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CALI
COLOMBIA

2020 Exploring Urban Resilience Pathways

UR NET Urban Resilience research Network

International Master City Resilience Design and Management

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About the report and the collection

Exploring Urban Resilience Pathways

This report is part of a collection wishing to provide a global overview about different cities' experience in resilience, and how this is evolving. The series is titled "Exploring Urban Resilience Pathways" and each report is prepared by one student of the Int. Msc. City Resilience Design and Management (URNet-UIC Barcelona) during the first semester, as a learning outcome of the acquired analytical skills - to find, understand, organize and communicate different perspectives, approaches and models of urban resilience implementation in a determined city.

The aim of each report is thus offering an easy-to-read overview, about how adaptive capacities have been evolving in a selected city, as set of mechanisms to respond through governance, plans, projects or communities-led initiatives to overlapping shocks and stresses within its recent history. Nowadays current City Resilience Strategies – launched and supported by the Rockefeller 100RC program – are included within these analyses, representing the ultimate trend of understanding, and implementing city resilience.

What is interesting to learn from this series of reports, is that each of them critically discusses how cities managed adaptive responses to different treats in the past, and how the concept of resilience entered city agenda, discourses and plans, making explicit what (and if) resilience brought to city policies and practices. Thus, the relationship between past and present adaptive capacities, between resilience and sustainability, and between city resilience and community resilience are critically discussed.

Although the scope of these reports is ambitious, and the analysis leading to each report results complex, the presentation has been designed in order to be easy to read and accessible to the general public. Each report of this collection maintains a standard structure, facilitating the reading and the reports and cities comparison.

Hope this initiative contributes to spread the understanding about how resilience is framed and implemented in many cities across the globe.

CALI COLOMBIA
2020 Exploring Urban Resilience

SUMMARY

Cali is a Colombian city located in the southwest of the country, being the third of the biggest cities, not only because it is the main economic and industrial center, but also its social context due to the Colombian conflict.

Its main challenges are earthquakes, landslides, and floods. At the same time the city is exposed to stresses as violence and insecurity, inadequate access to education, lack of adequate mobility and water pollution, that contributed to exacerbating the effects of shocks.

This report explored how the city dealt with shocks and stresses, usually through a responsive (and not preventive) approach, combining both hard measures (as dikes) and soft ones (like early warning systems).

When Cali Joined to 100RC, in 2015, and released the resilience strategy 2 years after, the concept of resilience was incorporated and shifted from a reactive perspective to a programmatic and integrated approach, trying to transform the city toward sustainability, and increase agency across local communities.

This report is illustrating the evolutions of risks management in Cali through a timeframe - before and after the introduction of "resilience" – showing how the city's approach to resilience changes and which tools have been used (policies, projects, plans, and initiatives).

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LIST OF **ACRONYMS**

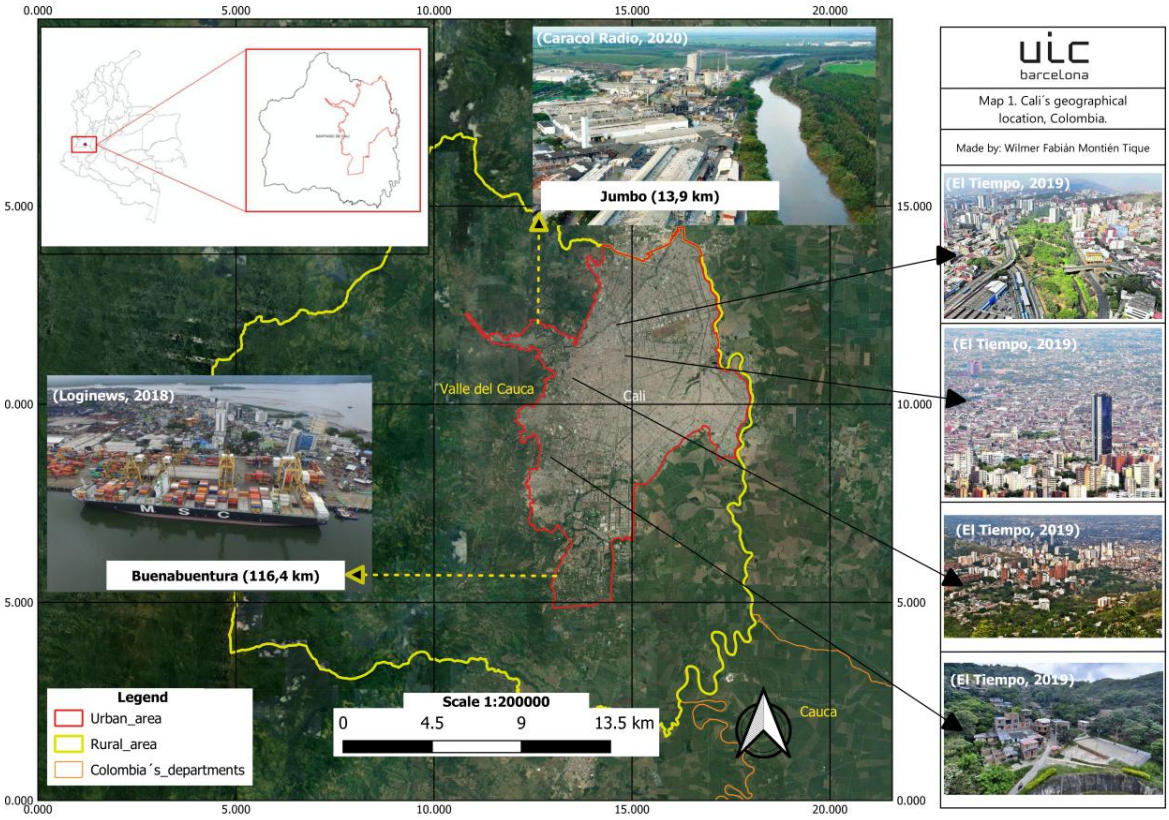
100 RC	100 Resilient Cities
CVS	Regional Autonomous Corporation of Valle del Cauca's Department
DAGMA	Administrative Department of Environmental Management of Cali
EMCALI	Cali Municipal Utilities Company
FARC	Revolutionary Armed Forces of Colombia
IDEAM	Institute of Hydrology, Meteorology and Environmental Studies
IFCES	Colombian Institute for the Promotion of Higher Education
IGAC	Geographic Institute Agustín Codazzi
MIO	Bus rapid transit system of Cali (Masivo Integrado de Occidente)
SDG	Sustainable Development Goals
SGC (INGEOMINAS)	Colombian Geological Service
SISCLIMA	Climate Change Information System
TIO	Territories of Inclusion and Opportunities
UNGRD	Unit for Disaster Risk Management
WQI	Water Quality Index

THE CITY: **CALI**

1. Introduction about the city

Cali is a city of 2'420.114 inhabitants located in the southwest of Colombia, at a high of 995 meters above sea level, between the Central and Occidental mountain range. It has an extension of 564 Km^2, where 119,21 Km^2 correspond to its urban area, and 44,79 Km^2 to its rural area, (Alcaldía de Santiago de Cali, 2015) (**Figure 1**).

Figure 1 Cali's geographical location.

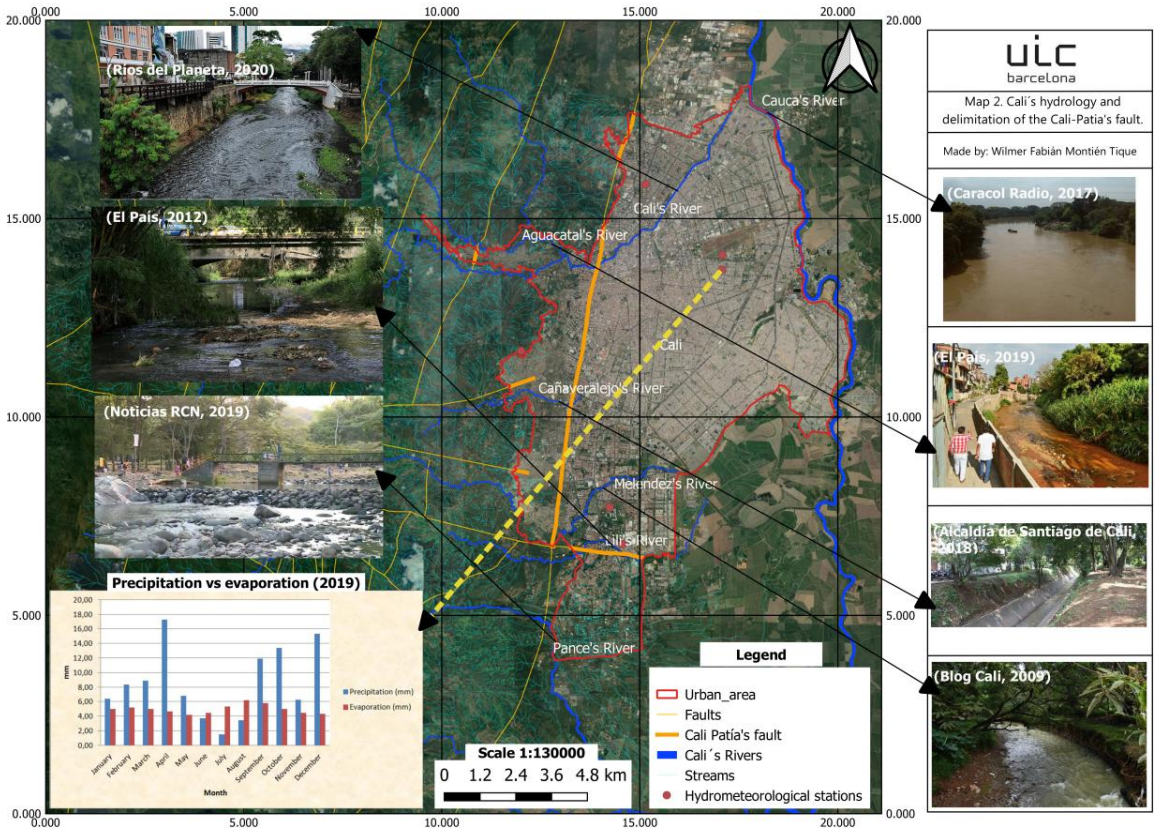


Source: Author, 2020, based on the Cali´s Land Use Plan.

