Community Mapping of Environmental and Health Risks in Ciudad Bolívar, Bogotá

Winning Essay of the 2024 Graduate-level Michael Baptista Essay Prize

by

Sarah Swan

Baptista Prizewining Essay

October 2024

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Community Mapping of Environmental and Health Risks
in Ciudad Bolivar, Bogotà

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A Major Paper submitted to the Faculty of Environmental and Urban Change in partial
fulfillment of the requirements for the degree of Master in Environmental Studies
York University, Toronto, Ontario, Canada

July 31, 2024

Abstract

My research explores community planning efforts in the marginalized neighborhoods of Soacha and Ciudad Bolivar, Bogotá, Colombia. Through a community mapping workshop attended by local leaders, 19 maps were created using the 'rich picture' technique. The 19 maps were then consolidated to create a comprehensive systems map, capturing the current conditions and aspirations of the residents. The findings highlight the complex social and environmental dynamics, providing a foundation for targeted interventions. My research also uses qualitative observations from a community tour to further contextualize systemic issues and grassroots solutions, demonstrating residents' adaptive strategies despite inadequate infrastructure and informal access to utilities. The community's aspirations for improvements—such as better healthcare, enhanced security, and road paving—offer valuable insights for policymakers, NGOs, and other stakeholders, providing many opportunities for future research.

My study aims to foster sustainable community improvements by providing data that can be used for advocacy by providing materials that organize and summarize the current contexts and goals of the community. This research contributes to the broader discourse on urban planning and climate resilience in the Global South, while exploring the efficacy of community mapping techniques in communicating a community's complexity.

Foreword

My research was conducted as a major component of the requirements for the Master of Environmental Studies (MES) degree. The primary objective of the study is to examine the intersection of community planning and environmental challenges in the marginalized neighborhoods of Soacha and Ciudad Bolivar, located on the periphery of Bogotá, Colombia. This project aligns with the MES program's emphasis on addressing complex environmental issues through interdisciplinary research.

This work contributes to my MES degree by demonstrating the application of environmental studies and planning concepts to real-world problems, emphasizing the role of community participation in environmental planning. In particular, the execution of this research contributed to a deeper understanding of my learning components, as established in my plan of study. My learning components are 1) Planning in the Global South, 2) Peripheral Urbanization, and 3) Environmental Health. Each component underscores a major theme of this research.

In fulfilling the MES degree requirements, this research highlights the importance of integrating academic inquiry with practical, community-centered approaches to address environmental and social challenges. It is my hope that this work not only advances academic understanding of the study area but also serves as a resource for policymakers, non-governmental organizations, and community leaders working towards a more equitable and sustainable future for marginalized residents of Bogotá's periphery.

Dedication

This work is dedicated to the memory of my dear friends, Heather, and Gavin. Your lives were filled with laughter, kindness, and a curious spirit that continues to inspire those who knew you. You both will always be part of my journey, and your memory motivates me to pursue meaningful work in honor of the lives you lived.

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1. Introduction

On January 22, 2024, a series of wildfires outside of Bogotá, Colombia, threatened the Southwestern outskirts of the city, burning seven homes (Torres Garzon, 2024). This Southwestern region is home to two major *localidades*, Soacha and Ciudad Bolivar. Within these *localidades*, there are many *comunas*, which refers to a unique organization of neighbourhoods in Soacha and Ciudad Bolivar that was initially based on geography but has now evolved to a political meaning and organization of space (personal correspondence 4, 2024). *Comunas* are referenced by number rather than name, and typically have their own community leader who takes on responsibilities ranging from conversations with the city government in Bogotá to community safety to community organizing (personal correspondence 4, 2024). One particular community leader, named Jimmy Leal, will be referenced throughout this paper as he was my main point of contact and colleague throughout my field work and additional research.

My research is focused on community planning efforts that are present in the southwestern periphery of Bogotá. I became interested in the Latin American context due to the complicated history of colonialism and how such struggle has become modernized due to climate change. I have always been interested in the disproportionate effects of climate change on marginalized groups, and the role in which planning should play in addressing such global concerns. I decided to focus on Colombia when I learned that Colombia experiences the highest rates of natural disasters due to climate change in the Latin American region.

Establishing a study area was the first step in my research journey. I connected with Dr. Luisa Sotomayor who was able to connect me with Dr. Samuel N. Aguero, an academic and

mayoral candidate in Bogotá who had experience and connections with community leaders in Soacha and Ciudad Bolivar. In particular, he had a close working relationship with a community leader of a human settlement in Ciudad Bolivar, named Jimmy Leal. Dr. Aguero is also well connected with several community advocacy groups, who helped with the organization and implementation of the community workshop.

With the guidance and connections of both Dr. Aguero and Jimmy, I was able to learn more about the context of Soacha and Ciudad Bolivar (the study area) and develop my research project. The coordination process was challenging due to a limited time frame, often unstable internet in Ciudad Bolivar, and of course the distance. However, with the dedication and interest of my Colombian colleagues the project began to materialize. Although the initial timeline was delayed due to the fire in Ciudad Bolivar, I was able to travel to Bogotá in March of 2024 to finalize details and host the workshop.

The goal was to host a community mapping workshop with community leaders across the *comunas* using the 'rich picture' technique. I wanted to develop a community-made systems map that could illustrate the unique processes and current context of the underserved and impoverished areas in Bogotá's periphery to have a documented understanding of how they are managing the effects of climate change. Additionally, I wanted to explore what the community leaders felt they needed most in their community. To accomplish this, there was a moment in the workshop where I asked participants to use red ink (instead of black) and add to their maps anything that they would like to see implemented in their community. This provided an organized framework of community priorities and needs, which can be used for future work or research.

While in Bogotá, organizing with Jimmy became easier. We were able to confirm the location of the workshop in a local kindergarten and I could pick up supplies (paper, pens, sticky notes, comment cards) that would be required for the workshop. I also met with a translator, who helped me practise my presentation. I informed the translator of the project details so he would be appropriately prepared for the context of the workshop. Though I had been practising my Spanish, the language barrier was going to pose a risk and a translator was required to ensure maximum engagement with the community. The translator helped interpret questions and facilitate conversations during the workshop and proved invaluable during the community tour where we gathered so much qualitative data, primarily through storytelling and an informal interview process.

After the successful completion of the community mapping workshop, and the creation of 19 maps, some community leaders offered to bring me on a tour of their *comunas* to enrich my understanding of the study area. This provided unique and invaluable experience, complete with myriad conversations about what life is like in the study area. I was welcomed into the homes of many community leaders, where they proudly told stories of how they were able to build their homes from recycled materials. We walked through the communities together, while I listened to information regarding the histories of the area and plans for the future.

This southwestern region of Bogotá is a previously informal settlement still primarily home to marginalized residents, creating a precarious intersection of community and environmental hardship. The human settlement in Ciudad Bolivar remains informal. The wildfires are a result of record heat temperatures throughout January 2024 due to the El Niño season. El Niño is a term used to describe a climatic pattern in the Pacific Ocean caused by trade winds (National Oceanic Atmospheric Association, 2023). Typically peaking in December and

lasting an average of 9-12 months and occurring every 2-7 years, El Niño (meaning 'little boy' in Spanish) pushes warm water east towards the Western coast of Latin America, resulting in warmer than average temperatures (National Oceanic Atmospheric Association, 2023). The warm water affects the pacific jet stream, pulling it further south than normal which impacts weather patterns across North and South America (National Oceanic Atmospheric Association, 2023).

Climate change exacerbates the effects of weather patterns such as El Niño and adverse events are primarily felt in regions that marginally contribute to global greenhouse gas emissions. On a large scale, this disproportionate divide occurs between the Global North (i.e. the regions that emit the most and experience fewer adverse events) and the Global South (i.e. the regions that emit the least and experience more adverse events). Though of course there is nuance within that claim and on regional scales there exists many complicated relationships between centres and peripheral areas. For example, in Canada, urban residents are responsible for the most emissions, yet rural, remote, and Northern residents are found to be more vulnerable to climate change due to "critical infrastructure decline or failure" resulting in "higher risks to health, safety and well-being" (Lulham et al., 2023, p. 18).

The divide between the Global North and Global South is influenced and reinforced by processes of colonialism and neoliberal capitalism which maintain global hierarchal structures. These processes create unequal economic conditions that are dependant on global trade networks and are rooted in Western overconsumption and resource extraction which causes environmental degradation. The geographic focus of this research is Ciudad Bolivar and Soacha, two *localidades* in Bogotá which were recently affected by wildfires caused by record winter heat influenced by El Niño and climate change. In particular, I reference a specific informal area and

self constructed area within Ciudad Bolivar, where Jimmy lives and leads. He refers to his *comuna* affectionately as a human settlement, a terminology that I use in this research. In its entirety, Colombia only contributes 0.4% of global GHG emissions. Yet in Latin America, Colombia has the highest rate of natural disaster events associated with climate change, averaging 600 events per year (Organization for Economic Co-operation and Development, 2022, p. 90). Like many countries in the Global South, they are forced to deal with the harsh realities created by the consumption and emission habits of the Global North. Although some factors leading to precarity operate on a national and global scale, the unique physical geography also contributes to the environmental and community hardships.

The steep terrain which hosts Soacha and Ciudad Bolivar is repeatedly exploited on two main fronts: housing and mining (personal correspondence 5, 2024). Additionally, the isolated, mountainous geography poses as a social and political threat with a history of conflict due to the location within the mountains. The mountains create a protected environment where, during the civil war, guerilla groups were able to control the land to bring supplies to and from the city (personal correspondence 6, 2024). Though at risk for landslides, residents continue to build higher on the mountain to avoid the flooding in the plateau and to accommodate for new growth or internal movement due to natural disaster.

