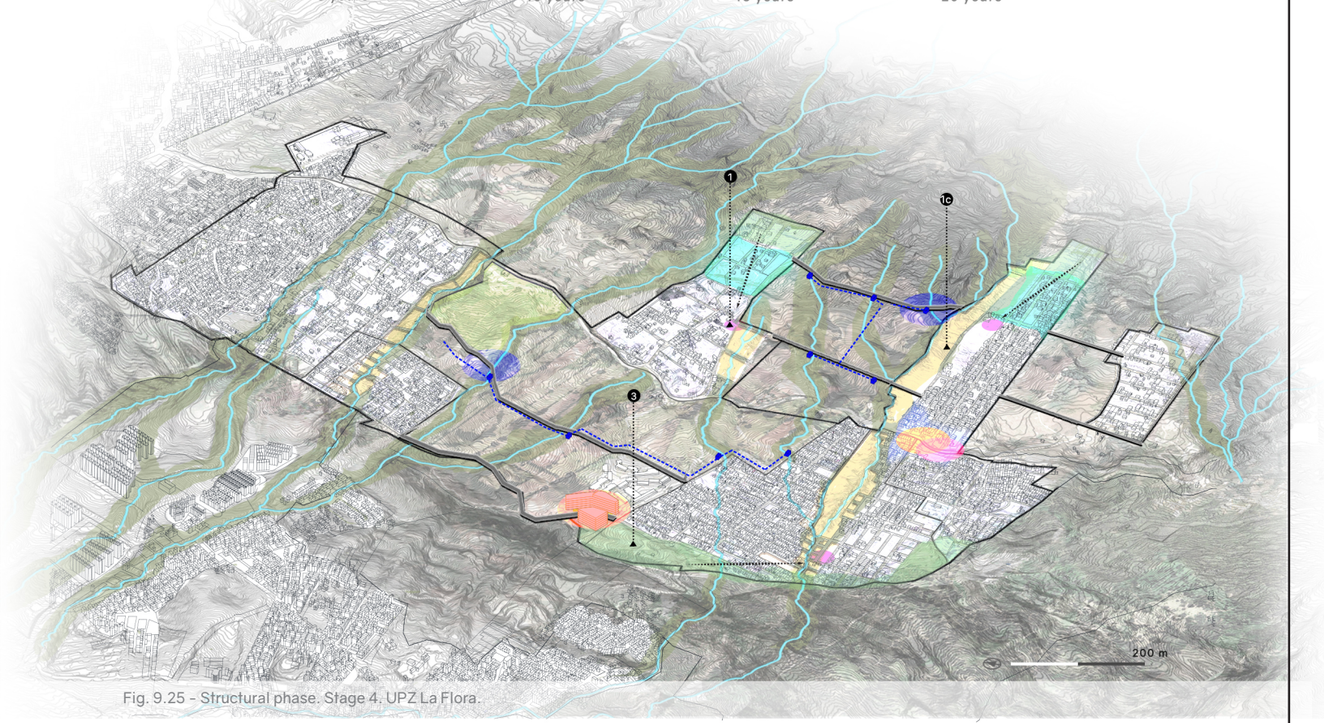
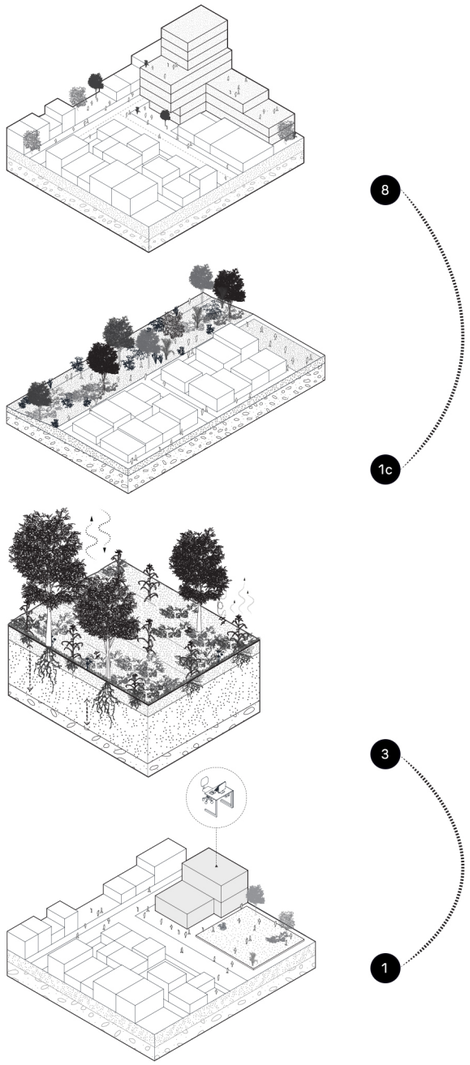


Fig. 9.25 - Structural phase. Stage 4. UPZ La Flora.

Implemented strategic actions



Multifunctional Densification

SDP + SDH + CVP + IDU + ERU + Private construction companies

The construction process of the multifunctional habitation hub culminates and the identified populations are relocated.

Green Networks

Community + SDA + DADEP+ SDP + JBB

The relocation of these populations settled in the water courses leads to a subsequent recovery of the buffer areas. This process leads to the reinforcement of the environmental corridor as an interconnecting element both on a local and urban scale.

Agroforestry

Community + IDIGER + SDA + SDDE

The reforestation carried out in the upper areas of the eastern side of the unit reaches a point of vegetation growth where complementary agricultural activities are now possible. The water collection systems and the water network that has been developed in time are linked to the same agricultural activities. The evolution of the forest into agroforestry occurs due to a recognition of local activities and is a process led by the rural communities in the area.

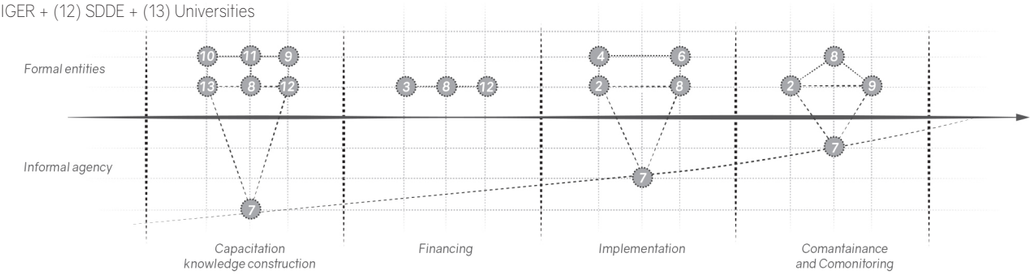
Capacitation Center

IDIGER + SDA + Community + SDP + SDDE +Universities

This process requires training and co-construction of information with the populations about the benefit of combining forests and agricultural activities, information about the types of agriculture adopted by the population and types of agriculture that can be carried out depending on the context. This reinforces the economic capacity of the rural families that inhabit this sector. (Co-production of knowledge)

Fig. 9.28 - Actors performance and rolls. Structural phase. Stage 4. UPZ La Flora.

(1) SDP + (2) SDH + (3) CVP + (4) IDU + (5) ERU + (6) Private Companies+ (7) Community + (8) SDA + (9) DADEP + (10) JBB + (11) IDIGER + (12) SDDE + (13) Universities



4.Functional and Distributional Phase

Fig. 9.31 - Implemented Strategic actions. Functional Phase. UPZ La Flora.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

SA
4. Facilities
2. Green Space
EA
4. Multifunctional public areas

Fig. 9.30 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Functional Phase. UPZ La Flora.

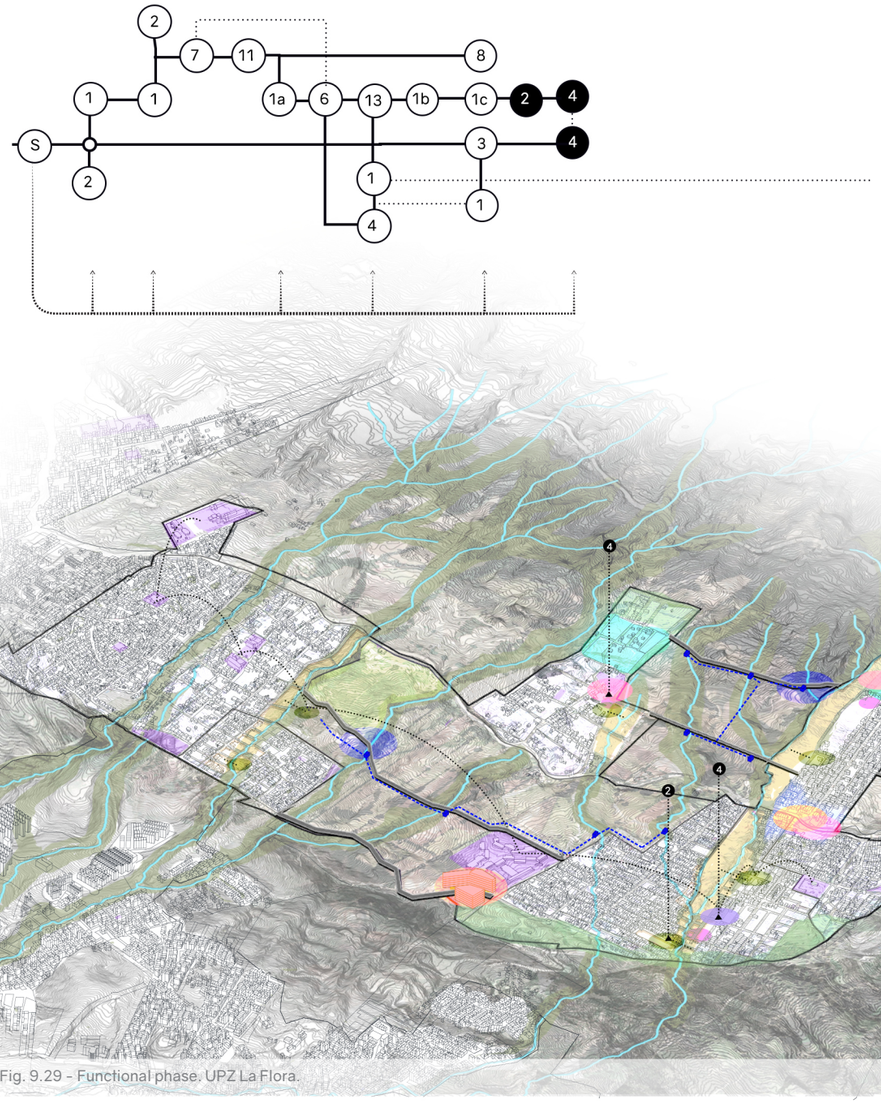
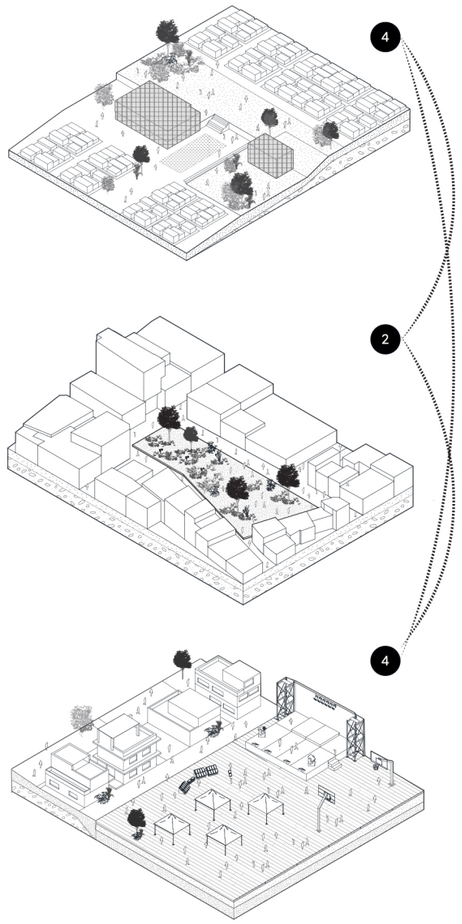


Fig. 9.29 - Functional phase. UPZ La Flora.

Implemented strategic actions

Following the consolidation of structuring systems, the distributive and functional phase is aimed at evaluating the distribution of services, opportunities and spatial interventions in relation to the possible links between structural elements, daily life systems and social networks.



Facilities

SDCRD+ IDRD + SDP+ IDU+ SDIS + Universities

The consolidation of the ecological corridors related to the water streams leads to a subsequent correlation between the environmental and social structures. The development of facilities in these areas is determined by social activation strategies focused on the young population. The multifunctional uses of these areas will be proposed and determined by children and young people where education, culture, sports, dance and other activities can be supported.

Green Space

Community+ DADEP+ SDA+ SDP+ IDU+ IDRD+ SDIS

The approach of equipments in this axis will be focused to weave the existing facilities of the sector through parks and green corridors, articulating the social and ecological dynamics of the area

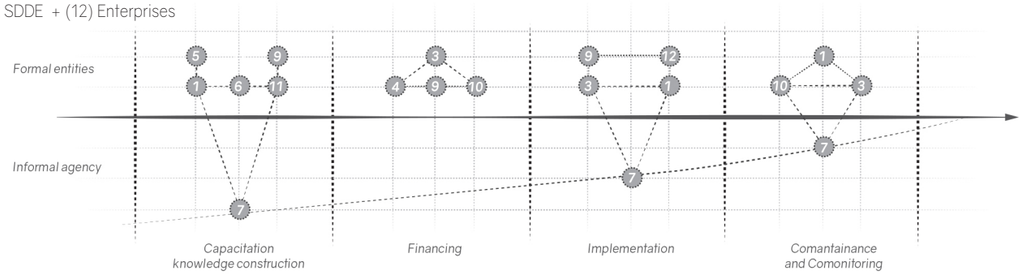
Multifunctional Public areas

SDCRD + IDRD + Community + SDP + IDU

The agroforestry activities that have been developed have reached the point of requiring new commercialization spaces, leading to the development of multifunctional public areas in the inside of the neighborhoods on the eastern side. These areas will be complementary to the current economic nodes, expanding the network on the local scale and on an urban scale as new collection and commercial hubs.

Fig. 9.32 - Actors performance and rolls. Functional phase. UPZ La Flora.

(1) SDCRD + (2) IDRD + (3) SDP + (4) IDU + (5) SDIS + (6) Universities + (7) Community + (8) DADEP + (9) SDA + (10) IDRD + (11) SDDE + (12) Enterprises



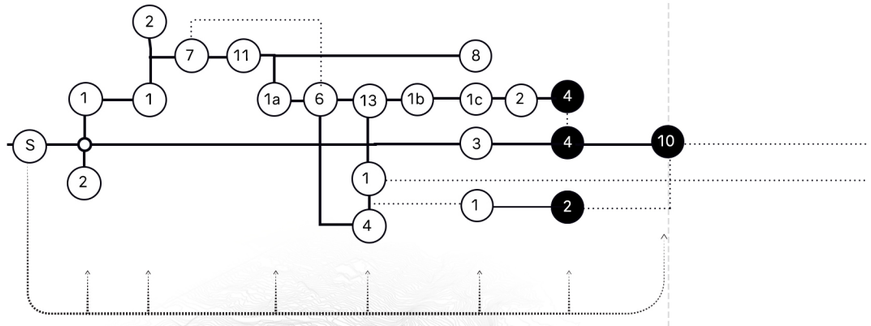
5. Correlated stabilization phase

Fig. 9.35 - Implemented Strategic actions. Stabilization Phase. UPZ La Flora.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE
10. Composting Area
EA
2. Resource Bank

Fig. 9.34 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Stabilization Phase. UPZ La Flora.



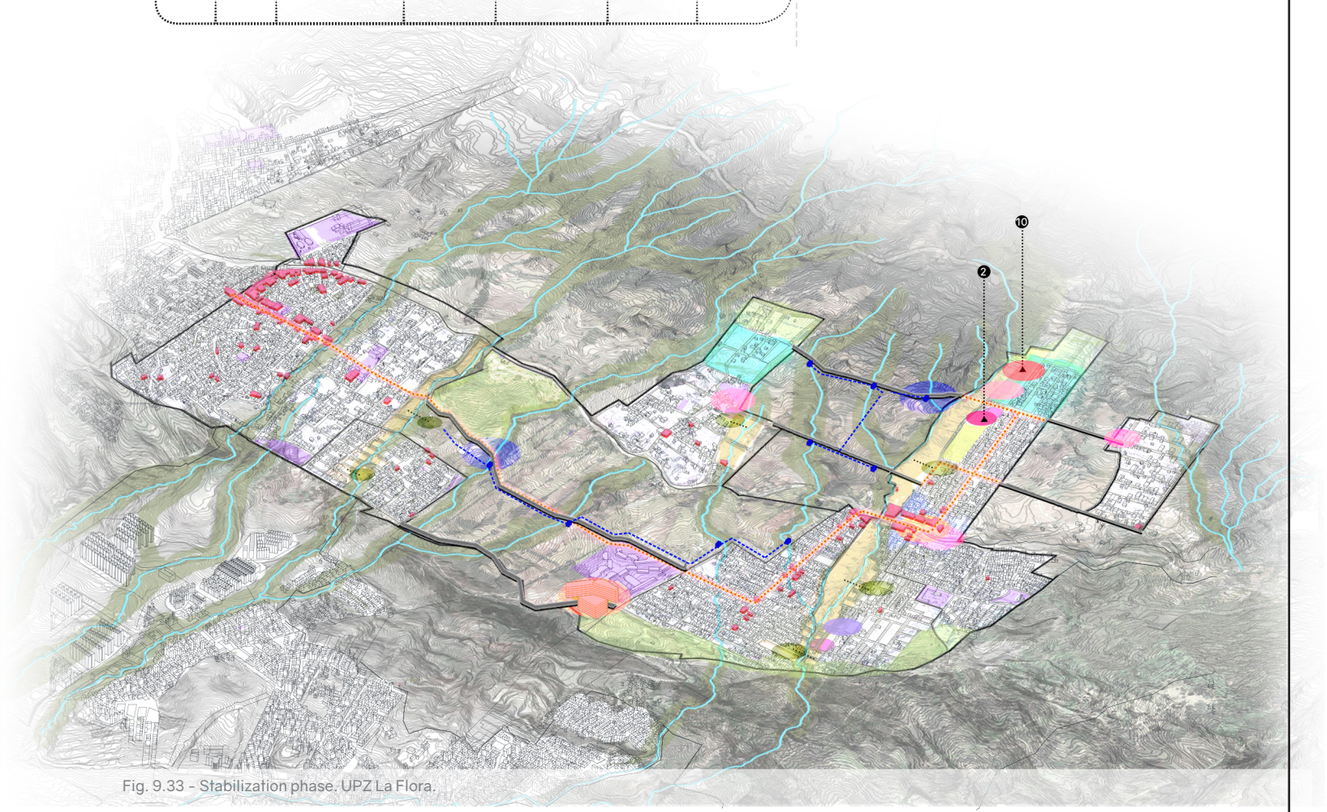
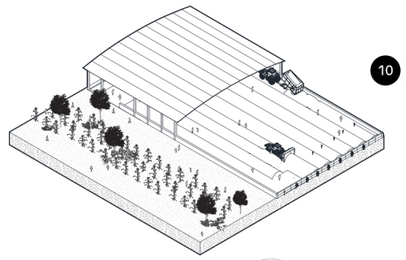
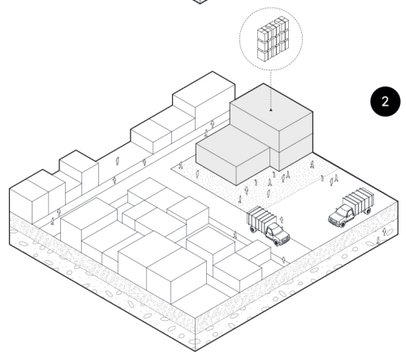


Fig. 9.33 - Stabilization phase. UPZ La Flora.





Composting Area

Community + SDA + SDDE + SDP

The stabilization of the first intervention cycle culminates with the development of a composting plant. This intervention aims to ensure that the activities have a renewable cycle and that they can benefit from the organic residues of the agricultural activities and generate fertilizers (own resources) for the maintenance of the activities in time, from a socio economic and ecological perspective.

Resource Bank

SDDE + SDA + Community + SDP + Medium enterprises

Both the harvesting of crops and the exchange and marketing of products increases the economic activities of the sector. The subsequent approach of a resource bank, will ensure that the populations have resources (seeds, tools, etc.) to continue and expand local activities in time.

The stabilization phase ends with concrete actions that are needed in order to assure the accountability of the collaboration between formal and informal actors. At the same time the implementations of these strategic actions will assure the continuity from both sides. The formal actors, as supporting agents and the local community as active engaged actors in the further development of the stabilized system.

The following diagram visualizes how through the co-evolutionary pathway, on the one hand vulnerability has been progressively reduced by reinforcing the cohabitation and co-evolution of social and ecological systems, and on the other hand how the development process has resulted in an evolutionary integration and collaborative work between formal and informal agents, increasing capacities and autonomy over time.

Fig. 9.36 - Summary of the Co-evolutionary pathway. UPZ Flora

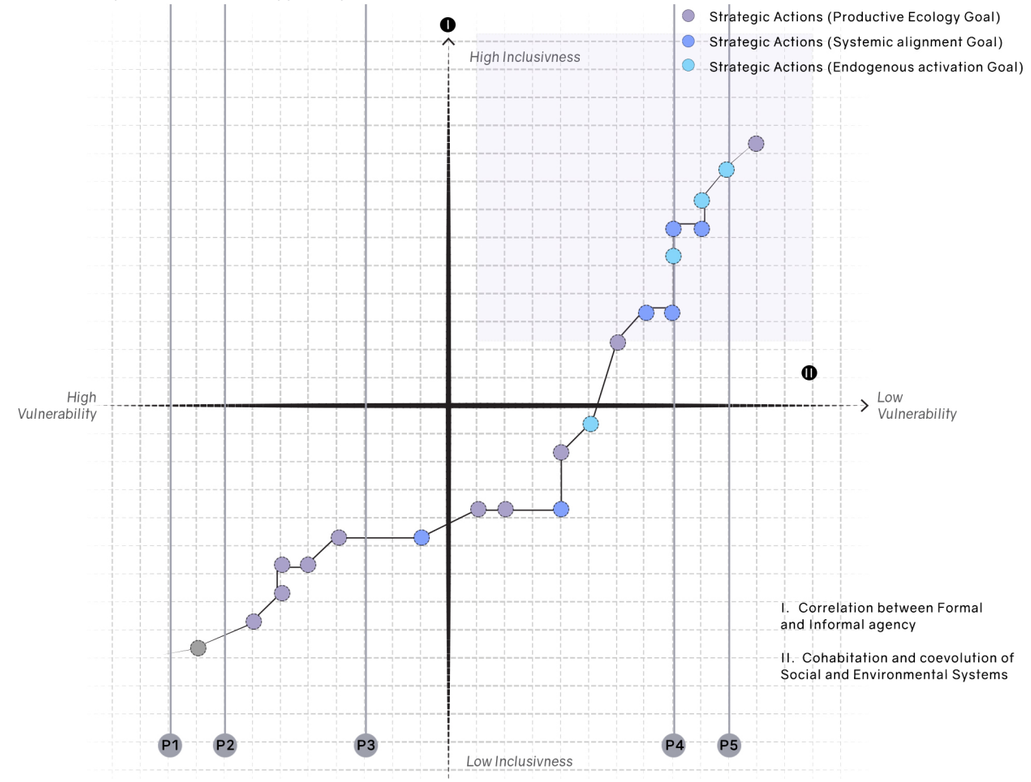
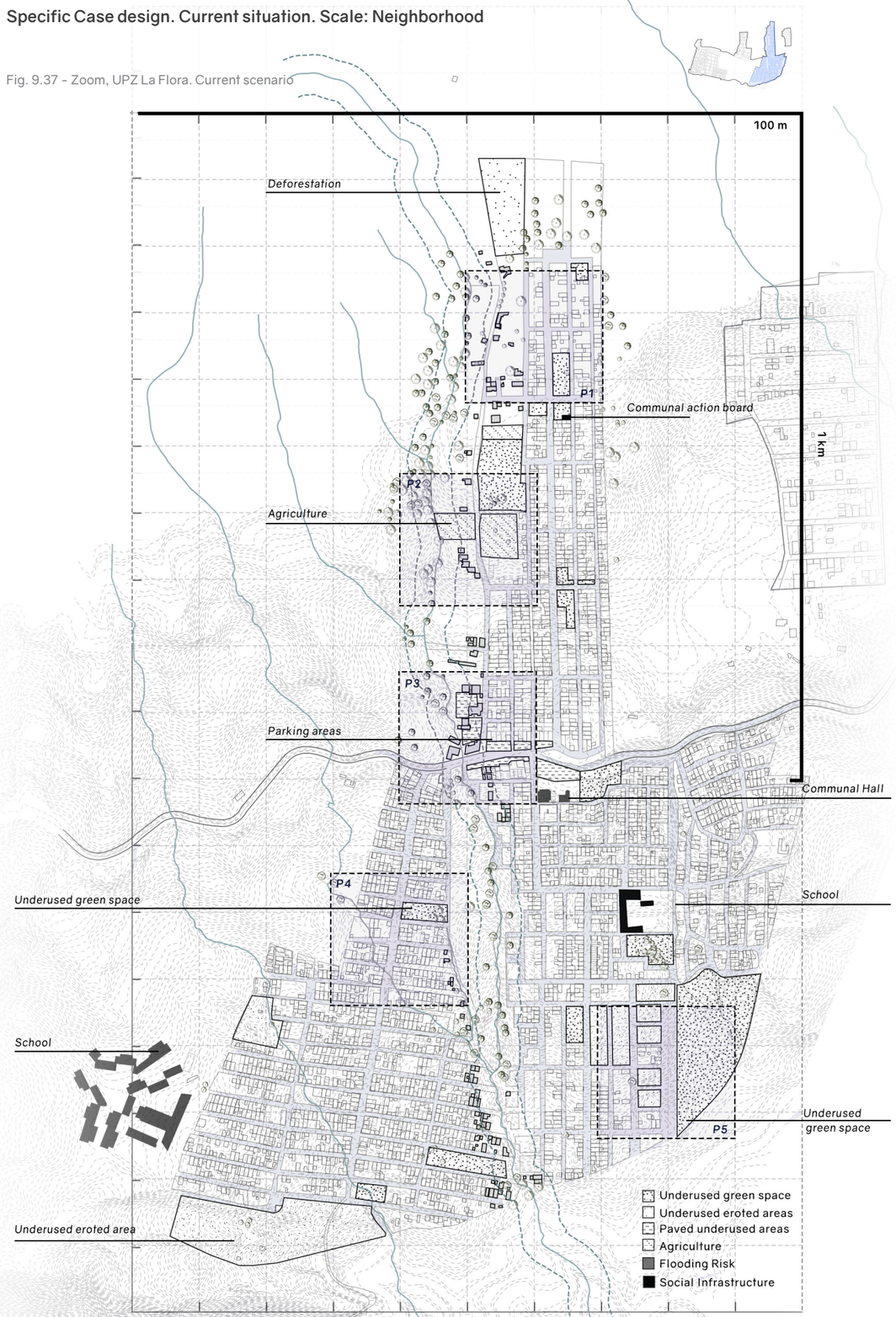


Fig. 9.37 - Zoom, UPZ La Flora. Current scenario



Specific Case design. Current situation. Scale: Neighborhood

Fig. 9.38 - Zoom, UPZ La Flora. Current scenario zooms

Map zoom in

Current situation - Picture



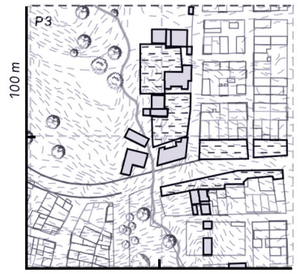


Big empty lots.
Source: Google Street View, 2020.





Source: Google Street View, 2020.



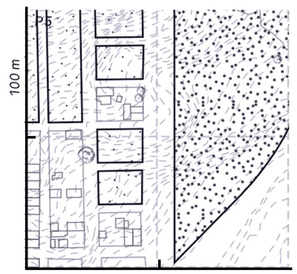


Source: Google Street View, 2020.





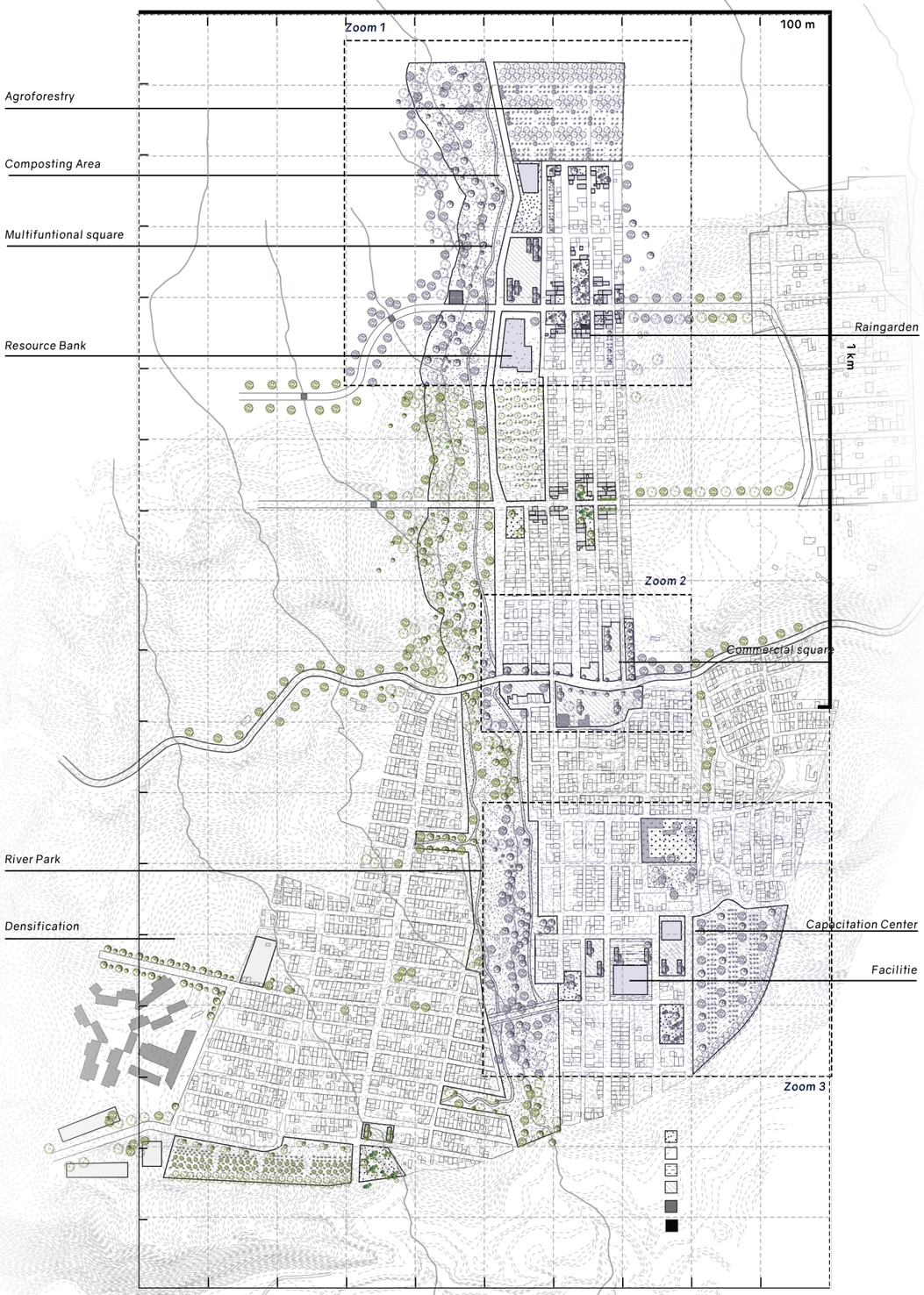
Source: Google Street View, 2020.





Source: Google Street View, 2020.