Climatologically, the city has a precipitation pattern typical of a tropical climate, with a bimodal rainfall of which - the periods from March to May and October to December represent rainfall seasons, the rest of the months correspond to dry seasons respectively- being the temperature humid and tropical, around 10 and 24 degrees (IDEAM, 2020). Hydrologically, there are seven main streams: Pance, Lilí, Meléndez, Cañaveralejo, Aguacatal, and Cali, even the Cauca's river, but partially, due to it flows parallel to the city (Alcaldía de Santiago de Cali, 2014). Geologically,

there are four active faults known as the Cali-Patía. Geomorphologically the region is characterized by a flat area and a mountain area (**Figure 2**) (UNGRD, 2018).

Figure 2 Cali's hydrology and delimitation of the Cali-Patía's fault.



Source: Author, 2020, based on the Cali´s Land Use Plan.

Relating to the economic context, Cali connects not only with the path to Buenaventura's port in the seacoast pacific but also with the Jumbo's industrial center in the north of the country (**Figure 1**). Even, the city is crossed by the Pan American highway, connecting it with other countries, and positioning itself as one of the main economic and industrial centers in Colombia, attracting enterprises and corporations from pharmaceutical, chemistry, paper, and cardboard sectors.

Respect to the Cali's social context, since the last fifty years, the city has faced massive displacements due to the Colombian conflict. Also, people from other countries immigrated thanks to the city's economic situation, creating job opportunities. Nowadays, Cali is the third of the biggest cities in Colombia, with a population of 2'420.114 inhabitants of which, 98% live in the urban area, only 2% live in the rural area (Alcaldía de Santiago de Cali, 2015).

CITY PAST
ADAPTIVE PATHWAY:"BEFORE RESILIENCE"

2. Shocks and stresses of the city

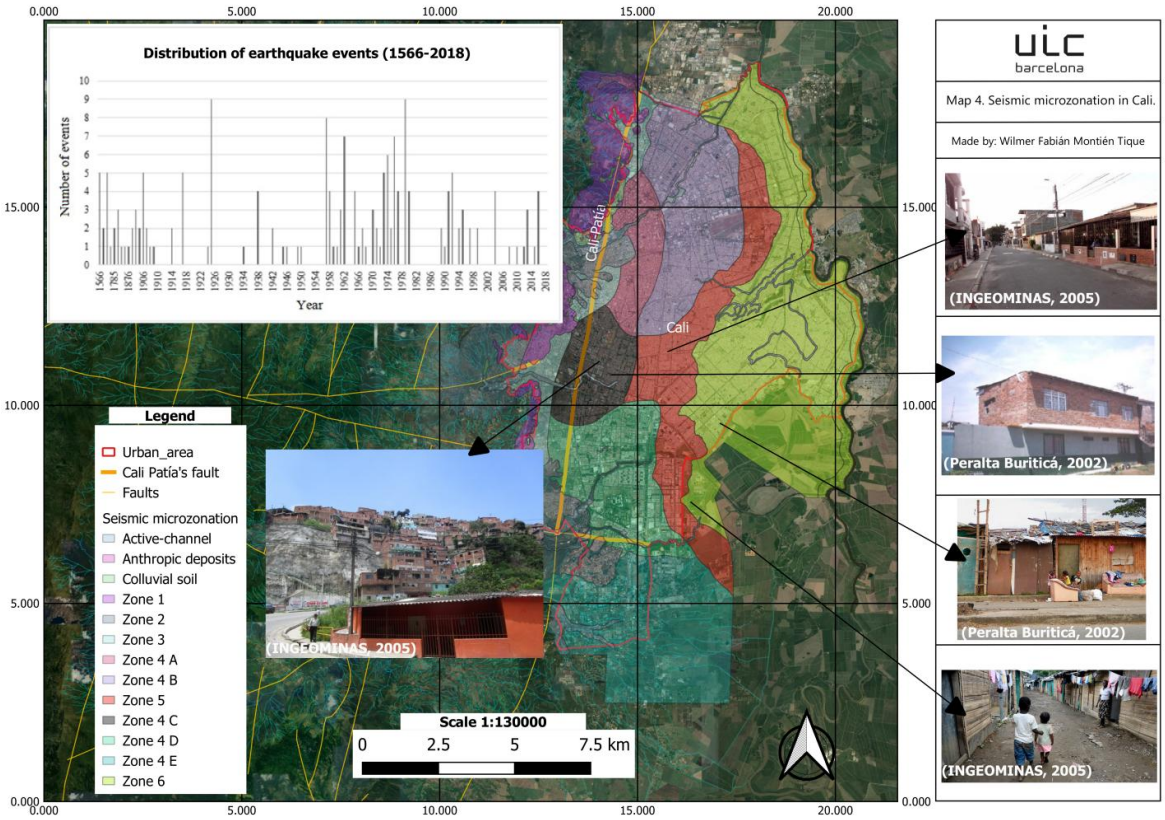
Cali has always been prone to a set of different (and potentially overlapping) shocks as earthquakes, landslides, and floods. Also, to stresses such as planning and management disarticulations, violence and insecurity, inadequate access to education, lack of mobility, and water pollution, which have been exacerbating the effects of shocks, under the background of the city structure and lives (Alcaldía de Santiago de Cali, 2015). The following bullet points describe evidence from shocks and stresses.

2.1. Shocks

EARTHQUAKES

The city has a high-risk level, especially in three geotechnical zones: 4 C, 5, and 6 (**Figure 3**), located in the east (INGEOMINAS, 2005), not only because of the Cali-Patía's active fault, but also informal settlements, derived by uncontrolled urban growth. Consequently, in the territory, there have been 97 events so far; five of them were significant owing to destroyed two hospitals, one school, two hotels, one textile factory, four banks, and eight churches, with more than 50 injuries and seven fatalities (UNGRD, 2018).

Figure 3 Seismic microzonation and distribution of earthquake events.

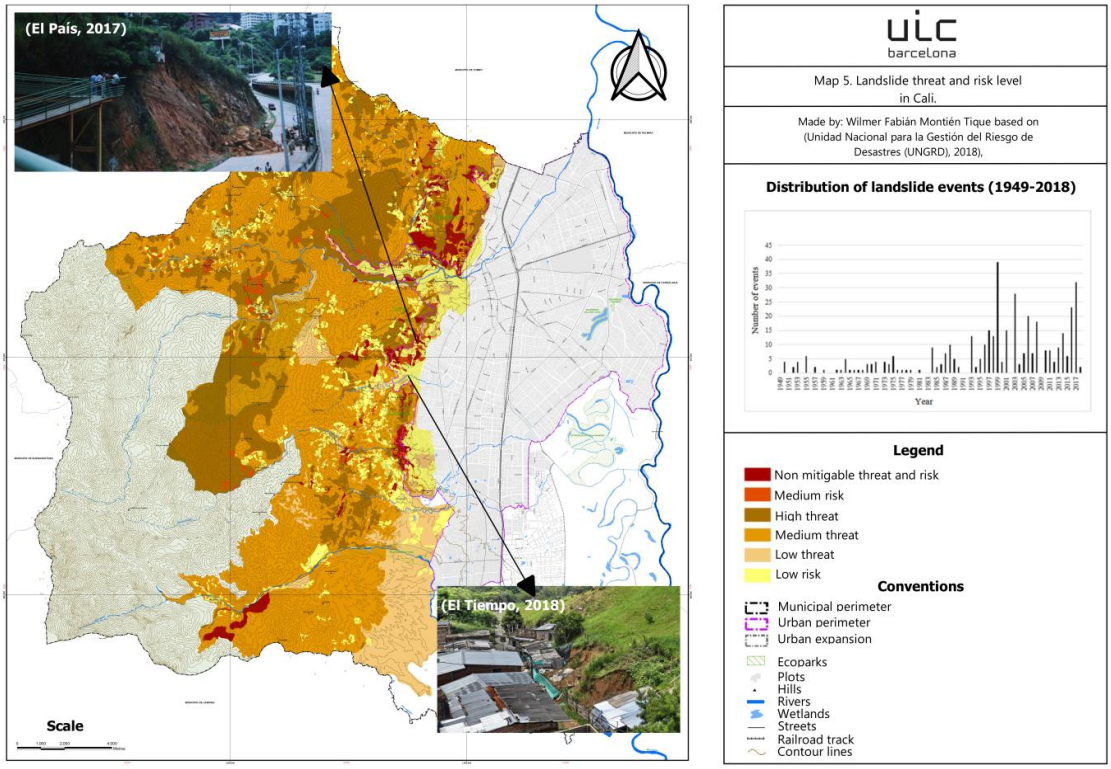


Source: Author, 2020, based on the Cali´s Disaster Risk Management Plan.