The existing homes and new ones being build operate under their own system of ownership, which is not formally recognized by the city government. From personal correspondence, I learned that residents typically buy property from the previous owners, but they do not receive a legal land title to prove to the government that they are the legal owners. This is because the land is not zoned for housing due to the precarity of the environment. As a response to the lack of support to find formal housing within Bogotá, residents (many of whom

used to live in Bogotá and were pushed out due to high prices) have developed their own system of purchasing homes and properties. As it is not a legal process in the eyes of the city government, it excludes residents from having property rights.

A major environmental hazard in this area is flooding and landslides, which is perpetuated by the continued destabilizing of the slopes to build houses and for mining. As the slopes are prepped for development and mining, vegetation is removed, thus removing natural anchors. The exposed mountain has little defense against the heavy rains, causing liquefaction and landslides down the mountains and causing flooding in the plateau areas. As participant 1 explained to me, "it doesn't rain a lot in my community, but it rains a lot in others and then it comes and floods my streets, making them into creeks or rivers" (personal correspondence, 2024). Participant 2 shared that "the city government is not taking care of the land. There are lots of wild areas and no control over the land, so people come and settle on the land then are forced to relocate" (personal correspondence, 2024). This condition creates a cycle of housing instability where residents build homes on geographically unsafe land, vulnerable to a natural disaster, and forced to move into other areas that are also considered unsafe.

My research explores the intricate intersection of climate change with health and wellbeing in Bogotá's specific peripheries of Soacha and Ciudad Bolivar. Through a community mapping approach, my research uncovers how environmental and community health risks can be effectively revealed by utilizing community mapping and the 'rich picture' technique. By hosting a community workshop to create comprehensive community systems maps, the study addresses the central research question: How can environmental and community health risks be revealed through community mapping and the 'rich picture' technique? This inquiry not only aims to highlight the specific vulnerabilities faced by residents of Bogotá's marginalized neighborhoods

but also to demonstrate the value of community mapping methods in identifying and visually representing these risks. The community maps also reveal elements that the participants would like to see implemented in their communities, providing a formalized baseline for future community projects, policies, or works.

2. Vulnerability to Climate Change

The geographies associated with urban slums and the urban peripheries are rendered unsafe due to the physical and social realities that create slum environments. In fact, Davis (2006) argues that the social elements of poverty exacerbate climate hazards because when assessing urban environmental vulnerability, social assets is a factor. He uses the equation 'risk' = (frequency and magnitude of natural event) x (population and shelter exposed to hazard) x (physical characteristics of the built environment) (Davis, 2006, p. 124). By this equation, urban informality increases the risks of all natural events. Building on this argument, Davis (2006, p. 126) explores the term "classquakes" to explain how most of the urban poor now live along geological fault lines, so their geography coupled with poor housing and structural material leaves them extremely vulnerable to earthquakes. And not only does urban poverty exacerbate natural hazards, but it also creates its own disasters by precariously interacting with toxic ecology and unsafe, poor infrastructure (Davis, 2006, p. 128).

In another example of how the social context contributes to risk, fires also devastate slums due to their high density, flammable housing materials, and reliance on open flames (Davis, 2006, p. 127). Fire trucks and support are unable to navigate the narrow and unpaved streets of slums or peripheral areas, so the fires spread more quickly relative to wealthier areas of the city and can easily destroy thousands of homes (Davis, 2006, p. 127). Please see Figure 1,

taken during my community tour, of an example of the steep, unpaved, and precarious nature of the geography in the study area. Though fortunately the 2024 fire in the human settlement of Ciudad Bolivar was quickly contained, the disasters demonstrate the lack of research on environmental health in the urban periphery. This is in part due to the fact traditional urban planning cannot effectively be applied so creative, community-centered research needs to be utilized to effectively understand and support existing local systems.

Figure 1: Ciudad Bolivar

Most slum upgrading programs weren't designed with climate change in mind; however, they provide the best avenue for integrating climate change frameworks into city initiatives (Satterthwaite, 2020, p. 153) as they directly involve the most vulnerable and therefore can have the largest quantifiable impact. Informal settlements exist outside of the formal framework of the city and thus have not been privy to receive services that the Intergovernmental Panel on Climate Change calls 'risk reducing infrastructure'. Urban informal settlements are growing each year,

with more than an estimated billion people living in these areas which are becoming increasingly vulnerable to climate change relative to formal areas due to the structural inequalities stemming from the location and quality of resilience infrastructure (Satterthwaite, 2020, p. 143). Many informal settlements are located at high risk of floods and landslides and close to undesirable urban features such as dumps, highways, rail tracks (Satterthwaite, 2020, p.147). They inhabit risky spaces because they are areas that are unsafe and/or unattractive for development (Satterthwaite, 2020, p. 147). As such, informal settlements don't just need to bounce back after a natural disaster, they need to bounce forward and mitigate climate change risks.

One of the most successful slums upgrading programs is called the Orangi pilot project, in Pakistan. Its success is accredited to the coproduction of the program between the local government and the community (Satterthwaite, 2020, p. 151). The most powerful tool of any community is its ability to be organized so it can advocate for itself (Satterthwaite, 2020, p. 150). The Orangi project supported community advocacy and indicates that decentralization of slum upgrading projects is needed to successfully increase resilience to climate change and other urban trauma.

Additionally, applying the 'life satisfaction approach' (LSA) in urban planning provides insights into the subjective well-being of residents in informal settlements (Arrieta et al., 2020). This method considers residents' happiness and satisfaction, offering a more holistic view of their quality of life. It also uses 'disaster risk reduction' (DRR) strategy to account for the multiple vulnerabilities in urban informal settlements and seeks to understand urban risks by exploring webs of interactions, similar to systems mapping. The 'life satisfaction approach' study had the overall goal of increasing capacity and reducing long-term urban risk in informal settlements, which I understand as being similar to building sustainability (Arrieta et al., 2020).

'Life satisfaction approach' is conducted using subjective wellbeing (SWB) indicators (i.e., how happy / satisfied are you with life overall?) which allows people to be more reflective and rests on the assumption that people want to achieve the highest subjective wellbeing level (Arrieta et al., 2020, p. 3). Research indicates that some Latin American regions, despite lower material wealth, often report higher levels of subjective well-being, highlighting the cultural importance of social and family relationships (Arrieta et al., 2020, p. 4). Arrieta et al.'s (2020) findings suggest that social mobilization and physical works, such as improving public spaces and infrastructure, have significant positive impacts on residents' well-being. Thus, integrating public spaces and infrastructure elements into urban planning can foster a more sustainable and satisfying living environment.

This is echoed in stories from personal correspondence regarding the importance of community caring and connections in Ciudad Bolivar and Soacha. For example, community leaders host dinners at their communal kitchen for people who have been affected by natural disasters or are experiencing housing insecurity. This is how planning can intersect with wellbeing, because 'physical works' are (re)created and supported by urban planning policy and can either enhance or ameliorate urban trauma.

The COVID-19 pandemic has further highlighted the vulnerabilities of informal settlements, often located in the periphery, where overcrowding, poor sanitation, and limited access to services exacerbate the spread of diseases (Corburn, 2021). Lessons from past epidemics, such as Ebola, suggest that community-based approaches are essential for effective health interventions in these areas. Mistrust of external foreign aid and medical professionals can hinder efforts, so strategies that involve residents in the planning and implementation processes are crucial for their success (Corburn, 2021, p. 351). Policy recommendations emphasize

enhancing medical care accessibility, economic support, and physical improvements to better prepare these communities for future health crises (Corburn, 2021, p. 350).

When visiting the study area, I was confronted with urban traumas and noted how the lack of park space and deteriorating buildings, among other factors, provided an entirely different sense of place when compared with more affluent areas in Bogotá. Though I understood the concept of 'sense of place' from a theoretical position, witnessing the stark contrast between Bogotá and its peripheries underscored the influence that urban design and planning have on making a 'place' feel safe, happy, or any other emotion.

The 'Cities for Life' approach, demonstrated through case studies in Richmond (California), Medellín, and Nairobi, illustrates the importance of resident-driven problem identification and solution implementation (Corburn, 2021). This method, rooted in social urbanism, prioritizes starting improvements in the poorest areas and engaging the community in the planning process. It aligns with participatory action research (PAR) and community-based participatory research (CBPR) principles, recognizing the value of lived experiences and local knowledge (Corburn, 2021, p. 7). By addressing urban trauma, such as violence, poverty, and inadequate infrastructure, and focusing on equitable policy changes, planners can foster healthier, more resilient communities.

The transformative potential of urban planning is evident in the case of Medellín, which has significantly reduced violence and improved living conditions through inclusive policies and infrastructural investments. Programs like the 'Integrated Slum Upgrading Program' of Medellín (PRIMED) have extended essential services and connectivity to marginalized areas, illustrating how targeted urban policies can reverse adverse trends and promote social equity (Corburn, 2021, p. 24).

Cities can have a profound potential in urban healing. Listening to those who are marginalized and have been traumatized by the city, understanding the historical processes that created trauma, building from community strengths and assets, and incorporating equity into policy and institutions (replacing discriminatory practices), are examples of much-needed urban research (Coburn, 2021, p. 13-15). City trauma comes from the presence or absence of built form, access, and resources. With a mental health crisis in cities (exacerbated over the COVID-19 pandemic), urban planners and politicians need to address this structural failure because the cause of such traumas is external and profoundly impacts the mental and physical health of a city inhabitants (Coburn, 2021, p. 10). Focusing on the city as an active system supports a holistic approach to revealing community risks and assets and can therefore provide a comprehensive understanding of citizen planning.

Urban vulnerability to climate change is measured (by the Intergovernmental Panel on Climate Change) by exposure, sensitivity, and adaptability (O'Brien, 2007, p. 74). There are two main discourses of vulnerability to climate change: 1) outcome vulnerability, which is associated with scientific framing, and focuses on the 'endpoint' by measuring the net and monetary impact of climate change; and 2) contextual vulnerability, which is associated with a human-security framing and focuses on the 'starting point' by investigating current inabilities of populations to cope with climate change and measured by social and ecological processes (O'Brien, 2007, p. 74). Human-security framing (contextual vulnerability) sees nature and society as inseparable and understands multiple factors and processes of change (O'Brien, 2007, p. 76). It provides nuance and focuses on equity, which is why this understanding of vulnerability extends best itself to working with marginalized groups. I believe human-security framing is contextually important in the urban periphery and informal areas because it provides a cultural and place-

based lens of what is valued and therefore what is being taken away due to climate change (O'Brien, 2007, p. 74, p. 77).