Fig. 9.39 - Zoom, UPZ La Flora. Proposed scenario



Specific Case design. Proposed situation. Scale: Neighborhood

Zoom #1

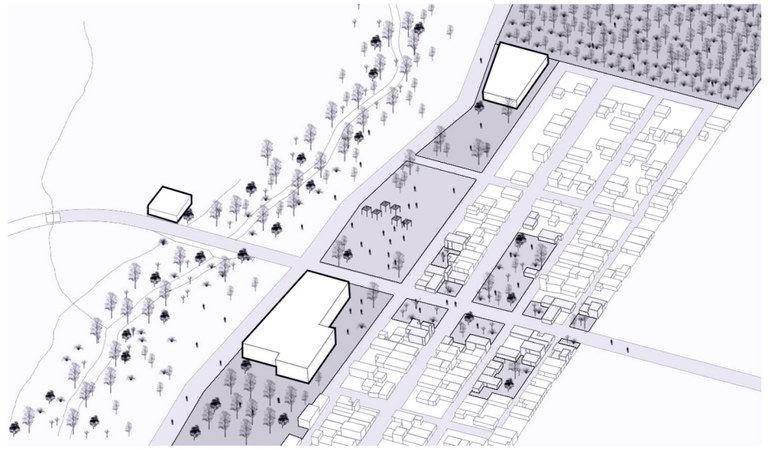


Fig. 9.40 - Zoom1 , UPZ La Flora. Proposed Scenario

Zoom #2

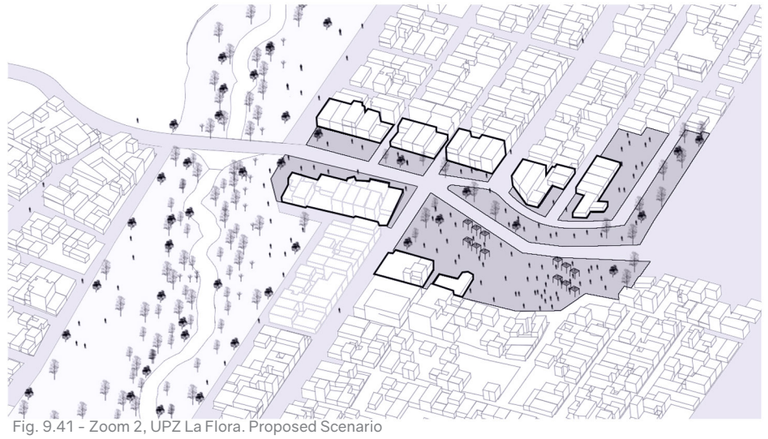


Fig. 9.41 - Zoom 2, UPZ La Flora. Proposed Scenario

Zoom #3

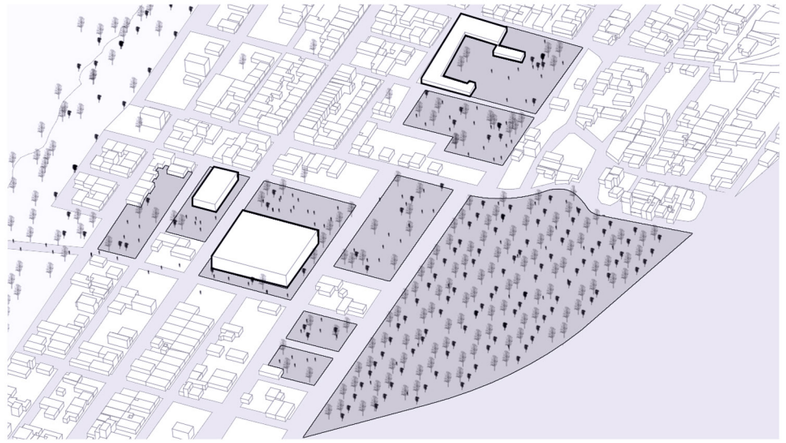


Fig. 9.42 - Zoom 3, UPZ La Flora. Proposed Scenario

Specific Case design. Proposed situation.
Systemic Operation in Bogotá. Scale: Local

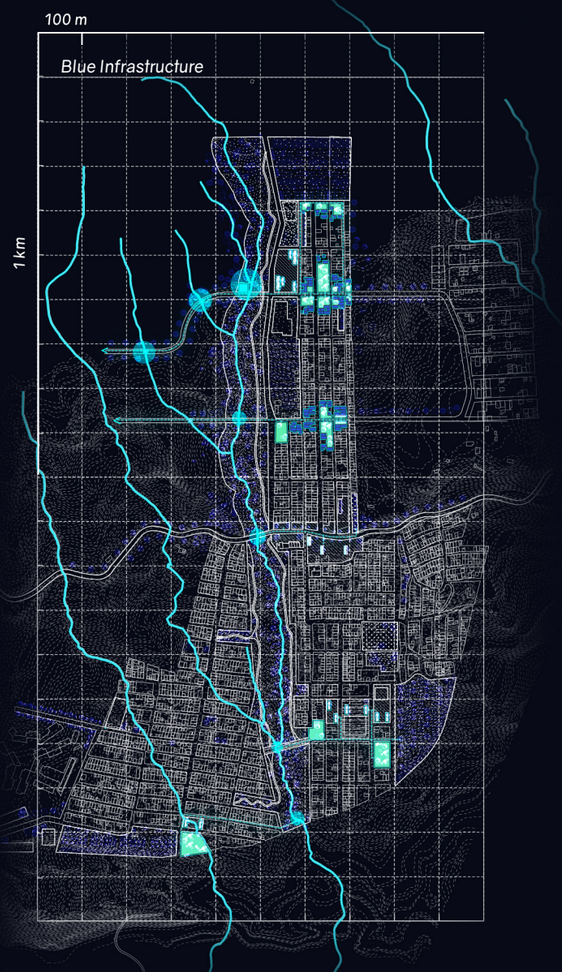


Fig. 9.43 - Systemic Operability Water Infrastructure.
Zoom in, UPZ La Flora

The implemented strategic actions in the proposed co-evolutionary pathway reached a systemic stabilization stage where both local scale actions and more complex mitigation strategies are correlated and therefore are transformed into a water management system where both local and municipal actors have an active role in the implementation, management and monitoring of the water ramifications.
The water systemic operability, which has been implemented from a correlated perspective with other socioeconomic and sociocultural systems, not only reduces the flooding risk and vulnerabilities, and restores the ecological backbones of the sector, but also contributes to and provides ecosystem services to other structural operations in the area.

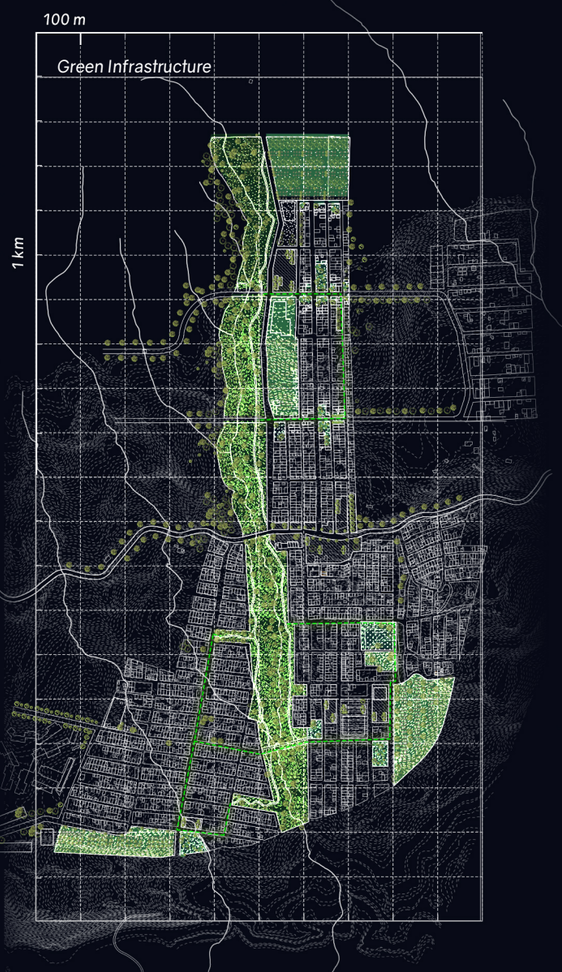


Fig. 9.44 - Systemic Operability Green Infrastructure.
Zoom in, UPZ La Flora

The systemic stabilization of the green backbones in the area manages to reduce the landslide risk, the land erosion and the flooding risk. Again, from local actions and more complex strategies on an urban scale, a reinterpretation of the role and capacity of local and municipal actors is possible as regards the implementation, maintenance and understanding of green infrastructures which, given their correlation with other identified systems, manage to fulfill the reduction of both social and ecological vulnerability in the area.

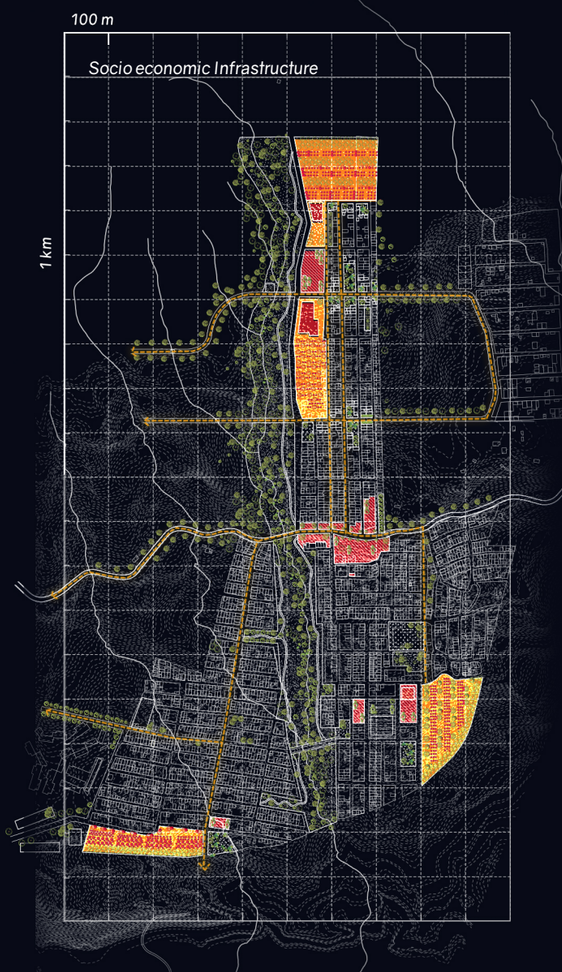


Fig. 9.45 - Systemic Operability Socioeconomic Infrastructure.
Zoom in, UPZ La Flora

From a socio-economic perspective, the strengthening and co-evolutionary process of green backbones, blue backbones and local economic practices strengthens both, the productive cycle, and the local population's knowledge about the maintenance and management of agricultural practices and multifunctional zones for the commercialization of products. This process achieves a point of stabilization where the productive systems become sustainable, in which the planning process between local communities and both public and private agents provides the population with the capacity to be self-sustaining from an endogenous perspective, reducing in a systematic way the socioeconomic and the environmental vulnerability.

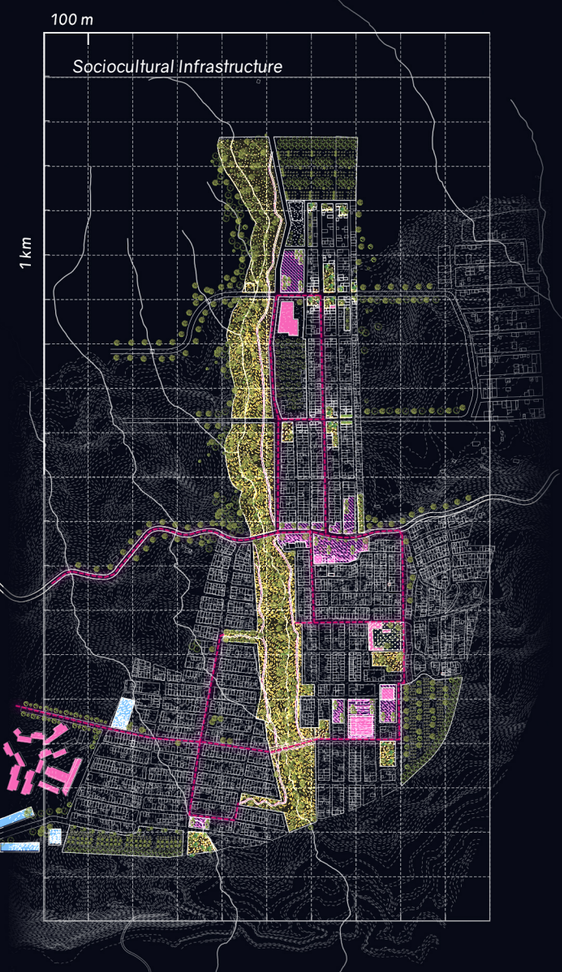


Fig. 9.46 - Systemic Operability Social Infrastructure.
Zoom in, UPZ La Flora

The implemented strategic actions during the co-evolutionary pathway were guided from the beginning to the end by a co-evaluation and social activation process in each phase, where the demographic composition and the main challenges of the sector became the development potentials. In this case, the high concentration of vulnerable populations such as women and children were the active agents in the transformation process, where the actions implemented achieved a stabilization and reduction of social vulnerability by directing actions to specific local problems.



As demonstrated in the previous section, the evolutionary transformation scenario in the planning unit led to a systemic stabilization at the local level.

By expanding the analytical scope to an urban context, the multi-scalar correlation of social and ecological systems is evident due to the reinforcement of structural elements in the planning unit. This systemic approach supports the evolutionary integration of vulnerable and fragmented areas into the functional structures of the formal city. Therefore, the impacts at the local scale are interrelated with the systems at the urban scale.

The intervened Blue infrastructure has a direct impact on the Tunjuelo river. Therefore, by diminishing the contamination rates and promoting the water collection and storage from the eastern hills, the flooding risk and contamination will diminish in the entire river course, considering the tunjuelo river as one of the main water bodies of the city.

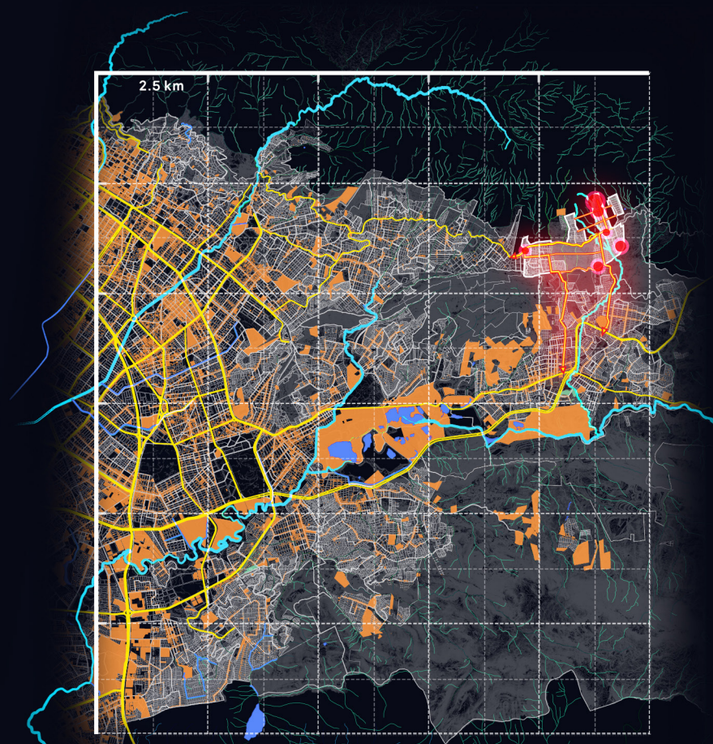
Fig. 9.48 - Multi-scalar systemic Operability and vision of the Green Infrastructure. UPZ La Flora within the Urban Scale



As has been highlighted throughout the analysis, the area is located between the eastern hills of the city, and the hills that constitute the ecological park "Entre nubes".

The environmental corridors and reforestation on both the eastern and western sides of the planning unit have a direct impact on the city's main ecological structures by strengthening the mountain ecosystem and soil recovery. At the same time, the conformation of the green axis in the planning unit leads to an integration with other green corridors and parks, where the evolutionary conformation of structuring ecological corridors can be directed, which in turn could provide ecosystem services to the city.

Fig. 9.47 - Multi-scalar systemic Operability and vision of the Water Infrastructure. UPZ La Flora within the Urban Scale



Both the incremental development of the road network in the planning unit, and the reinforcement of commercial nodes and commercial networks will open up the possibility of interconnecting commercial activities on an urban scale.

These new connections in the area towards the east and west, as well as the strengthening of the structural axis, and complementary roads in the interior, will not only strengthen local integration but also the possibility of accessibility to the site. The new multifunctional areas dedicated to marketing and services can progressively become reference points for populations close to the sector.

Fig. 9.50 - Multi-scalar systemic Operability and vision of the Social Infrastructure. UPZ La Flora within the Urban Scale



The strategic location of the area regarding ecological structures brings with it the potential to develop socio-cultural activities and at the same time strengthen the ecosystem services that these can provide.

The proposal to reinforce and complement a central axis that crosses from south to north and from east to west the planning unit, interspersing both commercial and recreational activities, achieves in turn to integrate the water axis to existing parks in the western zone and may be the beginning of a co-evoluionary development process to strengthen socio-cultural an ecological systems through activities on the edges of these areas.

Fig. 9.49 - Multi-scalar systemic Operability and vision of the Socioeconomic Infrastructure. UPZ La Flora within the Urban Scale

c. Co-evolutionary transformation scenario. UPZ Lourdes

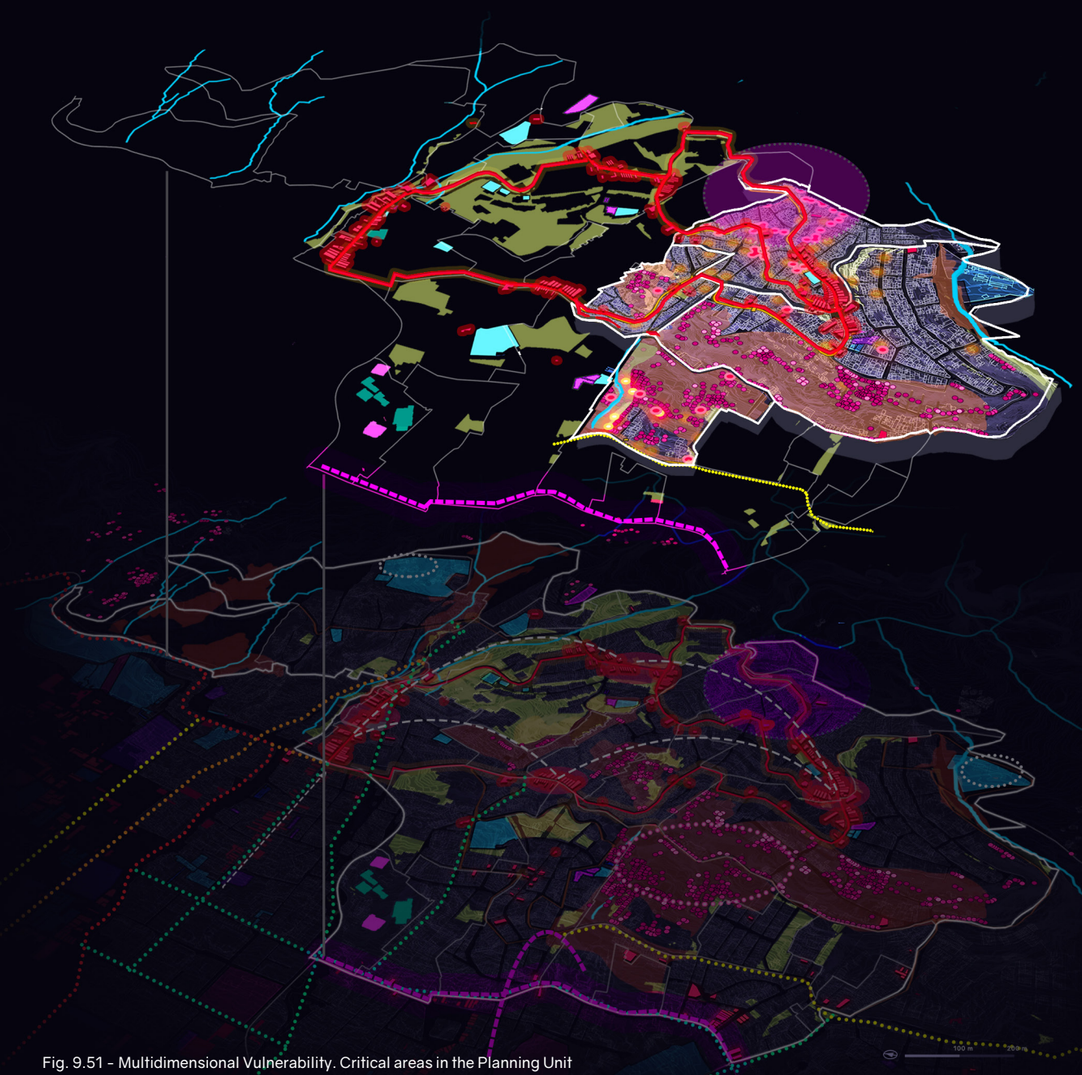


Fig. 9.51 - Multidimensional Vulnerability. Critical areas in the Planning Unit

c. Co-evolutionary transformation scenario. UPZ Lourdes
Strategic approach. Scale: Planning unit

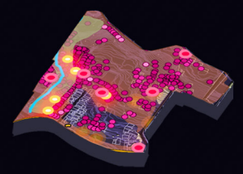
In order to start the implementation of the strategic actions in a scenario over time, the Multidimensional Vulnerability assessment, developed in the analytical framework, has two purposes. The first one is to identify the critical and/or strategic areas in order to reach the highest risk and vulnerability mitigation in the planning unit. The second is to identify the co-evolving systems that will establish the strategic goals in the long term and the implementation of the related actions.

In the case of the UPZ Lourdes, as has been demonstrated throughout the analytical framework, the areas with highest vulnerability rates and also the ones with the highest development potential are those shown in the following diagram. The identification of these neighborhoods and the correlated strategic goals leads to the first transformation phase.

Multidimensional Vulnerability assessment

Strategic Goals

14. Ramirez



Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Sliding and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

Ecology - Socio Economic
- Strategic Goal Productive Ecology
Sociospatial - Ecology
- Strategic Goal: Systemic alignment through reprogramation
Socioeconomic - Social
- Strategic Goal Endogenous activation

11. El Dorado



Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Sliding and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

Ecology - Socio Economic
- Strategic Goal Productive Ecology
Sociospatial - Ecology
- Strategic Goal: Systemic alignment through reprogramation

12. Santa Rosa de Lima



Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Sliding and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

Ecology - Socio Economic
- Strategic Goal Productive Ecology
Sociospatial - Ecology
- Strategic Goal: Systemic alignment through reprogramation
Socioeconomic - Social
- Strategic Goal Endogenous activation

10. El Consuelo



Social, ecological and socio economic Vulnerability

Spatial Fragmentation
Social Infrastructure
Social Segregation
Sliding and Flooding Risk
Ecological Fragmentation
Ecological Degradation
Economic Infrastructure

Sociospatial - Ecology
- Strategic Goal: Systemic alignment through reprogramation

1. Recognitional and Social activation Phase:

Fig. 9.53 - Implemented Strategic actions. Recognitional Phase. UPZ Lourdes

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

S: Micro Participatory Strategies
(Social Activation)

- Workshops
- Brainstorming
- Surveys and interviews
- Cultural and artistic activities
- Community meetings

As in the previous Case (La Flora) Social activation strategies are aimed towards the consolidation and reinforcement of local empowerment and community leadership. In order to start with the transformation process, it is essential to develop communication channels between the formal and informal agents to generate motivation and trust. Activities focused from the co-production of information and mapping, as well as recreational and artistic activities are sources of both demographic and territorial information, as well as tools to identify the social dynamics of the sector, identify the roles and leaders in the community, the capacities and local expectations.

Fig. 9.54 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Recognitional Phase. UPZ Lourdes

S

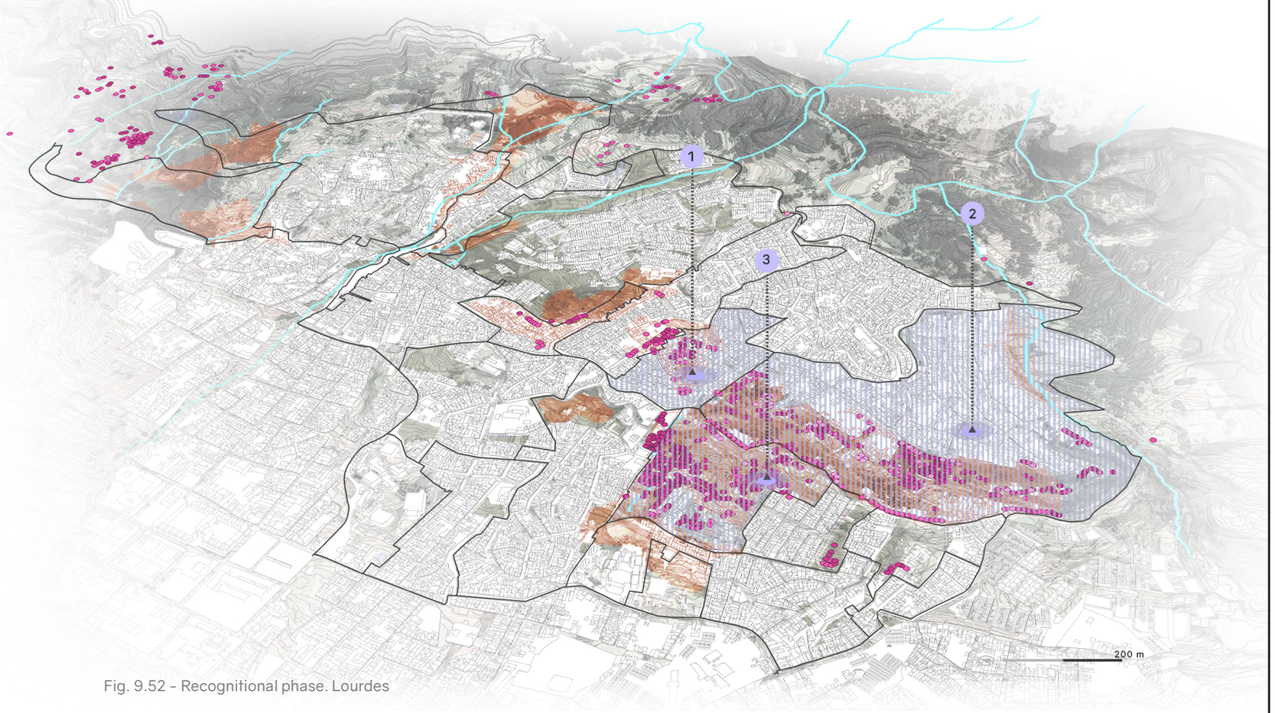
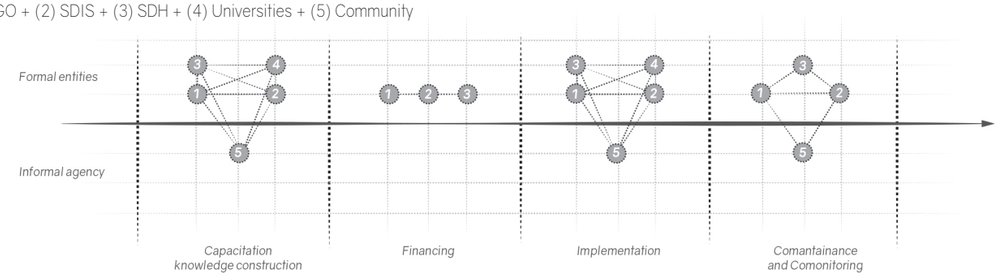


Fig. 9.52 - Recognitional phase. Lourdes

Fig. 9.55 - Actors performance and rolls. Recognitional phase. UPZ La Flora.

(1) NGO + (2) SDIS + (3) SDH + (4) Universities + (5) Community



1 **1. Barrio Santa Rosa de Lima**
Constructions: 570
Population aprox. : 1.995

2 **2. Barrio El Dorado**
Constructions: 1700
Population aprox. : 5.950

3 **3. Barrio Ramirez**
Constructions: 115
Population aprox. : 300

Collected Data:

- Adult population
- Informal enterprises in the house (more urban dynamics)
- For every 100 women there are 102 men
- Drugs, insecurity,
- Lowest number of facilities in the locality. 30 for each 10.000 inhabitants.
I- nformal core: recyclers, street inhabitants
- Households by dwelling : 1.81
- Person per household: 3.95

The inhabitants of Ramírez arrived after the disappearance of the old brick factories that stood at the foot of the eastern mountains. This happened in the late 1970s and most of them were families of waste pickers with very low incomes. At first there were only about 20 families that grew up. People built the houses with what they found, with what they took out of the recycling, boards, sandbags. These families spread out and extended the precarious sheds, where up to three generations lived together. Little by little, dozens of people displaced by Colombia's internal conflict also joined in.

"The Invisible Neighbors of President Santos" Maria Jose Carmona, Bogotá November 26, 2015 . Newspaper: EL PAIS

"By profession I am a recycler, like the vast majority of people who live here in Ramirez. For us, what is rubbish for others becomes a treasure. The maximum I can do per month is 550,000 pesos, not enough to pay a rent. So I came here seven years ago. At the time, no one paid, you took a piece of land and started building your house. It is no coincidence that almost all the inhabitants of the Ramirez district are made up of recyclers. People who work a lot, without a contract."

"It is in my heart to help and provide the help I never had. There was a big problem here regarding the debris dump and it was bad for our kids. So one day I decided I wanted to contribute with a park, a space for our children who didn't had any space to play. This idea turned into a ship. The idea of **"The Ramirez pirate ship", developed because we are a pirate neighborhood.** Now our children have a space to play and we are motivated for many other projects. I want to leave my stamp in this neighborhood."



The invisible resistance of Bogotá's "recyclers" by Federico Annibale - November 7, 2019
Picture source: youtube.com Chanel: Conectados Canal Capital. Interview: Los piratas de Ramirez. 20 abr. 2017

2.1 Procedural Phase

Fig. 9.58 - Implemented Strategic actions. Procedural Phase. Stage 1. UPZ Lourdes.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE

1. Reforestation and Re-vegetation (centros

8. Waste disposal and Recycling points

Fig. 9.57 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Procedural Phase. Stage 1. UPZ Lourdes

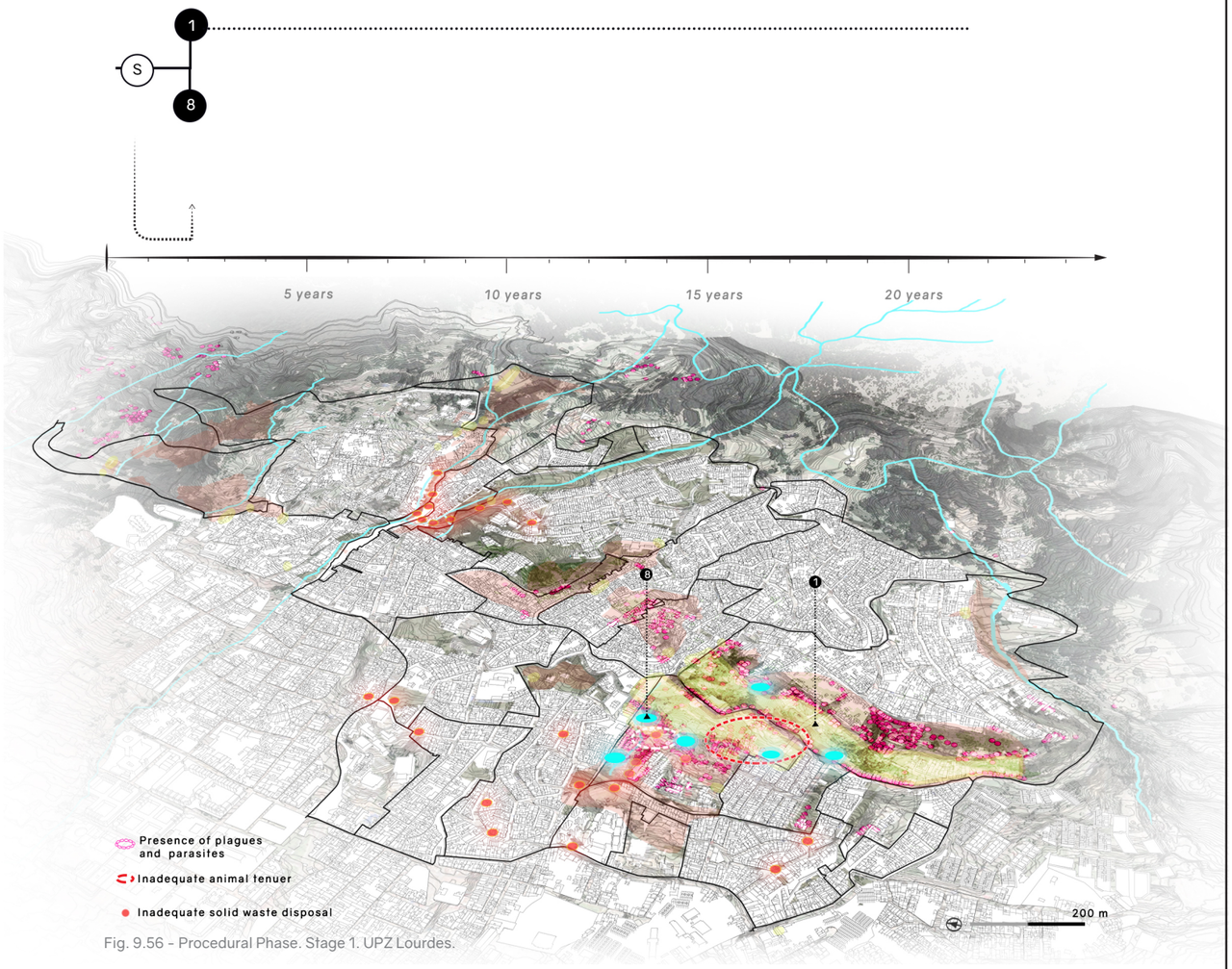
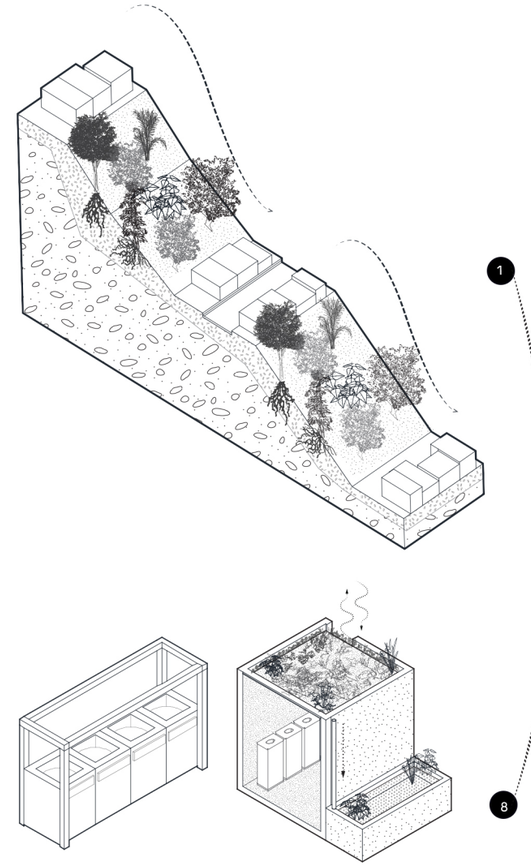


Fig. 9.56 - Procedural Phase. Stage 1. UPZ Lourdes.