LANDSLIDES

Over the boundaries among urban and rural areas, the territory is prone to landslides (IGAC, 2006), due to it is the densest area with informal settlements located in steep zones where natural topography was affected, and the soil is unstable due to its properties. Also, because it is a secondary risk, derivate from other hazards like earthquakes, even heavy rains (Corporación OSSO, 2013). Hence, in Cali, there have been 401 events heretofore; three of them were relevant, especially during La Niña in 2010-2011, which affected more than 2.300 families, and the sewer system was severely damaged (UNGRD, 2018) (**Figure 4**).

Figure 4 Landslide threat and landslide risk level.

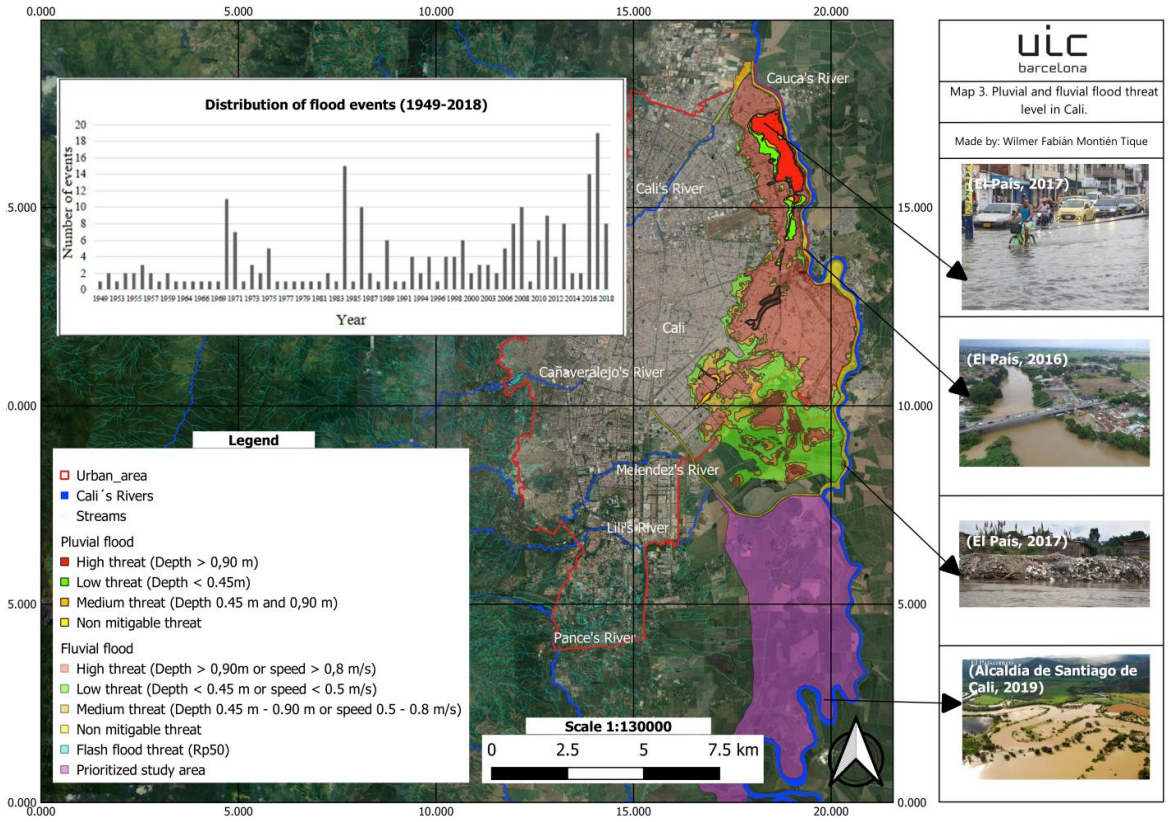


Source: Author, 2020, based on the Cali´s Disaster Risk Management Plan.

FLOODS

The east zone of Cali is prone to both pluvial and fluvial floods. The first one is the result of unqualified urban drainage (Hammond, Chen, Djordjević, Butler, & Mark, 2013), as it is the drainage basin of the Cali's river (Universidad Nacional de Colombia, 2013). Fluvial flooding instead, is depending on the possibility of the Cauca's river to overtop flood defenses of the Cali's Jarillón (dike), as happened in 2010 (Corporación OSSO, 2013). Thus 71% of the city is exposed and vulnerable to flooding (El País, 2016). Therefore, there have been 228 events until now, four of them, represented potential losses and casualties, particularly during La Niña in 2010-2011, given that it affected more than 900.000 families, and left economic losses in the industrial and agricultural sectors around 18'700.400 Euros or 20'397.189 Dollars (UNGRD, 2018) (**Figure 5**).

Figure 5 Pluvial and fluvial flood threat level.



Source: Author, 2020, based on the Cali´s Disaster Risk Management Plan.

2.2. Stresses

PLANNING AND MANAGEMENT DISARTICULATIONS

The focus of decision-makers has been short-termism; for this reason, there have been investments in actions that do not solve root causes. Besides, there is a lack of information that does not allow to make decisions based on robust data; even there is not a centralized information system to evaluate plans, programs, and projects. (Alcaldía de Santiago de Cali, 2015).

VIOLENCE AND INSECURITY

During the last fifteen years, Cali has reached 26.687 killings, mainly by a gang war, drug trafficking, micro-extortion, and intolerance (Alcaldía de Santiago de Cali, 2015). Due to migration, many people have fallen in this criminal economy (between 18 and 24 years old). Likewise, the lack of security and programmatic, social investments have not helped authorities to tackle this challenge genuinely (Alcaldía de Santiago de Cali, 2018) (**Figure 6**).

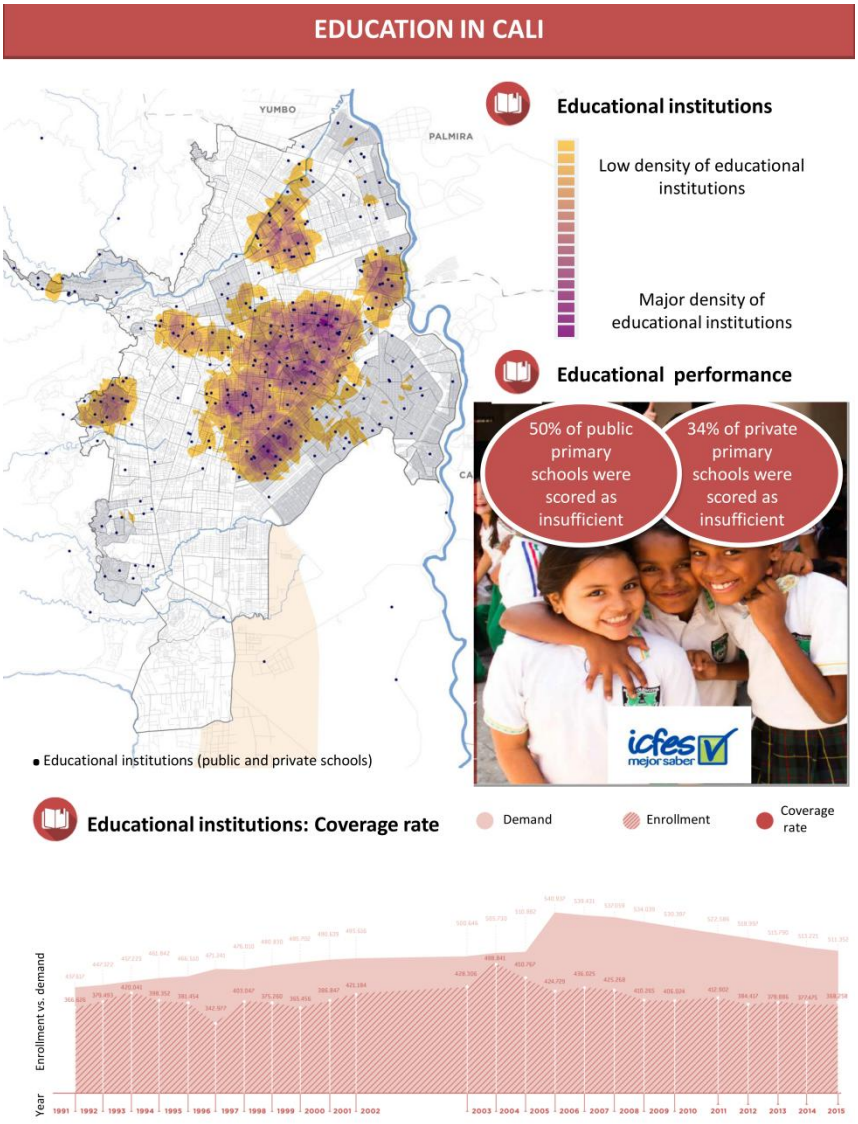
Figure 6 Facts related to violence and insecurity.

Source: Author, 2020, based on (Alcaldía de Santiago de Cali, 2018).