Roy (2016, p. 20-21) defines climate change impacts in three major categories: single onset events (floods, cyclones, etc.); slow onset processes (changing weather patterns, drought, sea level change, precipitation change); and cascade effects ("a chain of events due to an act affecting a system, such as reduced human security, and domestic and international migration"). The fact that informal residents are generally considered 'illegal' means that they are left out of the frameworks and initiatives meant to combat climate change impacts, which further their vulnerability of living in precarious conditions (Roy, 2016, p. 14-15). Roy (2016, p. 28) also highlights the social and historical dimensions of urban poverty, attributing the current slum reality to the consequences of uneven development across the world, which in my opinion, supports the efforts to incorporate climate justice into urban planning and poverty reduction.

Planners remain largely unaware of the impacts of climate change for the urban poor, and with the population rising, there needs to be dedication to understanding their adaptation techniques and how to integrate them with formal planning practices (Roy, 2016, p. 148). This should be done through "bottom-up community asset planning" that can be translated (through planners) to formal implementation strategies from the top-down official processes (Roy, 2016, p. 149). Asset planning can be conducted through the asset planning for climate adaptation (APCA) framework which creates a community-developed plan based on problem identifying and solution imagining with the intention of highlighting roles and actions for formal networks to undertake to support the community (Roy, 2016, p. 158). A project conducted in Cartagena, Colombia shows how understanding climate change is an effective starting point for planning in poor urban areas and encourages the real possibilities of relationships between local governments

and the urban poor (Roy 2016, p. 163-164). Roy (2016, p. 226) also presents the Ladera project, which undertook a risk assessment approach in three landslide sites in Ciudad Bolivar to understand individual and community framing of landslide risks in informal settlements in the urban periphery. The project concluded with the understanding that adaptation is not a single road but multiple pathways of possibility for urban governance by various actors (Roy, 2016, p. 234) and people's perception of urban risk is framed by their personal concerns and values (Roy, 2016, p. 233). It remains that for people living in informal settlements, the lack of infrastructure often leads to fear and further mistrust of the government, resulting in people not believing government-issued warnings of natural disasters. The loss of property and damages inflicted from extreme weather causes anxiety, fear, stress, and trauma (Hambrecht, 2022, p. 129).

City slum upgrading programs work to improve informal settlements structural and social resilience to climate change. Understanding local risk is the mediating piece between climate change resilience and slum upgrading because it maintains the emphasis on place-based, community-driven work (Scovronick, 2015).

Moreover, emphasizing local autonomy, community involvement, and culturally sensitive approaches can counteract the historical impacts of colonialism and create sustainable, inclusive urban environments and services. By integrating health, well-being, and environmental considerations into urban policies, planners can effectively address the complex challenges faced by residents of the urban periphery, fostering resilience and equity in urban development.

Planners have the responsibility and ability to use their tools to create more equity in cities by influencing urban transportation and built form, which can alter behaviors and patterns of cities (Vojnovic et al., 2019, p. 103). Principles and techniques such as connectivity, high density, transit-oriented development, and mixed developments should be used by planners to

promote car-free more sustainable transportation (Vojnovic et al., 2019, p. 104). We can use our technical skills and use spatial data to inform decision makers where city projects would have the most positive impact (Vojnovic et al., 2019, p. 105). The concept of planning for healthy cities is not by any means a new phenomenon but was originally explored as a solution to the poor urban conditions that were found in the United Kingdom during the 19th century urbanization because of the industrial revolution (Vojnovic et al., 2019, p. 102). Planning was revolutionized to create a sanitation and sewage system for the urban poor, and essentially acted as a function of public health, which dramatically changed the lives of the urban poor.

I firmly believe urban planning should always be for the benefit of the whole community, which often means starting with those who experience systemic disadvantages. Using complex systems thinking helps planners to understand the impacts of green spaces in cities, which not only promote better mental and physical health but also help mitigate against climate change (Vojnovic et al., 2019, p. 106). Cities are seen as key stakeholders that must be utilized to deliver on the United Nations sustainable development goals through good urban planning and design recommendations and strong leadership with a commitment to healthy cities (Vojnovic et al., 2019, p. 111).

Increased urbanization is not innately bad for health, and it can present many areas of opportunity to improve urban wellbeing. Urban areas, if serviced appropriately, can offer more services and better health outcomes for children stunting, nutrition, and maternal mortality but they also expose populations to other health effects that are not experienced in rural areas such as over crowding, air pollution, unhealthy lifestyles, and unhealthy consumption (Vojnovic et al., 2019, p. 152). The point is not to focus on the problems that are continuing to grow in urban areas but rather to see cities as sites for change and use technical and qualitative planning

techniques to increase the overall wellbeing for those who live in urban areas as "[u]rban health in Latin America and the Caribbean (LAC) cities thus presents an unprecedented opportunity for research, capacity building, and policy maker engagement in ways that are relevant not only to health in the region but to cities worldwide" (Vojnovic et al., 2019, p. 161).

One of the key recommendations from the 2022 Organisation for Economic Co-operation and Development (OECD) Urban Policy Review specifically calls for improving urbanization in Colombia by "mainstreaming climate change and disaster risk management into urban planning" (OECD, 2022, p. 17). Due to the increasingly present and pervasive risks from climate change, climate change must be integrated through urban and social policy to address existing consequences and mitigate for an uncertain future. Therefore, having a comprehensive understanding of the existing local systems and asking the community directly what they need to build a safe and resilient future for themselves is integral in building sustainable policy that will help those most vulnerable to climate change.

Relative to other OECD countries in the region, Colombian cities have low economic productivity due to low skilled workers and industry, a dominating informal sector, as well as a lack of innovation, technology, transportation, and collaboration among cites (Organization for Economic Co-operation and Development, 2022, p. 15). This disorganization and informality are fueled by the lack of clear governance and subpar implementation strategies which allows rapid urbanization in an unplanned manner resulting in the reproduction of social, economic, structural, and environmental challenges and inequalities: "To implement these strategies, Colombia needs to revamp its urban governance framework and improve local government capacity" (Organization for Economic Co-operation and Development, 2022, p. 17). The historical and projected rate of population growth in urban areas poses a challenge to many

Organization for Economic Co-operation and Development countries, especially Colombia which has higher urban populations than other regions with informal settlements housing over 5 million people (11% of urban population) in areas with a cumulative total land mass accounting for approximately 25% of the built environment (Organization for Economic Co-operation and Development, 2022, p. 15). The prevalence of the informal economy drives informal housing because people in the informal sector do not have access to mortgages (due to lack of formal wages), so they must build self constructed areas for themselves (Organization for Economic Co-operation and Development, 2022, p. 89).

3. Colonialism and Planning

As precarious as they may seem, Soacha and Ciudad Bolivar are desirable *localidades* and attract many displaced people from across the country and the Latin American region. It is accessible to settle in the area and build homes with recycled materials due to the isolation provided by the physical geography (personal correspondence 3, 2024). The demographic who has settled in these *localidades* in recent years was self-described as "internal migrants from the armed conflicts, Venezuelan refugees, afro-Colombians, Indigenous people, single mothers, and victims of conflicts" (personal correspondence 3, 2024). A community leader mentioned that residents of these areas are very intentionally welcoming of all people. He explained that there is no conflict between newcomers and the people who have been in the community for a long time. Ciudad Bolivar and Soacha are therefore very diverse and open to anyone who wants to settle there. They are very accepting of all people, including LGBTQ+, which is aligned with national LGBTQ+ legal frameworks. An article on LGBTQ+ safety in Latin America pointed out that Colombia has the strongest legal protections for the queer community on paper, yet it ranks the

highest in Latin America for LGBTQ+ killings (Bocanumenth, 2020). This example illustrates the disconnect between national policy and the lived reality of marginalized people in Colombia.

To understand the current context of citizen planning in previously informal areas, we must first look at the historical process of colonialism that have created spatial patterns of social exclusion and uneven development in Bogotá. Although, these processes and patterns are not unique to Bogotá, looking to other case studies can help support the use of community-based research in similar settings. Coburn (2021) supports the implementation of participatory action research (PAR) and community-based participatory research (CBPR) in urban planning studies of marginalized communities. He demonstrates that the key to alleviating urban trauma is to work with those (and honour work produced by those) who have been directly harmed by recognizing lived experience and tacit knowledge as a valid form of expertise (Coburn, 2021, p. 7). Coborn (2021) does not refer to individual trauma, but instead collective trauma felt in the community from events such as extreme poverty, community violence, food and housing insecurity, pollution, unkept parks and lack of access to green space, abandoned and poorly kept buildings, etc. -- anything in the city that negatively impacts the community through its poor performance (infrastructure) or the perpetuation of social problems can be viewed as urban trauma (Coburn, 2021, p. 9). Planners, and urban planning methods, have direct influence on the cycle of urban trauma and it becomes a responsibility of (professional or community-based) planners to eliminate the causes of structural violence in cities, much of which is rooted in structural racism and the intentional denying of services and safe spaces to marginalized populations (Coburn, 2021, p. 10-12).