Implemented strategic actions

The following interventions, as described in the procedural phase in the previous section, involve nature based solutions. This, due that working with nature requires a longer term of preparation and assessment and aimed to have lower costs in the implementation. In this case, the landslide risk and deforestation in the central core of the area leads to the implementation of reforestation and re vegetation actions as described below. Each action is defined through the actors already explained through the previous operability chart, and explores the possible interrelations with others in co-evaluation process at the end of the phase.



Reforestation n and Re vegetation

SDA + JBB + Community + IDIGER + SDP

The first social activation strategies identified recycling communities as the population with highest vulnerability rates, in which already some community leaders have been working in the improvement of the neighborhood. Based on this identification collaborative efforts were initiated with this community leaders, other community organizations, children and formal municipal actors with high expertise in vegetation and land slide mitigation in order to start a reforestation of the pronounced topographies that are currently without trees. The capacitation and co-production of information between formal and informal actors regarding the benefits of nature as an active agent of change results in the correlated needed strategy regarding high contamination in specific areas due to waste disposal.

Waste disposal areas and Recycling Points

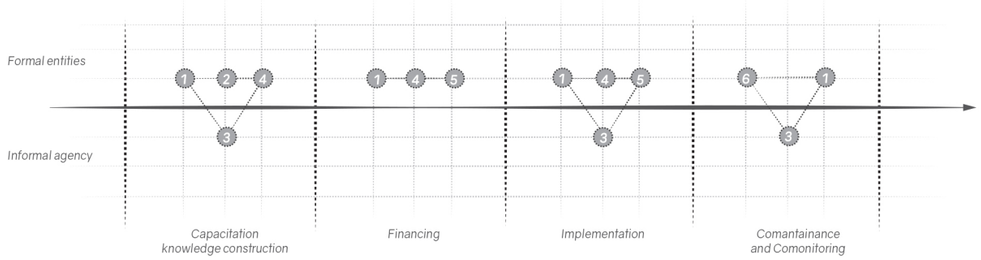
PA+ SDA + Community + SDP

The strategic action of implementing special sites for the disposal of waste and leftover materials from the recycling process gives rise to a collaborative process with the recycling communities where the materials required for the implementation of this space are largely reused. This, in addition to capturing the identity of the area, plays a sustainability role. The process includes the Bogotá waste collection company, where again agreements are reached on possible strategic points and new routes for the system to be integrated.

The following diagram shows the performance and role of the actors involved during this phase, where the construction of knowledge regarding reforestation and nature based solutions to counteract landslides, the seeding and the construction and monitoring of special waste nodes and crops, are developed in a collaborative process between formal and informal agents.

Fig. 9.59 - Actors performance and rolls. Procedural phase. Stage 1. UPZ Lourdes

(1) SDA + (2) JBB + (3) Community + (4) IDIGER + (5) SDP + (6) PA



2.2 Procedural Phase

Fig. 9.62 - Implemented Strategic actions. Procedural Phase. Stage 2. UPZ Lourdes.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE
- 5. Geo grids
- 7. Structural reinforcement
- 11. Relocation

Fig. 9.61 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Procedural Phase. Stage 2. UPZ Lourdes

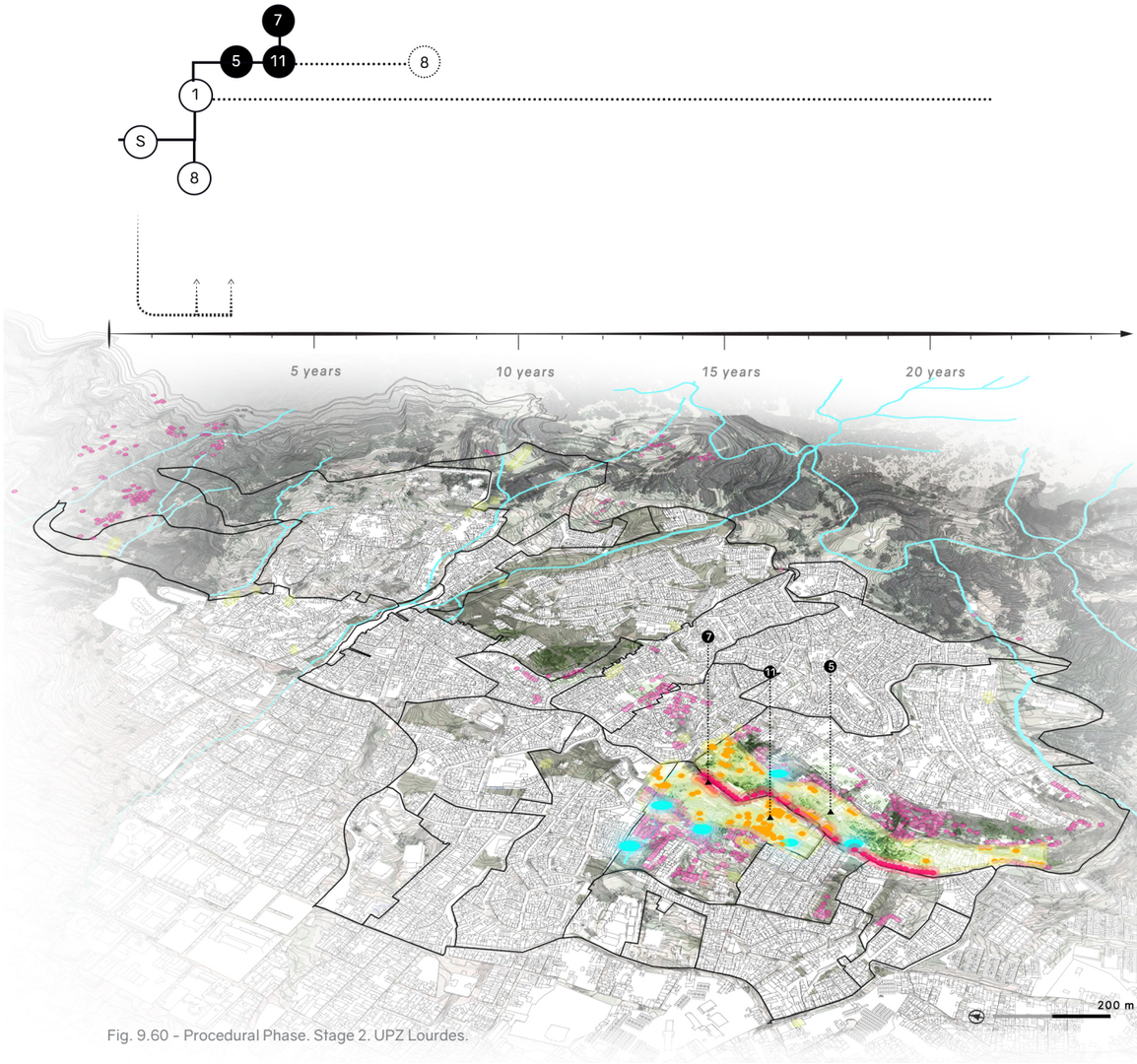
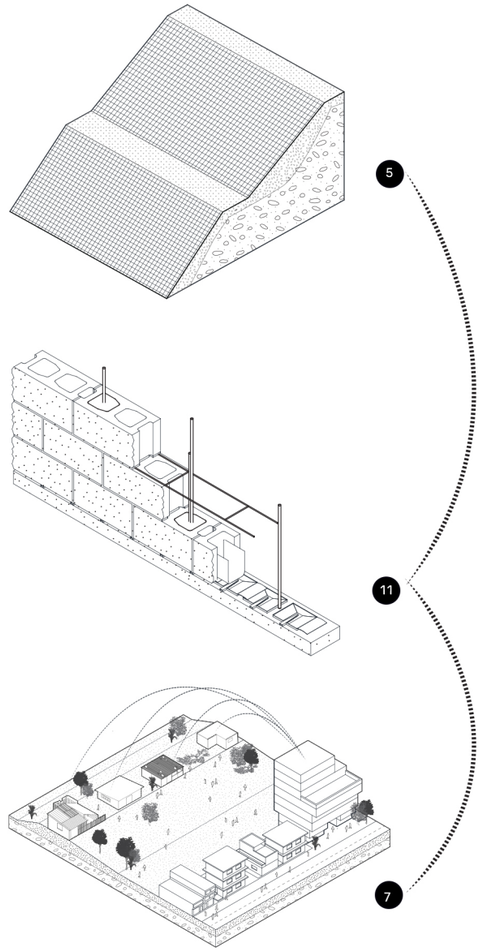


Fig. 9.60 - Procedural Phase. Stage 2. UPZ Lourdes.

Implemented strategic actions



Geo grids
IDIGER + IDU + SDP + Community

Due to terrain conditions, reforestation actions are complemented at some critical points with actions that incorporate both natural elements and engineering interventions. These processes starts a collaborative process between entities focused on the natural environment and entities focused on landslide risk mitigation. The community is again involved in the process of both training and monitoring of the implemented actions.

Structuring Reinforcement
CVP + SDH + SDP + Inh. + IDIGER

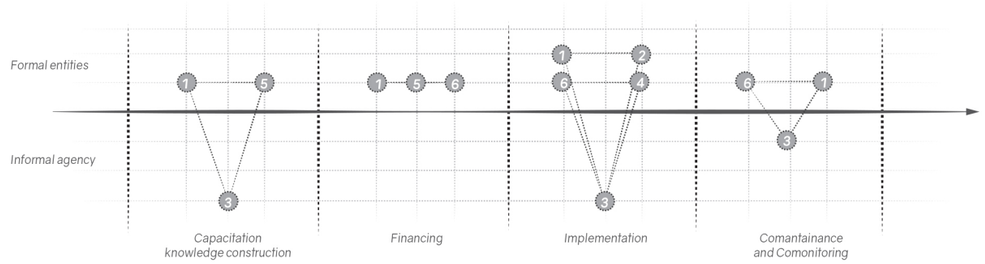
The reforestation and risk mitigation actions lead to two complementary actions, the reinforcement of structures in the road axes that can fulfill commercial purposes at a local level, and the housing relocation in risk and potential reforestation areas. The strengthening of these structures is carried out with formal entities and the informal recycling communities that built them. The risk mitigation entities enter into a collaborative process both with the entities in charge of housing issues in the city, as well as with the affected populations.

Relocation
CVP + SDH + SDP + Inh. + IDIGER

Relocation of dwellings in risk areas leads to two parallel processes. On the one hand the identification and characterization of the populations living in these higher risk areas, the training and provision of information about the relocation process, and on the other hand the evaluation of possible areas within the neighborhood where these populations can relocate without breaking the links and social ties with their community.

Fig. 9.63 - Actors performance and rolls. Procedural phase. Stage 2. UPZ Lourdes

(1)IDIGER + (2) IDU + (3) Community + (4) SDP + (5) CVP + (6) SDH



3.1 Structural Phase

Fig. 9.66 - Implemented Strategic actions. Structural Phase. UPZ Lourdes.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE
- 3. Multifuntional public areas
- 1. Multifuntional networks
- a. Gray Infrastructure

Fig. 9.65 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Structural Phase. UPZ Lourdes

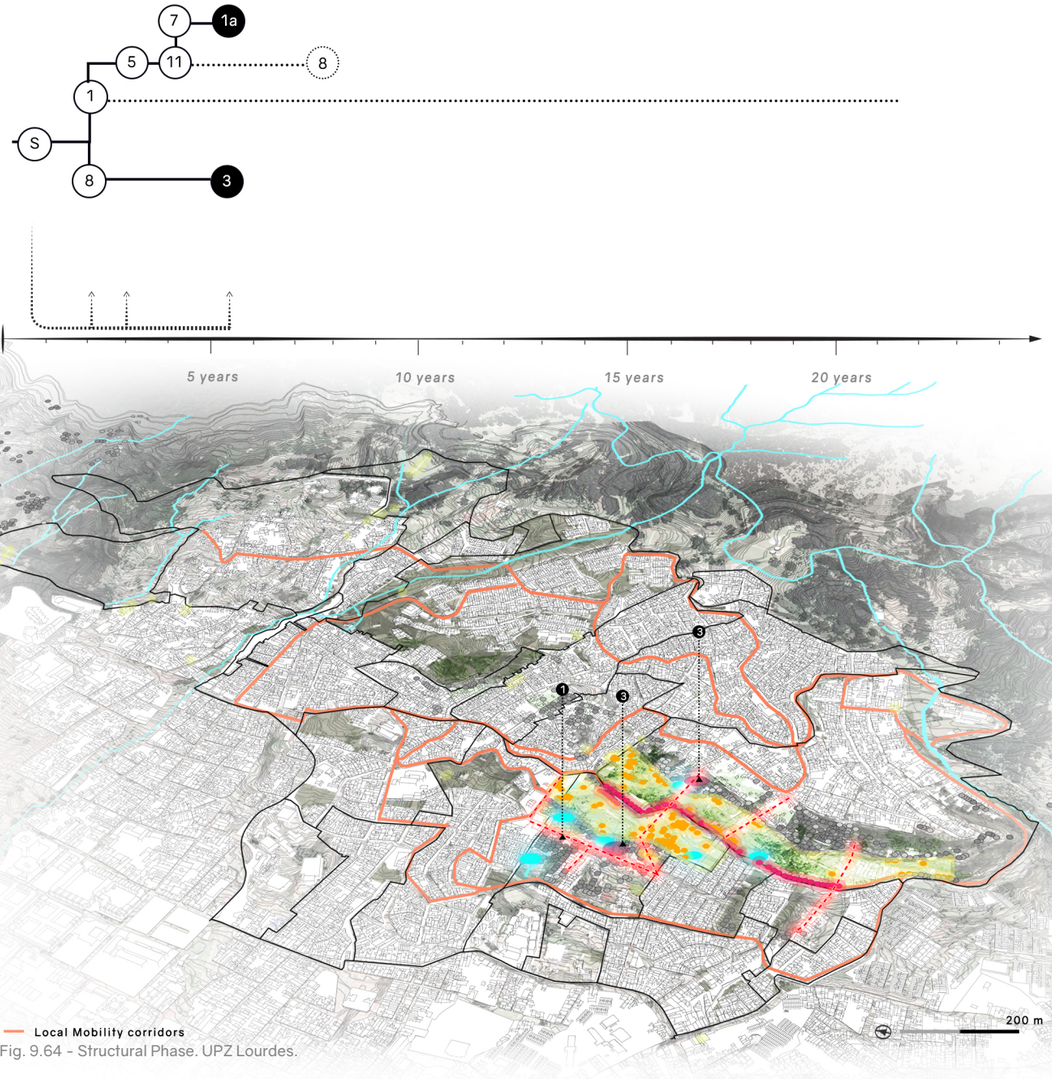
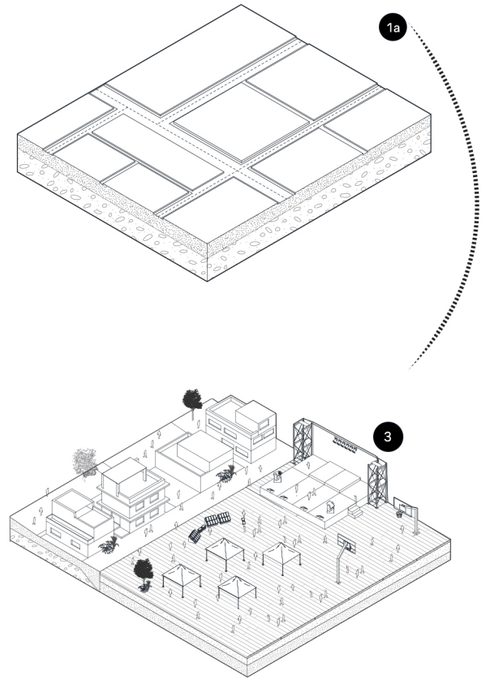


Fig. 9.64 - Structural Phase. UPZ Lourdes.

Implemented strategic actions

The next phase is based on the recognition, consolidation and integration of urban structural systems within the functional dynamics of the city. This recognition therefore implies the approach of an evolutionary interrelation of local strategies with more urban scale systems, evaluating both the possibilities and needs with regard to socio-spatial connectivity and accessibility, as well as the consolidation and transformation of ecological backbones.



Gray Infrastructure

SDM + SDP + IDU + EAAB + Community

After evaluating the positive impacts of the proposed interconnections on a local and urban scale, the development of the roads is carried out through a collaborative process between the municipal entities in charge of mobility systems and the local community. The mobility assessments indicate that connectivity infrastructure crossing large non-permeable lots will improve the integration of waste picker neighborhoods into the planning unit. These large plots have the most pronounced topography, where co-creation processes with the community require innovation in order to find joint solutions that respond to social, spatial and ecological conditions.

Multifunctional Public areas

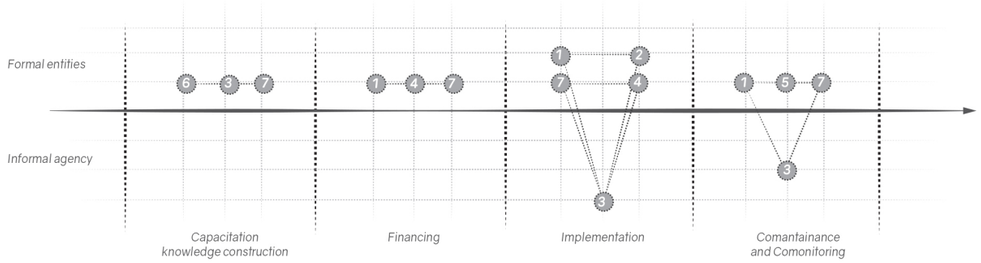
SDCRD + IDRD + Community + SDP + IDU

While establishing connectivity axes, a correlated action arises. The axes require some interaction and pulling points at the extremes. The lack of commercial, recreational and social interaction spaces leads to the development of multifunctional squares that allow an integration process with the surrounding communities. The implementation and maintenance of these interventions initiates a co-creation process with the community.

The following diagram shows the performance and role of the actors involved during this phase, where the construction and innovation regarding mobility infrastructures and communal spaces will reinforces the role of the recycling community in the area by empowering and making them part of the implementation, design and maintenance of this space.

Fig. 9.67 - Actors performance and rolls. Structural phase. UPZ Lourdes

(1) SDM + (2) SDP + (3) Community + (4) IDU + (5) EAAB + (6) SDCRD + (7) IDRD



3.2 Structural Phase

Fig. 9.70 - Implemented Strategic actions. Structural Phase. Stage 2.UPZ Lourdes.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE
13. Drainage Infrastructure
SA
1. Multifuntional networks
d. Public Services
EA
5. Community Center

Fig. 9.69 - Co- evolutionary pathway. Timeline and Interrelate strategic actions. Structural Phase. Stage 2. UPZ Lourdes

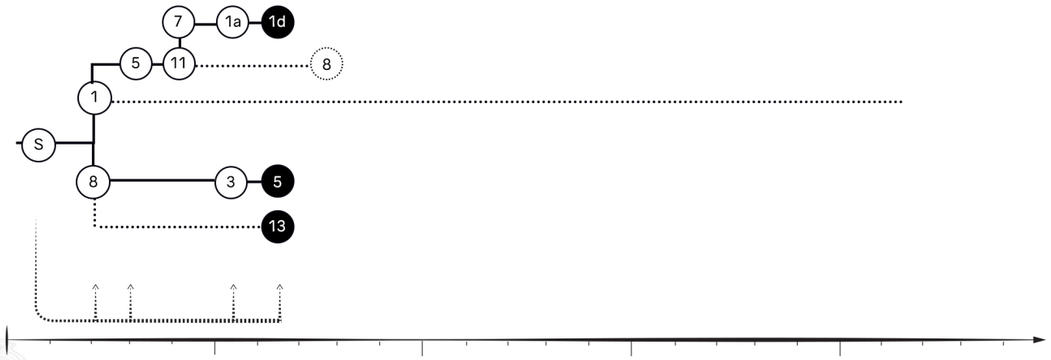
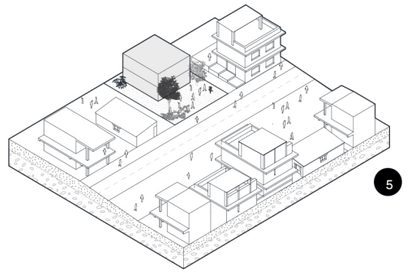




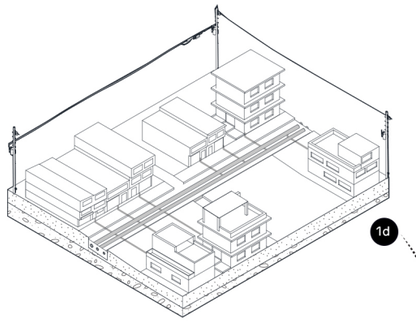
Fig. 9.68 - Structural Phase. Stage 2. UPZ Lourdes.

Implemented strategic actions



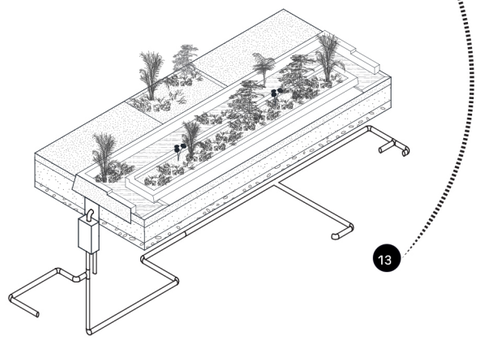
Community Center
Community + SDP

The development of a waste disposal hub and the creation of a multi-functional area within the neighborhood has led to the construction of a community center operated by social leaders in order to manage and maintain this cluster, which has been consolidated as a local identity focus for the neighborhood. This construction is again in the same process of co-creation with the community and the children, with recycled materials.



Public Services
UAESPS + EAAB + ETB + COD + GEB + GNB + IDU +SDP + SDH

The development of one of the roads that will link the neighborhood from north to south will lead to the installation of public services in the inside of the neighborhood.



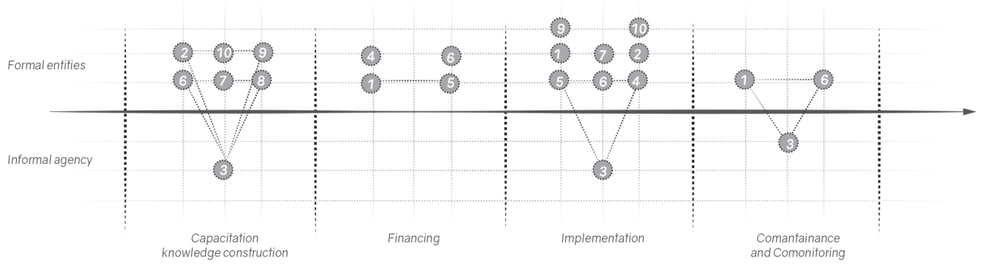
Drainage Infrastructure
EAAB + SDP + IDU

Both waste management and reforestation actions lead to improvements in the water quality of the water course. This stabilization have led to the installation of a water collection system on the slope. This will help prevent soil erosion, irrigate the growing forests and provide water to the community for maintenance and cleaning of the new common areas.

The actions at this stage, being oriented towards the construction and development of service infrastructures, requires a high collaboration between formal entities. The provision of services and water management will help to reduce the social and ecological vulnerability and will provide natural resources in order to continue with other strategic actions.

Fig. 9.71 - Actors performance and rolls. Structural phase. Stage 2. UPZ Lourdes

(1)SDP + (2) SDH + (3) Community + (4) IDU + (5) EAAB + (6) UAESPS + (7) ETB + (8) COD + (9) GEB + (10) GNB



3.3 Structural Phase

Fig. 9.74 - Implemented Strategic actions. Structural Phase. Stage 3. UPZ Lourdes.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE
1. Water colection
2. Raingarden
SA
1. Multifuntional networks
c. Green Networks
8. Densification

Fig. 9.73 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Structural Phase. Stage 3. UPZ Lourdes

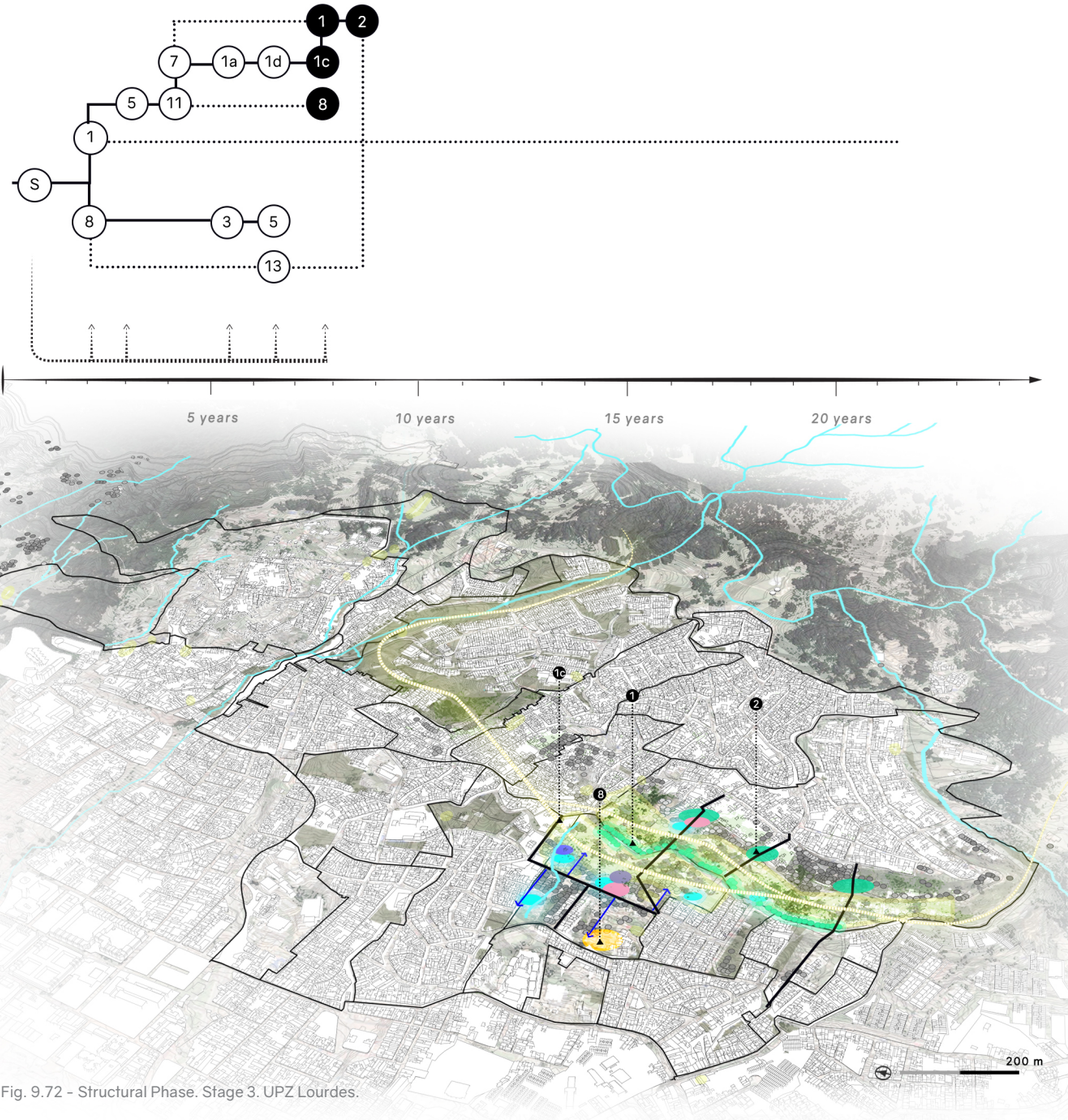
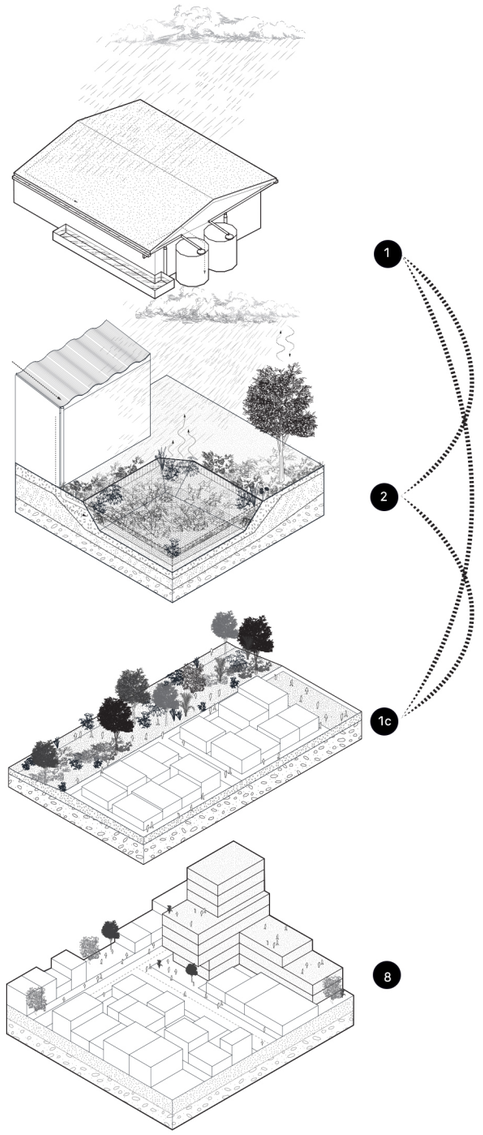


Fig. 9.72 - Structural Phase. Stage 3. UPZ Lourdes.

Implemented strategic actions



Water Collection
Inhabitant + EAAB
The reinforcement of the structures in the road axes reaches its culmination. These structures will be used for the storage and marketing of various goods produced by the communities. Being in the middle of two forest areas, these structures will be supported by water collection systems that will help stop erosion and prevent soil disruption.

Rain garden
Inhabitant + SDA

Water collection systems lead to the creation of complementary natural services. The creation of rain gardens in the upper parts of the slope will have the same collection functions and will serve both aesthetic and landscape purposes. The care of these areas will be the responsibility of the communities.

Green Network
Community + SDA + DADEP + SDP + JBB

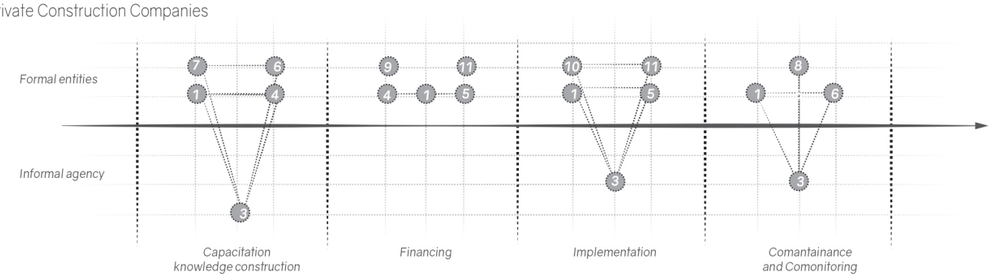
The reforestation efforts reached a stage where the vegetation has already grown and an environmental axis begins to consolidate within the planning unit. Since vegetation has been established for risk mitigation purposes, certain areas are complemented with urban agriculture, ornamentation and additional gardens.