INADEQUATE ACCESS TO EDUCATION

Cali has gaps mainly in educational performance, according to the ICFES, most of the schools do not meet educational standards. Apart from this, by lack of infrastructure, and maintenance of existing buildings, especially the ones that require infrastructural reinforcements (Alcaldía de Santiago de Cali, 2015). Even though Cali has 350 educational institutions, however, there are 6.700 children without access to education because of demand is above the offer (El País, 2019) (**Figure 7**).

Figure 7 Education status.

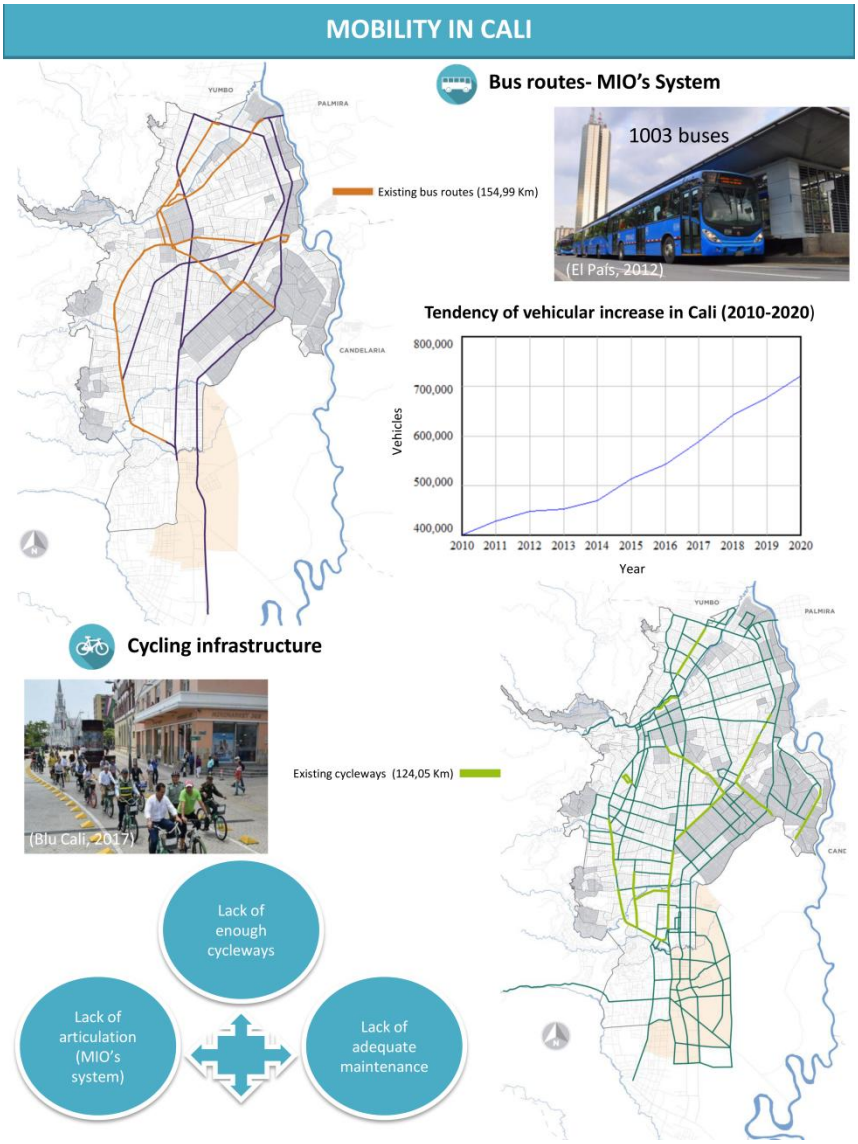


Source: Author, 2020, based on the Cali´s Education Secretary.

LACK OF MOBILITY

Traffic congestion has been increasing in the last ten years. Nonetheless, the city has a bus rapid transit system (MIO) (Alcaldía de Santiago de Cali, 2015). Despite its coverage (1.003 buses), people are still using informal public transport, and the majority would prefer to buy either a car or a motorcycle rather than use public transport, exacerbating transit in the city. Finally, there is a lack of cycleways. (Alcaldía de Santiago de Cali, 2020) (**Figure 8**).

Figure 8 Facts related to mobility.

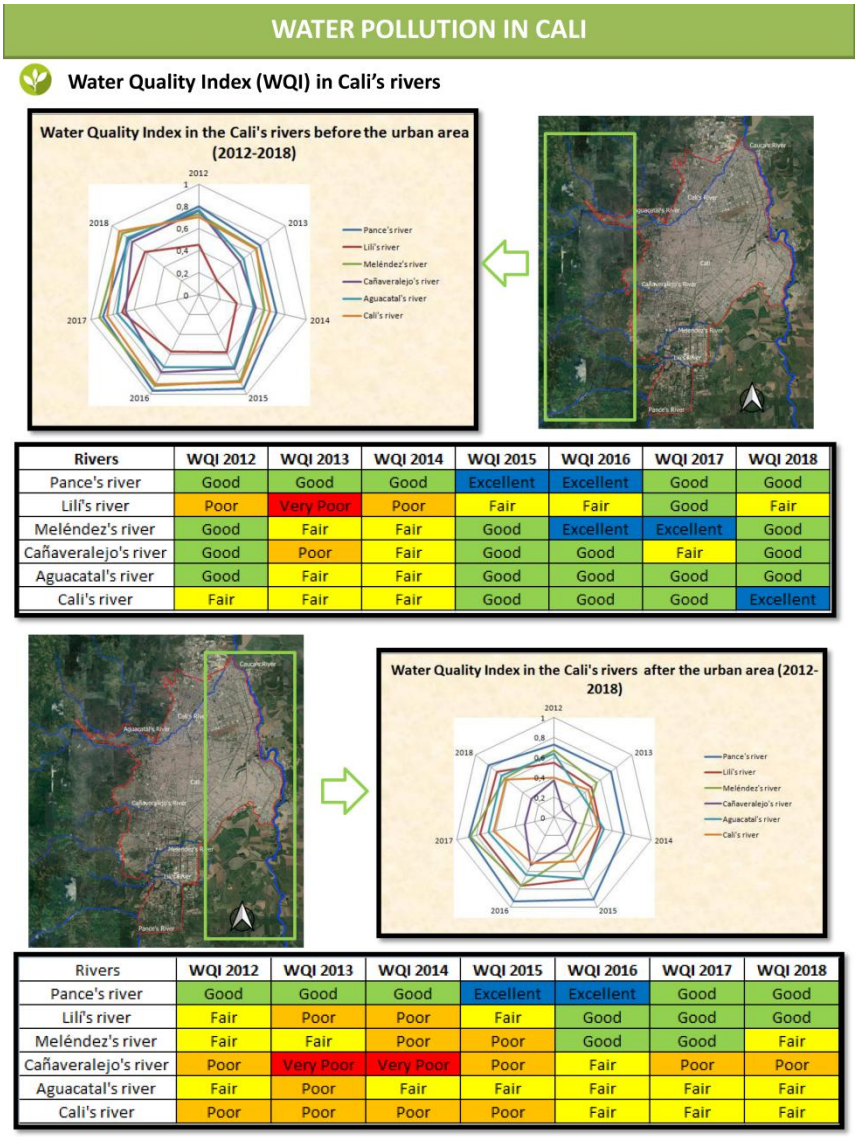


Source: Author, 2020, based on the Cali´s Mayor Office and (Arboleda, Parra, Aristizábal, Hernán Sabogal, & Sabogal, 2012).

WATER POLLUTION

Water management has become one of the main concerns, due to climate change, (e.g., water scarcity). Nevertheless, there is only one river among the seven that has appropriate WQI: the Pance's river (Ministerio de Tecnologías de la Información y las Comunicaciones, 2019). The rest of the streams has problems related to ***sewage discharges*** (Alcaldía de Santiago de Cali, 2018), ***illegal mining*** (e.g., the Melendez's river) (Alcaldía de Santiago de Cali, 2015), ***deforestation, and inadequate solid waste management*** (e.g., the Aguacatal's stream) (UNGRD, 2018) (**Figure 9**).

Figure 9 WQI in Cali's rivers (2012-2018).



Rivers	WQI 2012	WQI 2013	WQI 2014	WQI 2015	WQI 2016	WQI 2017	WQI 2018
Pance's river	Good	Good	Good	Excellent	Excellent	Good	Good
Lili's river	Poor	Very Poor	Poor	Fair	Fair	Good	Fair
Meléndez's river	Good	Fair	Fair	Good	Excellent	Excellent	Good
Cañaveralejo's river	Good	Poor	Fair	Good	Good	Fair	Good
Aguacatal's river	Good	Fair	Fair	Good	Good	Good	Good
Cali's river	Fair	Fair	Fair	Good	Good	Good	Excellent

Rivers	WQI 2012	WQI 2013	WQI 2014	WQI 2015	WQI 2016	WQI 2017	WQI 2018
Pance's river	Good	Good	Good	Excellent	Excellent	Good	Good
Lili's river	Fair	Poor	Poor	Fair	Good	Good	Good
Meléndez's river	Fair	Fair	Poor	Poor	Good	Good	Fair
Cañaveralejo's river	Poor	Very Poor	Very Poor	Poor	Fair	Poor	Poor
Aguacatal's river	Fair	Poor	Fair	Fair	Fair	Fair	Fair
Cali's river	Poor	Poor	Poor	Poor	Fair	Fair	Fair

Source: Author, 2020, based on (Alcaldía de Santiago de Cali, 2018), and (DAGMA, 2012).