Ciudad Bolivar and Soacha in many ways exist outside of the formal and legal frameworks of Bogotá as most of the *comunas* are dubbed 'illegal settlements' by non-residents

and 'human settlements' by resident advocates and community leaders. This gives rise to methods of state resistance in the form of community organizing and mobilization, allowing residents to advocate for their needs through direct action while actively negotiating with the city government. This movement is referred to as *derecho a la ciudad*, or right to the city. The quote below explains how residents see their right to the city:

> "Our community demands the right to territory, a piece of land where we can live peacefully and tranquilly, as stated in Article 22 of our national political constitution. If the mayor's office harasses us and attacks us, claiming that the territory belongs to them, they are violating Article 51 (all Colombians have the right to decent housing) especially since the documents state that the land belongs to a private individual who allows us to live here. The mayor's office of Bogotá argues that this is high-risk land, which may be true, but the community is willing to take the risk. The mayor's office of Bogotá offers a disguised debt as a solution, labeled as a subsidy to be paid over 15 years, and the day the family cannot pay the installment, the bank auctions off the property, leaving the family in debt and never eligible for subsidies again.

> That is why we demand the right to territory, a piece of land where we can live in peace, where state armed groups do not attack us because of our condition." (Jimmy Leal, personal correspondence, translated from Spanish, 2024).

Urban planning in the urban periphery, particularly in cities like Bogotá, requires a multifaceted approach that recognizes the complex adaptive systems within these areas. Informal settlements, or previously informal areas, are often self-constructed and lacking formal integration with the city's infrastructure and services, thus presenting unique challenges and opportunities for urban planners. A recent study in Rocinha, Brazil, emphasizes the use of 'integrated modification methodology' (IMM) to gain a nuanced understanding of the city's behavior by breaking it down into its subsystems (Arcidiacono, 2017, p. 358). This approach

reveals that improving the 'land use and land cover' (LULC) in informal settlements directly enhances environmental services, thereby boosting the natural and social well-being of residents (Arcidiacono, 2017, p. 361). Utilizing tools like 'integrated valuation of ecosystem services and trade-offs' (InVEST) allows for the examination of the broader impacts of land use decisions in informal settlements, providing valuable insights for more effective urban planning.

Historically, urban planning in Bogotá has been influenced by colonial and postcolonial legacies, shaping the current state of the urban periphery. These areas, often neglected by formal urban development policies, have grown organically, driven by the needs and initiatives of their residents. The colonial mindset of segregation and control has persisted, leading to spatial and social divisions within the city. As such, contemporary urban planning in Bogotá must address these historical injustices by fostering inclusive and participatory processes that engage peripheral residents. This involves not only improving physical infrastructure and services but also recognizing and valuing the social capital and resilience inherent in these communities. By integrating the voices and experiences of peripheral residents into urban planning, Bogotá can move towards a more equitable and sustainable urban future.

Culture intersects the conversation of development from a colonial angle because it has historically been used to explain a lack of capitalist development in Latin America (Cupples et al., 2019). This imposed Western metric of success equates capitalism (and thus the subordination and exploitation of local populations and the environment) with the essentialized term 'development'. The measuring of development becomes essentialized as the act of replacing Indigeneity and sustainability with capitalism in the social and economic fabric of a city or community (Cupples et al., 2019). Therefore, under the guise of 'development,' colonial ways of life begin replacing and upsetting Indigenous order. It becomes a justification for the invasion,

disruption, and extraction of non-Western areas, profoundly reshaping urban space in the Global South. The concept of 'underdevelopment' itself is merely a framework to further the colonial legacy in communities that do not mimic Western ways of life in efforts to maintain global networks of dependency (Cupples et al., 2019). When exploring urban planning policy in the context of the Global South, it is important to ground the research in a decolonial lens to prevent the imposition of Western policy and a colonial narrative.

Processes of colonial capitalism replacing Indigeneity are not a thing of the past. Housing policy becomes a catalyst for capitalism to dominate informal areas. In the spirit of formalized development (top-down approaches), cities push to either legalize or disband self-constructed areas as a method of ensuring profit through land development. In Bogotá, the size and stability of these areas is too large to be disbanded (as compared with a Western example of a tent city) so to address urban issues from a city's perspective, land must first be legalized. However, Davis (2006) clearly demonstrates that land titling (integrating informal housing into the formal sector) is not the answer, as it individualizes a community struggle and stratifies the already marginalized community. A case in point is developers are currently building middle-class housing in the urban peripheries of Bogotá, resulting in the increase of land prices so the urban poor cannot afford to even own land in the periphery (Davis, 2006, p. 91). This is following a trend of urban elites capitalizing on informal settlements by providing basic infrastructure and then either evicting tenants or drastically increasing the rent.

Bogotá has limited affordable housing accessible to low-income residents which creates patterns of people living in informal settlements in the urban periphery of the city (Rukmana, 2020, p. 135). The most densely populated areas are the low-income areas (usually south and west edges of the city) as a result of such housing access. North and Eastern areas of the city

have lower density and higher built form and more social and economic prosperity characterized by services, urban amenities, and the most concentrated formal employment in the city (Rukmana, 2020, p. 135). Low-income areas are located on average about 12 kilometers from formal employment areas, creating a barrier that does not exist in other areas of the city (Rukmana, 2020, p. 135), indicating housing, transportation, and employment areas are not well coordinated to be accessible for low-income residents.

Bogotá has an increasing middle class and social mobility (Rukmana, 2020, p. 136) which signifies successful aspects of urbanization and as such the spatial patterning and configuration is changing rapidly with an increase in public space development, retail, and commercial. The urban land-use changes as a result of the economic and class change, ideally providing more opportunities for low-income residents.

Processes of urbanization are linked with the dynamics of global capitalism, imperialism, and geopolitics. Davis (2006) emphasizes the interplay between global forces and local contexts that have led to the chaotic conditions in many megacities around the world. He critiques the notion that cities are simply the product of local decisions and instead emphasizes the role of larger geopolitical and economic forces in shaping urban landscapes. This supports the use of systems thinking when understanding cities due to the complex and highly interrelated nature of actors and processes that occur at different levels. Davis (2006) articulates the concept of "pirate urbanization" which he defines as squatting on land that has value, through an invisible real estate market, as studied in 1970s Bogotá (Davis, 2006, p. 40). 'Pirate urbanization' is not a result of land invasions, which is a radical squatting pattern often used in the Global North (for example, seen in the 1970s in Berkeley, California) (Davis, 2006, p. 40). Pirate urbanization highlights how informal settlements, often in the urban periphery, are an active and intentional

process (rather than a passive and inherent way of living) and highlights how the urban poor use non-formal markets to build security and achieve economic mobility. The land is legal but illegally subdivided into small plots with very basic services, which allows for slum landlords to privatize squatting and squatter settlements as residents have legal title to their land. Though my conversations with community leaders in Ciudad Bolivar and Soacha did not reveal anything of this specific nature, they did speak about systems that made Bogotá unviable from both a financial and safety perspective.

Since the 1950s, Colombia has had guerrilla groups which thrived under the ideological civil war between the Conservatives and Liberals in what is known as *'La Violencia'* (Corburn, 2021, p. 21). After deindustrialization in the 1970s, many urban dwellers struggled to find jobs which lead to the increase of the informal sector and thus socioeconomic inequality. This can be understood critically as a structural failure by the city and local government to support the economic transition. By the 1980s, following the increasing rates of urbanization, the guerrilla groups were asserting their dominance in urban areas to control politics and dictate land use, development, and social well being. This period led to internal displacement as people were forced off their lands and into cities, making Colombia home to one of the largest groups of internal refugees, according to the UNHCR. This drastically changed cityscapes across the country, increasing the rates of informal and peripheral urbanization, patterns still being reproduced to this day. 1991 saw a new constitution for Colombia declaring it a social state under law which led to decentralized municipal governments and participatory democracy, which allowed Colombian municipalities to regain control over their municipalities and implement public works to increase safety and wellbeing. A recent Medellín mayor developed a major slum upgrading program called the 'Integrated Slum Upgrading Program' of Medellin. According to

Corburn (2021, p. 24), "[t]he program built new housing, delivered land rights to some of the urban poor, and extended water, roads, and sanitary infrastructure to previously excluded barrios. A number of schools and health centers were built, and hillsides were stabilized to prevent landslides." The project also built the first gondolas and electric escalators creating connectivity to the poorest areas of the city (Corburn, 2021, p. 21-24). Medellín benefitted immensely from 'Integrated Slum Upgrading Program.' Medellín was once one the most violent cities in the world in 1995, but now it is not even in the top 100 most violent cities and is often recognized globally for its innovation (Corburn, 2021, p. 6). This is a good example of how urban policy and reform can completely flip the trajectory of a city and its inhabitants in Colombia.

Ciudad Bolivar and Soacha did not see the same levels of investment at this time and their populations have continued to increase despite the urban problems persisting. Though there are emerging infrastructure conversations between local leaders and the municipal government of Bogotá regarding servicing, safety, and road paving, it remains the primary responsibility of the residents to advocate and organize solutions to their complex problems. My research contributes to mapping out the systems and subsystems of Bogotá's periphery and connect with residents to establish a list of their top needs and demands for their community.

Planning laws and frameworks currently lack a comprehensive and holistic approach to help cities (which are clearly struggling). Strong policy and implementation frameworks and multilevel support are needed in more at-risk and vulnerable areas that are facing a host of urban problems (Organization for Economic Co-operation and Development, 2022, p. 90). Colombia is currently developing a new National Urban Policy program (known as Cities 4.0) which to be more effective, needs to address the progress from the previous 2014 program and account for the failures of implementation and lack of a formal evaluation model (OECD, 2022, p. 15).

Colombian cities are struggling without clear land-use plans which are the most effective way to implement National Urban Policies given that, as of 2021, 80% of land use plans were either fully outdated or under review to be updated (OECD, 2022, p. 16). To target the disconnect, the National Urban Policy suggests the modernization of land use planning and the harnessing of urban policy to "advance equity and social justice" (OECD, 2022, p. 17).