Densification
SDP + SDH + CVP + IDU + ERU + Private construction companies

The populations located in higher landslide risk in the area were now relocated to the interior of the neighborhood in areas of lower inclination, along the axes that already have public services and well-established community centers.

Fig. 9.75 - Actors performance and rolls. Structural phase. Stage 3.UPZ Lourdes

(1) SDA + (2) JBB + (3) Community + (4) EAAB + (5) SDP + (6) DADEP + (7) JBB + (8) SDH + (9) CVP + (10) IDU +
(11) Private Construction Companies



4.1 Functional and Distributional Phase

Fig. 9.78 - Implemented Strategic actions. Functional Phase. UPZ Lourdes.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE
8. Recycling Points
EA
2. Green spaces

Fig. 9.77 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Functional Phase. UPZ Lourdes

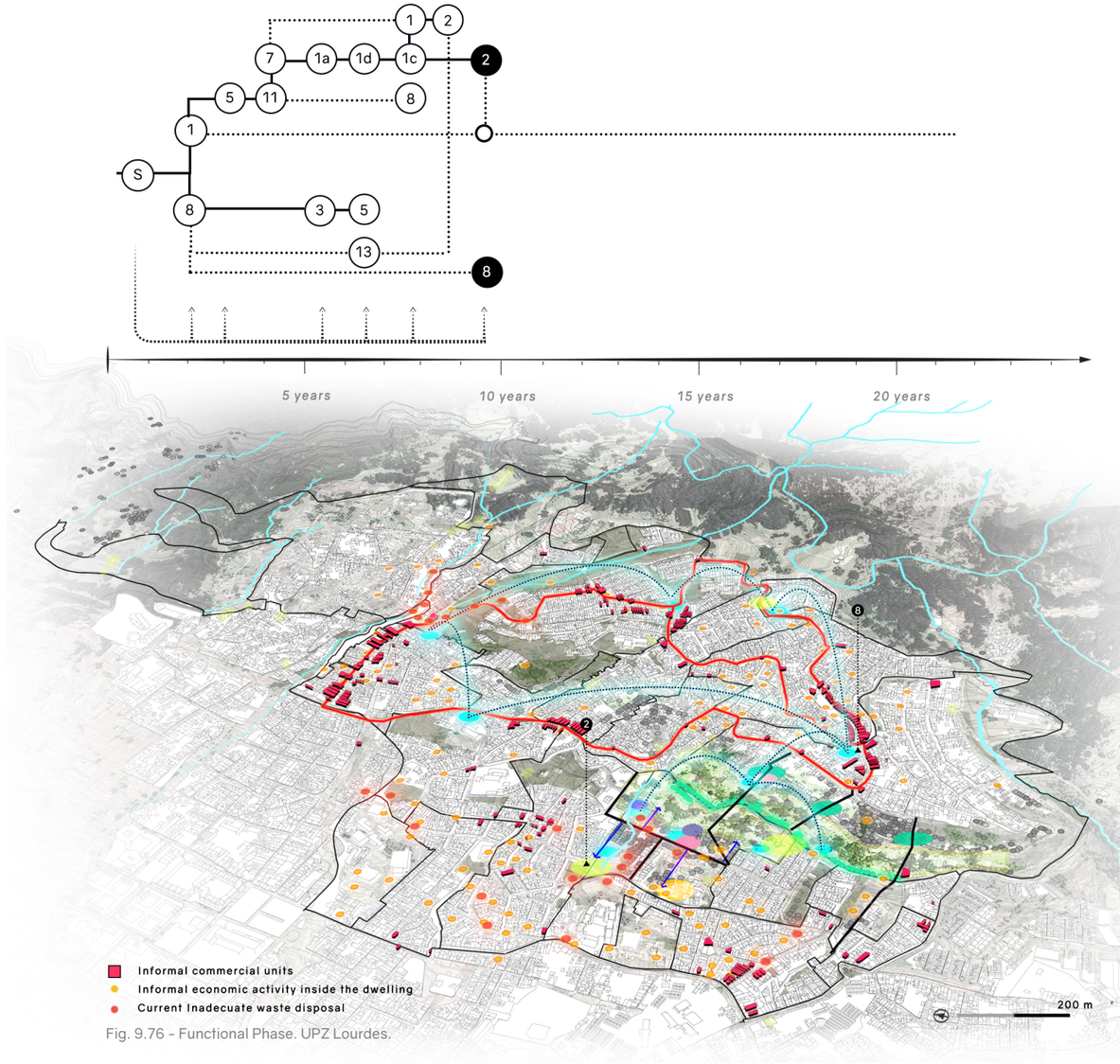
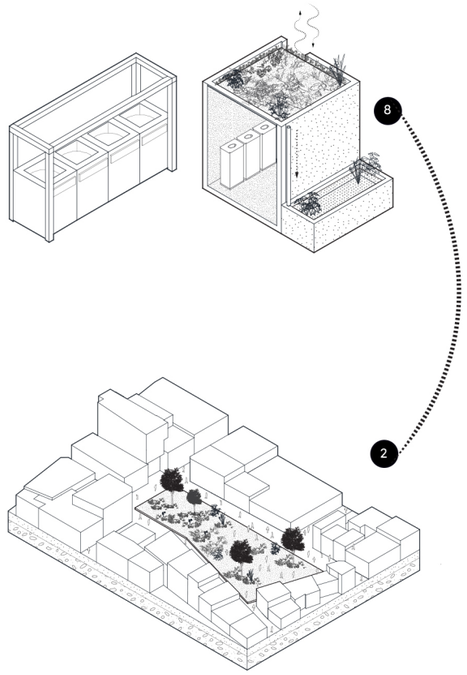


Fig. 9.76 - Functional Phase. UPZ Lourdes.

Implemented strategic actions

Following the consolidation of structuring systems, the distributive and functional phase is aimed at evaluating the distribution of services, opportunities and spatial interventions in relation to the possible links between structural elements, daily life systems and social networks.



Recycling Points
PA + SDA+ Community + SDP

Once the social and ecological systems are reinforced in the most vulnerable core of the planning unit, the distribution of functions in other areas will help to expand the socio-economic systems and integrate this center with its surroundings.

Waste disposal areas located inside the recycling neighborhood are extended to waste collection areas across the area, related to the current economic infrastructures. The same implemented action in another period of time is now focused on the interaction between different communities through sustainable and recycling activities.

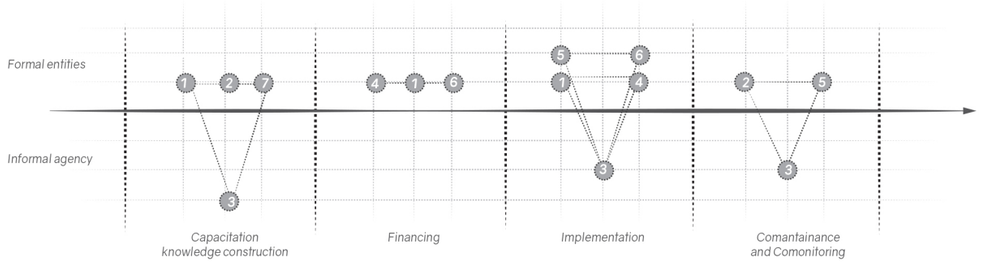
Green Spaces
Community + DADEP + SDA + SDP + IDU + IDRD + SDIS

The expansion of strategies brings with it the expansion of the ecological and recreational system that began to consolidate in the center.
To this end, certain green areas are beginning to be established in spaces that lack social infrastructure. These spaces will be connected to the waste collection stations, generating green areas that can gradually be consolidated as parks around the notion of sustainability.

The actions at this stage, being oriented towards the construction and development of recycling areas and green spaces, requires a high collaboration between different communities in the planning unit. The starting strategic actions focused on the reinforcement of the first vulnerable recycling populations, became at this point not a limitation but a potential and line of development. The empowering of local specific economies expanded through the planning unit guiding and evolutionary resilience between ecological and social systems focused on local environmental related economies.

Fig. 9.79 - Actors performance and rolls. Functional phase. UPZ Lourdes

(1) SDA + (2) PA + (3) Community + (4) SDP + (5) DADEP + (6) IDU + (7) IDRD



4.2 Functional and Distributional Phase

Fig. 9.82 - Implemented Strategic actions. Functional Phase. Stage 2 UPZ Lourdes.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

SA
- 4. Facilities
- 3. Multifunctional public areas

Fig. 9.81 - Co- evolutionary pathway. Timeline and Interrelate strategic actions. Functional Phase. Stage 2. UPZ Lourdes

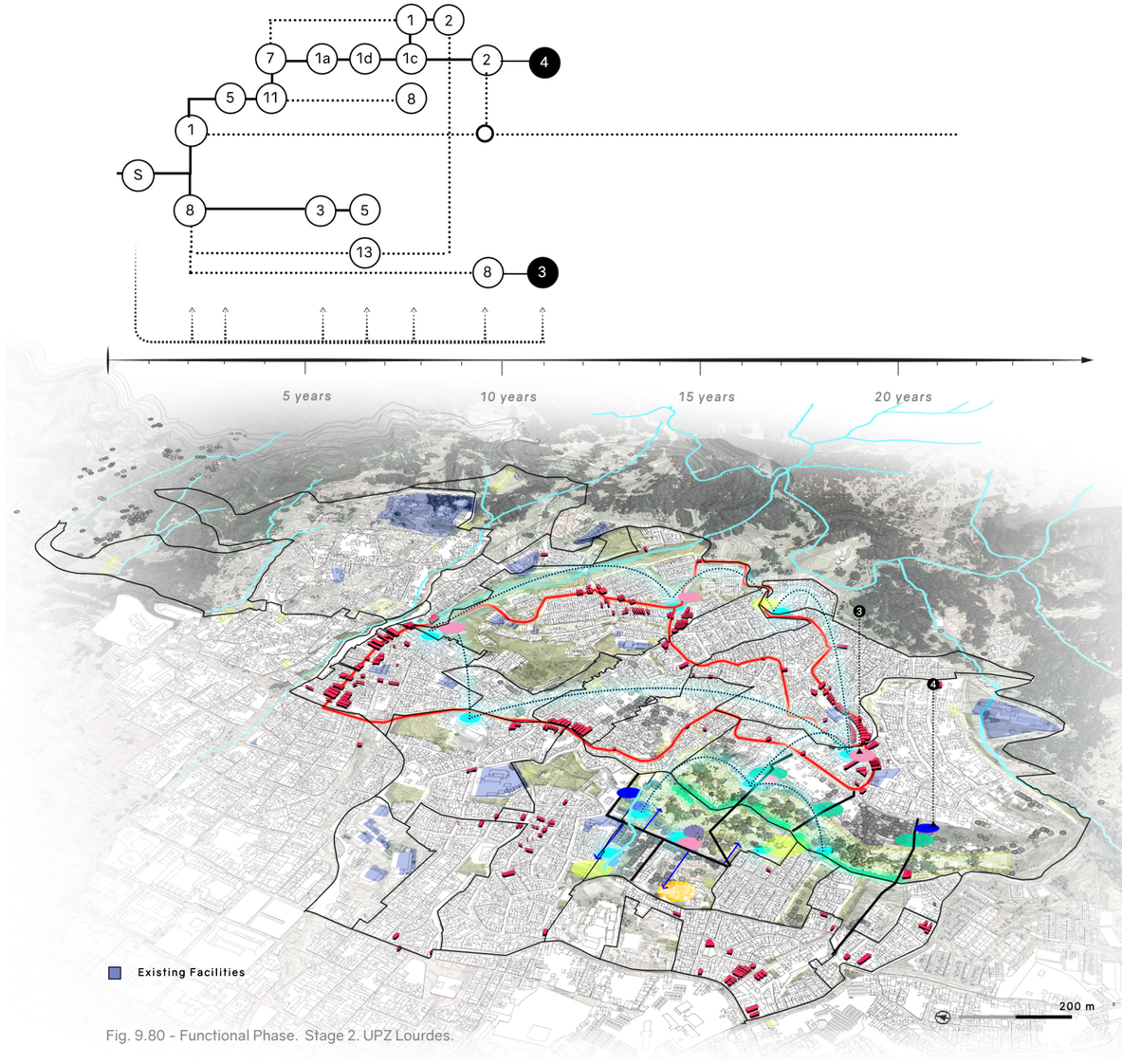
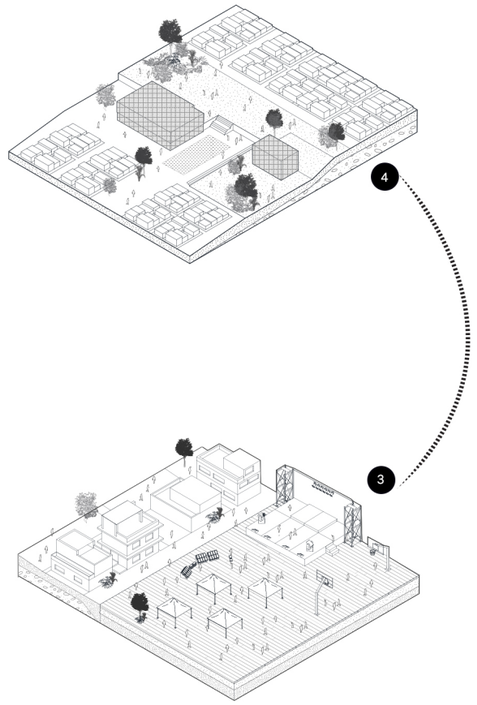


Fig. 9.80 - Functional Phase. Stage 2. UPZ Lourdes.

Implemented strategic actions



Facilities

SDCRD + IDRD + SDP + IDU + SDIS + Universities

The parks and ecological structures lead to the proposal of a facility that complements the water collection unit and reinforces the ecological and recreational axis in the core of the planning unit.

Multifunctional Public areas

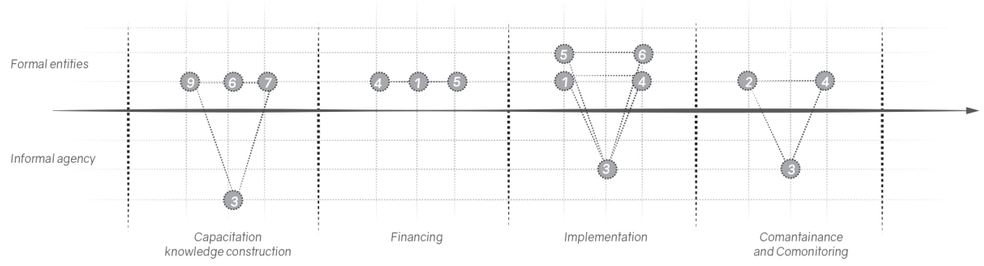
SDCRD + IDRD + Community + SDP + IDU

The waste collection points, located in the functional structures inside the planning unit, reached a point of consolidation and community links between diverse local individuals require the expansion and development of interaction spaces.

The activities around recycling were transformed into commercial activities of different products and services regarding circular economies. After a co-evaluation process between formal and informal agents, nodes of major activities and interaction were identifies and are strategic areas for the developing of public multifunctional areas. This process is carried out with formal entities in charge of the development of public space and with the communities to establish roles in the implementation and maintenance of these places.

Fig. 9.83 - Actors performance and rolls. Functional phase. Stage 2. UPZ Lourdes

(1) SDCRDC + (2) IDRD + (3) Community + (4) SDP + (5) IDU + (6) SDIS + (7) Univ. + (8) SDH + (9) SDDE + (10) SDIS



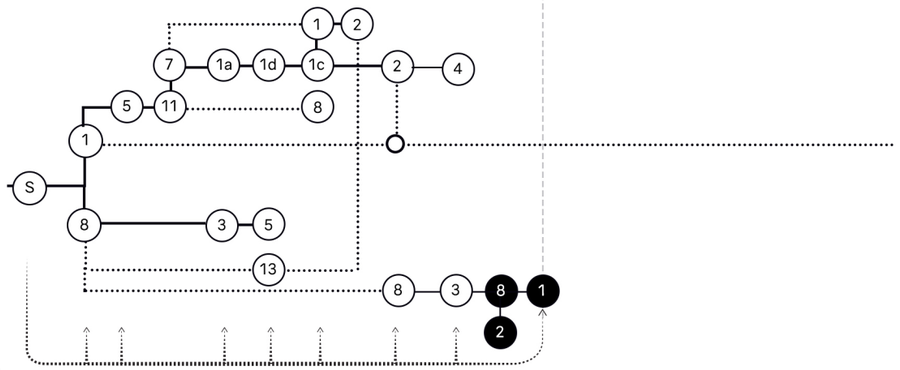
5. Correlated stabilization phase

Fig. 9.86 - Implemented Strategic actions. Stabilization Phase. UPZ Lourdes.

PE		SA	EA
1	1	1a	1
2	2	1b	2
3	3	1c	3
4	4	1d	4
5	5	2	5
6	6	3	
7	7	4	
8	8	5	
9	9	6	
10	10	7	
	11	8	
	12		
	13		
	14		
	15		

PE
8. Waste disposal plant
EA
2. Resource Bank
1. Capacitation centers

Fig. 9.85 - Co-evolutionary pathway. Timeline and Interrelate strategic actions. Stabilization Phase. UPZ Lourdes



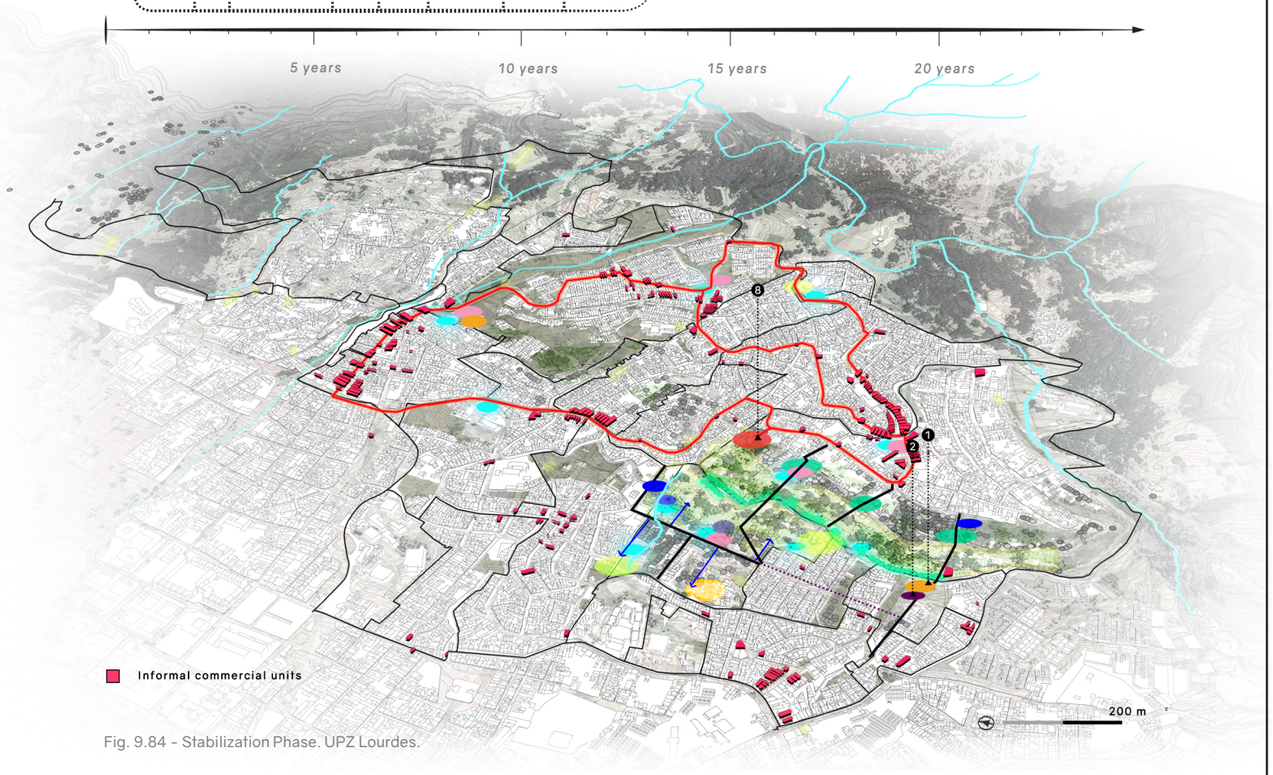
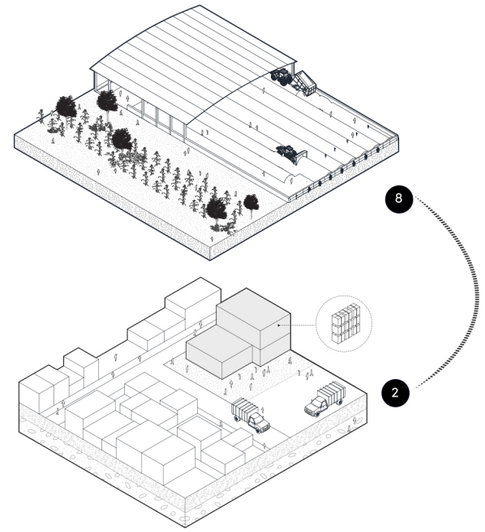


Fig. 9.84 - Stabilization Phase. UPZ Lourdes.

Implemented strategic actions

The stabilization phase ends with concrete actions that are needed in order to assure the accountability of the collaboration between formal and informal actors. At the same time the implementations of these strategic actions will assure the continuity from both sides. The formal actors, as supporting agents and the local community as active engaged actors in the further development of the stabilized system.



Waste disposal building

Community + SDA + SDDE

The consolidation of the circular economy network within the most vulnerable area as well as in the structuring commercial axes n the planning unit leads to the creation of a recycling plant. This is carried out with the support of municipal entities focused on local economic development and municipal entities focused on the urban development of the city. This strategic action will consolidate a strategic point both at local and urban level.

Resource Bank

SDDE + SDA + Community + SDP + Medium enterprises

The consolidation of the recycling plant, and the strengthening of the local economic network is concluded with a resource bank that will ensure the continuity of the activities both of formal agents in the supply of resources and materials and of the local communities by reinforcing sustainable economic activities that at the same time are strengthening ecological resilience.

The following diagram visualizes how through the co-evolutionary pathway, on the one hand vulnerability has been progressively reduced by reinforcing the cohabitation and co-evolution of social and ecological systems, and on the other hand how the development process has resulted in an evolutionary integration and collaborative work between formal and informal agents, increasing capacities and autonomy over time.

Fig. 9.87 - Summary of the Co-evolutionary pathway. UPZ Flora

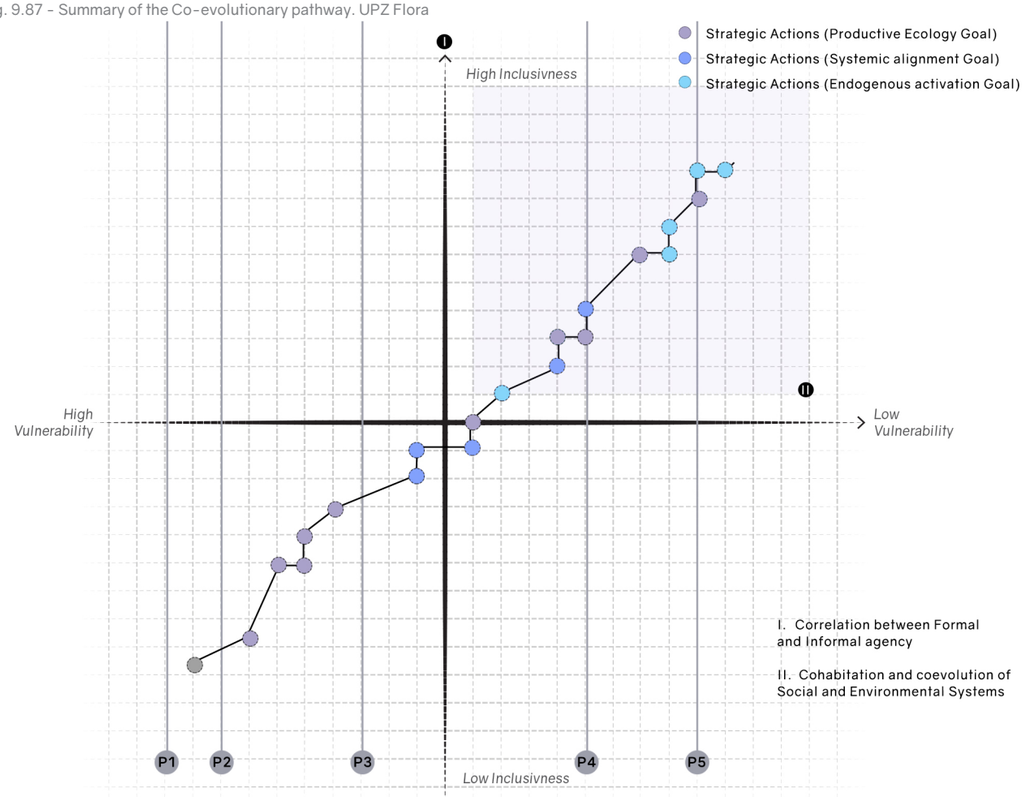


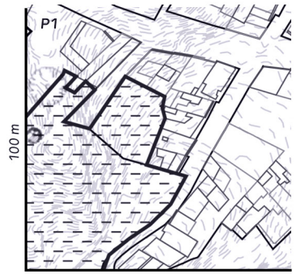
Fig. 9.88 - Current situation. Neighborhood Scale. UPZ Lourdes



Fig. 9.89 - Zooms, UPZ Lourdes. Current scenario

Map zoom in

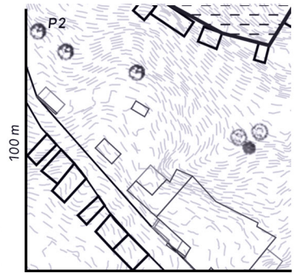
Current situation - Picture





Deforestation, eroded and contaminated land by informal development process

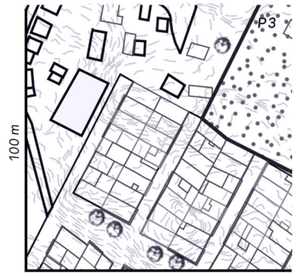
Source: Google Street View, 2020.





Abandoned buildings and inadequate waste disposal areas

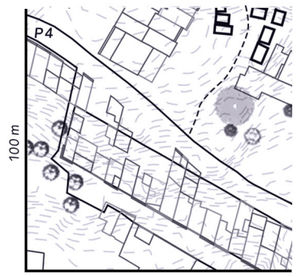
Source: Google Street View, 2020.





Recycling neighborhood, where recycling and residential activities converge in the same space

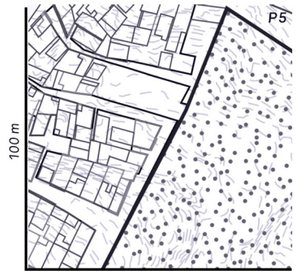
Source: Google Street View, 2020.





Inadequate Waste disposal areas and water pollution of canals.

Source: Google Street View, 2020.





Large undeveloped areas, where rubbish is currently dumped.

Source: Google Street View, 2020.

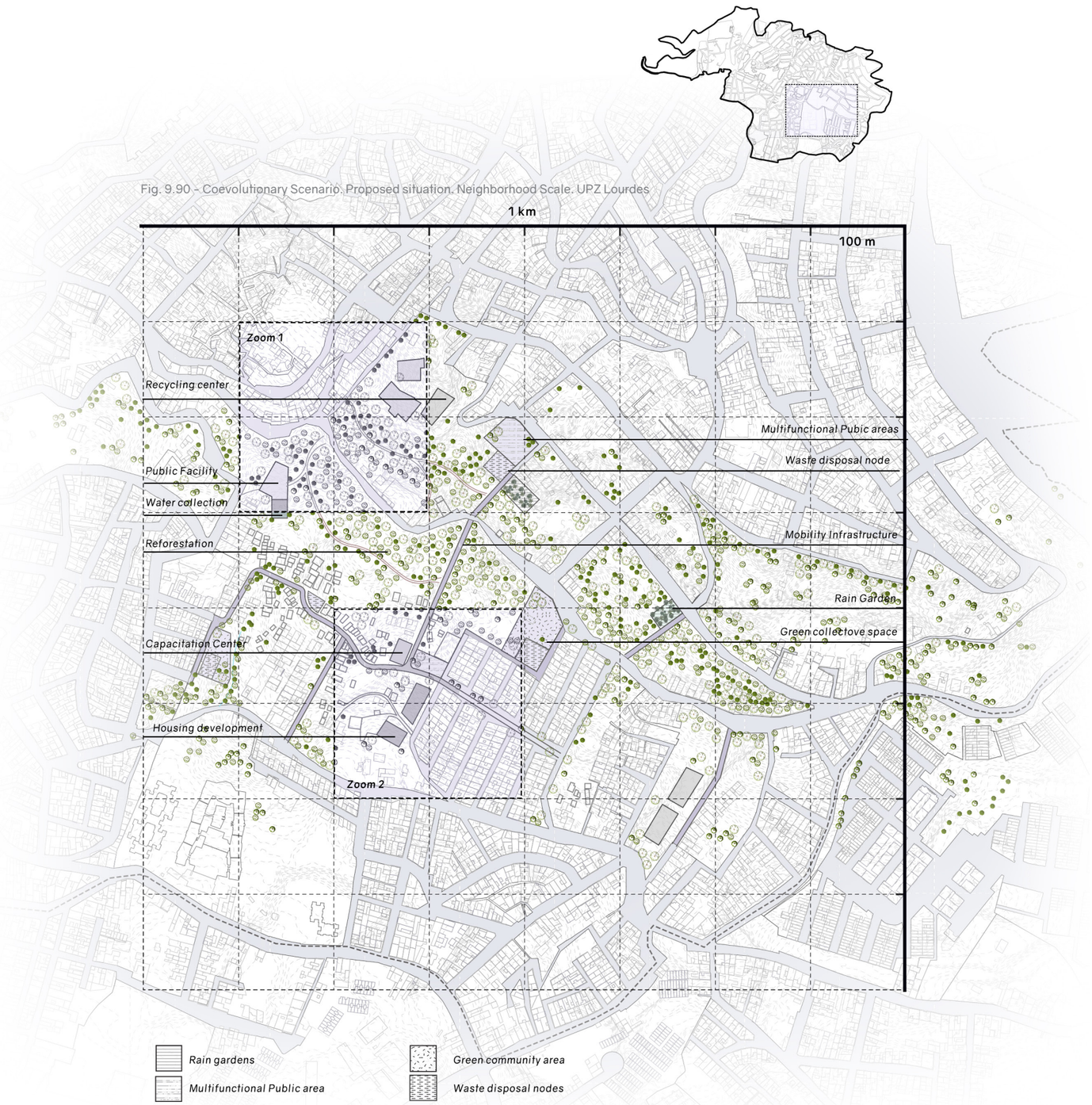


Fig. 9.90 - Coevolutionary Scenario. Proposed situation. Neighborhood Scale. UPZ Lourdes

Specific Case design. Proposed situation. Scale: Neighborhood

Zoom #1

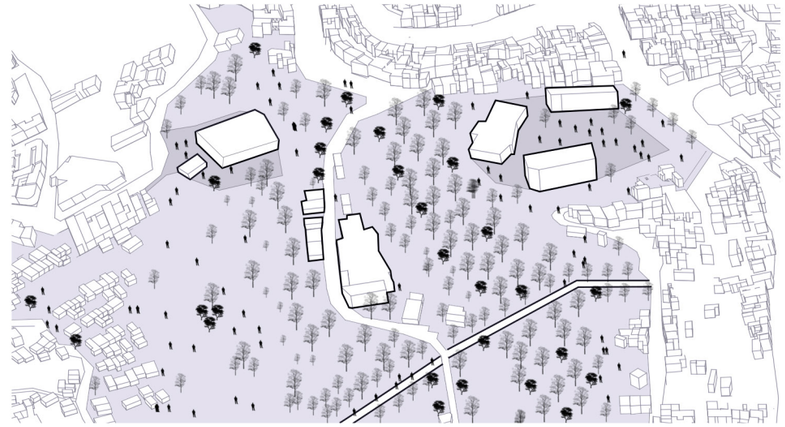


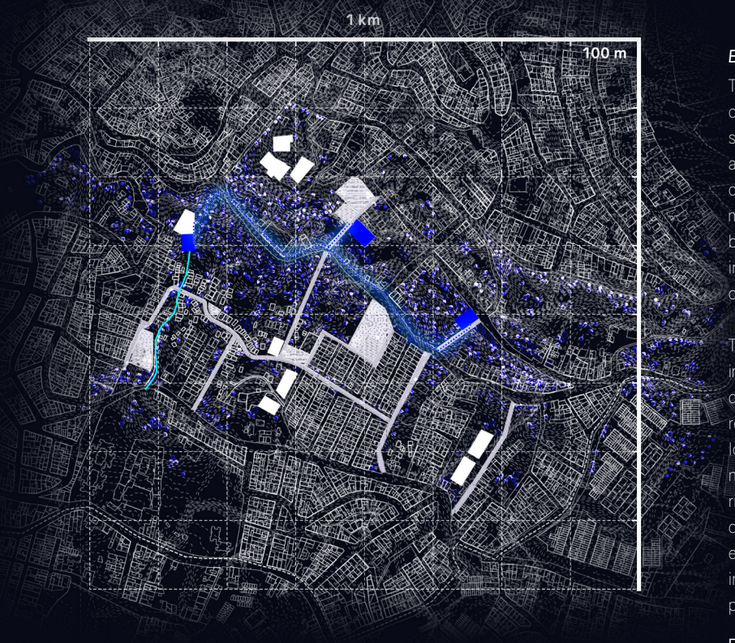
Fig. 9.91 - Zoom1 , UPZ Lourdes. Proposed Scenario

Zoom #2



Fig. 9.92 - Zoom 2, UPZ Lourdes Proposed Scenario

Specific Case design. Proposed situation.
Systemic Operation in Bogotá. Scale: Local

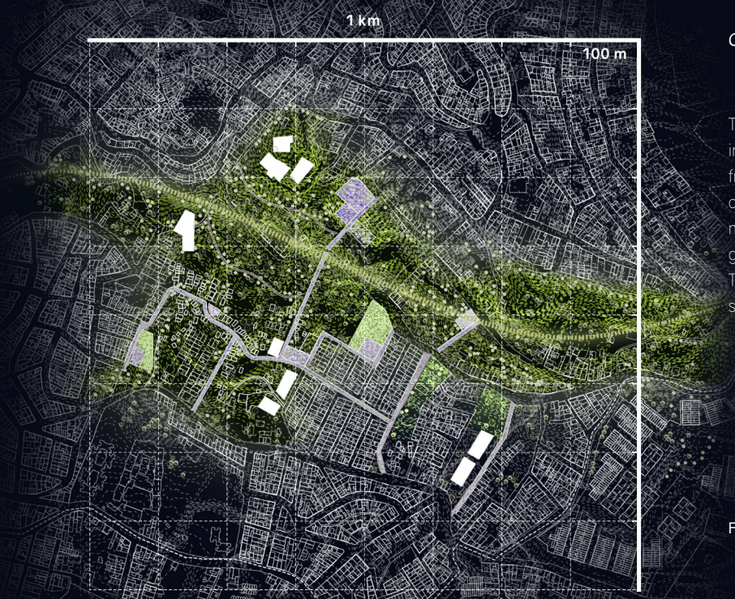


Blue Infrastructure

The implemented strategic actions in the proposed co-evolutionary pathway reached a systemic stabilization stage where both local scale actions and more complex mitigation strategies are correlated and therefore are transformed into a more resilient water management system where both local and municipal actors have an active role in the implementation, management and monitoring of the proposed systemic operation.