2.3. Before the development of the resilience policy: risk management approaches

Cali has tackled shocks and stresses through the implementation of policies, plans, and projects, either after a disaster or under public policy, thus following a responsive (and not preventive) resilience approach. The following subsections describe the previous experience to cope with shocks and stresses. Additionally, in **Figure 10**, there is synthesis -a timeline- illustrating critical dates about the most devastating events and the implemented measures, and policies involved, in the history of Cali (before the arrival of the most recent city resilience integrated frameworks, as the Rockefeller 100 RC).

2.3.1. Previous experience to cope with shocks

The city carried out three big projects responding to the flooding threat: **the Aguablanca's plan**, sponsored by the CVC, where there was a construction of a dike throughout the Cauca's river. **The Master Sewer Plan** executed by the EMCALI to improve the sewer network (Corporación OSSO, 2005). Lastly, **the Cali's Jarillón (dike)**, supported by the CVC, DAGMA, UNGRD, and the EMCALI, focused on dike's structural reinforcement, drainage basins enhancement, and relocation of vulnerable settlements (El País, 2016).

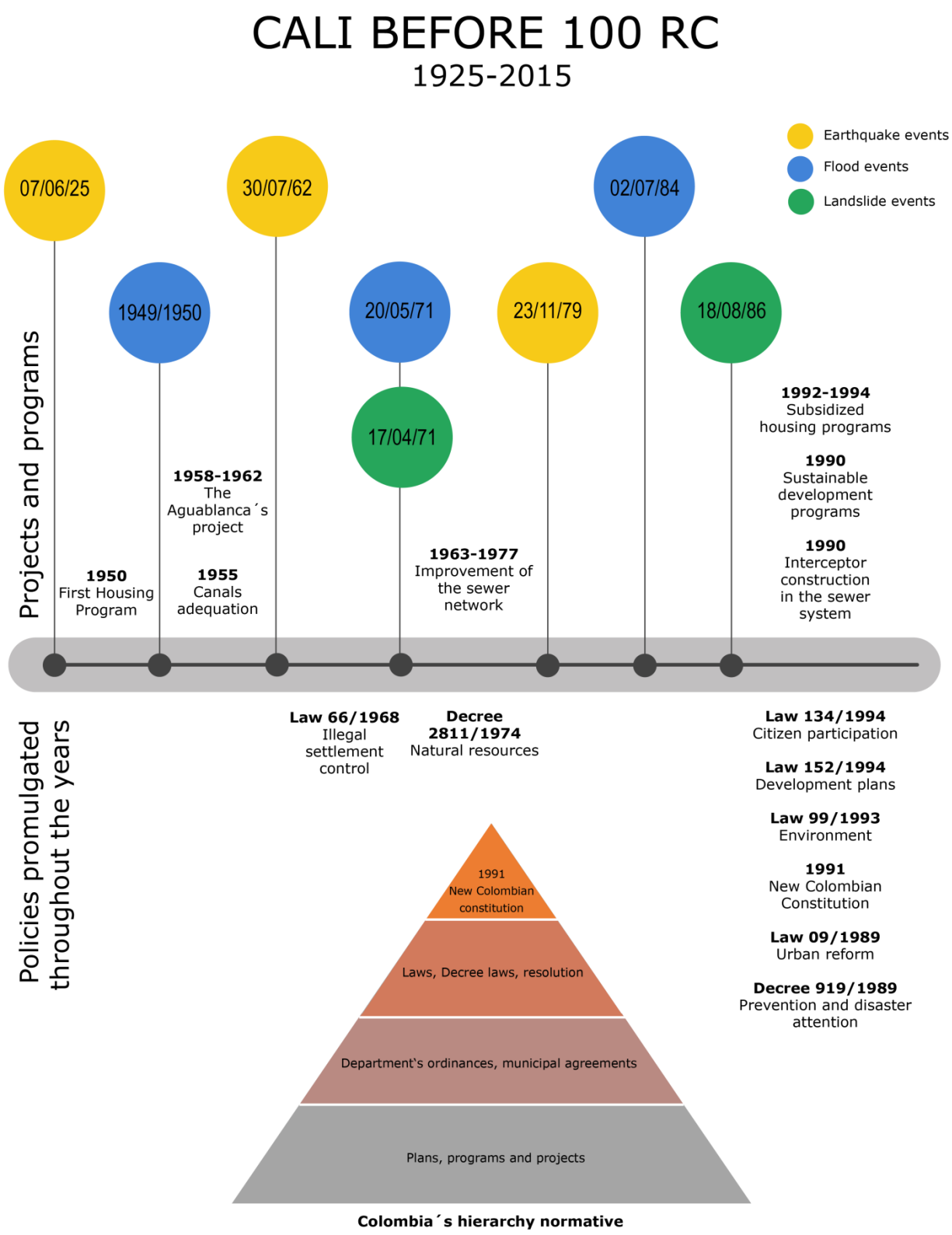
Furthermore, responding to landslides and earthquake threats, the Cali's Mayor Office addressed retaining wall projects, and urban renovation plans, even housing programs, (Corporación OSSO, 2013).

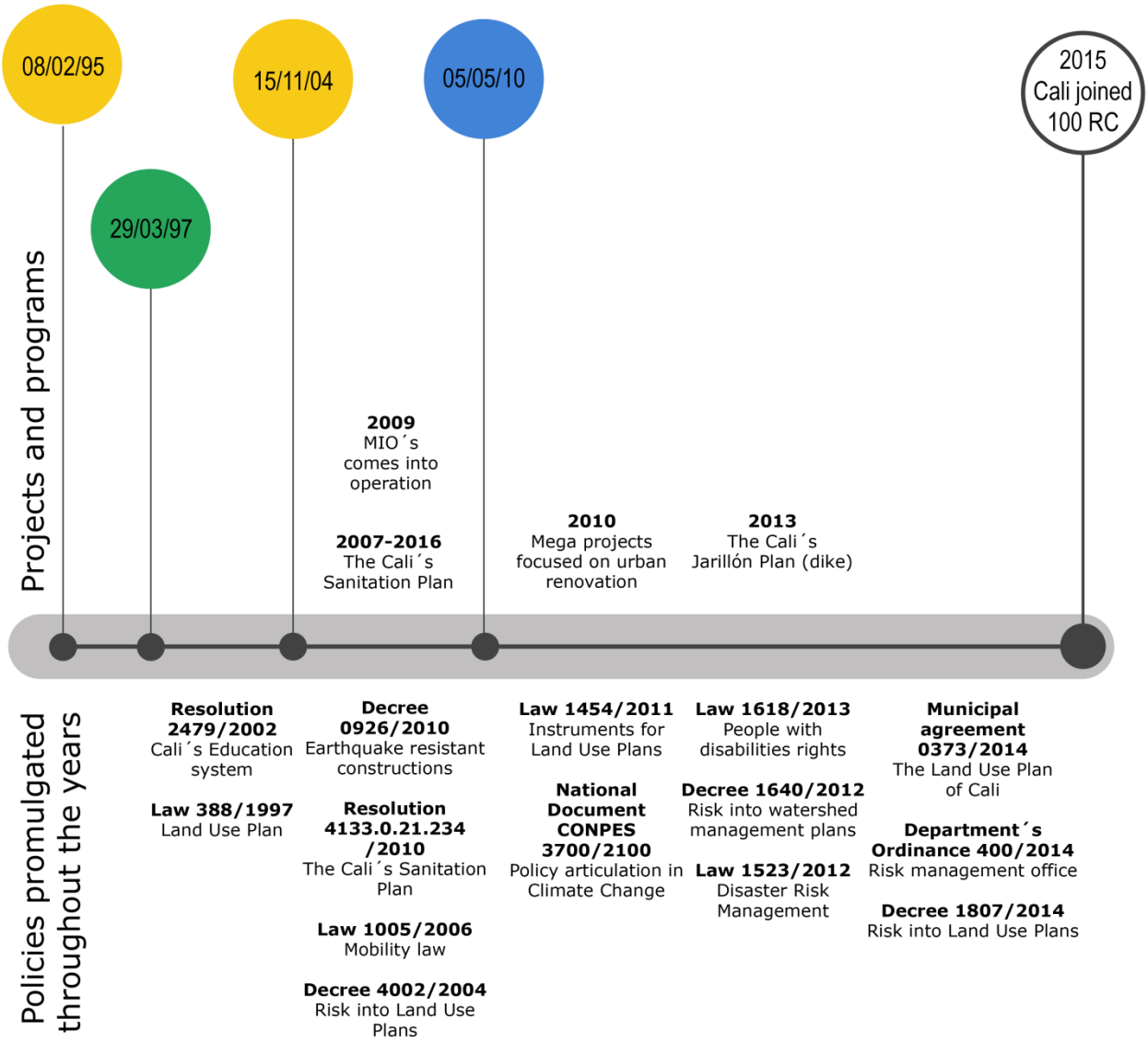
Finally, apart from hard measures to cope with floods, landslides, and earthquakes, also soft measures were implemented along the path, for instance, early warning systems and the seismic-resistant construction norm (Corporación OSSO, 2005).