There is also a disconnect between land use planning and transportation planning as transportation plans are often not designed congruently with land-use planning. Transportation planning also struggles from a lack of consistent funding for their operations, which is a failure of city financing (OECD, 2022, p. 16). The OECD's National Urban Policy states that "developing a good quality road network is the second most important priority for development in municipalities" (OECD, 2022, p. 88) which conveniently provides the link between planning and air quality, as transportation and road paving have major impacts on urban air pollution. Air pollution in Colombian cities remains a health threat, and the National Urban Policy fails to provide an effective climate change framework that connects the urban and environmental (OECD, 2022, p. 16). Informal workers are more exposed to air pollution (particularly PM10, PM2.5, NO2, SO2 air pollutants) because their work is often outdoors and for long hours, which increases their exposure to pollutants. Colombia only contributes 0.4% of global GHG emissions (China, India, and the U.S. collectively contribute 42.6% of global greenhouse gas emissions for reference (Friedrich et al., 2023). Yet in Latin America, Colombia has the highest rate of natural disaster events associated with climate change, averaging 600 events per year (OECD, 2022, p. 90). As such, improving air and water quality is a subtheme of the "environmental sustainability" theme in the OECD National Urban Policy (OECD, 2022, p. 102). The integration of environmental planning in urban systems has been a policy priority since the 2014 System of

Cities program, although as this review mentions, the implementation framework has not been strong enough to realize the potential of the policy.

Moreover, capitalism intersected the trajectory of development in the Global South through structural adjustment programs (SAPs). Structural adjustment programs were common in the 1970s and 1980s and encouraged national governments to close social housing programs which lead to more housing privatization, ideologically aligned with the International Monetary Fund and the World Bank (Davis, 2006, p. 62-63). This led to the displacement of native labour to slums and shantytowns (Davis, 2006, p. 53).

The subsequent retreat of the state and social programs is credited as being the primary cause for the increase in poverty and inequality, grounded in a culture where foreign banks investments and debt creation are more important than supporting the worlds most vulnerable (Davis, 2006, p. 153). In essence, profit became more important than people which has created the social and physical landscapes of urban poverty that continue to grow. For example, urban poverty in Latin America grew 50% between 1980 and 1986, accompanied by a shift in poverty from rural majority to urban (Davis, 2006, p. 156). The International Monetary Fund and the World Bank have therefore been criticized by post-development scholars for their role in perpetuating neoliberal policies under the guise of good governance.

Colonialism is inextricably linked with displacement and operated under the guide that Indigeneity must be displaced to allow modernity (Cupples et al., 2019). There cannot be modern cityscapes without the displacement of marginalized groups. In other words, colonialism *becomes* development (Cupples et al., 2019, p. 54). Therefore, the essence or "seed" of decoloniality is intertwined with modernity (Cupples et al., 2019, p. 55). Coloniality has an "anatomo-political" dimension meaning it effects not only systems but also bodies (Cupples et

al., 2019). This is how colonial power becomes entangled with race and gender hierarchies as methods of power accumulation. It is not enough to control merely economics, colonialism (and thus capitalism) becomes a way of life through biopower and control of bodies (Cupples et al., 2019, p. 56). This is evidenced in the displacement of people from Bogotá to the urban peripheries, their continued political and spatial exclusion, and how these marginalized areas are welcoming to all peoples in response to a city that is not.

4. Development and Post Development Theory

Socially excluded groups are often invisibilized, impoverished, and face stigma and discrimination. Socially excluded groups also face cumulative disadvantages, meaning the negative traits that are associated with excluded groups have a compounding effect if people experience more than one of them, increasing their risk and vulnerability (Dani et al., 2008, p. 125-126). Social policy needs to understand and account for the complex processes of exclusion, and it needs to be simultaneously addressed at multiple levels in order to be effective. Part of the health inequity felt in Indigenous populations is due to a lack of cultural understanding and Indigenous voice and perspective in health policy (Dani et al., 2008, p. 261).

In a theoretical response to development theories, post-development studies attempt to bury the intellectual ideas and theories regarding development. Post-development opposes the rhetoric of alternative development and instead proposes "alternatives to development" (Cupples et al., 2019, p. 64). Post-development and alternatives to development can be utilized when looking at implementing planning tools and policy in the Global South because classic development theory is often criticized for creating dependency on western modernity (Cupples et al., 2019, p. 64-65). When exploring planning tools in the Global South, planners need to centre local autonomy to

combat these issues and avoid falling into dependency traps that further produce poverty. This is why community-based research and participatory action research processes are the best methods to voice community needs and aspiration, with, however, a minimal impact on dependency in Latin American cities.

Development is criticized as trying to universalize the Western and colonial way of life in areas that 'fund' the lifestyle of the west (through resources, labour, capital, space/ displacement, etc.) (Cupples et al., 2019, p. 65). Naturally, the spaces that fuel the capitalist development of the West will not be able to see the same benefits, as their exploitation is integral in the development paradigm. Therefore, trying to model a development plan based on the same trajectory as the West is irrational. This post-development critique supports the use of participatory action research when working in Latin America and supports the "alternatives to development" theory. Additionally, scholars in the Global South were inspired to explore alternatives to development because "the evidence that the ecological consequences of the 'developed' way of life in terms of resource consumption and environmental destruction were such that this way cannot be treated as a model to be replicated" (Cupples et al., 2019, p. 66).

Post-development is seen as a "power-sensitive" model (Cupples et al., 2019, p. 70) that can inspire social change rather than allowing the development theory and its assumptions of growth to stay naturalized on a global level. Development theory and discourse is sold as being natural and benefiting everyone, therefore removing a space for people to object to or criticize it because its goodness becomes assumed and naturalized. This allows for the continued reproduction of capitalism (and therefore colonialism) through development discourse because it becomes apolitical, above being discussed as it supposedly benefits everyone. The assumption removes it from politics and ethics and instead portrays wellbeing (measured against Western development)

as a linear, technical path. It puts the focus of inquiry on following the development path rather than addressing the structural processes that impede people from following the path which then leads to so-called underdevelopment. By focusing on marginalized communities, the fallacy and shortcomings of development theories are personified. We see first-hand how capitalist promises have failed so many in the Global South and how their creative resistance through direct action and community organizing provides pathways to more sustainable, healthy, and decolonial cities.

However, post-development theory gets criticized for having "Pontius-Pilate politics" which means taking a neutral stance in the face of moral or ethical dilemma and demonstrates reluctance to make a difficult decision (Cupples et al., 2019). This criticism is used for post-development theory because it often fails to make difficult concrete political decisions and instead chooses to support local social movements (i.e., "passing the torch" or burden of decision making) (Cupples et al., 2019, p. 68). Although, I believe the intersection of planning tools in post-development responds to this criticism because it aims to provide concrete options for the Global South by working with and supporting local leadership.

5. Ciudad Bolivar and Soacha

Urban vulnerability is driven by inequities, which informs the spatial (re)-location and patterns of different groups. High density (especially in the urban periphery) and low connectivity of the urban periphery exacerbate risk when there are climate events. Urban inequity is a complex problem that cannot be remedied by solely improving physical infrastructure, as it is historically linked with power relations (especially those related to land). However, urban planning research methods such as the 'rich picture' technique can provide a platform for exploring complex problems by revealing relationships, systems, and interests of community members. My research

offers a comprehensive framework that centers the strengths and capacities of the community while also providing guidelines for future research or work in the study area, based on community need. The framework consists of three main components:

1. Community Mapping: The first step involves identifying and documenting the various systems and processes within the community. This includes tangible factors such as infrastructure, geography, and economic activities, as well as intangible factors like social networks and community activities. The mapping process engages community members to share their knowledge and perspectives, encouraging a sense of ownership in the maps.

2. Engaging the Community: Active participation of community members is crucial throughout the process. This is primarily relevant during the community workshop where the maps were created and the facilitation of discussions and collaboration throughout the exercise.

3. Co-Creating Solutions: Based on the community input, the next step involves co-creating potential solutions to address the challenges and opportunities in Ciudad Bolivar and Soacha. This included the addition of desired community features to highlight what participants believe is needed in the community. This provides the framework for potential future research in the study area.

Planners can provide technical expertise, facilitate access to resources, and create an enabling environment for community-led initiatives, like the community workshop. Community-centred approaches are crucial for planning in the Global South as there exists a vast difference in understanding 'the slum' between residents and formal planners. For the urban poor or slum residents, the urban periphery are places of production and innovation, whereas for traditional planners, they are seen as "mere cancer in the city" (Davis, 2006, p. 65). I believe this disconnect

needs to be ameliorated by planners through intentional efforts to include marginalized residents in decision making and give credit to their local ways of life and resilience. It would then not only provide a decolonial approach to a traditionally harmful practise, but it would also ensure that the planning methods that are implemented would be culturally appropriate and therefore more sustainable.

6. Rich picture mapping process and results

In addition to a review of the relevant scholarly and gray literature, my qualitative research privileges on a community-based approach to mobilize community meetings and rich picture mapping. By adopting this mixed-methods approach, my research design aims to capture the complexity of the community, offering a holistic understanding that can inform evidence-based recommendations for improving environmental and community well-being.

The 'rich picture' mapping process

The main data collection method for my research was a 'rich picture' community mapping. 'Rich picture' is a community mapping technique that is helpful when using systems thinking to demonstrate the complexity of the research focus area as its own system. In a similar vein to community mapping, 'rich picture' mapping enables a community-produced 'map' of specific systems and subsystems which in my research focuses on environmental health in neighbouring communities of Ciudad Bolivar and Soacha. The rich picture is used in the "pre analysis" phase to help illustrate the connections and relationships that may have been missed by other methods of research (Wageningen, 2008). This methodology encourages group work and collective thinking to represent their community subsystems (Wageningen, 2008).