The water systemic operability, which has been implemented from a correlated perspective with other accessibility and infrastructural systems, reduces de contamination in the water stream located in the inside of the vulnerable recycling neighborhood, and will help to reduce the sliding risk that is the mayor threat in this area. This different water collection points will also contribute ecosystem services to other structural operations in the area regarding the maintenance of green and public infrasrcutres.

Fig. 9.93 - Systemic Operability Water Infrastructure. Zoom in, UPZ Lourdes



Green Infrastructure

The systemic stabilization of the green backbones in the area manages to reduce the landslide risk from local actions and more complex strategies on an urban scale, in which reforestation and natural root structures are working together with geogrid and more complex mitigation strategies. The consolidation of this area as a green and sustainable node.

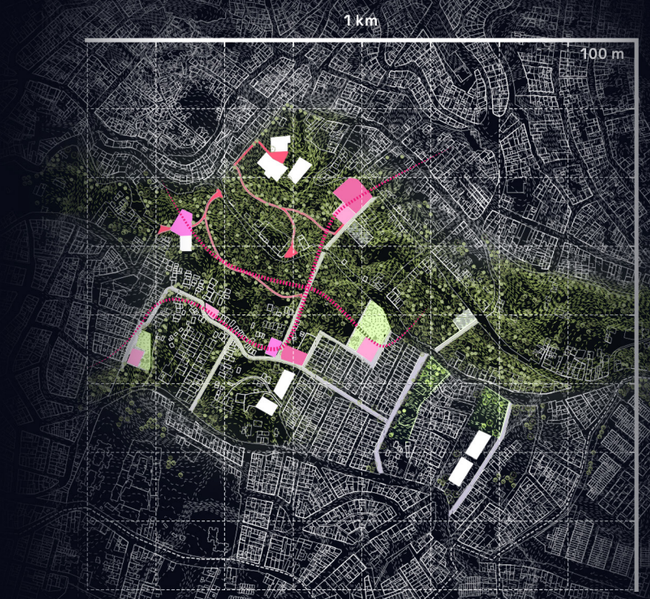
Fig. 9.94 - Systemic Operability Green Infrastructure. Zoom in, UPZ Lourdes



Socio economic Infrastructure

From a socio-economic perspective, the strengthening and co-evolutionary process between ecosystem and environmental related economies ended up in a strong recycling and sustainable urban nodes. The highest challenges regarding social vulnerabilities are now through the development process over time a strength in the area. The productive cycle, and the local population's knowledge about recycling activities and the sustainable construction of urban collective spaces are the key for the maintenance, management and continuity in the strengthening of the socioeconomic system. This process achieves a point of stabilization where the productive systems become sustainable, in which the planning process between local communities and both public and private agents provides the population with the capacity to be self-sustaining from an endogenous perspective, reducing in a systematic way the socioeconomic and the environmental vulnerability.

Fig. 9.95 - Systemic Operability Socioeconomic Infrastructure. Zoom in, UPZ La Flora



Sociocultural Infrastructure

The implemented strategic actions during the co-evolutionary pathway were guided from the beginning to the end by a co-evaluation and social activation process in each phase, where the demographic composition and the main challenges of the sector became the development potentials. In this case, the high concentration of vulnerable populations with a clear interest and socioeconomic activity were the active agents in the transformation process, where the actions implemented achieved a stabilization and reduction of social vulnerability by directing actions to specific local problems.

Fig. 9.96 - Systemic Operability Social Infrastructure. Zoom in, UPZ La Flora

Specific Case design. Proposed situation.
Systemic Operation in Bogotá. Scale: Urban



Blue urban Infrastructure

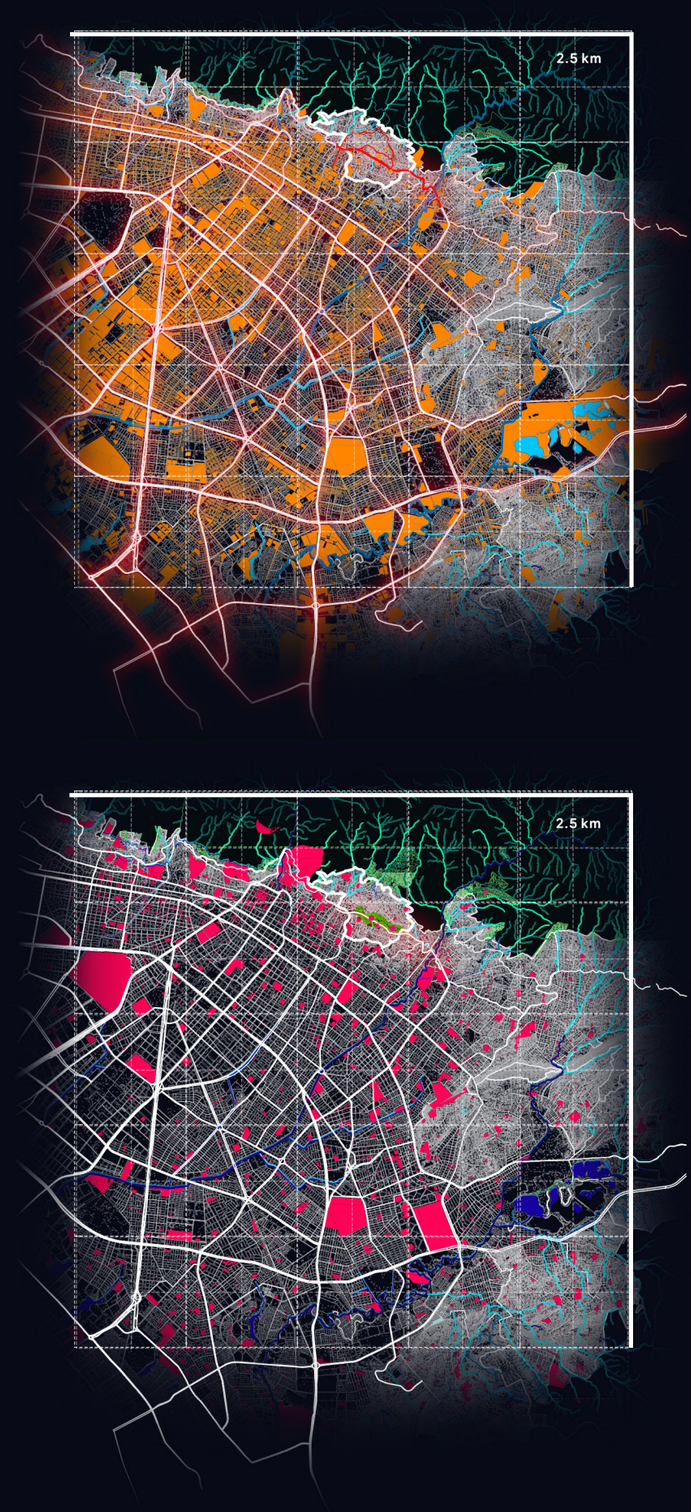
As demonstrated in the previous section, the co-evolutionary transformation scenario in the planning unit led to a systemic stabilization at the local level. By expanding the analytical scope to an urban context, the multi-scalar correlation of social and ecological systems is evident, due to the reinforcement of structural elements in the planning unit. This systemic approach supports the evolutionary integration of vulnerable and fragmented areas into the functional structures of the formal city. Therefore, the impacts at the local scale are interrelated with the systems at the urban scale. The intervened Blue infrastructure has a direct impact in one of the canals if the area but has a higher impact in the consolidation of the urban node, reducing the sliding risk and reinforcing the socio-ecological approach to the streams in the eastern side.

Fig. 9.98 - Multi-scalar systemic Operability and vision of the Green Infrastructure. UPZ Lourdes within the Urban Scale

Green Urban Infrastructure

The consolidation of a local green node has an impact in the urban Scale. At a city level, this local interventions and co-evolving stabilization system will reinforce the connection firstly with the green corridors in the eastern area and will provide a new identity node in an urban scale, in which formal and informal dynamics can interact around recycling topics and sustainable economies. This will be part in the constructions of green social and green networks that are already seen at an urban scale.

Fig. 9.97 - Multi-scalar systemic Operability and vision of the Water Infrastructure. UPZ Lourdes within the Urban Scale



Socio economic urban Infrastructure

As stated before, the impacts of the co-evolving transformation process regarding the environmental related economies in the area and the infrastructural developments regarding mobility and accessibility, have an impact in the urban scale. The proposed connections are integrating the area with the principal structuring mobility access of the city as seen in the map. The development of a recycling plant and the hole infrastructure regarding sustainable economic activities could guide an integration of formal and informal inhabitants, in which this point could connect to the principal economic activities in the city center and could became a reference point in the urban dynamics.

Fig. 9.100 - Multi-scalar systemic Operability and vision of the Social Infrastructure. UPZ Lourdes within the Urban Scale

Sociocultural urban Infrastructure

The proposal of the evolutionary transformation of socioeconomic and ecological systems, through adaptive public spaces and green parks could also reinforce the social integration between the formal and informal city. The social infrastructure is also connecting the current facilities in a bigger scale as seen in the map.

Fig. 9.99 - Multi-scalar systemic Operability and vision of the Socioeconomic Infrastructure. UPZ Lourdes within the Urban Scale

10. Operability Pathway

Overview

The Co-evolutionary transformation scenarios aimed to visualize the diverse actions that could be implemented in order to address the multidimensional vulnerability in particular informal environments through a long term vision, and therefore guide the integration of this areas within the functional and socio-spatial dynamics of the city.

As stated through the proposal, the proposed method aims to find a complementary approach to the current upgrading planning platform in Bogotá, turning the current program into a vehicle to strengthen and expand the capacities of the local communities to increase their autonomy and adaptability. This means, that the planning approach does not design a definitive proposal, on the contrary, it embraces flexibility through the exploration of possible co-evolving actions, that will therefore open up the collaborative evaluation and cooperation between diverse actors depending on the possible next correlated implemented action.

As stated above, the collaborative evaluation between diverse actors with the ones regarding the next proposed co-evolving action, will define a flexible approach, not only in the spatial and functional operability of the proposal, but also in the planning and governance domain. The exploration of adaptive and alternative pathway of the current planning operability in Bogotá, will demonstrate how the proposed model increases the resilient capacity and expands the planning scope and redefine the interrelation between formal and informal agents. The strategic actions, as explained in previous chapters, were classifies through different scales of implementation, assuring that local communities and formal entities have the capacity to accomplish the proposed goals. The following chapter will explore the co-evaluation and the possible agreements between the actors in a scenario construction in one of the neighborhoods in the Planning Unit La Flora,

Chapter Structure

a. Villa Rosita Neighborhood

b. Current Operability of the Upgrading Program

c. Operability Pathway.
SAS (Story-and-Simulation) approach
to scenario development

d. Spatial and Systemic interrelations

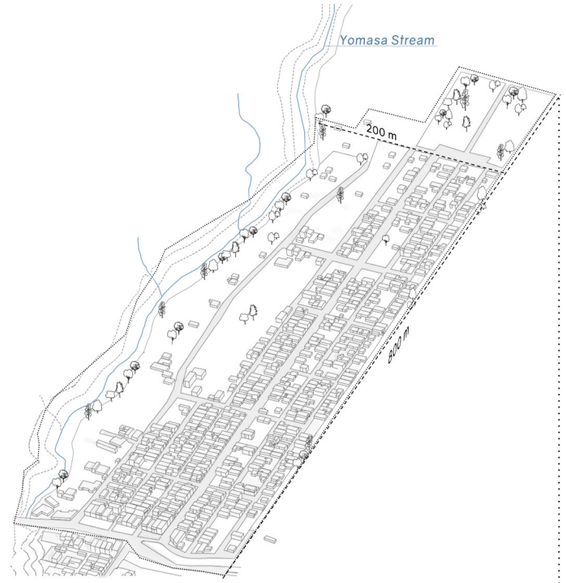
e. Spatial qualities of the developed scenario

Testing the operability of the proposed Model

a. Villa Rosita Neighborhood

The chosen neighborhood to simulate the proposed operability of the program is the Villa Rosita neighborhood. As shown in the map, the proposed Co-evolutionary Pathway already determined the implementation of certain strategic actions in time. The purpose of this chapter is focused on unfolding step by step of how these actions could be carried out in time, what are the necessary instruments for the implementation, and what could be the spatial qualities of the proposed operation.

As it has been evidenced in the analysis of this zone, this neighborhood is characterized by being located in a high slope that is still in process of consolidation. The neighborhood is bordered by the Yomasa stream and has many empty spaces. The population is characterized by being composed of more than 60% women and children coming from rural areas of the country, thus determining a high level of engagement in informal agricultural activities.



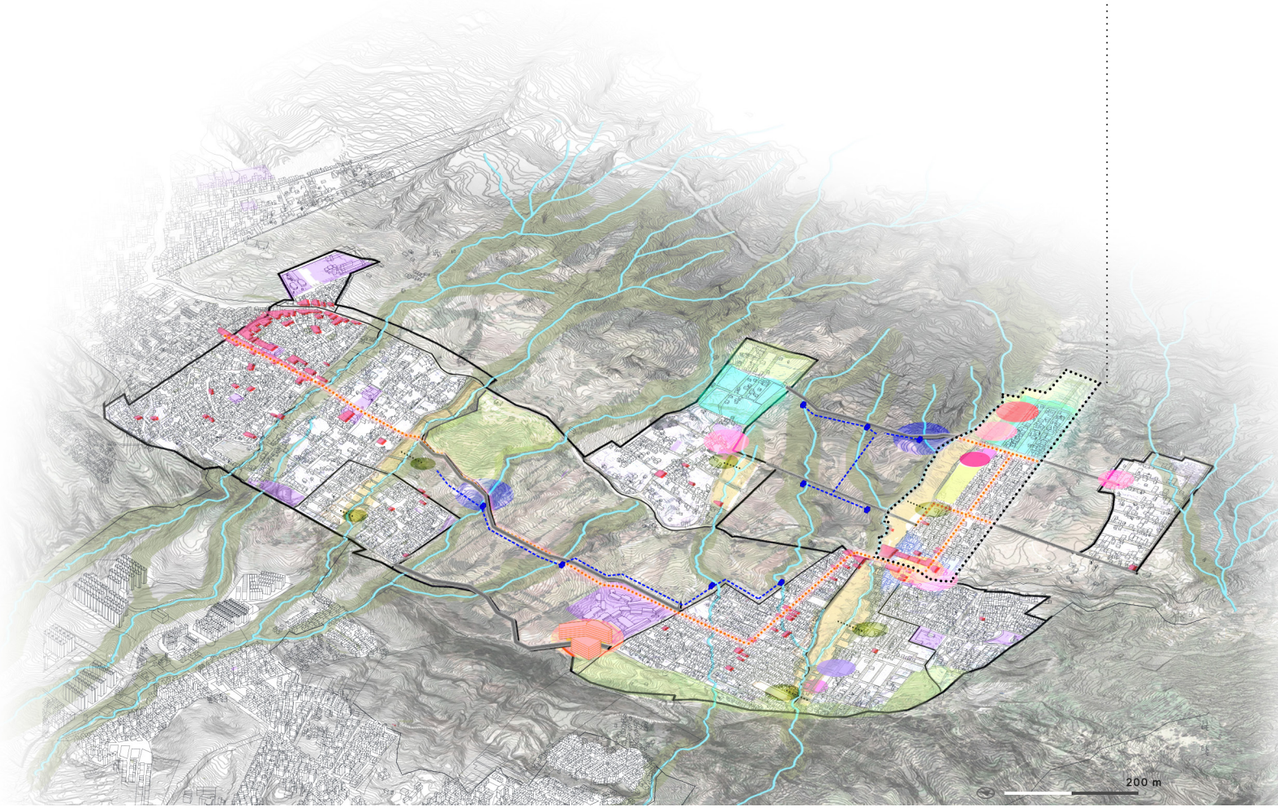
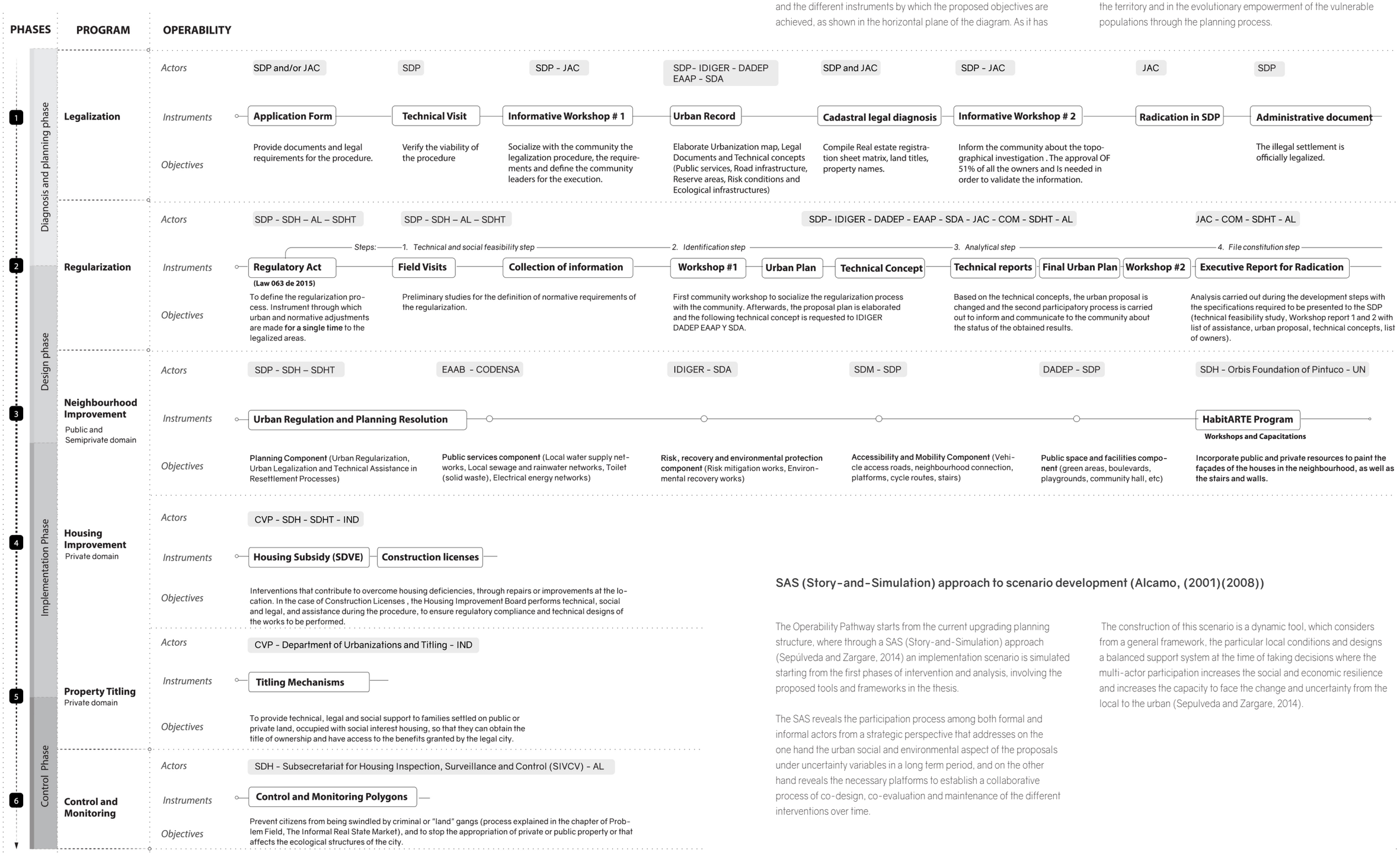


Fig. 10.1 - Selected area to test the proposed complementary operability of the current upgrading program. Villa Rosita Neighborhood

b. Current Operability Structure of the Upgrading Program in Bogotá

Fig. 10.2 - Current Operability Structure of the Upgrading Program in Bogotá.
Source: Bogotá Mayors Office. District Secretariat of Habitat. Document 258 of 2017. Scheme made by author



The following diagram shows the current operation of the program. The operative structure is determined by six strategies (Legalization, Regularization, Neighborhood Improvement, Housing Improvement, Titling, and Control of Informality). Each one of these strategies or programs is defined by certain actors and municipal entities in charge and the different instruments by which the proposed objectives are achieved, as shown in the horizontal plane of the diagram. As it has been argued from the problem statement, this approach is thought in a short to medium term, is static and rigid and can be expanded and complemented in order to address and embrace the uncertain future in a long term perspective by re-imagining the role of local and formal actors as active agents of change in the functional transformation of the territory and in the evolutionary empowerment of the vulnerable populations through the planning process.

SAS (Story-and-Simulation) approach to scenario development (Alcamo, (2001)(2008))

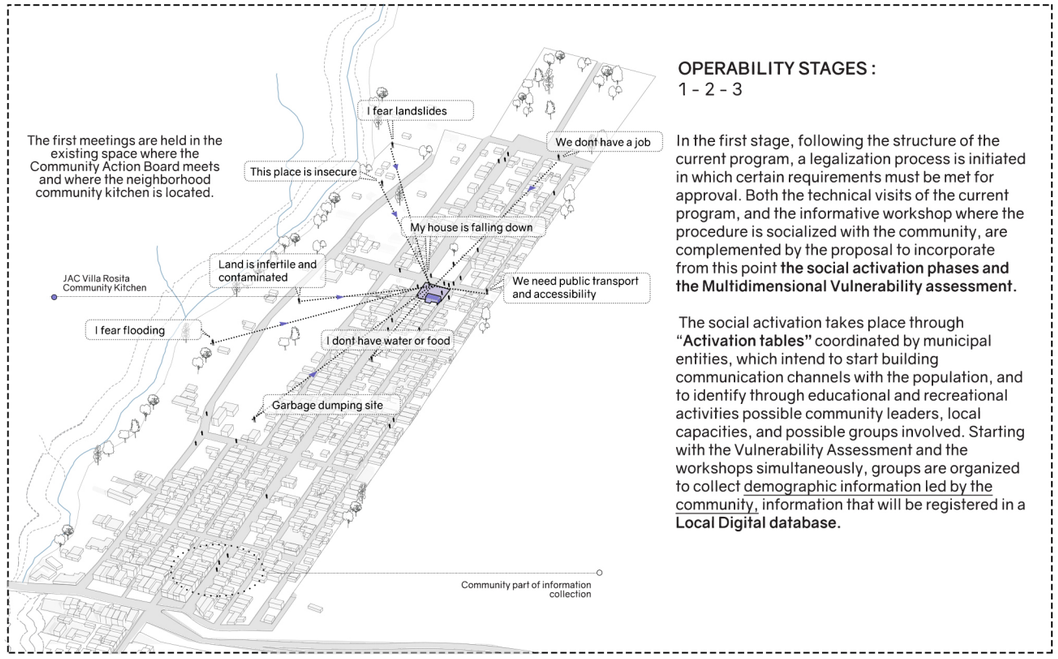
The Operability Pathway starts from the current upgrading planning structure, where through a SAS (Story-and-Simulation) approach (Sepúlveda and Zargare, 2014) an implementation scenario is simulated starting from the first phases of intervention and analysis, involving the proposed tools and frameworks in the thesis.

The SAS reveals the participation process among both formal and informal actors from a strategic perspective that addresses on the one hand the urban social and environmental aspect of the proposals under uncertainty variables in a long term period, and on the other hand reveals the necessary platforms to establish a collaborative process of co-design, co-evaluation and maintenance of the different interventions over time.

The construction of this scenario is a dynamic tool, which considers from a general framework, the particular local conditions and designs a balanced support system at the time of taking decisions where the multi-actor participation increases the social and economic resilience and increases the capacity to face the change and uncertainty from the local to the urban (Sepulveda and Zargare, 2014).

c. Operability Pathway. SAS (Story-and-Simulation) approach to scenario development

Fig. 10.3 - Proposed operability structure Operability Stages (1-3) - Current Legalization strategy.



OPERABILITY STAGES :
1 - 2 - 3

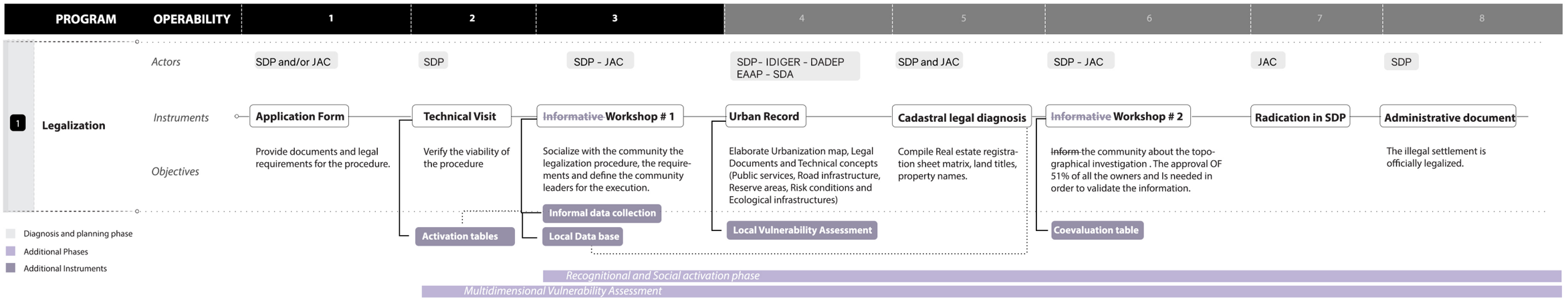
In the first stage, following the structure of the current program, a legalization process is initiated in which certain requirements must be met for approval. Both the technical visits of the current program, and the informative workshop where the procedure is socialized with the community, are complemented by the proposal to incorporate from this point **the social activation phases and the Multidimensional Vulnerability assessment**.

The social activation takes place through **"Activation tables"** coordinated by municipal entities, which intend to start building communication channels with the population, and to identify through educational and recreational activities possible community leaders, local capacities, and possible groups involved. Starting with the Vulnerability Assessment and the workshops simultaneously, groups are organized to collect demographic information led by the community, information that will be registered in a **Local Digital database.**



Source: Google Street View, 2020.

Fig. 10.4 - Proposed Operability Structure. Complementary approach to the Legalization program in Bogotá.



Source: Bogotá Mayors Office. District Secretariat of Habitat. Document 258 of 2017. Scheme made by author

c. Operability Pathway. SAS (Story-and-Simulation) approach to scenario development

Fig. 10.5 - Proposed operability structure Operability Stages (4-8) - Current Legalization strategy.

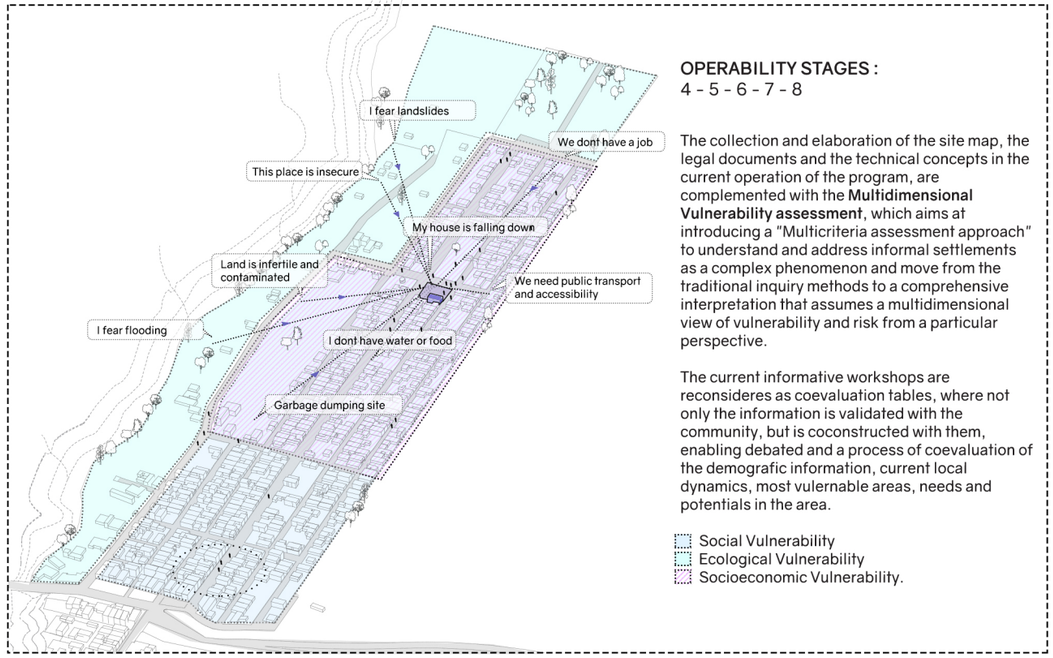
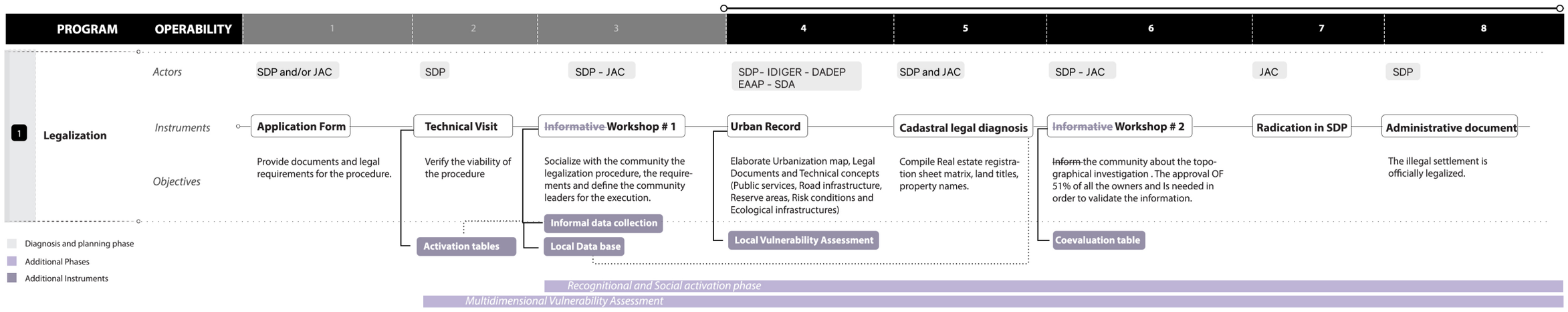


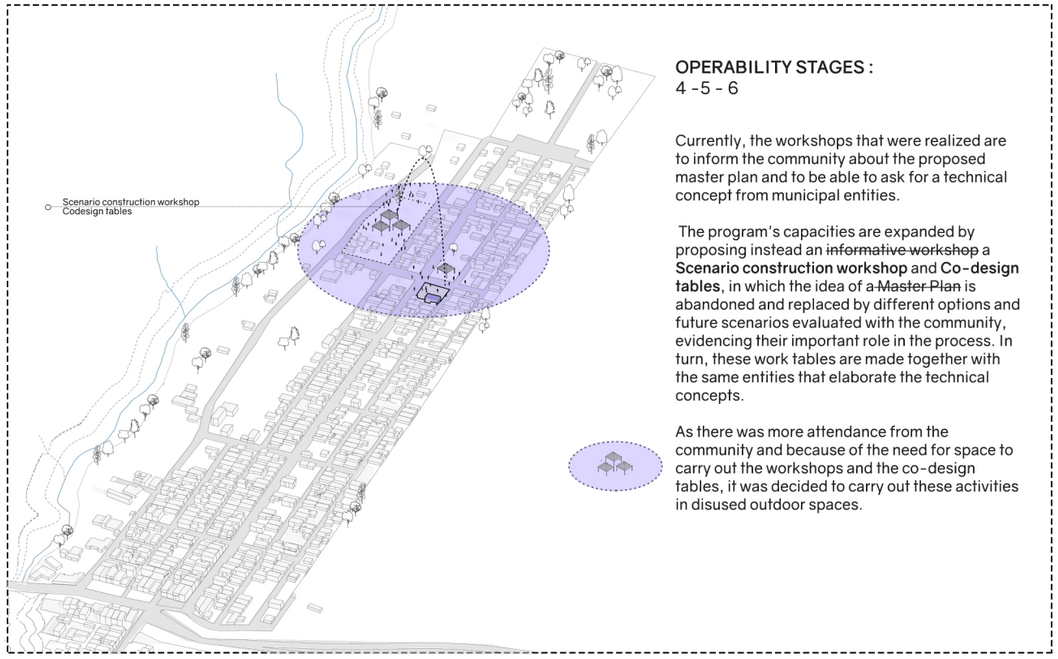
Fig. 10.6 - Proposed Operability Structure. Complementary approach to the Legalization program in Bogotá.