2.3.2. Previous experience to cope with stresses

During the last 30 years, the local government has increased investments in security, mobility, and water pollution, mainly the program "Urban Security System Based on Quadrants" (Alcaldía de Santiago de Cali, 2018), the driving restriction policy called Peak and Plate (Pico y Placa), the operation of the extensive public transport system - MIO, finally the Cali's Sanitation Plan (Contraloría General de Santiago de Cali, 2013).

Figure 10 Time frame before 100 RC.





Source: Author, 2020.

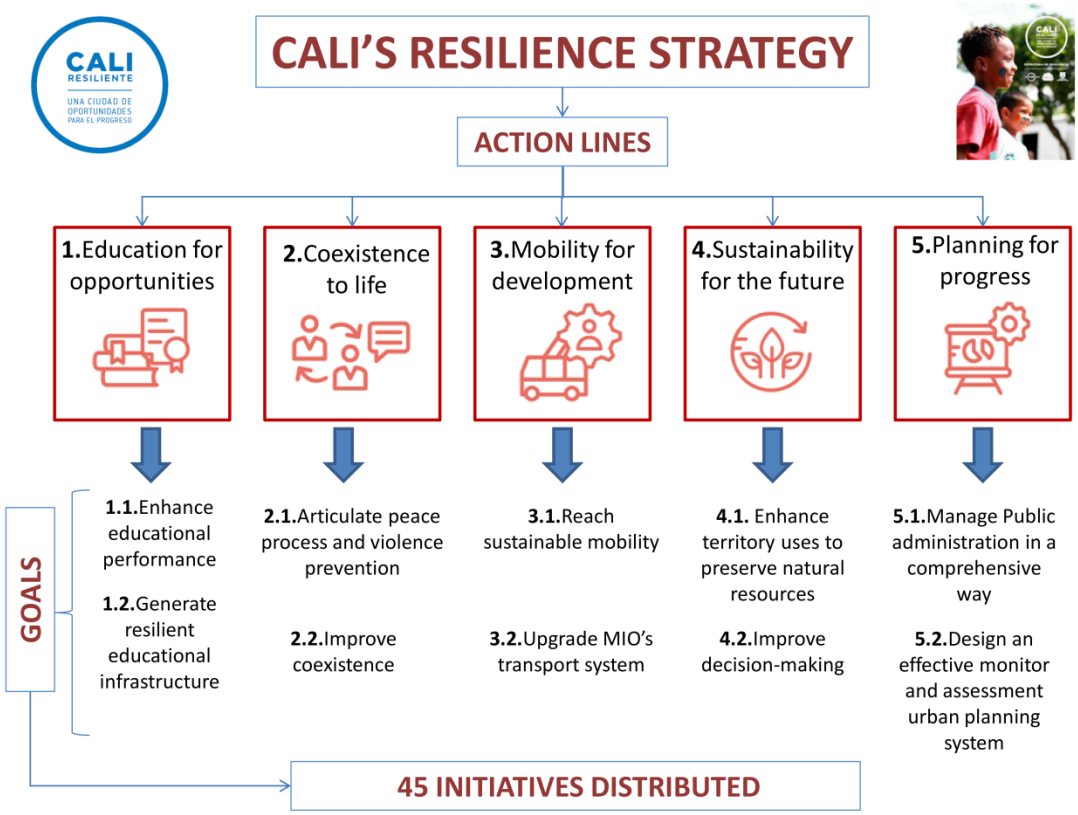
From the recent history of the city, it shows that shocks and stresses were addressed from a reactive perspective rather than a programmatic and integrated approach. **Figure 10** illustrated that after disasters, Cali released most of the central public policies based on national laws, as support to invest and execute their plans, projects, and programs. However, it is important to mention most structural and non-structural measures did not have synergies that could have focused on holistic actions. Leading to duplicate efforts and the formulation and updating of policies, for example, the "Decree 919/1989: Prevention and disaster attention" had to be updated to "Decree 1523/2012: Disaster Risk Management", due to focus was in terms of emergency attention rather than disaster risk management.

Resilience in Cali
FROM THOUGHTS TO ACTIONS

3. Resilience enters Cali's plans, policies, projects, and initiatives

Once Cali joined the 100 RC in 2015, the city started to work on five lines of action: **education for opportunities**, **coexistence**, **mobility for development**, **sustainability**, and **planning for progress**. In 2018, Cali released the resilience strategy called "Resilient Cali: a city of opportunities for progress" (**Figure 11**). The document has ten goals and 45 initiatives, considering timescale, and the city's functionality to bounce forward to sustainability (Alcaldía de Santiago de Cali, 2015). Lastly, the strategy addresses the concept of resilience as "*the capacity of individuals, communities, and institutions within a city, to survive, absorb, respond, adapt and grow, independently of challenges to overcome.*" (Alcaldía de Santiago de Cali, 2015).

Figure 11 Cali´s resilience strategy.



Source: Author, 2020, based on the Cali´s resilience strategy.

Consequently, the strategy broke paradigms from short-term planning to a holistic and comprehensive approach one, which, involves coordination between stakeholders and the community to make decisions in a constructive way rather than working in silos as it had happened before.

Thus, Cali began incorporating resilience not only to increase agency in the community but also to reduce the exposure to shocks and stresses, even to recover, adapt, and to transform the city on the road to sustainability.

As a starting point, Cali performed a groundbreaking approach through the harmonization of public policies and plans. One such example is the alignment of the Cali's Comprehensive Plan of Adaptation and Mitigation to Climate Change and the Disaster Risk Management policy. Of which integrated a transverse axis of action -risk management in the context of climate change- with programs like "capacity improvement to hydro-meteorological events, derivate from climate change," to tackle both mitigation and adaptation, avoiding duplicated efforts, as it happened during La Niña in 2010-2011. Stemming from this context, **Figure 12** displays policies, projects, and programs carried out after the publication of the resilience strategy (Alcaldía de Santiago de Cali, 2015).

Figure 12 Time frame after 100 RC.

Source: Author, 2020.

Apart from this, Cali institutionalized resilience into the administrative division of the Cali's Mayor Office, where a resilience office was settled, having the status and power of self-governance. Thus, with a resilience approach, integrated legislation, robust risk studies (which showed what is threatening the system? and what are the agents exposed and sensitive?), and community's participation, Cali formulated projects, programs, and initiatives, clustered in the five lines of action, aforementioned. It is essential to point out some existing projects like the Cali's Jarrillón (Dike), were also included, but with a resilience perspective toward sustainability rather than maladaptation (Alcaldía de Santiago de Cali, 2015).

Herewith projects are described in the following bullet points, which synthesize the most in education, coexistence, mobility, sustainability, and urban planning. Each one of them shows time scales split, either in the short term to 2020, medium-term to 2030, or long term to 2040, respectively, as well as the resilience principles involved.

Even if worth mentioning that most of them were launched in 2018, thanks to the budget sponsored by **National public funds:** The National Risk Management Fund and the National Environment Fund. **Multilateral funds:** The Adaptation Fund and the Clean Technology Fund and **Bilateral funds:** The International Climate Initiative and Japan's Fast-start financing (DAGMA, 2015). What is more, 10% of the city's budget is designated to carry these actions out (100 Resilient Cities, 2017).

EDUCATION

<table>
<tr><th colspan="3">1.Quality Education Information System</th></tr>
<tr><td colspan="2">Description</td><td>It is an integrated initiative to enhance educational quality through an official platform that consolidates data in real-time about schools, educational performance, academic resources, coverage rate, etc. It is accessible to all institutions, so the school community is also able to submit information. The interface also shows data about enrollment, and infrastructure status, which it illustrates to stakeholder’s robust information to intervene. One such example is that it shows how many schools do not meet educational standards; hence, other institutions can support. (Alcaldía de Santiago de Cali, 2015).</td></tr>
<tr><td colspan="3">Timescale: Medium term</td></tr>
<tr><td colspan="2" rowspan="2">Resilience principles</td><td>Robust</td></tr>
<tr><td>Reflective</td></tr>
</table>

2.School infrastructure maintenance plan	
Description	It is a bottom-up plan designed to deal with a lack of maintenance and infrastructural reinforcement. Also, the aim is to keep educational infrastructure systemically, not only in terms of physical mitigation but also school community's protection by dignifying their educational environment and raising satisfaction (Alcaldía de Santiago de Cali, 2015). The plan considers the Cali's Quality Education Information System, aforesaid, and the earthquake-resistant construction norm.
Timescale: Long term	
Resilience principles	Robust
	Integrated

Nowadays, Cali is designing the following initiatives: Educational Performance Public Policy, Education Coverage Strategy, New Education Headquarter Construction Plan, and the 7-Hour School Day Program (Alcaldía de Santiago de Cali, 2015).