In collaboration with local community groups Barrio Pinto and Mesa Tecnica de Altos de La Estancia, a meeting with community leaders was organized with the purpose of developing rich picture maps of the focus area. The rich picture community maps were created at a community meeting on April 7, 2024, hosted at a Kindergarten by the border between Ciudad Bolivar and Soacha. The participants were asked to come prepared to illustrate how climate change or poor environmental health affects their lives by connecting factors and agents with arrows indicating a relationship. The community meeting began with a brief introduction and presentation of the technique, facilitated by a translator. Though creativity was encouraged, a set of guiding questions shaped the direction of the maps. In total, 19 individual maps were created in the workshop. The maps, varying in detail, depict the community system as perceived by the author. The rich picture technique illustrates the complexity of factors while mapping out the interrelated processes and feedback that are (re)produced in the community. The final rich picture illustrations stayed with the community members so it can be used as an advocacy tool for improving infrastructure and policy for environmental and community health.

Questions guiding the process of making of the rich picture community mapping are: After identifying the specific *localidad* they are from, participants were asked to mark where they live in the center of the map. They were invited to add any details related to their home, e.g., building size and type, who else lives in the home, the environment and amenities around it or any details that affect your home. Places of employment, time of commute and challenges to get to work were added. Other daily activities (e.g., markets, stores, community centers, parks) and means of getting there were also mapped – and so were community spaces or places of gathering with specific details of activities occurring there.

Participants were also asked about extreme weather events (e.g., rain, winds, temperature, wildfires) and how they affect their ability to move around your community, access employment, school, or food and clean water sources. Additional factors (e.g., transportation systems, landslides, air pollution, congestion, lack of safety etc.) were also added to the map in terms of ability to move around, access employment, school, or food and clean water sources. Participants were then asked to add any climate-related events that they were concerned about occurring or had already occurred, how they manage such adverse weather or climate effects as well as frequency of occurrence. Participants were also asked about resources they access to address challenges and disruptions in their everyday life (e.g., shelters or government/no-governmental organizations). Participants were also asked about their own families and their trajectories (school, employment, chores, income contributions and role in community).

The final directive asks participants to add a star on the top of the page if they are satisfied with the housing, transportation, and public infrastructure in your community or a square if they wish for greater support and help when a natural disaster hits the community. Participants were then asked to finally add any improvements to infrastructure that they would like to see in their community, amenities to improve their daily life, wellbeing, or ability to access employment, education (for you or your children), resources, or services.

The exercise concluded with a 15-minute reflection to add any other systems, activities, relationships, resources, or places that they interact with that would be relevant to their personal and community wellbeing. A drop box was also available to collect written comments or feedback on the event.At the workshop, participants were provided a written copy of the different topics to be mapped. I was anticipating having a projector to have a powerpoint to accompany the presentation and to present the guiding questions but due to a miscommunication

there was only a whiteboard available. The written copies of the guiding questions turned out to be extremely helpful as the room became loud given the discussions which communicating to the entire group difficult. I also walked around the room, touching base with each table and providing an opportunity for questions to be asked. Some participants had limited time and needed to leave early, so having the guiding questions printed out at each table allowed them to move through the exercise at a quicker pace and complete the activity in an expedited time. Due to what my main point of contact, Jimmy, attributed to "cultural differences", the workshop began about an hour later than scheduled, leaving limited time to go through each question in depth. However, this limitation had minimal impact on the quality of the maps and additional comments from the workshop. From the initial maps, I consolidated the major themes to create a singular map of the Ciudad Bolivar and Soacha *comunas* to increase the accessibility and distribution potential of the product.

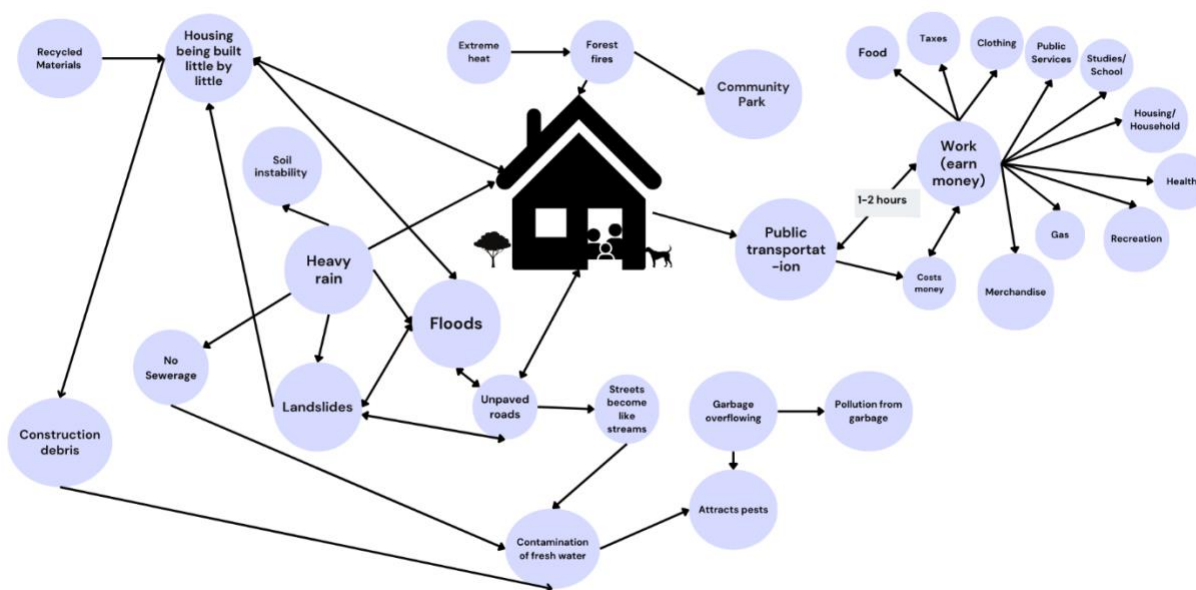### *The 'rich picture' mapping results*

The rich picture mapping results are organized into 3 sections, representing 3 elements of the community meeting fieldwork: 1) the 'rich picture' systems maps; 2) comments by participants on what they would like to see in their respective community; and 3) my own qualitative observations from the community workshop.

During the 'rich picture' mapping workshop, 19 individual community systems maps were created by participants to capture the various factors influencing daily life in Bogotá's impoverished *localidades* of Ciudad Bolivar and Soacha. These maps were an essential part of understanding the complex interrelations within these communities, as they create a visual representation of how factors intersect in this study area. Following the workshop, I consolidated these 19 individual maps into a singular comprehensive map, shown in Figure 2. This

consolidation process involved synthesizing the data from all the community maps to ensure that the final product accurately reflected the collective work from all of the community meeting participants.

In Figure 2, the data from these 19 community maps has been consolidated, digitized, and translated from Spanish to facilitate ease of presentation and discussion. This figure visually represents the intricate network of interrelated systems and factors that impact the daily lives of residents in Ciudad Bolivar and Soacha. Each arrow on the map signifies a relationship between factors, illustrating how one element influences another within the community system. These relationships are crucial for understanding how various aspects of life in this region are interconnected, which then informs potential interventions and policy decisions aimed at improving conditions in these neighborhoods.

As a consolidated version of the highly detailed and personalized participant-made community maps, Figure 2 provides a foundation for further discussion and action to address the complex issues highlighted through the workshop. While individual maps included drawings, notes, and labels personalized to each participants life, the consolidated map focuses on representing systems of services, processes, and relationships rather than personal stories – based on frequency and partly to maintain versatility and anonymity.

Figure 1: Soacha and Ciudad Boliva 'Rich Picture' Mapping
(Consolidated Map of 19 Individual Maps)

Figure 2 can be read in myriad ways. It is a systems map that represents interrelated factors that are present in both *localidades*. I chose to consolidate all the maps into one map, rather than two (1 for Soacha and 1 for Ciudad Bolivar) because there was no discernable difference between the systems maps from each *localidad*. The are geographically so close and experience similar events so I created one map rather than being repetitive and showing 2 maps that effectively communicated the same thing.

The home is in the center of the map, with several family members inside. On the outside of the home, there is an image of dog to represent the many dogs in the study area. I also included an image of a tree outside the home as many people mentioned that there was some green space nearby their homes.

The arrows demonstrate relationality. For example, at the top of the map is a factor 'extreme heat.' Extreme heat is attributed to forest fires (as indicated through the arrows). From there, the map shows that forest fires affect both the home and the community park.

Most participants use public transportation to go to work, or areas where they can earn money. On average, it takes participants 1-2 hours to access these places of employment. From here, the arrows indicate the primary expenses that participants spend their money on.

Heavy rains occur often in the study area, which impacts the community. Heavy rains effect housing and other infrastructure due to direct and indirect impacts. For example, heavy rains cause soil instability, can flood, or overwhelm improper sewerage systems, and contribute to landslides and floods. Landslides and floods are also heavily influenced by the lack of paved roads and steep terrain. The streets can liquefy from the heavy rain mixing with the dirt roads, causing liquefaction and thus landslides. This makes it very difficult for residents to leave their homes as the roads are unsafe. For low-lying areas in the study area, the water pools and collects, causing floods.

This process can contaminate freshwater services, which leads to the attraction of pests in the *localidades.* Contamination occurs from construction debris as well, as the (re)-building of homes is a common occurrence due to growth and natural disasters.

To provide some context for Figure 2 and to demonstrate the type of systems maps that were created at the workshop, I will highlight two participant-made maps.

Figure 2: A Participant's Map

Figure 3 demonstrates the participant's community system primarily with pictures, choosing to add numbers which correspond to another sheet where they provided a brief explanation (noting the participant missed number 5) translated from Spanish to English:

1. I live in my own house, built little by little.
2. From my house to the store, it takes 20 minutes, half an hour to get there.
3. To my work (I am a domestic worker on certain days) it can take up to 3 hours of transportation.
4. The expenses from my salary are based on: food, transportation, health, education, entertainment, clothing, public services, social works, I live with my mother.
6. We are exposed to climate changes.
7. Security is terrible.
8. Places of worship.