Source: Bogotá Mayors Office. District Secretariat of Habitat. Document 258 of 2017. Scheme made by author

c. Operability Pathway. SAS (Story-and-Simulation) approach to scenario development

Fig. 10.8 - Proposed operability structure Operability Stages (4-6) - Current Regularization strategy.



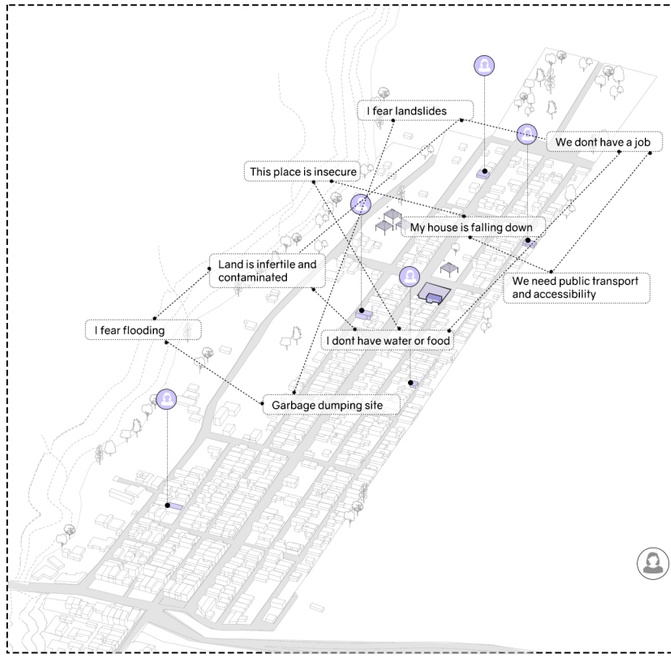
OPERABILITY STAGES :
4 -5 - 6

Currently, the workshops that were realized are to inform the community about the proposed master plan and to be able to ask for a technical concept from municipal entities.

The program's capacities are expanded by proposing instead an ~~informative workshop~~ a **Scenario construction workshop** and **Co-design tables**, in which the idea of a ~~Master Plan~~ is abandoned and replaced by different options and future scenarios evaluated with the community, evidencing their important role in the process. In turn, these work tables are made together with the same entities that elaborate the technical concepts.

As there was more attendance from the community and because of the need for space to carry out the workshops and the co-design tables, it was decided to carry out these activities in disused outdoor spaces.

Fig. 10.9 - Proposed operability structure Operability Stages (7-10) - Current Regularization strategy.



OPERABILITY STAGES :
7 - 8 - 9 - 10

The discussions tables lead to subsequent **Technical evaluation sessions**, which are complemented by **co-design and capacitation workshops** for the community about possible interventions on a local scale. **The technical concepts** incorporate local capacities and incorporate the expectations of the communities in risk and vulnerability mitigation in a multiscalar approach.

The Normative report is complemented with the **Vulnerability assessment Framework and the evaluation of future scenarios.** The capacitation tables and workshops have already been a tool to evaluate local capacities and possible first interventions.

Most vulenrable areas

Corelated encounter challenges

Community leaders per areas
As explained in the Vulnerability assessment, more than 60% of the population in this areas is composed by **woman** and children from rural areas of colombia. This are the leaders identified and recognized as important actors in the next development process.

- OPERABILITY STAGE : 1 - 2 - 3

The proposal redefines the beginning of the regularization stage proposed by the program by transforming the ~~regulatory act~~ into an **Adaptive and Flexible Agreement**, with the possibility of evaluation and change.
The Assessment Framework, the participation tables and the data collection in the legalization phase are the same platform to start evaluating the correlations between the problems and possible lines of action.

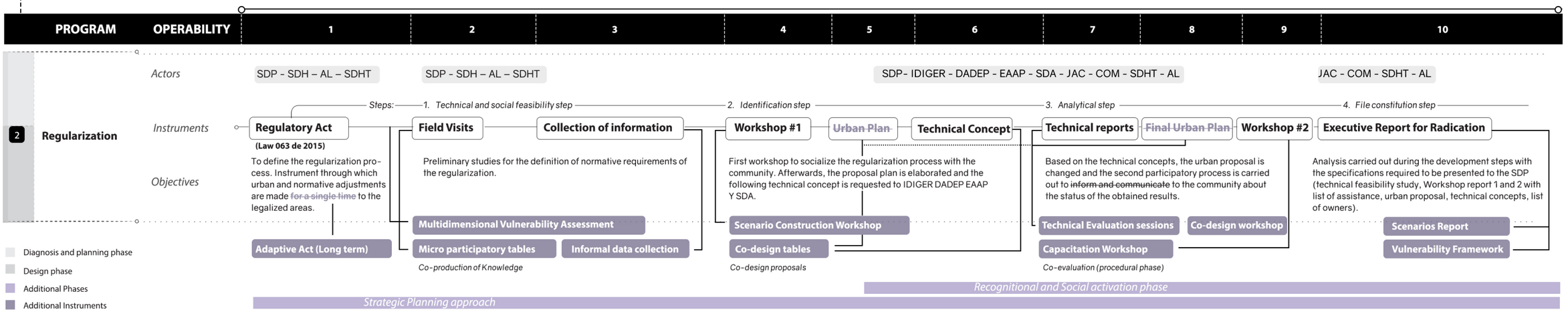
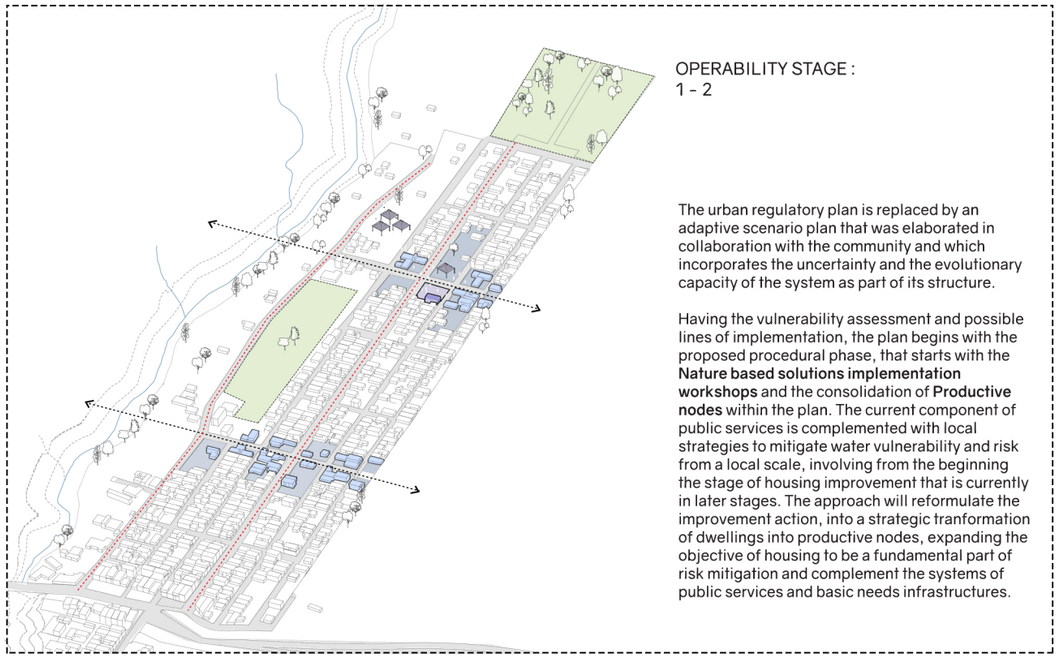


Fig. 10.7 - Proposed Operability Structure. Complementary approach to the Regularization Strategy in Bogotá.

Source: Bogotá Mayors Office. District Secretariat of Habitat. Document 258 of 2017. Scheme made by author

c. Operability Pathway. SAS (Story-and-Simulation) approach to scenario development

Fig. 10.11 - Proposed operability structure Operability Stages (1-2) - Current Neighborhood and housing improvement strategy.

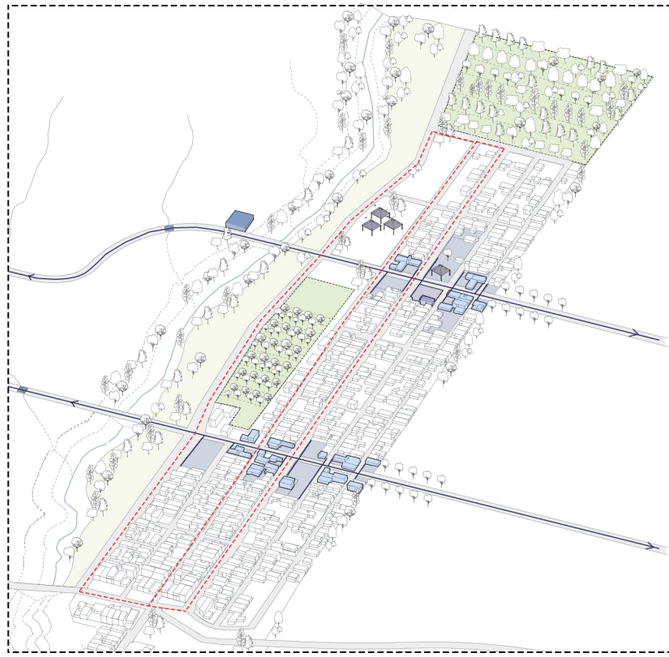


OPERABILITY STAGE :
1 - 2

The urban regulatory plan is replaced by an adaptive scenario plan that was elaborated in collaboration with the community and which incorporates the uncertainty and the evolutionary capacity of the system as part of its structure.

Having the vulnerability assessment and possible lines of implementation, the plan begins with the proposed procedural phase, that starts with the **Nature based solutions implementation workshops** and the consolidation of **Productive nodes** within the plan. The current component of public services is complemented with local strategies to mitigate water vulnerability and risk from a local scale, involving from the beginning the stage of housing improvement that is currently in later stages. The approach will reformulate the improvement action, into a strategic tranformation of dwellings into productive nodes, expanding the objective of housing to be a fundamental part of risk mitigation and complement the systems of public services and basic needs infrastructures.

Fig. 10.12 - Proposed operability structure Operability Stages (3-5) - Current Neighborhood and housing improvement strategy.



OPERABILITY STAGE :
3 - 4 - 5

The second component of the current program is related to risk, recovery and environmental protection, and is complemented as mentioned previously with nature based solutions. The proposed co-evaluation tables, will give the community the opportunity to report on the progress and performance of the interventions, and through the use of vulnerability workshops, the following interventions will be evaluated in relation to ecological risks in order to scale up the iterventions where needed.

The next proposed stage, the structural phase, expands the current component of mobility and accessibility by integrating both assessments and scenario building with technical tools, as well as th proposed co-maintenance sessions for the communities to learn of the various systems, both hydro, green and gray that are integrated into the proposed multifunctional networks.

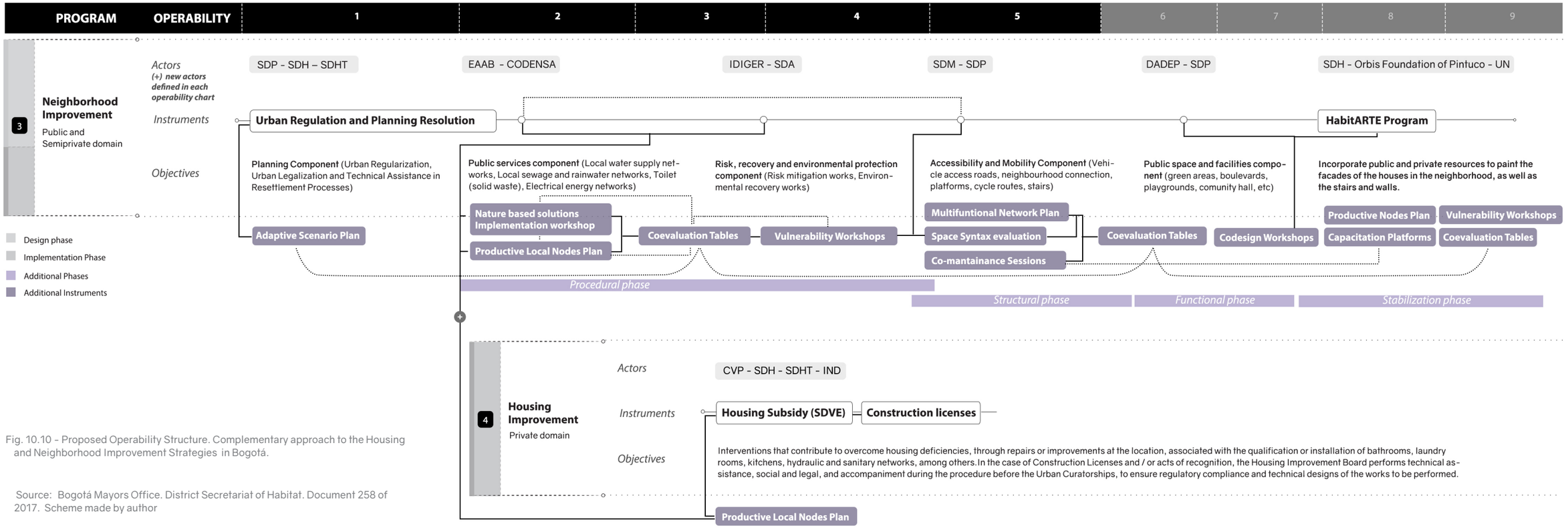
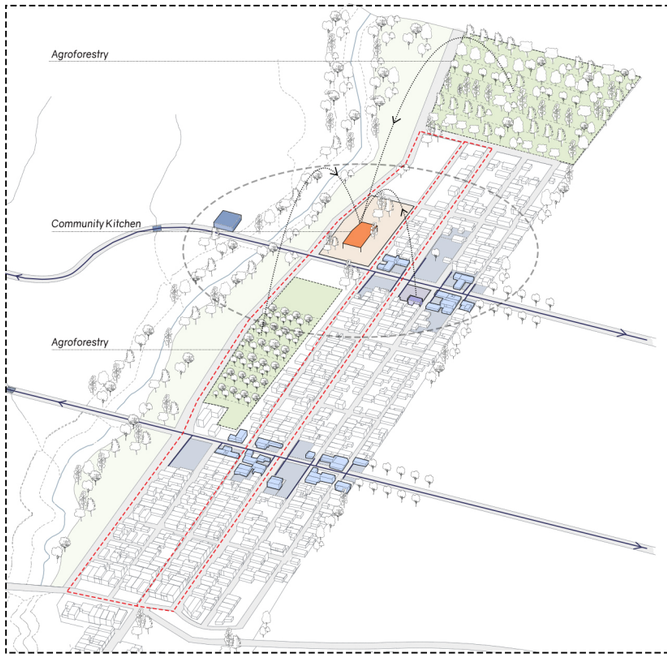


Fig. 10.10 - Proposed Operability Structure. Complementary approach to the Housing and Neighborhood Improvement Strategies in Bogotá.

Source: Bogotá Mayors Office. District Secretariat of Habitat. Document 258 of 2017. Scheme made by author

c. Operability Pathway. SAS (Story-and-Simulation) approach to scenario development

Fig. 10.14 - Proposed operability structure Operability Stages (6-7) - Current Neighborhood and housing improvement strategy.



OPERABILITY STAGE :
6 - 7

The co-evaluation tables again provide a space for communities to report on the performance of interventions and propose possible future interventions.

The proposal reformulates the current static and generic approach of the public space component of the program, changing the idea of a master plan design of a green space, opening the oportunity for the community and formal entities to work together in co-design workshops, which aims to achieve a space with an identity that responds to the local needs, expectations and dynamics.

The vulnerability assessment and the strategic planning approach of the program identified different areas without use that could be transfomed into multifuntional public spaces and the transformation of the current river borders into ecological passive recreational areas, managed and comantained by the community and ecological municiapl entities.

Since the beginning, the activites held on in the existing Community center and kitchen were expanded to the outdors. The diferent co-design workshops held in this places, the leading rol of rural woman and the coevolving development of different agricultural activities led to a new common outdor kitchen, as a central point that connects the dayly life systems and communal dynamics and opens a new space for discussion between formal and informal agents.



First stages
Current indor community kitchen as reunion point.



Following stages
Outdor spaces for coevaluation and codesign.



Final stages
Co-construction of an Outdor Kitchen as a local community space.

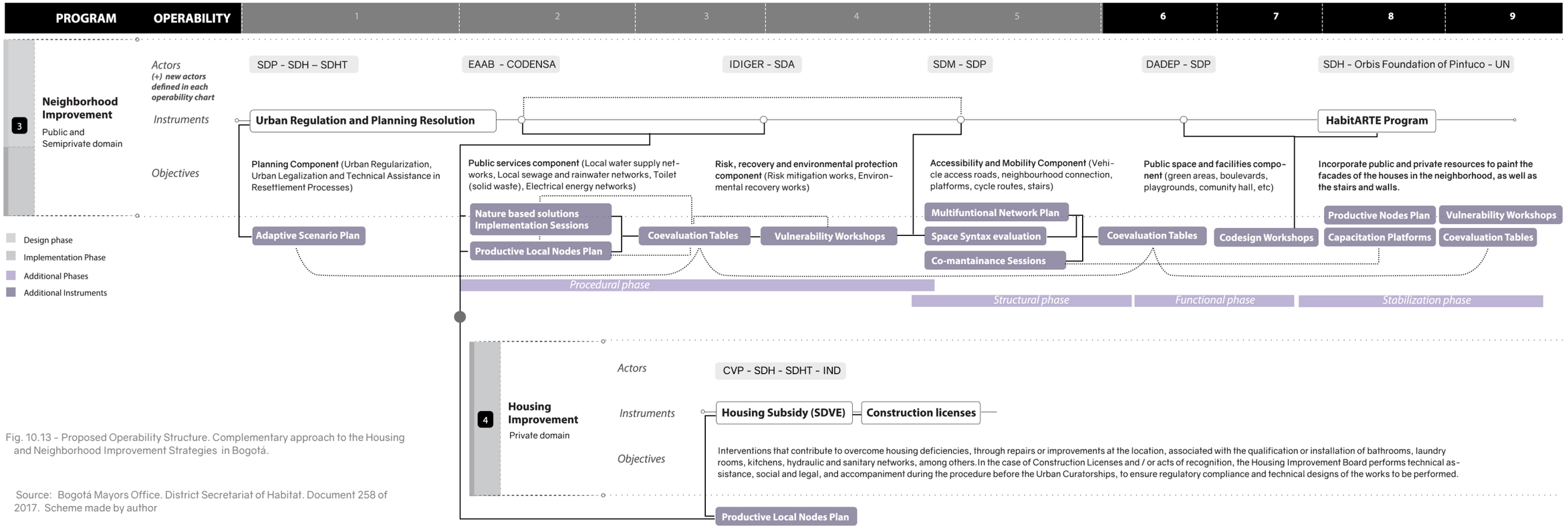
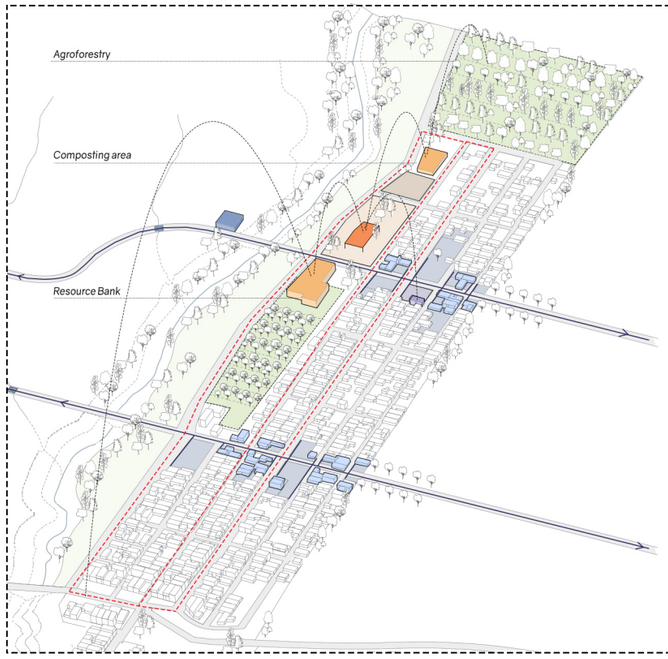


Fig. 10.13 - Proposed Operability Structure. Complementary approach to the Housing and Neighborhood Improvement Strategies in Bogotá.

Source: Bogotá Mayors Office. District Secretariat of Habitat. Document 258 of 2017. Scheme made by author

c. Operability Pathway. SAS (Story-and-Simulation) approach to scenario development

Fig. 10.16 - Proposed operability structure Operability Stages (8-9) - Current Neighborhood and housing improvement strategy.



OPERABILITY STAGES :
8 - 9

The previous component is synchronized with the current habitarte program, which currently works independently of the regularization. The interventions on facades proposed in the Habitarte program are complemented by strategic actions proposed in the stabilization phase, which will improve the environment but will provide the communities with tools to become self-sustainable.

The proposed productive nodes concept, applied to the dwellings, is incorporated into the public domain. The training and co-evaluation platforms will allow the community to take appropriate action in the proposed areas. In this case, the community kitchen and the agroforest development led to a new endogenous local socioeconomic system, that is compelemted with a resource bank and a composting area. This intervention will assure the acountability of both, community leaders and formal entities in further engagement and development.

The coevaluation workshops call upon the entities that developed the technical concepts and the communities to evaluate the implications, impacts, further risk and posible next scenarios of following interventions.

The monitoring and control polygons are complemented with comaintenance and comonitoring tables with the community for the construction of information and complementation of the data base of the sector. This will allow not only to monitor the social dynamics of the sector, but also to understand and have clear information about the population that arrives, the reasons and the possible location of the same within the next cycle of intervention. At the same time, the mechanisms of titling, despite not being developed in the proposal, open to the reflection of possible models of co-ownership that can reflect on land tenure and develop innovative proposals on the subject.

Fig. 10.15 - Proposed Operability Structure. Complementary approach to the Housing and Neighborhood Improvement Strategies in Bogotá.

Source: Bogotá Mayors Office. District Secretariat of Habitat. Document 258 of 2017. Scheme made by author

d. Spatial and Systemic Interrelations - Spatial Framework

The set of proposed interventions conclude with a stabilization phase and require an evaluation to verify that they comply with the rules of Anchoring, Interrelating and Synchronizing. The following diagrams visualize the fulfillment of the different rules established in the spatial framework.

The diagram 10.19 illustrates the anchorage of the proposals to existing ecological systems. The (1.a) connection with existing water systems is evidenced by the connection of the proposal to the Yomasa water body.

The (1.b) connection with green structures is evidenced on the one hand in the connection with the eastern hills and the agroforestry patches, and on the other hand, in the recovery of the green axis of the river basin and the possible green zones that connect to it. With regards to the interrelation between the proposed actions, the transformation of the dwellings in productive nodes in terms of water collection is linked to an axis of water gardens and productive gardens, which on the one hand establish a clear green axis that connects the neighborhood with the river. Each of these systems is in turn connected to the drainage and water collection systems in more complex scales.

Context
1. Anchoring:

a. Connection to existing water systems
b. Connection to existing green structures

Interrelation of the proposed set of actions
2. Interrelating:

i. Blue infrastructure
ii. Green infrastructure

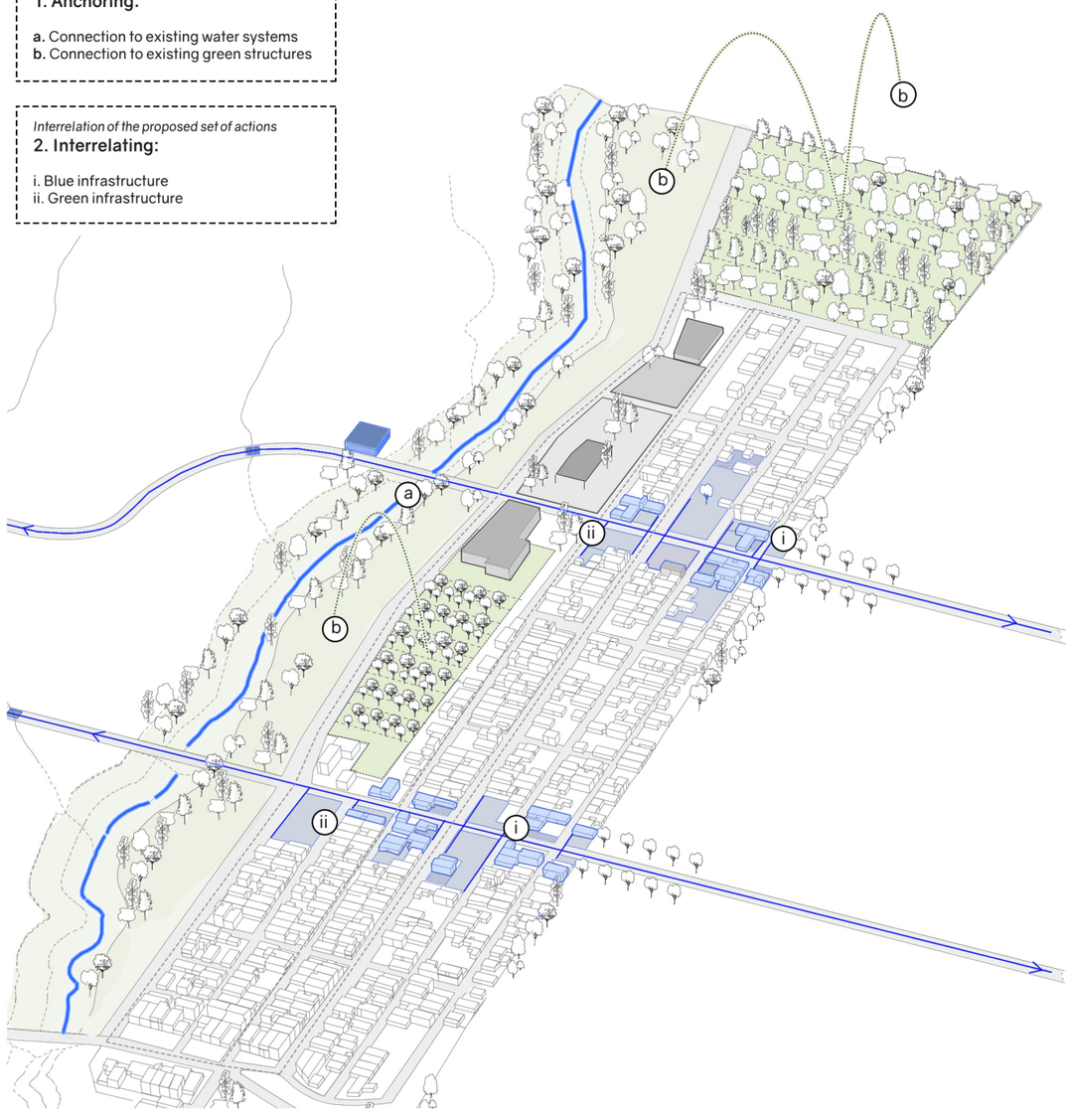


Fig. 10.17 - Fulfillment of the Rules of the proposed Spatial Framework

d. Spatial and Systemic Interrelations - Spatial Framework

The reprogramming of the space (d), related in turn to the rule of synchronizing endogenous and exogenous agencies, arises with the proposal of the outdoor kitchen conceived in a space destined to be a multi-functional public space. As it is described in the scenario approach, this idea developed in an evolutionary process with the participation processes and enables a space of congregation and co-evaluation between formal and informal agents. The discussion center, which in turn becomes a point of sharing food and experiences, is linked to the large population of rural women who inhabit these places.

The development of different agroforestry patches, in turn are complemented by a composting area and a resource bank, which as explained in the stabilization phase, are spaces that ensure the accountability of formal and informal agents in the subsequent stages of evolution and maintenance of the proposals. The set of these proposals generates a new axis that generates both a cultural and functional integration of the proposal and the reality of the context (ii).

Context
1. Anchoring:

c. Activation of underused space
d. Reprogramation of space

Interrelation of the proposed set of actions
2. Interrelating:

iii. Cultural and functional interrelation.

Agency
3. Synchronizing:

Endogenous–exogenous synchronization



Fig. 10.18 - Fulfillment of the Rules of the proposed Spatial Framework

e. Spatial qualities of the developed scenario

Current Situation - Villa Rosita Neighborhood

Fig. 10.19 - Current Situation. Street in Villa Rosita Neighborhood



Source: Google Street View, 2020.

e. Spatial qualities of the developed scenario

The application of the proposed model and the construction of a possible implementation scenario is reflected in the development of the " Blue Street".

This example visualizes how from local scales it is possible to contribute to the reduction of risk and vulnerability, in this case the construction of a system of branches and water patches that are destined to the collection and management of water. Both the collection of water in the dwellings and the rain-gardens are articulated to more complex drainage systems, which in turn are connected to collection and sanitation infrastructures near the Yomasa stream as seen in previous schemes.

The multi-scalar hydraulic system approach is articulated in the operability with the current "Habitarte program", where improvements in the facades and the idea of painting them blue, is linked to the production system at street level and the proposed program of productive nodes at the level of the house. Water becomes an important part in the identity of this space, where both nodes, patches, edges and corridors are systemically and spatially articulated.

1. Water collection
2. Rain garden
3. Drainage Infrastructure
4. Housing Improvement
5. Revegetation
6. Community productive garden

Fig. 10.20 - Proposed Situation. The blue Street in Villa Rosita Neighborhood

e. Spatial qualities of the developed scenario

Current Situation - Villa Rosita Neighborhood

Fig. 10.21 - Current Situation. Villa Rosita Neighborhood



Source: Google Street View, 2020.

e. Spatial qualities of the developed scenario

This example visualizes how the evolutionary and adaptive character of the proposed model can guide the activation and reprogramming of disused spaces from a local and endogenous perspective.

As explained previously, the co-implementation of an outdoor kitchen over time becomes a new node of participation and congregation. This space rethinks the kitchen space as isolated from the decision-making space, integrating women as main leaders both in decisions and in activities of meeting, eating, cooking, etc. This node becomes a connection point between the proposed activities of agroforestry, composting, and agriculture and family activities. The public space of the proposal has a particular and local sense and responds to the particular needs and potential of the sector.