COEXISTENCE

1. Peacebuilding Social Lab	
Description	It is a groundbreaking and integrated program in-field learning to foster community empowerment, manage conflicts, and makeover them in opportunities for change and social transformation (Alcaldía de Santiago de Cali, 2015). Cali has launched the initiatives as "Peace is my story," "Add peace, subtracting violence," "Enhancing peace culture," and "Art through graffiti" to carry it out.
Timescale: Short term	
Resilience principles	Inclusive
	Reflective

2.Peace and coexistence observatory	
Description	It is a bottom-up approach, focuses on the framework cross-region (city-region), which, through a virtual platform, allows submitting the community's experiences related to peace and coexistence (Alcaldía de Santiago de Cali, 2015).
Timescale: Long term	

2.Peace and coexistence observatory	
Resilience principles	Integrated
	Reflective

3.Pilot project: Coexistence and security focus on prioritized territories	
Description	It is a pilot project on humanitarian intervention and territorial sovereignty. The objective is to decrease violence constructively, based on initiatives posted by local government in prioritized areas. Because of this, women, teenagers, youth, families, and communities can participate and define roles, times, and action spaces to promote strength of identity, leadership, inclusivity, social justice, adopt solidarity, collaborate, and look for synergies. (Alcaldía de Santiago de Cali, 2015).
Timescale: Short term	
Resilience principles	Integrated
	Reflective

4.Managers of citizen culture for peace	
Description	It is a program launched in 2017; it was formulated to help disarmed and demobilized people from the FARC, victims from the conflict, and youths who live in violent contexts (gangs war and drug-trafficking). Some of the activities are training in citizenship culture, through regular and multiple workshops with the support of the Cali's Mayor Office (Alcaldía de Santiago de Cali, 2015).
Timescale: Medium term	
Resilience principles	Inclusive
	Resourceful

5.Comprehensive Gang Intervention	
Description	It is a program launched in 2017, to work constructively with young gangs that have not involved with criminal groups. The idea is to encourage teenagers to have a life project, promote community mobilization and development. One instance could be through psychosocial and economic guidance (Alcaldía de Santiago de Cali, 2015).
Timescale: Long term	
Resilience principles	Inclusive
	Resourceful

6. Sport as an educational tool and Football Net Cali		
Description	It is a strategy which pillars are: develop socio-emotional abilities, teamwork, education, violence prevention, and coexistence; considering sports like football and extreme sports as an educational tool (Alcaldía de Santiago de Cali, 2015).	
Timescale: Long term		
Resilience principles	Resourceful	
	Integrated	

Last but not least, initiatives like the Articulation strategy of violence mitigation projects, Citizenship Culture Policy, Resilience Principles Training Plan, Citizenship Culture for peace, and sports events, are still in the design phase (Alcaldía de Santiago de Cali, 2015).

MOBILITY

1. Cycling infrastructure enhancing		
Description	Due to a lack of cycleways, this project aims to increase from 124,05 km to 438,8 km cycling infrastructure; at the same time, it is going to articulate with the exclusive lane of the public transport system (Alcaldía de Santiago de Cali, 2015). The project aligns with the programmatic axis "Bicycle use promotion" of the comprehensive Plan of Adaptation and Mitigation to climate change (DAGMA, 2015).	
Timescale: Medium term		
Resilience principles	Integrated	
	Inclusive	

Cali is planning interventions related to the Sustainable Mobility Observatory, Subway's construction, inclusive infrastructure, and enhancing of the massive public transport system MIO. These projects have synergies with the programs "Strategy for the promotion of the use of electric vehicles" and "Diagnosis for the promotion of alternative energy sources for the operation of the MIO's system" from the comprehensive Plan of Adaptation and Mitigation to climate change (DAGMA, 2015).

SUSTAINABILITY

1. Water Resources Recovering Program	
Description	Taking int account Cali's hydrology, the program poses to enhance water quality and re-built ecological functions, keeping supply and water security, especially in rural areas, where water quality is better than the urban sector. (Alcaldía de Santiago de Cali, 2015). This action articulates with the program "Conservation and restoration of natural strategic areas, associated with the Main Ecological Structure" from the comprehensive Plan of Adaptation and Mitigation to climate change (DAGMA, 2015).
Timescale: Medium term	
Resilience principles	Integrated
	Robust

2.Payment schemes for ecosystem services	
Description	This program proposes a payment scheme for ecosystem services not only to the citizens but also to the owners of the plots where rivers flow (Alcaldía de Santiago de Cali, 2015). This measure aligns with the program "Water Resources Management" from the comprehensive Plan of Adaptation and Mitigation to climate change (DAGMA, 2015).
Timescale: Long term	
Resilience principles	Resourceful
	Flexible
	Integrated

3. Implementation of the comprehensive habitat improvement policy	
Description	The core of this initiative bases on comprehensive interventions in precarious settlements in high-risk flood areas and to promote the ecosystem's protection. It was released in 2019, taking into account the "Municipal Resolution 0411/2017: Comprehensive habitat improvement public policy" (**Figure 12**) (Alcaldía de Santiago de Cali, 2015).
Timescale: Long term	
Resilience principles	Robust

4.Prevention of Human Settlements in ecosystems	
Description	To avoid environmental impacts to ecosystems from the human settlements, Cali formulated this prevention and control program, with a top-down approach. The measure aims to raise awareness by promoting ideas across people in terms of water and ecosystems not as objects of socio-economic and political processes, but as a social infrastructure shape (Alcaldía de Santiago de Cali, 2015). The project has synergies with the program "Updating guidelines for water and biodiversity management with a climate change approach" from the comprehensive Plan of Adaptation and Mitigation to climate change (DAGMA, 2015).
Timescale: Medium term	
Resilience principles	Reflective
	Robust
	Integrated

5.Urban drainage systems improvement	
Description	Through structural and non-structural measures specifically in the pluvial sewer system, the city adopted the Master Sewer Plan to enhanced the network by increasing capacities and functionality to tackle unqualified urban drainage in rainfall seasons (Alcaldía de Santiago de Cali, 2015). This action has synergies with the programs "Sustainable urban drainage systems as an instrument of resilience to climate change" and "Natural water network recovery program as a regulator of urban drainage" from the comprehensive Plan of Adaptation and Mitigation to climate change (DAGMA, 2015).
Timescale: Long term	
Resilience principles	Robust
	Integrated

Aside from these projects, there still in the process other interventions like the socio-environmental observatory, the platform for decision-making at the Cali's Early Warning System, governance mechanisms for coordination to climate change, and construction of the Crisis Room (Alcaldía de Santiago de Cali, 2015).

URBAN PLANNING

1.Improvement of the institutional traceability in projects	
Description	By continuing using the Colombian Platform for Investment Projects, the program aims to enhance institutional traceability. Hence, this measure avoids corruption and redoubled efforts, contributing to efficiency and public management (Alcaldía de Santiago de Cali, 2015).
Timescale: Medium term	
Resilience principles	Integrated

2.Automation and rationalization of processes, procedures, and services	
Description	It is an initiative aiming to simplify and enhance effectiveness in procedures regarding projects and proposals, avoiding planning and management disarticulations, and promoting transparency, through communications technology (Alcaldía de Santiago de Cali, 2015).
Timescale: Medium term	
Resilience principles	Integrated
	Inclusive

Cali is designing the Hotbed of research in investment projects and a robust monitoring system of investments in urban planning (Alcaldía de Santiago de Cali, 2015).

In conclusion, compared with the situation before and after resilience, Cali increased holistic actions in critical urban dimensions as education, coexistence, mobility, sustainability, and urban planning. These projects were formulated systematically with the community to tackle shocks and stresses. As was mentioned, most of them were executed recently, and others are in progress.

UR Pathway
WRAP-UP AND DISCUSSION

4. A city of opportunities and challenges: Risks management before and after "resilience"

The report introduced Cali as a city rich in water resources (due to its climate) and one of the main economic and industrial centers in Colombia. However, Cali is also a city of challenges, as seen in section 2, mainly to earthquakes, landslides, and floods. Additionally, Cali is threatened by stresses, as planning and management disarticulations, violence and insecurity, lack of adequate access to education, deficiency of mobility, and water pollution. Before "resilience" was incorporated, Cali had dealt with shocks and stresses, either after a disaster or under the public policy (e.g., the Cali's Sanitation Plan) with a responsive (and not preventive) approach, through hard measures as dikes and soft measures like Early Warning Systems. Even though the city tried to be robust in legislation, however, there still had been reactive interventions.

When Cali joined the 100 Resilient Cites in 2015, and its resilience strategy was released in 2018, then the concept of resilience was incorporated as the capacity of a city to survive, absorb, respond, adapt and grow, independently of challenges to overcome. Hence, the strategy broke paradigms from short-term planning to a holistic approach, involving coordination among stakeholders and community constructively rather than working in silos as it happened before. As a first step, Cali performed a groundbreaking approach based on the harmonization of public policies and plans. Secondly, Cali formulated holistic projects in critical urban dimensions, for instance, education and sustainability.

Source: (Charry Cortés, 2017)

On top of that, the resilience strategy addresses some resilience principles, as "inclusiveness" (in all the projects with the local government), "reflective" (in building on what has been built, by reviewing any initiative already implemented to tackle shocks and stresses), "robustness" and "integration" (within broad legislation that has synergies among projects), and "flexibility and resourcefulness" (with actions on community empowerment for change and social transformation, which can be adjusted and manageable to tackle unknown environments).

4.1. What did resilience bring and left for Cali? The emerging complexity of managing resilience

The emerging of resilience in Cali brought a more integrated and holistic perspective to the previous reactive-oriented risks management practices. Aspects related to community resilience, gender justice, and education were forward looking and transformative strategies embedded with a new understanding of facing city challenges. Such a broad new perspective opened the ground for emerging management challenges, among different aspects and programs related to resilience, and implying some resilience trade-offs (meaning that specific strategies while decreasing particular vulnerabilities, at determines spatial and temporal scales, resulted in unexpected increases of vulnerabilities to other scales or groups, as introduced theoretically by (Chelleri, J Waters, Olazabal, & Minucci, 2015).