9. Poorly constructed roads, unpaved streets.

10. Buses, TransMilenio.

11. Landslides, collapsed houses.

12. Sewers, garbage.

13. Fires, smoke.

14. Housing lacking residential improvements, sewage, public services.

15. Hospitals.

16. Health center.

17. School.

18. Sports fields - parks.

Each of these factors provides crucial insights for urban planning. Knowing that homes are built gradually indicates a need and support for self-construction and maintenance projects. See Figures 4 and 5 for examples of the housing in the human settlement. The 20-minute travel time to the nearest store highlights the density of the residential areas with limited access to local markets. The significant commute time for domestic workers underscores the necessity for improved public transportation systems and more localized and more diverse employment opportunities. Understanding the distribution of household expenses can guide the allocation of resources and services to better support the community's financial needs. Awareness of climate change impacts is critical for developing resilient infrastructure and community-specific emergency preparedness plans. Understanding how climate change directly impacts your area can ensure you have a localized response to the hazards.

Figure 4

Figure 5

Security issues were a common theme throughout the maps. Poor security points to a need for community safety programs, and urban design that could promote safety by increasing access and urban healing. Figure 3 was the only map that mentioned places of worship, which is interesting as typically, they are essential for community cohesion and spiritual well-being. This either indicates a need for protected and accessible religious spaces or that places of worship have not played a significant role in the community, perhaps due to their absence.

Road quality is a repeated issue in the study area as demonstrated in Figure 2 and 3. Poorly constructed and unpaved roads (see Figure 5) require investment in infrastructure to improve transportation, walkability, accessibility, and reduce hazards. Investment in road paving would also be beneficial for public transportation. Having efficient and reliable public transport

is vital for reducing commute times to services and places of employment while improving access to various parts of the city. The mention of landslides and collapsed houses indicates a need for better land use planning in vulnerable areas, construction materials and standards, and disaster risk reduction strategies. Also effecting the environmental sustainability of the area, according to Figure 3, is the lack of waste management. Having effective sewage and garbage management systems are essential for public health and urban healing.

As hazards from fires was a recent impact in the area, it was mentioned frequently. In Figure 3, there is a drawing of flames near the home. I think implementing a community awareness program is crucial for addressing these concerns. This participant also mentioned general residential improvements which seems to include upgrading housing, sewage, and public services which could contribute to a higher quality of life and reduces urban health risks. This map also addresses the limited access to hospitals and health centers which can be addressed to improve community health and emergency care. The drawing of the hospital is circled in red, indicating that this is a feature that the participant would like to see in the community. Sports fields and parks are important for physical health and community interaction, requiring investment in safe and well-maintained recreational areas. As seen on my community tour, the human settlement in Ciudad Bolivar is in the process of building a sports field to address the lack of park and sport infrastructure.

By addressing the factors highlighted in the maps, urban and community planners can create more livable, sustainable, and resilient communities that meet the needs of their residents.

Figure 6 demonstrates another participant map, highlighting the streets with runoff from heavy rains, the contamination of fresh water and streams, and risk of landslides. Under the image of the flames, rain cloud, sun, and factory, the participant writes "the cycle of risk

renewal" indicating the natural and anthropogenic factors that contribute to risk in the community. The money sign and extending arrows indicates how income is typically allocated for this participant. In the red ink on the left side of the page, we see a list of what the participant would like to see implemented in the community (see Figure 7 for a consolidated list).

While illustrating the existing systems and infrastructures in the study area is crucial for understanding the current context, I was equally interested in capturing the aspirations and needs of the community members. To achieve this, I asked the participants to add (in red ink) to their maps anything that does not currently exist in their community but that they would like to see implemented. These additions ranged from improvements to existing infrastructure to entirely new features that the community members felt were necessary.
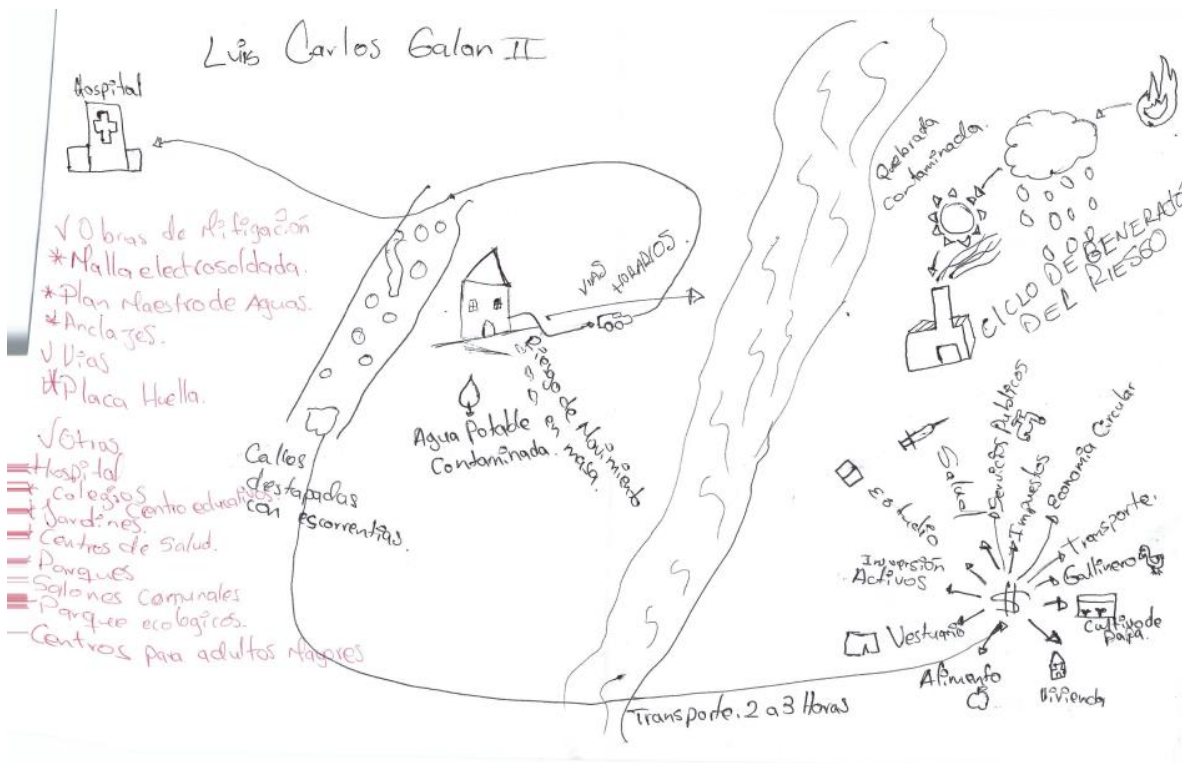

Figure 3: Another Participant's Map

Another significant element of the workshop was to identify the community features or infrastructure improvements that residents would like to see in their neighborhoods. Given that Ciudad Bolivar and Soacha are marginalized and self-constructed communities, many people do not have formal access to essential services such as water, electricity, and sanitation. Instead, they often rely on precarious means to meet their basic needs.

Figure 7 represents these desired community features, relative to the frequency with which they were mentioned across the 19 maps. This figure highlights the collective priorities and aspirations of the residents, providing a clear indication of what they believe is most needed for their community's development. The insights gathered from this exercise are invaluable for several reasons. Firstly, they offer a grassroots perspective on community needs, directly reflecting the voices of those who live in Ciudad Bolivar and Soacha. Secondly, they may serve as a guiding framework for future planning and projects. By understanding what the community prioritizes, policymakers, NGOs, or other stakeholders can tailor their interventions to address issues identified by the residents themselves. The workshop not only shed light on the existing challenges and systems within these neighborhoods but also revealed the community's vision for a better future. This dual approach of examining both current conditions and future aspirations provides a comprehensive understanding of the community's needs and priorities, providing a resource for informed actions.

Community Features	Count
Health center / Hospital	16
Pavement / Paving / Road Infrastrucure	16
Surveillance / Security / Cameras / Alarms	13
Schools	13
Parks / Sports / Recreation / Green Areas	12
Sewerage / Sewage / Canalizing pipes/ water master plan	8
Transportation	8
Community Halls	3
Risk Mitigation	3
Public services	3
Community dining rooms	2
Senior Center	2
Welded wire mesh	2
Anchors	2
General Infrastructure	2

Figure 7: Desirable Community Features Identified by Workshop Participants

Tied for the highest frequency of mentions are health centers or hospitals and pavement, paving, or road infrastructure. These two factors were noted by participants as something they would like to see implemented in their community on 84% of the maps (16 of 19). This suggests a significant demand for improved healthcare access and better road conditions. The apparent lack of access to health services in the study area is a critical issue. Residents' ability to receive timely and adequate medical care is affected by the absence of local health centers or hospitals. Furthermore, the lack of adequate road infrastructure exacerbates this problem, making it challenging to access healthcare facilities in other areas. The poor road conditions can also delay emergency services from accessing the study area.

As discussed, the lack of road paving creates myriad issues ranging from air pollution due to dry dirt roads to landslides when heavy rain mixes with these unpaved surfaces. This not only affects the health and safety of the residents but also impacts the overall quality of life by

making transportation more difficult and hazardous. Accessibility concerns are paramount, as unsafe roads can isolate communities.

Additionally, 68% of participants mentioned that they would like better security or safety measures in their community. Safety is a major concern in the study area, restricting residents' ability to occupy public spaces and interact with each other freely. Enhanced security measures would not only improve the residents' sense of safety but also encourage social cohesion and community activities.

Residents also expressed a desire for more schools in the study area. This need is closely related to the desire for parks, green spaces, and sports fields, as schools typically include these features. Having more educational institutions would provide essential education services while contributing to the community's physical and social environment through recreational facilities.

Transportation and sewerage systems are the next most frequently desired features. Improved transportation could reduce commute times and enhance connectivity within and beyond the community, to areas of employment. Efficient sewerage systems are crucial for maintaining public health and preventing environmental contamination, particularly the contamination of clean water.