1. Water collection
2. Rain garden
3. Drainage Infrastructure
4. Housing Improvement
5. Revegetation
6. Community productive garden
7. Community Kitchen
8. Sharing Node
9. Agroforestry

Fig. 10.22 - Proposed Situation. Sharing Node, Villa Rosita Neighborhood

e. Spatial qualities of the developed scenario

Current Situation - Villa Rosita Neighborhood

Fig. 10.23 - Current Situation. Villa Rosita Neighborhood



Source: Google Street View, 2020.

e. Spatial qualities of the developed scenario

The development of different productive gardens, agroforestry fields, the resource bank and the composting area turn the proposed multifunctional public spaces into market spaces on a local scale, where the outdoor kitchen once again becomes an important element of the public space in this sector.

The synchronization of exogenous and endogenous agents around the same food table for decision making, not only gives a new character to the public space, but also guides new ideas of spaces such as new spaces to be able to take care of children while women work in these areas. In turn, these new spaces are articulated to the dynamics of water collection for agricultural and cooking needs.

1. Community Kitchen
2. Multifunctional square
3. Local market
4. Neighbourhood Improvement
5. Community productive garden
6. Reforestation
7. Play ground
8. Drainage Infrastructure
9. Agroforestry

Fig. 10.24 - Proposed Situation. Productive Node Villa Rosita Neighborhood



Conclusions

Lastly, the following section presents the final Thoughts of this research.

Problem Statement

The rising poverty rates, internal displacement, the market-oriented development and deep socioeconomic inequalities have led to a binary configuration of the urban fabric in Bogotá, defined as the formal and informal city. The Informal urbanization process has a major importance in the production of urban space and involves different vulnerabilities rates in the social, spatial and environmental domains.

The upgrading program in Bogotá, although being crucial in the transformation of informal settlements, has not succeeded in generating a structural change due to the implementation of generic and short-term interventions that, on one hand, have not a clear continuity regarding the evolutionary and complex character of this type of upgrading process and, on the other one, are not correlated towards social and environmental resilience. Therefore, the planning scope should expand their capacity in order to address and embrace the uncertain future in a long term perspective by re-imagining the role of local and formal actors as active agents of change in the functional transformation of the territory and in the evolutionary empowerment of the vulnerable populations, through the planning process.

Research Question

How can an adaptive strategic framework create a new spatial and planning vision for vulnerable areas in order to achieve a sustainable, dynamic and cohesive urban environment in the city of Bogotá?

Conclusions

The project aim was to design an alternative complex model to improve the current slum upgrading platform within a new perspective that embraces a long term adaptive vision and redefines the role of formal and informal actors as agents of change in a co-creation process.

The recognition, and therefore the expansion of the current efforts and planning structures in Bogotá, transformed the current method in which formal and informal actors are working together, by redefining the operability of the upgrading process. The proposed complementary approach transformed the planning platform into a vehicle to on one hand guide social and ecological resilience and on the other transforms formal and informal agency through the adaptive process.

The recognition of the systemic co-evolving interrelations and the co-production, co-evaluation and co-maintenance strategies in a multi-actor collaborative process are currently not addresses in the development process and are precisely the opportunities in order to improve and complement the current approach. A model that works in a centralized way in which the decision, maintenance and implementation of specific actions are only in charge of the formal entities, and where communities or smaller local organizations do not have a relevant role, influences in fact the future dynamics and evolution of the urban area. The model redefines the approach to risk as a tool to improve the local conditions and capacities and at the same time guides the development of an integrated city in time.

The constant Co-evaluation process needs to strengthen the responsiveness of urban areas, reaction capacities and knowledge about possible needed actions if the current implemented action fails, decentralizing the decision process, recognizing that each actions plays a role in the construction of robust and resilient systemic network.

The critical understanding and evaluation towards the physicality of the proposed co creation processes of the current upgrading program raised the challenge in the redefinition of the scope and spatial quality when intervening and designing in this type of environments. The proposed model contributes to the redefinition of the role of designers and planners in this type of context by reconstructing the fundamentals of the design tasks ahead. This represents a call for the re-inclusion of socially produced spaces as more than just sub-products, by way of suggesting that social disparities have an interrelation and interdependence with the generating structures, influenced by formal development instruments rooted in the hierarchical notion of control (Leanne, 2013) (Marx, 2011) (Soja, 1980).

The adaptive strategic Framework is therefore not a definitive and static project, in turn it is a dynamic tool to reveal the diverse challenges but also the amount of opportunities in the local informal environments. By recognizing the importance of local groups as agents of change and the adaptive condition of complex systems within the planning structures the proposed framework aims to activate and change the segregated dynamics of the city, empower the local and most neglected communities, reinforce bottom-up approaches and provide alternative possibilities for more resilient and meaningful urban spaces.













11. Reflection

Overview

The following chapter summarizes the main reflections around the methodological approach and the proposed adaptive framework, by explaining its advantages, parameters and possibilities for its effective practical implementation, considering the scientific, social and ethical relevance of this work.

Abstract

Challenges such as rising poverty rates, internal displacement, market-oriented development and social inequalities can be clearly identified in the binary configuration of Bogotá's formal and informal environment. Urban informality emerges as one of the main and most diverse ways for producing urban space and being characterized, given the complex development circumstances, by entailing high social, ecological and socioeconomic vulnerability rates.

Bogotá's slum upgrading program, despite being a crucial instrument in the transformation of informal settlements, has proven to be insufficient to overcome the fragmentation between formal and informal urban systemic dynamics and has shown a limited strategic vision to counteract in a correlated and adaptive way the multidimensional vulnerability in informal environments on a long-term perspective.

The thesis proposes an adaptive planning framework, understood as a complementary approach to the current planning structures. This framework aims to guide the cohabitation and co-evolution between social, economic and environmental systems over time, and expand the current planning scope by redefining the interrelation and role of formal and informal actors as co-agents of change in the adaptive process.

Chapter Structure:

1. Research and Graduation studio and Master Track (The relationship between the graduation topic, the studio topic, the master track and the program.)

2. Research method approach and scientific relevance. Elaborating on the research method and approach reflecting thereby upon the scientific relevance of the work.

2.1 Research Method approach
2.2 Analytical Framework
- Vulnerability index and the multidimensional vulnerability diagnosis
- Critical assessment of the current planning approach

2.3 The design of a co-evolutionary framework (research-oriented design)

2.4 Social and scientific relevance of the work.

3. Relationship between the proposed framework and the possible transferability of the results and potential applications of the results in practice.

4 Ethical and Final Considerations (A reflection on the advantages and limitations of the chosen methodology, ethical issues and dilemmas encountered in doing the research)

This thesis seeks an answer for the following question (main research question): How can an adaptive strategic framework create a new planning vision for vulnerable areas in the city of Bogotá in order to achieve a sustainable, dynamic and cohesive urban environment?

The following chapter summarizes the main reflections around the methodological approach and the proposed adaptive framework, by explaining its advantages, parameters and possibilities for its effective practical implementation, considering the scientific, social and ethical relevance of this work.

1. Research relevance, graduation studio and master track. The relationship between the graduation topic, studio topic, master track and program

The development of the proposed adaptive strategic framework, and the critical assessment of the current slum upgrading approach for informal environments in Bogotá (Colombia) is naturally related to urban planning and, therefore, to the selected study (Complex Cities). Nowadays, the complex co-existence of social, political, and economical dimensions is challenging the traditional dichotomy between the 'formal' and 'informal city' and contesting the definition of the 'informal' itself. Driving the meaning of informality beyond the 'classic' understanding of this phenomenon as the "city of the poor", not just applicable to Colombia, but to Latin America and, in general, the Global South; and calling for urgent co-production of more fair and conscious urban spaces (Lutzoni, 2016).

Considering the above, the socio-spatial and socio-economic fragmentation between the formal and the informal city must be understood as clear evidence of the failure of the urban planning sphere, by lacking to recognize informality as a fundamental part of a city's operational and organizational system. There are several pressing issues on the international agenda that must be addressed through innovation e.g. the challenges posed by programs aiming for the elimination of poverty, the structural and functional transformation of urban systems, and the latent need for adaptation and socio-ecological resilience in an era threatened by climate change and diverse sorts of natural disasters (even a pandemic that would certainly change the world). Now, it is more vital than ever to adopt strategies that embrace the full extent of the varied and diverse formal and informal actors, bringing their backgrounds, disciplines, realities and needs and considering them when thinking the solutions, as part of a creative and democratic transformation path with a long-term vision.

Traditionally, planning instruments are based on stability and predictability, while informal settlements are characterized for being dynamic and changing environments. In this sense, the proposal explores how, from the field of urbanism, designing a novel planning methodology might reinforce the adaptive capacity of informal settlements in order to respond to dynamic, foreseen or unforeseen, changes. Such a proposal requires a non-linear approach, based on development conditions rather than a fixed development plan. Thus, the implemented adaptive approach is grounded on the multi-scalar understanding of the challenges, strengths, weaknesses, and threats of a particular space and the possible interrelations to the systemic operability of the city.

2. Research method approach and scientific relevance. Elaborating on the research method and approach reflecting thereby upon the scientific relevance of the work.

2.1 Research method approach

The complexity in understanding, analyzing and addressing specific challenges of informal environments, which are determined by a wide range of conditions, requires in turn a complex assessment system as solution. It should be noted from the outset that seeking the improvement of informal areas, certainly, is not a new challenge in the urban planning policies in Colombia. The country has been recognized worldwide for the efforts related to the informal neighborhoods upgrading programs on a number of occasions. Cities such as Bogotá (the capital) and Medellín (the second largest city and economic platform) have been awarded for their proposals around concepts (and theories) such as 'social urbanism' or their well-known innovations in mobility issues. In spite of these efforts, it is evident that the referred interventions have not achieved structural transformations over time and that many of these proposals do not end up being carried out, at least fully or properly, due to funding problems, time management concerns, or corruption, among others.

Taking into consideration the specific case of Bogotá, the mechanism through which the District Administration (Alcaldía Distrital) promotes and orients the upgrading, complementary and/or reordering actions of housing units as well as, in general, the informal urban space, is compiled in an upgrading program which is carried out by the District Habitat Secretariat (Secretaría Distrital de Hábitat). Despite the specific challenges and necessary changes in each of the informal areas in the city, the district program has been developing generic interventions on a short-term perspective, with a physical and technical approach that lacks an integral development assessment. Such a desired integral assessment must address the evolutionary and complex challenges of self-built environments from a correlated perspective between social, socioeconomic, environmental and political spheres.

In the following section, some essential elements and main reflection on the analytical and design methods will be elucidated.

2.2 Analytical framework

Vulnerability index and the multidimensional vulnerability diagnosis

Based on the previous considerations, the analytical framework was structured based on the creation and development of a 'vulnerability index'. The main value of this tool is that with it is possible to organize and prioritize the diverse analytical variables regarding socio-spatial, ecological and socioeconomic vulnerabilities that have an impact on the systemic operability of a city. Furthermore, this index was also instrumental when developing the assessment, in terms of bridging the adoption of a critical understanding and realizing the correlation of diverse systems (both social and ecological) in the structural causes of particular problematics evidenced in the selected areas of analysis. Secondly, the isometric and three-dimensional representation presented in the analysis intended to capture the complex topographies, the degrees of consolidation and the systemic operations of the analyzed systems, resulting to be an essential tool in qualitative terms. Using such a representation to illustrate the realities of these places proved to be a powerful instrument.

Critical assessment of the current planning approach

The second analytical method focuses on exploring actions and strategies carried out by two different District Administrations (each period of four years) under their upgrading programs in two critical and very indicative locations from the informal area of Bogotá. This analysis was necessary to understand the structural problems of the current program i.e. lack of long-term vision, implementation of isolated actions as solutions and, ultimately, the evidence of persistent high rates of vulnerability over time.

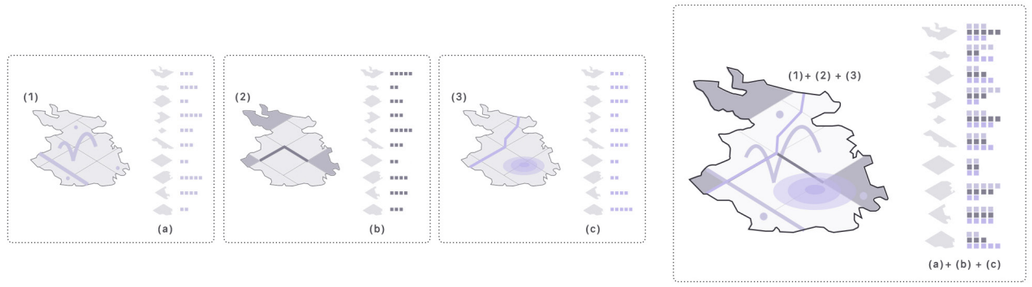
The current upgrading program is conceived as an end and not as a vehicle to strengthen and expand the capacities of the communities and, therefore, to increase their autonomy and adaptability. Regarding the physical interventions in the environment, the program proposes interventions in both the public domain, e.g. road infrastructure and service actions, as well as in the semiprivate and private domain, e.g. interventions in facades and dwellings. However, the intervention models, and the urban and architectural design processes, are ignoring the particularities of the settlements, forcing and imposing generic interventions that do not recognize any differentiation between one settlement and other, despite being in different locations, distinct time of consolidation, population structure and characteristics, among others. This same approach to very diverse informal settlements, ends up imposing the same aesthetics and formal conception of "how these spaces should look like".

Therefore, the understanding and application of the notions of 'co-production' and 'local participation' in processes of socio- spatial transformation is challenged through findings. It must be clearly noted that the idea of involving communities is not new, it has been adopted in different strategies of upgrading programs in the past, yet the scope and focus transform the idea of co-production into a formally pre-established notion, in which the involvement of local communities merely represents a final check at the very end of the implementation of the strategy.

The analysis stresses the importance of rethinking the role of the urban planner and designers in informal contexts. On the one hand, it is crucial to redefine the practical foundations of design and co-creation tasks and, on the other hand, to redefine the long-term goals, where strategic interventions must activate a path that allows an evolutionary transformation of the formal and informal agency. The continued participation of all actors must be ensured through strategic interventions over time. Informal communities must be equipped with the necessary tools in order to continue developing and transforming their environments endogenously and, consequently, lowering their vulnerability and exposure to risk in structural terms.

The design of the planning framework is supported by evidence, comprised in the findings provided by the two analytical tools. This framework embraces the co-evolution of social and ecological systems and, through the alignment of the biophysical, social and socioeconomic systems, it is capable of activating and transforming the role of formal and informal agents into co-agents of change in the adaptive process.

Fig. 11.1 - Correlated Understanding of the Vulnerability results



2.3 The design of a co-evolutionary framework (research-oriented design)

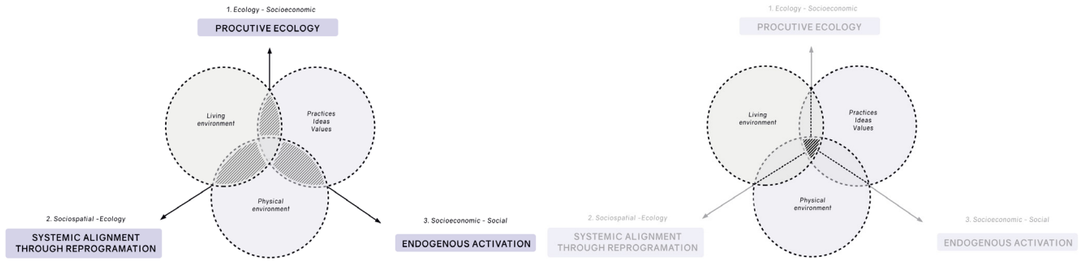
By designing a co-evolutionary framework what is pursued is the creation of a collaborative process for action. The development of such a framework is proposed as a complement to the current upgrading program in Bogotá. One in which the existing conditions of an urban context can be appropriated and, subsequently, guide the co-evolutionary transformation of a specific location. As explained in the previous section, the cross-dimensional analysis which was defined through the 'vulnerability index', resulted in a multi-dimensional and correlated approach to vulnerability.

Based on the definition proposed by Giorgos Kallis, where co-evolution is understood as the progressive and evolutionary transformation between interacting social and environmental systems (Kallis, 2007), three co-evolving systems were defined which structured the long-term goals and the strategic actions of the proposal. To be more specific, an example of one of the proposed goals, is the one framed under the notion of 'Productive Ecology', which interrelates and adopts the vulnerability in the ecological domain and the vulnerability in the socioeconomic domain, in a same co-evolving system. This is implemented by proposing nature based solutions and possible environmental related economies. The approach aims to counteract ecological and socioeconomic vulnerability and achieve the systemic stabilization of social and ecological systems in the long-term.

In turn, the proposed 'co-evolutionary pathway model' (Haasnoot et al. 2013) was instrumental, when exploring the implementation of diverse actions classifying them according to spatial-temporal scales, to visualize the possible outcomes in adaptive scenarios that stabilize the socioecological systems over time. These co-evolutionary actions enabled the exploration of potential paths once an action reached a culmination point (Kwadijk et al. 2010).

Then, the possible adaption paths helped to understand the implications derived from each action through a testing-by-design process. In addition, this process was also a convenient tool to determine the feasibility of applying the notion of 'collaborative process' between formal and informal actors. This function could range from co-production of knowledge, co-production of space and joint maintenance, co-monitoring and co-evaluation of the measures proposed.

Fig. 11.2 - Co-evolutionary Goals



2.4 Social and scientific relevance of the work.

2.4.1 Social relevance of the work

Historical context

In order to highlight the social relevance of this thesis, it is important to note from the outset that Latin American countries are characterized for having strong contrasting social realities. In Colombia, specifically, almost 30% of families (3.8 million households) live in vulnerable and inadequate conditions and around 670,000 families are reportedly homeless, mostly as a result of the protracted internal armed conflict (according to Ministry of Housing estimates from 2013). Fortunately, the strongest and most enduring illegal actor, the Revolutionary Armed Forces of Colombia ('FARC' for its acronym in Spanish), laid down its arms and sealed a peace agreement with the Colombian government in 2016 (Casey, 2016). However, peace, equality and social justice are far from being a reality in Colombia. As a consequence of this, and a number of related factors such as: widespread corruption, the cross-cutting influence of drug trafficking, rural neglect and underdevelopment, among others, high numbers of population migrated, or were forcedly displaced, to urban areas leading to a proliferation of informal settlements on the peripheries of the cities (Pizarro, 2015) (Codhes, 2014).

Additionally, in recent years there has been an overwhelming trend of Venezuelan migration, which further exacerbates the problem of informality in Colombian cities (Tiempo, 2018). Lastly, climate change cannot be ignored, as its implications increase the risk of disaster in the most vulnerable populations which have fewer adaptive and reactive capabilities against external threats (Nugent, 2019). The combination of all these factors generates the necessity for district authorities to formulate policies which involve those living in informality with the obligation of ensuring their access to the full scope of the State's prerogatives.

Current events and state of affairs

In 2019 Colombia, and in the last few years in many countries of Latin America (Bolivia, Chile, Ecuador, among others), has seen massive social mobilizations and widespread discontent with corrupt, unjust and inequitable power systems and economic structures. This sense of civic unity and collective consciousness must be used to promote creative and innovative changes, introducing alternative policies, and opening dialogue spaces with citizens. All these, would generate results in terms of both cooperation and joint development towards a more equal and more opportunity-rich society (Dabène, 2019).

This proposal reflects a personal motivation towards recognizing the urgent need to implement and develop the concepts and principles of equity, equal opportunities and spatial justice. As it is displayed since the cover image of this study, the aim of the intervention actions in informal settlements should not be the imposition of formal standards, but rather an intermediate process of co-creation between the authorities and the populations that inhabit these territories. In this scenario, not only the role of the local is reinterpreted, ceasing to be a 'victim' to be considered as an active agent of change with long-term adaptation and development skills, but furthermore the role of the urban designer and planner is also reinterpreted, by reframing the practical foundations of design and co-creation, power relations and built space management.

COVID/19

An assessment of the social relevance of this thesis would be somewhat outdated if the implications of the COVID-19 outbreak are not considered, at least briefly. This crisis poses major challenges for this type of environments. Problems such as: the lack of access to clean water, trouble to implement basic hygiene measures, overcrowding, lack of public services, and hospital infrastructure to properly attend these vulnerable populations, reopens the question about the inadequacy of measures and tools to address the high levels of vulnerability of these territories (Castro, 2020).

Working conditions in the informal sphere, where direct day-to-day contact, and personal or whole-family economies are based on daily production and sales, makes conditions of isolation difficult to implement. In this sense, the adaptive and resilient conditions for these informal populations are more necessary than ever. For instance, the adaptability of the so-called 'public multi-functional structures', as stated in the proposal, could be transformed to provide temporary shelter for COVID-19 positive people. The stabilization and provision of ecosystem services that might improve health and hygiene conditions become indispensable to face the current scenario. This crisis in turn leads to further reflection on the structural causes of epidemic processes and public health, where the implementation of strategies focused on the resilience of social and ecological systems could provide both formal and informal agents with the capacity to adapt and react to uncertainty (Castro, 2020).

2.4.2 Scientific relevance of the work

Opening the debate about public policies, upgrading planning mechanisms, and the disconnected institutional and social dynamics, is relevant for future urbanization processes and current urban environments, especially those in developing countries like Colombia. Recognizing the importance of local groups as agents of change and the adaptive condition of complex systems within the planning structures could activate and change the segregated dynamics of the city, empower the local communities, reinforce bottom-up approaches and provide alternative possibilities for more resilient urban reconfiguration. This represents a call for the re-inclusion of socially produced spaces as more than just sub-products, by way of suggesting that social disparities have an interrelation and interdependence with the generating structures, influenced by formal development instruments rooted in the hierarchical notion of control (Leanne, 2013) (Marx, 2011) (Soja, 1980).

Incorporating theories of 'evolutionary resilience' (Davoudi), 'complex adaptive systems' ('CAS') (Dooley, 1996), 'adaptive governance' (Leanne (2013) (Adger, 2012) and 'adaptive pathways' (Haasnot, 2013) in the design and implementation of urban planning strategies for developing countries contexts, provides new tools for the practical upgrading mechanisms of informal settlement. In the academic arena, the discussion around socio-ecological resilience and adaptability in planning frameworks remains mostly at a theoretical level and still requires further exploration in the field of design and practical application. Colombia, as has been evident throughout this work, despite having good advances and being pointed as a global example in upgrading informal settlements, still requires many efforts, in the academic and professional fields, to achieve a co-relation between various disciplines and actors.

Therefore, this proposal represents a contribution to develop a theoretical and practical link, that is able to provide the potentiality of "new" knowledge, which later can be transferred to comparable programs and strategies in other countries of Latin America or the Global South. In addition, this study also serves on a scientific level to test these theories in practice and extract conclusions that will generate empirical evidence to support them.

3 Elaborating on the relationship between the proposed framework and the possible transferability of the results and potential applications of the results in practice (social, professional and scientific framework)

The selection of critical exemplary areas

The two areas selected (Lourdes and La Flora), for unfolding the analytical method and testing the implementation of the proposed co-evolutionary framework, are characterized for representing the most critical variables and circumstances in relation to the multidimensional vulnerability in Bogotá. At the same time, both locations respond to a typological selection that serves well as general example of inherent characteristics of the informal areas in the city. While one of the areas accounts to recent development conditions in the periphery, high poverty rates and ecological vulnerability, the other one addresses higher consolidation characteristics and to a better connection with the formal city. These general features are found in multiple areas of the city, revealing that the assessment and planning method can be replicated to other locations.

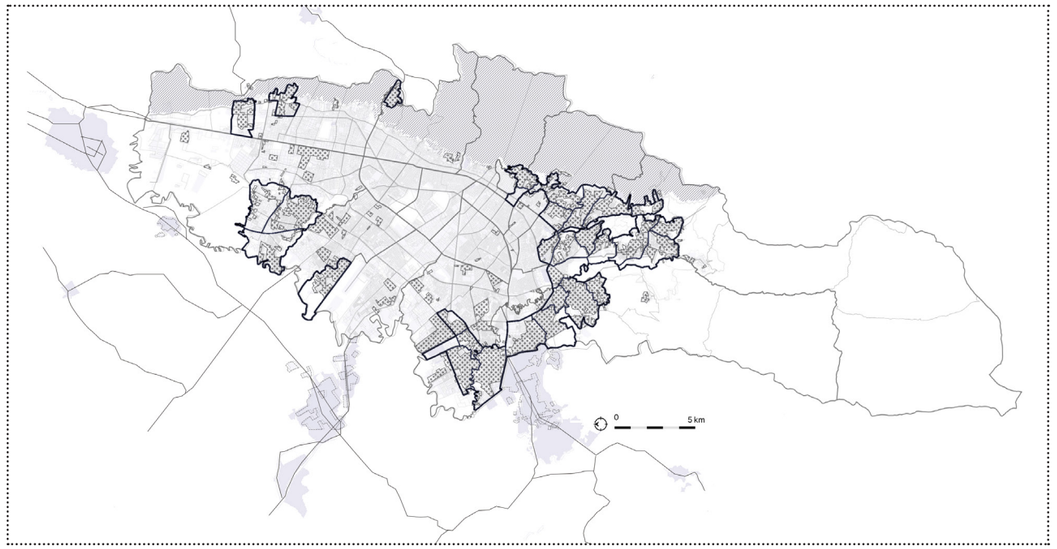
In this sense, the proposed methodology provides an operational frame, which guides the steps that must be followed in relation to the assessment and elaboration of potential strategies without rigid and generic designs. The co-habitation of social and ecological systems and the low-income population empowerment, as a result of the dissemination of the innovative strategies, the co-production of knowledge and space, new management and maintenance rolls and the evolutionary synergies with other functional systems of the city are part of the general objectives of the proposal. These general objectives, and the developed tools, might also be implemented in diverse environments and formal urban structures, not only for diverse informal settlements.

The overall method could in itself adapt and expand its capacities by integrating or redefining the strategic goals of a proposal and be transferred to analyze other areas. Consequently, the definition of the variables does not define or restrict the assessment, evaluation and design method. The reasoning behind the structure of this framework could create a useful exploration approach to the necessary actions to implement inclusive, comprehensive and effective policies. Further research would be necessary in order to test the adaptability and other actions in different informal contexts, in which the identification and gradient of vulnerabilities and challenges will vary.

Naturally, this approach has limitations. There are major obstacles when it comes to devising strategies that break down generic and rigid intervention models. It is acknowledged that this type of proposals involve more time, resources, efforts, and require deeper analysis, greater willingness to evaluate multiple management and development models and, in turn, needs multi-stakeholder cooperation, which challenges current power hierarchies and traditional methods.

Therefore, the proposed adaptive approach is not meant to replace the more traditional planning methods. Instead, it can be seen as a valuable enhancement to the existing planning structures.

Fig. 11.3 - Territorial Delimitation of the current Slum Upgrading Program in Bogotá.



4 Ethical and Final Considerations (A reflection on the advantages and limitations of the chosen methodology, ethical issues and dilemmas encountered in doing the research)

Advantages of the chosen methodology

The main advantages of the proposed methodology are in the operability of the model. By correlating the analysis variables to the design proposal, the application of each phase facilitates decoding a large amount of information. Despite being a complex (this does not necessarily implies that its application is difficult), its step-by-step approach facilitates its implementation. Furthermore, since the proposal is based on existing planning platforms, the identification and critical assessment of the current involved actors allowed a better reconstruction of the cooperation and collaboration networks in the adaptive process.

A great advantage of the co-evolving method is the correlation between different scales and complexity ranges in the implementation. By proposing strategies at different scales and complexities (from dwellings to urban scale), the importance of understanding the correlated impact between a dwelling water collection facility and a water treatment and collection infrastructure is made visible.

Challenges encountered in doing the research and ethical dilemmas

One of the main challenges faced during the research process was to collecting the necessary demographic and social data from informal settlements. Due to the fact that certain informal areas are not considered within the formal structures of the city, the social, economic and cultural data of the community is not collected through the district planning programs. It is evident that this dynamic, as it occurs in a spontaneous and complex manner, makes the compilation of information a difficult and challenging task.

This leads to a reflection on the construction of information and on the characterization of these settlements from early stages of development. The idea of 'co-production' must transcend to fields of information and data of current situations and in the evaluation of proposals. Bogota's upgrading program has incorporated in its method a system of control and follow-up of informality in which the monitoring management carried out by municipal entities is focused on identifying, Geo-referencing and avoiding the expansion of informal settlements.

By broadening the scope of this type of strategies could involve the community in task such as gathering demographic information and other data. Also, engaging the community in joint activities for the construction of knowledge, for instance examining the reasons for the arrival of different populations to this sector, creating awareness of the structural roots of the problems they face as a commune, in order to better portray the social and cultural conditions of these places.

Regarding a dilemma faced in the development of this work, there is one that stands out for its relevance. This is that strategic urban planning programs must be efficient (optimize results using the least amount of resources available) but also fair in social and economic terms. When proposing an adaptive planning strategy that is characterized for being democratic, involving as many actors and visions as possible, to achieve results that endure and improve people's living conditions in the long term, the efficiency of planning systems unilaterally imposed, or at least lacking a solid collective construction, is somehow abandoned. In the face of this dilemma, the balance suggests that inclusion implies investment of more resources (in terms of time, money, effort, etc.) and that this investment and extra effort is justified because it seeks the well-being of the neediest populations and aims simultaneously to generate changes and long-term improvements.

Final considerations: The challenge of uncertainty

The implementation of co-evolutionary pathways that, on the one hand, address different types of uncertainties and, on the other hand, are able to guide sound decisions to respond to unforeseen changes, represents a major challenge. The exploration model, that redefined current static approaches into dynamic methods seek to develop, through the construction of a long-term vision, an awareness capacity in order to overcome the risks and threats, react and take decisions (Haasnoot, 2017).

The explorative development of two different pathways with a same general procedural framework, revealed how the same method could develop pathways and strategic combinations regarding the context variables, as well as how the co-construction of knowledge and awareness was a key constant element in the definition of each phase. The extent of the proposal's capacity to respond to external factors is framed within the constant demands of the co-evaluation process aimed at strengthening the response capacity of urban areas and integrating into the education and capacity-building actions for the population, not only within the framework of the co-construction of the space. This includes providing training for evacuation in the case of natural disasters or emergencies, rapid reaction capacity and awareness of the potential reactions needed in case of failure of actions being taken at present. The model redefines the risk approach as a tool to improve local conditions and at the same time the method to build a city which is integrated over time (Haasnoot, 2017). Such measures are related to the specific design capacity for each action and the development of a systemic operability network.

Despite the main challenges facing the proposed planning framework and the major concerns in terms of inequity in the urban sphere, major policy changes are currently under way in relation to informality in Colombia and, in general, in Latin America. As a result, it is clear that there is enthusiasm and hope for change and that the proposed model can contribute to the evolutionary path of inclusion and transformation that the world demands today.

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12. Glossary and Appendix

Acronyms and Abbreviations

-POT: Land-Use Plan
('POT' for its acronym in Spanish, 'Plan de Ordenamiento Territorial')

-UPZ: Zonal Planning Unit
('UPZ' for its acronym in Spanish, 'Unidad de Planificacion Zonal')

- SDP: District Planning Secretariat
('SDP' for its acronym in Spanish, 'Secretaría Distrital de Planeación')

- SDH: District Habitat Secretariat
('SDH' for its acronym in Spanish, 'Secretaría Distrital de Hábitat')

- SDG: District Governance Secretariat
('SDG' for its acronym in Spanish, 'Secretaría Distrital de Gobierno').

- SDIS: District Social Integration Secretariat
('SDIS' for its acronym in Spanish, 'Secretaría Distrital de Integración Social').

- CVP: Popular Housing Fund
('CVP' for its acronym in Spanish, 'Caja de Vivienda Popular')

- UAECD: District Cadastre Special Administrative Unit
('UAECD' for its acronym in Spanish, 'Unidad Administrativa Especial de Catastro Distrital')

- DPAE: Department of Prevention and Emergency Care
('DPAE' for its acronym in Spanish, 'Departamento de prevención y atención de emergencias').

- IDPAC: District Institute for Participation and Community Action
('IDPAC' for its acronym in Spanish, 'Instituto Distrital de la Partcipación y la Acción Comunal').

- DADEP: Administrative Department for Public Space Defense
('DADEP' for its acronym in Spanish, 'Departamento Administrativo de la Defensoría del Espacio Público').

- EAAB: Water and Sewage Company of Bogota
('EAAB' for its acronym in Spanish, 'Empresa de Acueducto y Alcantarillado de Bogotá')

- SDM: District Mobility Secretariat
('SDM' for its acronym in Spanish, 'Secretaría Distrital de Movilidad)

- SDA: District Environmental Secretariat
('SDA' for its acronym in Spanish, 'Secretaría Distrital de Ambiente')

- SED: District Education Secretariat
('SED' for its acronym in Spanish, 'Secretaría de Educación Distrital').

- ERU: Urban Renovation Company
('ERU' for its acronym in Spanish, 'Empresa de Renovación Urbana').