The following bullet points describe and discuss the new approach introduced by resilience and the evidences from these trade-offs and management challenges.

4.1.1. City's approach in the context of resilience: bouncing forward… but how?

As mentioned in the last section, Cali adopted the concept of resilience as introduced and framed by 100 RC through a "bouncing forward" approach, meaning trying to create room for improvement, innovation and thus urban transformation, rather than focusing on responses and defense from hazards. Nowadays, Cali focuses on the root causes of risks, rather than an easy fix of symptoms and responses to threats. Indeed, as described through the boxes in section 3, comprehensive actions in urban systems were taken respect to education, security, mobility, sustainability, and urban planning (Alcaldía de Santiago de Cali,

2015). For this reason, the city is trying to **impulse resilience through new leadership, tacking stresses more than shocks**, **and a more people-centered approach** (Peralta & Velásquez, 2017). Thanks to the resilience strategy, the focus area of Cali is **its capacity to intertwined policies with plans and projects**.

An example of such an integration mission is the alignment between the comprehensive Plan of Adaptation and Mitigation to climate change with the Disaster Risk Management Policy, which allowed the city to understand the climate emergency context in a holistic way. Thus, Cali has been working toward what recently has been defined as a "climate urbanism" (Long & L Rice, 2018) – city management and planning focused toward the pillar of the carbon emission reduction, but in line with vulnerability reduction and social justice criteria - through programs as the "Traditional knowledge as a climate change adaptation strategy" and the "Eco-efficient public lighting" - by promoting a cultural shift, regarding the decrease in water and energy consumptions (DAGMA, 2015). Likewise, the city is working on Nature-Based Solutions as the "Adaptation and environmental recovery of parks, green areas, and management of Urban Heat Islands" as nexus between climate – risk – community, and increasing biodiversity and fostering health, well-being, and culture (DAGMA, 2015).

4.1.2. Community resilience and gender justice

Currently, the city is incorporating and feeding the community resilience lens through learning, gender justice, behavioral changes, education, and livelihoods (Alcaldía de Santiago de Cali, 2015). Aiming **to foster community empowerment and social transformation,** as follows:

Community empowerment: By facilitating a transformational leadership of the women's role in the political, economic, social, and environmental spheres of the city, leading to boost the strength of identity (Alcaldía de Santiago de Cali, 2015). Furthermore, Cali recognizes women are powerful agents of change, through participation in decision-making (Alcaldía de Santiago de Cali, 2018).

Social transformation: By promoting community knowledge in climate change, healthy lifestyle, and self-learning in food-growing practices, even fostering the local

economy. Through social and educational activities on organic agriculture and creating a space for inter-community relations (see subsection 3) (DAGMA, 2015).

4.1.3. Spatial dimensions and trade-offs among resilience strategies

Cali's actions obey the Colombian hierarchy. As a result, the city articulates its strategies across city boundaries and the region, normatively. All the way, through good governance, enabling a direct exchange of ideas, offering project support, institutionalizing water quality, and climate change trajectories under the subsidiarity principle (DAGMA, 2015).

Nevertheless, by doing so, the city is facing some trade-offs associated with air quality and mobility, air quality and security, lastly, risks, and exposures, of which, Cali needs to take into consideration on the road to sustainability through the resilience strategy, as shown below:

Air quality/mobility: Cali is expanding cycleways to promote bike usage as an alternative means of transport, to decrease air pollution, and promote a better quality of life. From another side, it exacerbates traffic congestion, by reallocating road space to bikeways (directly replacing car lanes), in a city which most people have cars or motorbikes, rather than bikes.

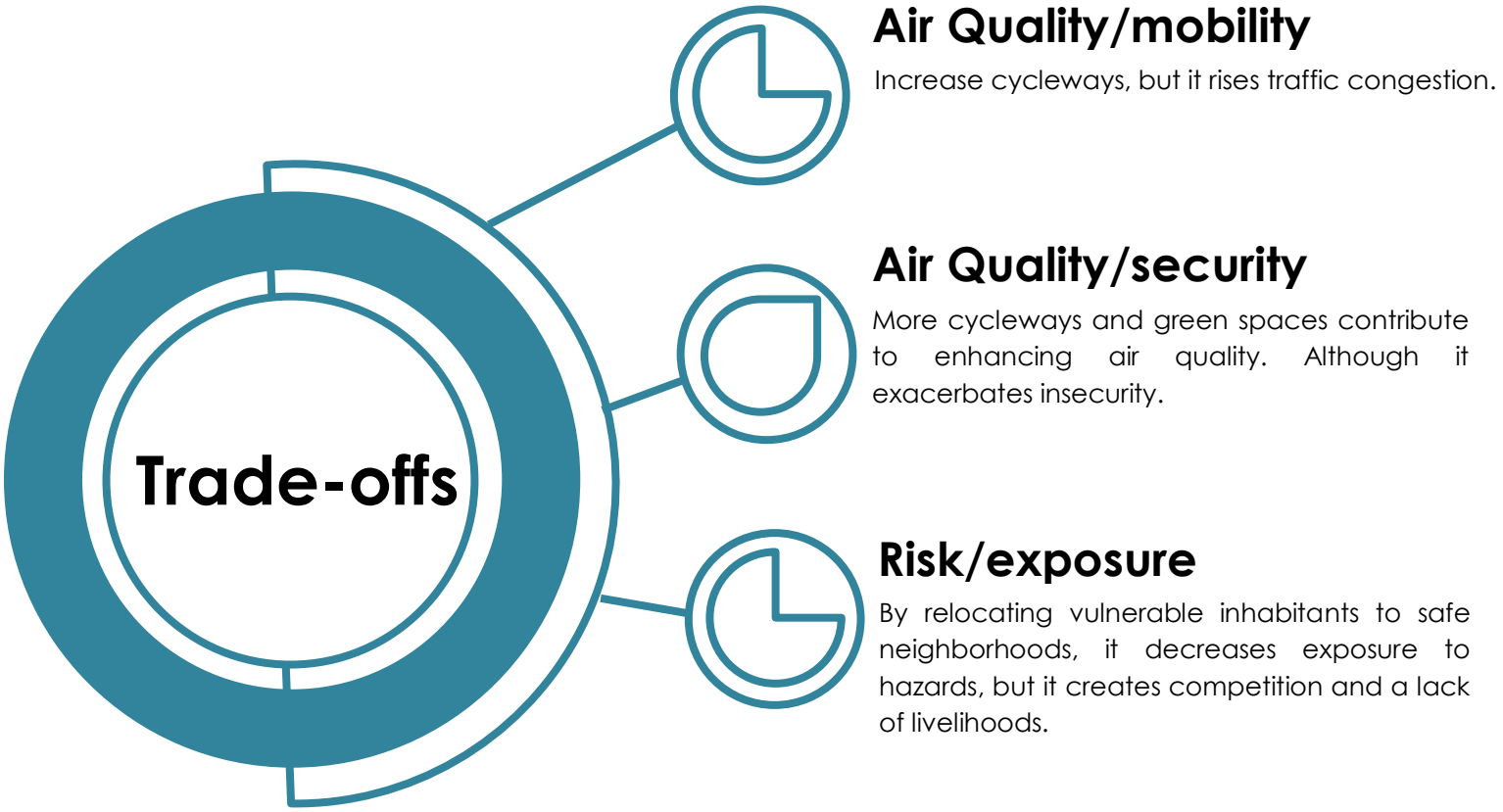
Air quality/security: By the time Cali reallocates road space to cycleways and increases green spaces, it contributes to enhancing air quality. Nonetheless, this measure raises insecurity, making these public open spaces a focus where users can be victims of robbery.

Risk/exposure: The city is relocating vulnerable inhabitants to safe neighborhoods and make sure all of them have access to education, health, and a decent job. Decreasing exposure to floods. However, by doing so, it creates competition and a lack of livelihoods between benefited population and the community who also demands access to education, health, and a decent job.

Figure 13 illustrates that decreasing vulnerabilities in terms of air pollution and vulnerabilities to floods increases other weaknesses in the city, like traffic congestion, insecurity, and competition of livelihoods, respectively.

Lastly, Cali is keeping up to finish the design the rest of the measures (see subsection 3), to be redundant and cover these shortfalls.

Figure 13 Trade-offs Cali is facing nowadays.



Source: Author, 2020.

CONCLUSIONS

The report explained how resilience contributed to the city's past understanding of urban risks management and how the city resilience strategy is currently framed and implemented in Cali. This means exploring the evolution that in Cali happened from a shock and hazard reactive resilience actions to more prevention and stresses-focused interventions.

The document described how Cali incorporated a groundbreaking approach by integrating public policies into actions as well as, comprehensive initiatives that took place over critical urban systems like security and sustainability.

Despite the resilience strategy was released recently, Cali has shown significant advances related to community resilience and gender justice. Nonetheless, the city is facing trade-offs as air quality and security that need to be considered, to do not exacerbate vulnerabilities by decreasing other ones, and, consequently, to redouble efforts.

Cali aspires to change the behave of people in understanding better urban resilience, climate change, and disaster risk reduction, and impulses the community to be involved in decision-making for the sake of the city. However, since the city started to work on the initiatives mentioned in subsection 3, respect to timescale, it represents a significant challenge to accomplish ambitious social actions, especially if they were conceived in the short term, and at a city level. Of which the city needs to consider to avoid paths that lead to maladaptation rather than sustainability.

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