The remaining features, although not mentioned as frequently, still play a vital role in building a cohesive, healthy, and sustainable community. These include better community halls and dining rooms, risk mitigation, public services, senior centres, welded wire mesh (used to increase slope stability), anchors (used to increase slope stability), enhanced public services, and general infrastructure improvements. Addressing these areas, even if they were less frequently mentioned, is important for creating a well-rounded urban development strategy. As these

features were mentioned on 2 or 3 maps, that is still 11%-16% of participants, which is significant.

Overall, the participants' responses highlight key areas of focus for urban planning, including healthcare, road infrastructure, security, education, transportation, and sewerage systems. By addressing the factors mentioned on the maps, urban and community planners can develop strategies that meet the residents' needs, promoting a healthier, safer, and more connected community.

After the workshop, my local collaborator Jimmy guided me on a tour of Soacha and Ciudad Bolivar. Through this tour, he provided immense information about the ways of life, histories of the area, and community organizing efforts. I was able to see first-hand the areas we had spend all morning drawing and discussing. Just across from Jimmy's home in the human settlement in Ciudad Bolivar was evidence of the wildfire that affected the *comuna* the month before. As a response to the lack of formal support, services, and planning, the urban poor, living in often dire conditions, have developed their own strategies for survival and resilience (Davis, 2006, chapter 3). There were many elements of the tour that highlighted Ciudad Bolivar and Soacha's immense capacity for community mobilization despite neglect from municipal government. The following section presents fieldnotes vignettes outlining community features that I observed and the respective impacts on the communities.

All the homes in these two *localidades* are built from recycled materials that have been collected across the greater Bogotá region or repurposed from other places in the community. Most of the homes have concrete floors with wooden beams supporting plastic or tin sheet roofs. They are efficiently and creatively built, optimizing the small spaces to fit their needs and budgets. Kitchens are fitted with hot plates and pots and pans hanging above. The conditions of

the homes vary across the community with the responsibility on the individual to make it nice. Most of the homes have running water including toilets and showers.

Following a dirt road just off of the main paved road that marks the boundary between Soacha and Ciudad Bolivar lies the entrance to a *comuna* in Ciudad Bolivar. Near the entrance and surrounded by netting is a community garden growing potatoes, cucumbers, tomatoes, and onions for the community. It is stewarded solely by a former guerilla soldier who lives in the area.

The is no formal city supply of electricity to Soacha and Ciudad Bolivar. However, residents engage in a movement know as the "right to the city" which claims that all residents have a right to services in the city. In other words, it is the city's responsibility to provide essential services to residents and since they are failing to do so, citizens mobilize and take the services anyways. For electricity, this means running their own wires to the city towers to service homes. Such connections are not left to individuals as "the community buys the cables and accessories to connect the electric service, and we also pay an electrician to make the necessary arrangements" (personal correspondence 3, 2024).

Ciudad Bolivar does not have a formal waste management program, however Soacha does. Jimmy articulated that this led to residents leaving garbage outside of homes which then created a larger community issue of rodents and animals coming into the *comuna*. Though some participants mentioned that rodents and smelly garbage was still an issue, there are community efforts to educate residents and implement a system of garbage chutes. This creates a space for residents to bring their garbage so it can be collected by trucks that come Monday, Wednesday, and Friday each week. Jimmy encourages people in his community to bring the garbage to the

chutes on days when the trucks come by to avoid spillage and thus rodents although the scheduling of when to bring the garbage to the chutes continues to be an issue.

As Soacha is more formalized, they have access to city water and sewage pipes. However, Ciudad Bolivar do not receive the same services. To access fresh water and the sewerage system, the *comuna* buys and lays their own pipe in the area and taps into the services that are being provided to Soacha, as it runs right through their neighbourhood. This illustrates the high level of community organization that is executed by the community members.

In the valley of Soacha, there is a lake that once stood as a pristine natural feature over 40 years ago. It has since deteriorated significantly. Due to intense densification and inadequate service planning, the lake now serves as a repository for waste and refuse from the surrounding neighborhoods.

As seen earlier, a major issue in the area is the lack of road paving. This issue becomes exacerbated through climate change as the world experiences more climate instability and higher rates of natural and climate related disasters. This becomes problematic in drought or heavy rain conditions. The unpaved dirt roads remain dry for extended periods of time, leading to worsening air quality due to more particulate matter. The roads become hardened in dry conditions, which then intensifies the effects of heavy rain because the ground is less permeable. The dirt roads become wet and unsafe, causing flooding and landslides in the area.

As natural disasters are common in this region, Ciudad Bolivar offers a humble community kitchen (see Figure 8) consisting of one room and open doorway, multiple bags of flour, and a single open-flame stove with a large pot. Community leaders organize meals for those who have been affected by natural disasters in the *comuna* and residents who are experiencing housing loss can also use the space to make food for themselves and their family.

Figure 8

As the community continues to grow in population there becomes a need for new development. Additionally, natural disasters impact the available housing stock, putting further pressure on building and development. When landslides or heavy rain occurs, it floods the low laying regions, pushing new development higher up the mountain. New homes are community developed and constructed in an effort to accommodate the growing population. However, as development is pushed higher up the mountain, it threatens the slope stability of the area. The limited or clearing of greenery and vegetation, which naturally anchor the soil and absorb excess water, can lead to increased soil erosion. Without these natural stabilizers, the slopes become more susceptible to landslides and erosion. Additionally, the removal of trees and plants can exacerbate the risk of flooding by reducing the land's ability to absorb rainfall, causing water to run off more quickly and forcefully. This combination of factors potentially leads to greater

impacts from floods and landslides, endangering both the environment and the communities below and on the slopes.

In both Soacha and Ciudad Bolivar, children make up the majority of the population. This demographic creates a social responsibility for adult residents to care for the children in their community, regardless of kin. Currently, the community is planning on building a soccer field in the area to provide the youth with healthy activity and sports. Additionally, Jimmy mentioned that having a positive activity for young people will hopefully prevent them from being involved with drugs.

As a leader, Jimmy shares with me that one of his responsibilities is monitoring the safety of his *comuna*. He has conversations with 'thieves' in his *comuna* and asks them not to steal. However, 13 of 19 (68%) maps that were created in the meeting mentioned that security and surveillance systems were wanted in the community. There are community spaces of gathering although some of the women present expressed that it was not safe to be there alone.

Overall, the qualitative data provided an enriching experience to my field work, allowing a comprehensive understanding of the study area. Though unplanned, the experience of walking through the study area contributed to a deeper understanding of Ciudad Bolivar and Soacha and provided me with the time to ask questions and have conversations with community leaders.

7. Conclusion

The findings from the community mapping workshop and subsequent tour of Soacha and Ciudad Bolivar underscore the multifaceted challenges and community organization of these neighborhoods. The consolidated 'rich picture' systems map (Figure 2) and the prioritized community needs (Figure 7) reveal a comprehensive view of both the existing conditions and the

aspirations of the residents. This visual representation is not only a tool for understanding the complex social and environmental dynamics but also a foundation for targeted interventions that address community challenges identified by the residents themselves.

My qualitative observations from the community tour further contribute to this understanding by providing a tangible context to the systemic issues and community-led solutions captured in the maps. The tour speaks loudly of the 'right to the city' and the resident's capacity for constructing their own homes, securing essential services, and organizing communal efforts such as community gardens and kitchens. Despite the exclusion from formal city services, the residents of Soacha and Ciudad Bolivar have developed adaptive strategies for community support. These grassroots efforts illustrate a high level of community organization, despite systemic challenges such as inadequate infrastructure, informal access to utilities, and vulnerability to natural disasters.

The juxtaposition of the community's current situation with their aspirations for future improvements, as highlighted in the workshop, creates a detailed picture of these neighborhoods. The desired features identified in Figure 7 reflect a community vision for development, emphasizing the need for improved health care services, enhanced security, and road paving, among other priorities. These insights can offer valuable guidance for municipal officials and policymakers, non-governmental organizations, or other stakeholders aiming to support these communities in achieving their goals. Additionally, I hope the organized work can be of benefit for the community during continued conversations with the city government of Bogotá. By aligning interventions with the expressed needs and priorities of the residents, it is possible to foster sustainable community improvements.

Through this research, its guiding question was answered. Environmental and community health risks can be effectively revealed through community mapping and the 'rich picture' technique by visually documenting the lived experiences, systems, and aspirations of residents. This approach captures complex social and environmental dynamics, providing a comprehensive understanding of systemic issues and highlighting areas for targeted interventions based on community-identified needs.

Future Research

The findings of this research present several avenues for further exploration. While the current study has provided a starting point of research regarding urban and community planning in Ciudad Bolivar and Soacha, there exists numerous opportunities to build upon this work. This includes, but is not limited to, projects related to the implementation of the desired community features. For example, collaborating with the community to help improve the road infrastructure and paving. This could materialize in many different ways and capacities, ranging from mapping potential areas for road paving, advocating for road paving or even assisting with road paving.

Apart from infrastructural and community work, there are many avenues of research regarding policy or gaining a deeper understanding of the history of community systems in the study area. Negotiations with the city government of Bogota were also mentioned throughout my fieldwork, and exploring such relationship could provide grounds for future research.

One of the limitations of this projects was time. Facilitating meaningful relationships with community members requires a lot of time. This project has immense capacity to collaborate with a community that has demonstrated its strong leadership, community organizing, and commitment to improvements. Though this research was rigourous and provided

materials that can be used by the community for advocacy, I am sure that more community

mapping workshops would reveal even more stories. Due to the limitation of time and scope, I

was only able to host one community workshop. It was an enriching activity filled with

collaboration and storytelling. Each participant had so much to share, I wish I had the time to sit

with each of them and document their stories and visions for the future. Future research could

focus on the storytelling aspect of this community to highlight the individual community leaders

in Ciudad Bolivar and Soacha.

The potential for future research is multidisciplinary and exciting. It is my sincere hope

that future studies can continue to expand on this preliminary research and continue to learn from

the community about how climate change is managed by the community in marginalized areas.

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