- ETB: Bogota's Telecommunication Enterprise
('ETB for its acronym in Spanish, 'Empresa de Telecomunicaciones de Bogotá').

- UAESPS: Special Administrative Unit for Public Services
('UAESPS' for its acronym in Spanish 'Unidad Administrativa Especial de Servicios Públicos').

- COD: Codensa Energy Company
('Codensa' for its acronym in Spanish, 'Enel-Codensa Comercializadora de Energía')

- GEB: Bogotá's Energy Group
('GEB' for its acronym in Spanish, 'Grupo de Energía de Bogotá).

- GNB: Natural Gas Company
('GNB' for its acronym in Spanish, 'Gas Natural Bogotá S.A.')

- IDU: Urban Development Institute
('IDU' for its acronym in Spanish, 'Instituto de Desarrollo Urbano').

- IDRD: District Institute for Recreation and Sport
('IDRD' for its acronym in Spanish, 'Instituto Distrital de Recreación y Deporte').

- SDCRD: District Cultural, Recreation and Sport Secretariat
('SDCRD' for its acronym in Spanish, 'Secretaría Distrital de Cultura, Recreación y Deporte').

- JBB: Bogotá Botanical Garden
('JBB' for its acronym in Spanish, 'Jardín Botánico de Bogotá')

- IDEAM: Hydrology, Meteorology and Environmental Studies Institute('IDEAM' for its acronym in Spanish, 'Instituto de Hidrología, Meteorología y Estudios Ambientalesl')

- CAR: Regional Autonomic Corporation ('CAR' for its acronym in spanish, 'Corporación Autónoma Regional')

- IDIGER: District Institute for Risk Management and Climate Change
('IDIGER' for its acronym in Spanish, 'Instituto Distrital de Gestión de Riesgos y Cambio Climático')

- CA: Community association
- INH: Inhabitants

.- GIS: Geographical Information System

- CAS: Complex Adaptive Systems

Design case exploration

Overview

The following section will go through an example of the proposed "co-creation" process between formal and informal agents, focused in the possible physicality and functionality of a concrete spatial intervention.

The current understanding and application of the notions of "co-production" and "local participation" in processes of socio-spatial transformation in informal settlements are questioned through the proposal and discoveries. Therefore, the example case will zoom in a strategic area in the planning Unit Lourdes after the proposed Co-evolutionary scenario, and will expose and analyze the formal and informal role in the implementation and construction of the proposed strategic actions, by exploring and redefining the role of urban planners and designer in the physical materialization of specific interventions on informal environments.

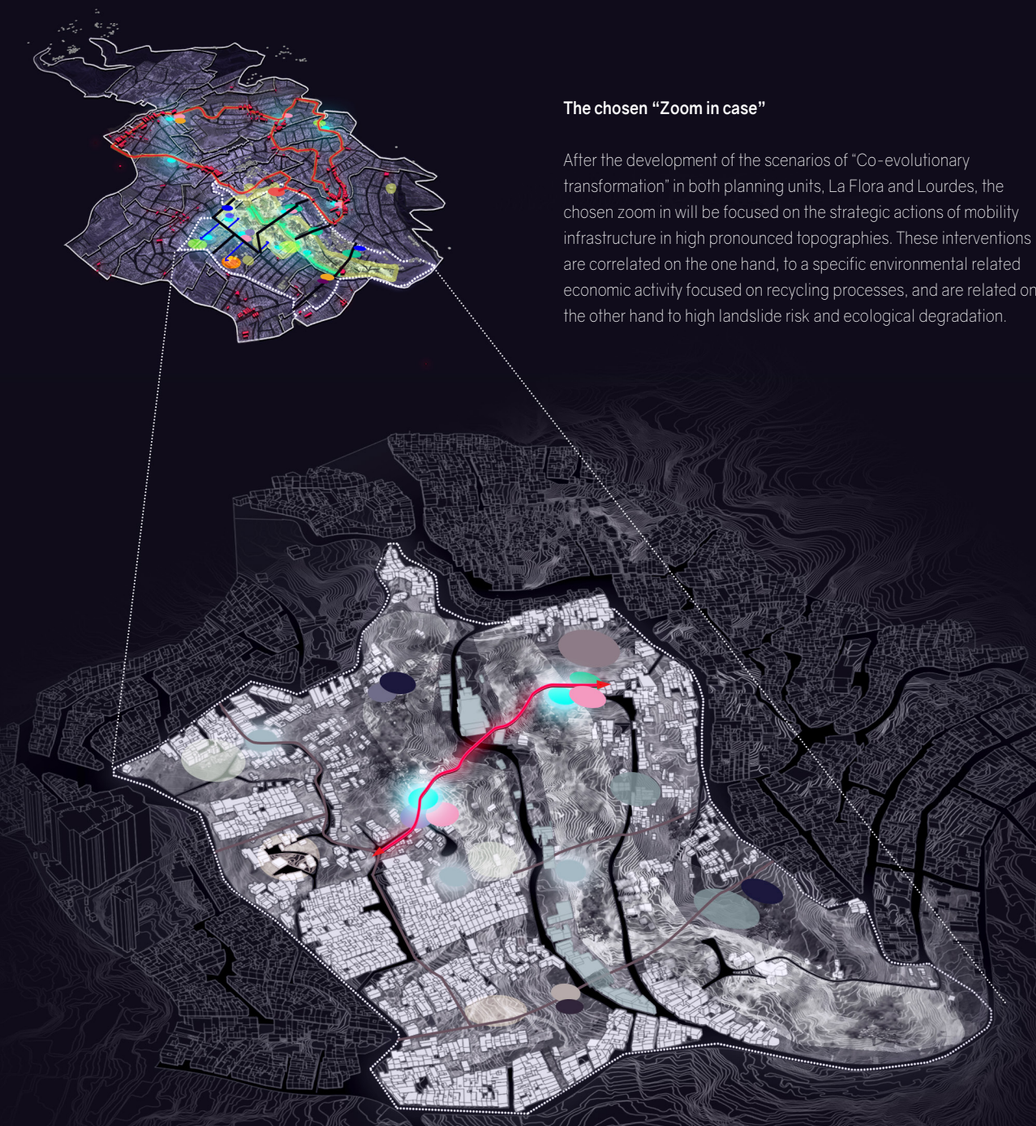
Chapter Structure

1. Co-creation process between formal and informal agents. *Introducing the exemplary case*

2. Recycling Community.

1. Co-creation process between formal and informal agents. *Introducing the exemplary case*

Co-evolutionary Transformation scenario.
Planning Unit Lourdes



The chosen "Zoom in case"

After the development of the scenarios of "Co-evolutionary transformation" in both planning units, La Flora and Lourdes, the chosen zoom in will be focused on the strategic actions of mobility infrastructure in high pronounced topographies. These interventions are correlated on the one hand, to a specific environmental related economic activity focused on recycling processes, and are related on the other hand to high landslide risk and ecological degradation.

Fig. 12.1 - Chosen Exemplary case in the visualization of possible co-creation processes in UPZ Lourdes.

— Mobility Infrastructure in pronounced topographies involving recycling communities

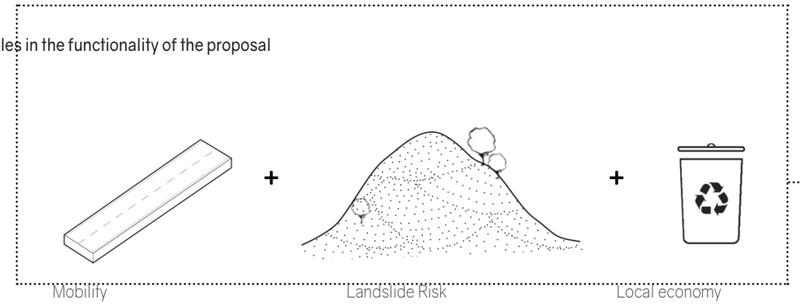
As shown in the following image, the implemented strategic actions over time, led to a scenario in which the connection Axe has the purpose to connect a capacitation center and waste disposal node in the inside of the recycling neighborhood, with a multifunctional public area and recycling plan in the upper area. The co-creation process requires an appropriation of local socioeconomic systems in correlation with environmental variables, in order to achieve a comprehensive intervention in the area.

1. Co-creation process between formal and informal agents. *Introducing the exemplary case*

The informal agents identified in the recognitional phase will be active agents in the implementation of these specific strategic action. The co-creation of space between formal and informal agents, is realized through the involvement of local needs and potentialities as part of the development of the intervention, understood in terms of its materiality, its possible multi-functionality, its implementation process and further maintenance. The aim of this type of example is to highlight the importance not only of spatial intervention and the reduction of social and ecological vulnerability, but also explore and visualize the possible innovation, uses, behavior and local appropriation that could arise with a more comprehensive and local oriented evolutionary process.

In the specific case of Lourdes, the Co-evolutionary pathway reached a conformation of strategies that were explained in previous chapters. The development of the pathway suggested that in order to reduce socio-economic and social vulnerability, interconnections between the informal core and the local commercial infrastructure should be considered. The process aims to explore possible solutions that involve the environmental related economy of recycling with mobility issues. At the same time, the approach of permeating the areas with complex topography puts an additional challenge in correlating the technical variables that understand the social dynamics of this specific population with environmental risk mitigation issues.

Correlated variables in the functionality of the proposal



2. Recycling community

Recycling activities play a crucial role in the livelihoods of the recyclers' households in Bogotá, who have few, if any, employment alternatives or source of income. Families in this group of informal economic activity are in a highly vulnerable condition.

The garbage collection process is carried out by wooden carts as shown in the following diagrams. This local produces transport medium facilitates the transport and collection of different materials such as glass, cardboard, plastic, among others.

The aim in the co-creation process is to incorporate the understanding of the importance of this type of transport elements and the identity behind them, as an determining element that guides both the functionality and the materiality of the intervention. This will ensure the involvement of the community in the process, and a coherent approach to local determinants and potentialities.

Fig. 12.2 - Recyclers in Bogotá. Functional Local produced mobility items.



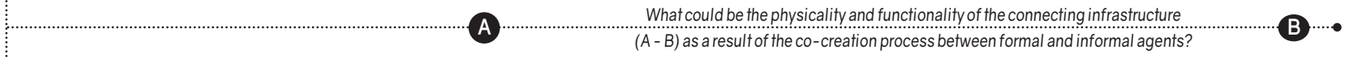
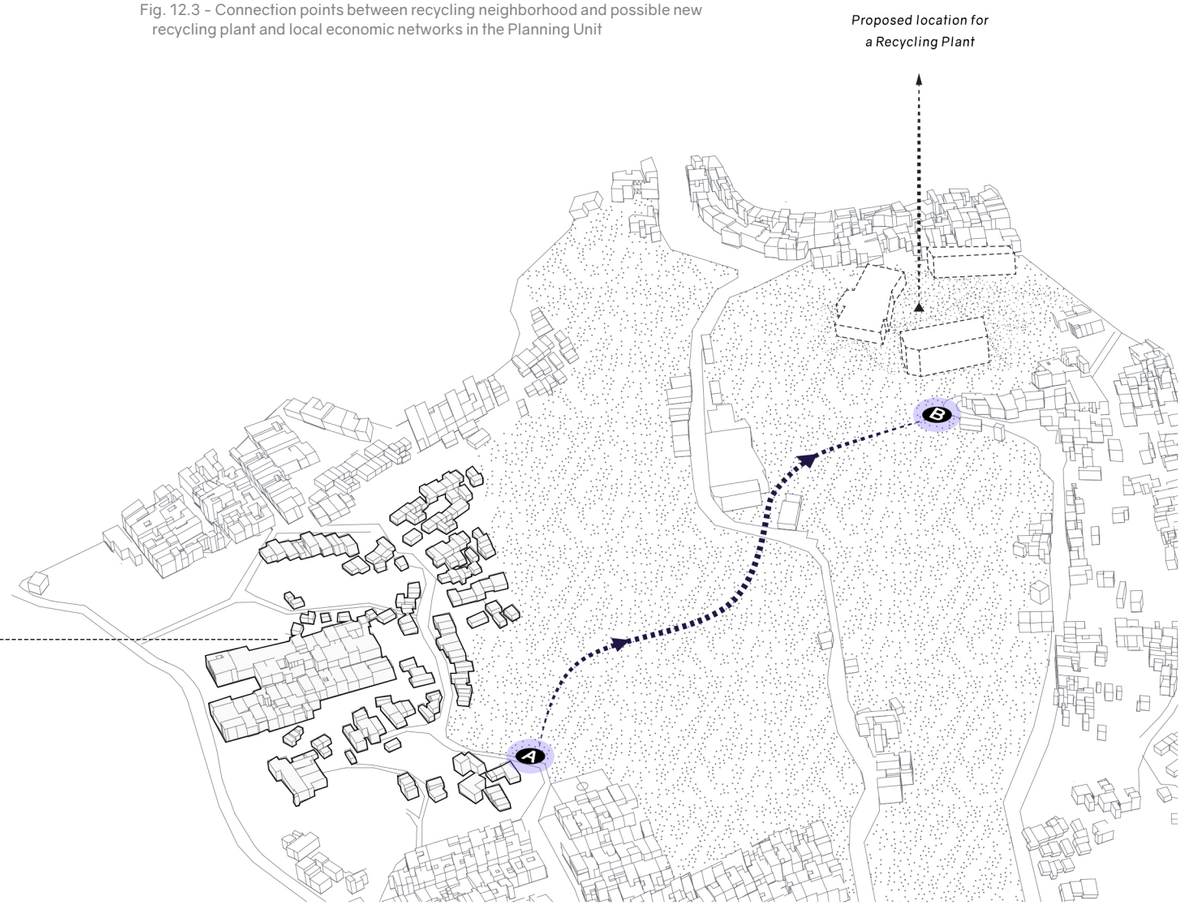


Fig. 12.3 - Connection points between recycling neighborhood and possible new recycling plant and local economic networks in the Planning Unit

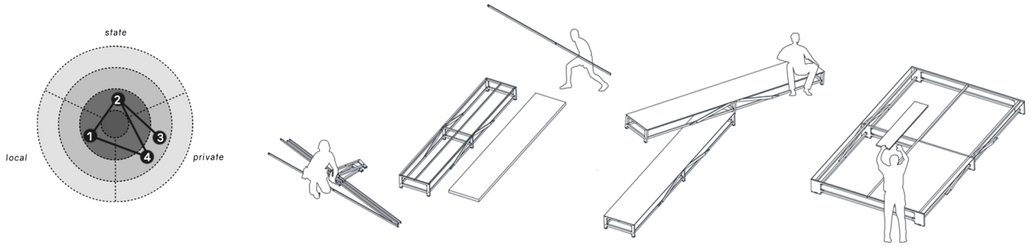


Development stages and actors

As exemplified by the development of the Co-evolutionary Pathway in Lourdes, the first phase was the Recognitional phase. The main objective of this phase was to recognize and approach the vulnerable community, identify the leaders, community networks and main needs and potentialities of the population. A possible scenario for co-creation between the recycling communities and the formal entities was then elaborated. As explained above, the intervention should have a correlated function between local economies, the risk of landslides and the need for greater accessibility. Three stages were defined for the construction of the structures to be installed: The construction of the pedestrian modules, the assembly of the rails for the recycling carriages, and the manufacture of complementary furniture for the communal spaces that are integrated in the new correlated mobility system.

Pedestrian Network

Fig. 12.4 - Construction of the Pedestrian Network. Co-creation example Lourdes.

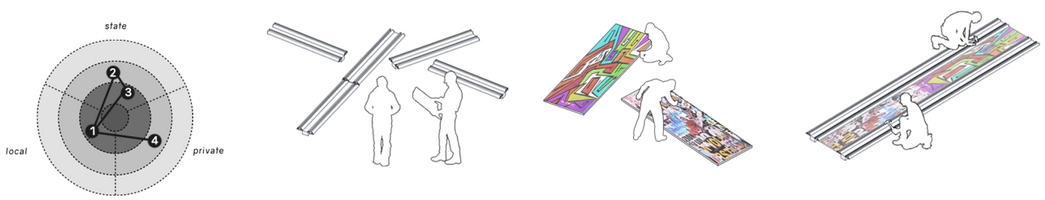


1. Recyclers and Local community
2. DADEP
3. Private Companies
4. NGOs

The construction phase starts with the development of the stair modules that are made of wood and recycled materials. The process of development takes place among the recyclers, the local community, formal entities related to the development of public space, NGOs and private companies that want to donate and contribute with materials for the elaboration.

Rail Network

Fig. 12.5 - Construction of the Rail Network. Co-creation example Lourdes.



1. Recyclers and Local community
2. EAAB
3. Engineers
4. Artists

The second step is the assembly of the rails system modules for the recycling carriages. The rails are designed with the community, engineers and actors of the water company of Bogotá. The agents from the formal side, ensure the multi-functionality of the rails, serving on the one hand the mobility of the wagons, as well as the collection and flow of water. The central walking track sheets open up a process between artists and the local community, personalizing them through graffiti art, in which young people and children participate.

Urban Furniture

Fig. 12.6 - Construction of Urban Furniture. Co-creation example Lourdes.

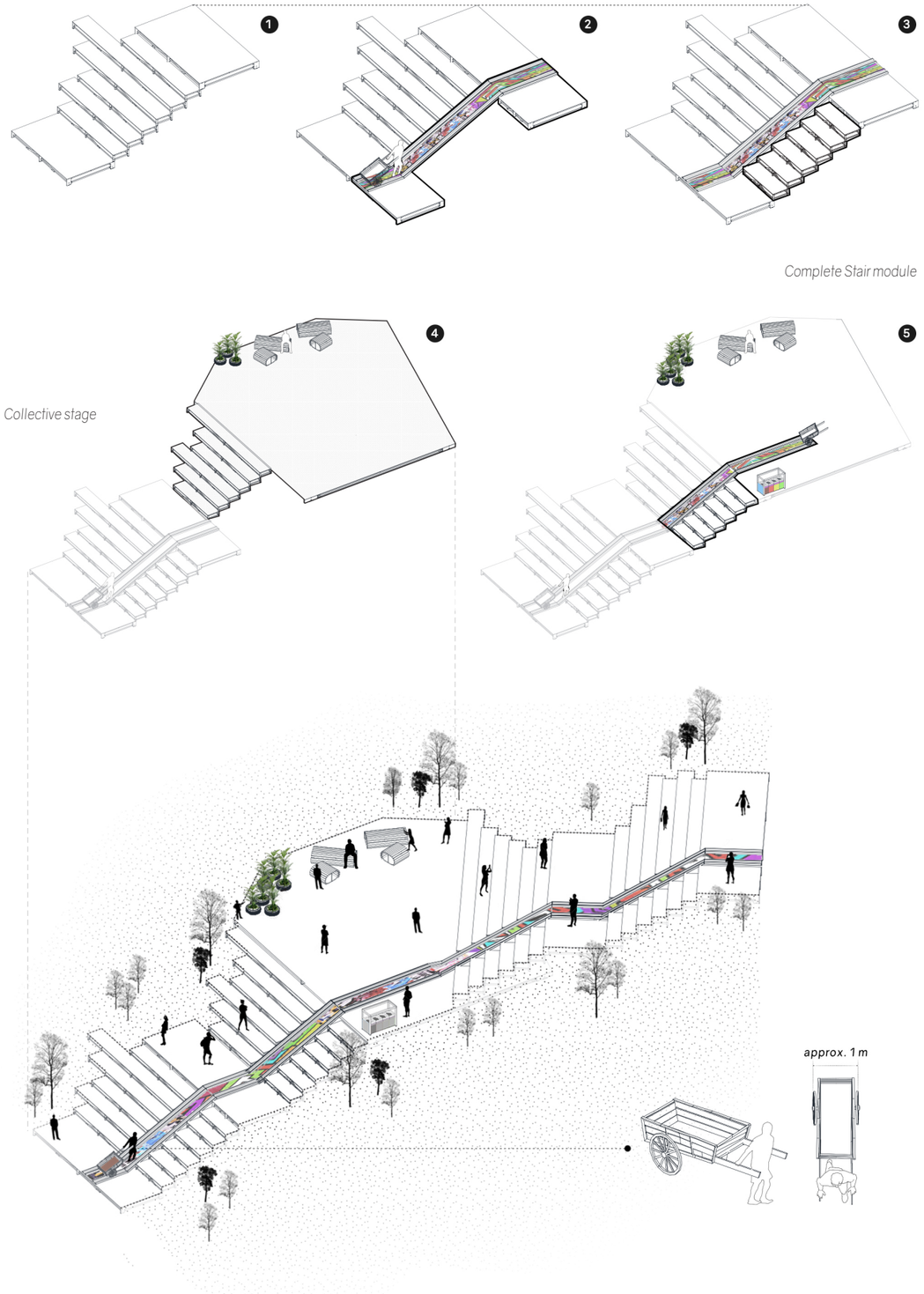


1. Recyclers and Local community
2. DADEP
3. JBB
4. Private Companies

The proposed community areas that will be placed during the route will open the process of co-creation of complementary furniture made from recycled materials. In these processes the community, women and children participate in the elaboration of garden and flower pots, cubicles of collection of garbage and urban furniture, accompanied and advised by the waste collection company, the botanical garden and municipal entities engaged in the development of public space. Again, private companies and NGOs can enter the process of donating materials and contributing to the construction process.

Assembling process

Fig. 12.7 - Construction Phases. Co-creation example Lourdes.



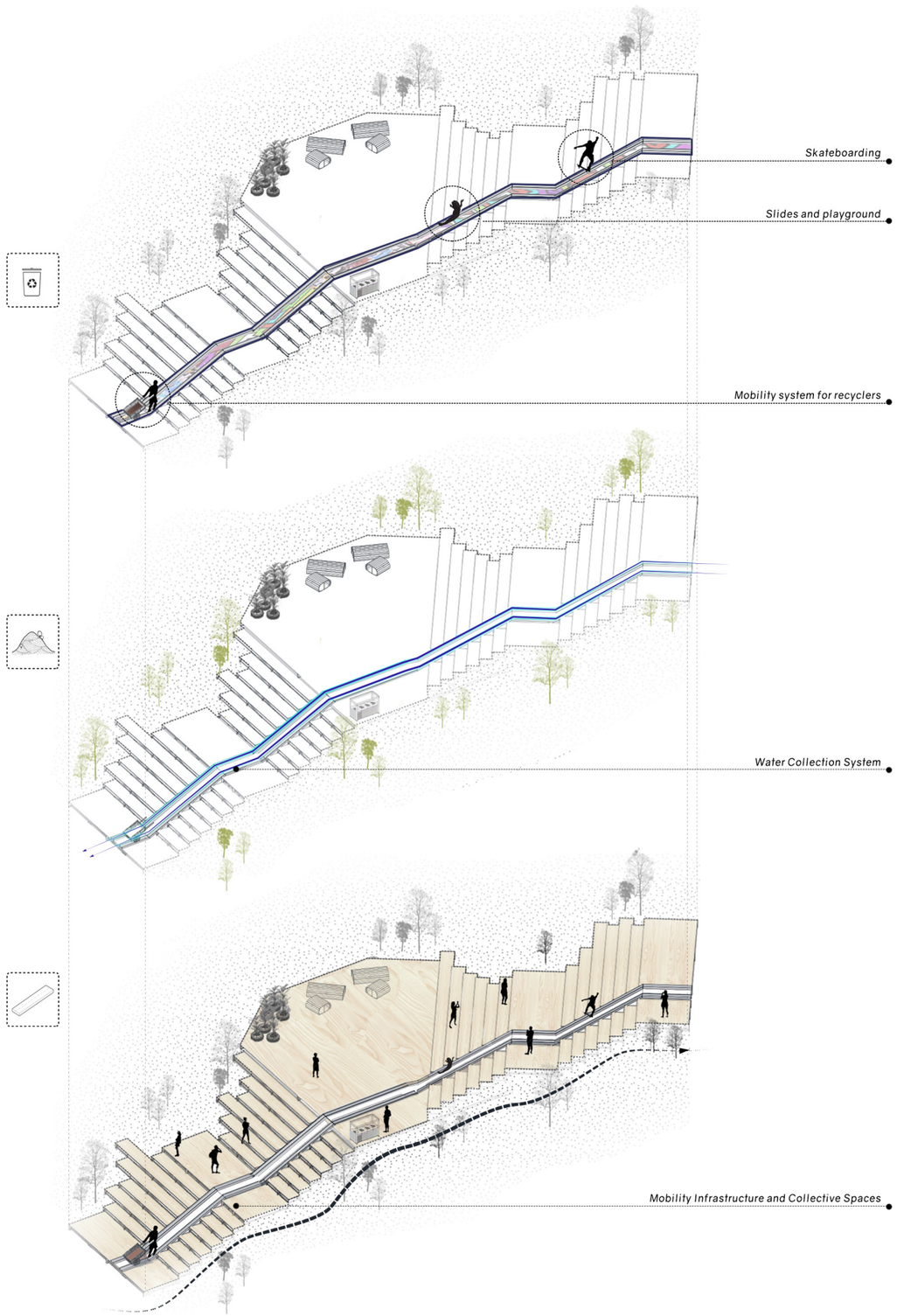


Fig. 12.8 - Systemic Operations in the proposal. Co-creation example Lourdes.

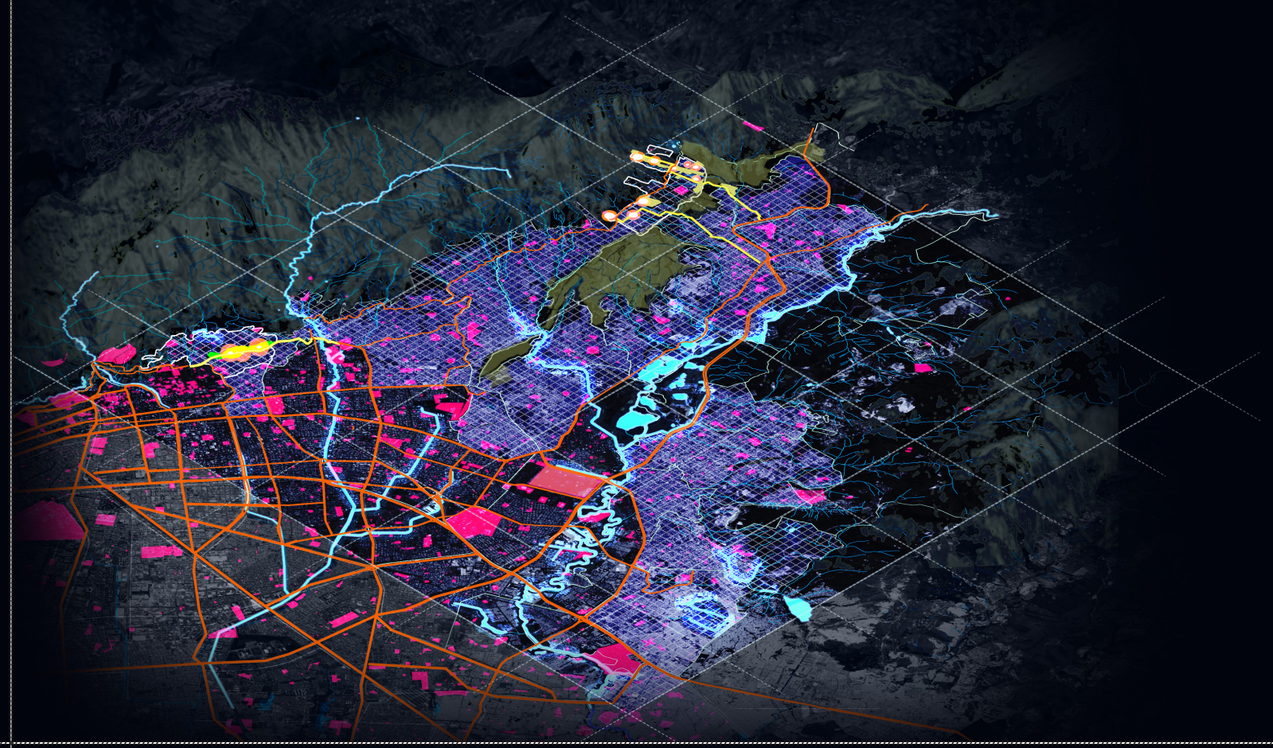
Fig. 12.9 - Imaginary Visualization. Co-creation example Lourdes.



Blue Infrastructure



Sociocultural Infrastructure



Green Infrastructure



Socio economic Infrastructure



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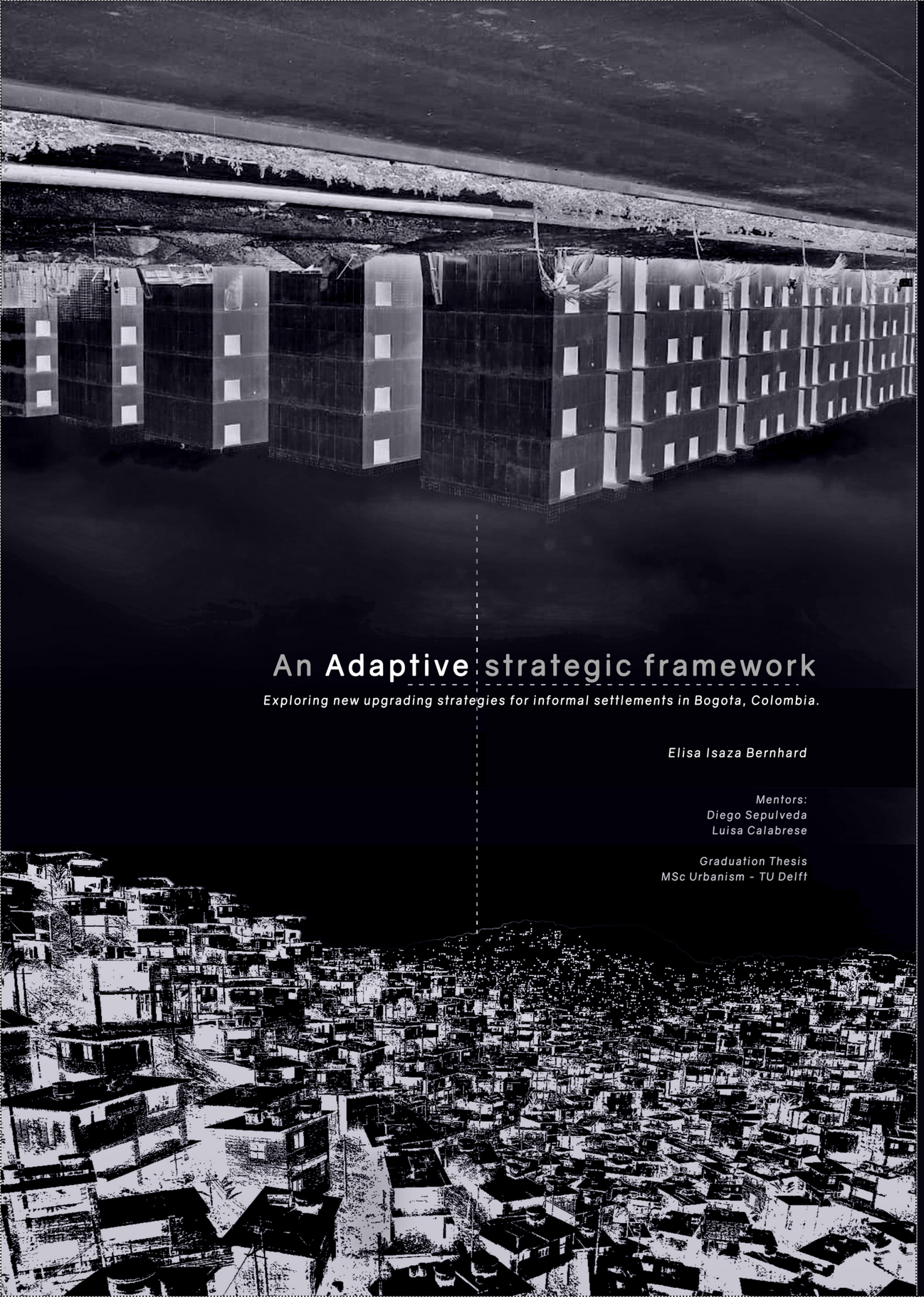
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An **Adaptive** strategic framework

Exploring new upgrading strategies for informal settlements in Bogota, Colombia.

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Graduation Thesis
MSc Urbanism - TU Delft

This proposal reflects a personal motivation towards recognizing the urgent need to implement and develop more comprehensive urban strategies, based on principles of equity, spatial justice and socio environmental resilience in a long term perspective. As displayed in the cover image of this study and now the ending of this project, the aim of the proposed framework is not to impose formal standards, but rather an intermediate process of co-creation between multiple actors and multi-systemic relations, in which the role of the local and nature is reinterpreted, communities ceasing to be seen only as 'victims' and nature ceasing to be only a threat, to be considered as active agents in the transformation process of informal areas. Furthermore, the model proposes the reinterpretation of the role of the urban designer and planner by re-framing the practical foundations of design, planning, power relations and built space management.

Urbanism

TU Delft BK Bouwkunde