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Jacqueline Carter Date

Slum Upgrading and Risk Reduction: A Case Study of Colombian Cities

By
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Master of Public Health
Global Health

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Committee Chair

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B.A., International and Area Studies
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2010

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An abstract of
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Abstract

Slum Upgrading and Risk Reduction: A Case Study of Colombian Cities
By Jacqueline Carter

Background: The Latin America and the Caribbean region has nine of the world's top 20 countries that are most exposed to disasters, making the region the most disaster prone in the world. The region is farther characterized by the amount of people living in urban centers that continue to grow rapidly. As the cities continue to grow so do the socio-economic inequalities and the formation of informal settlements on the peripheries of the cities. Informal settlements or 'slums' typically form on land that is uninhabitable and unstable and lack access to basic services and government involvement. This makes them particularly vulnerable to natural disasters.

Methods: Case studies of 4 Colombian cities were chosen as the method to explore potential mitigation strategies for slum communities in the event of a natural disaster. Colombia was chosen because it is widely considered a leader in disaster risk management in urban settings in Latin America 5 cities in Colombia were chosen to display work being done to manage risks to natural disasters: Bogota, Cali, Manizales and Medellin. Similar information was gathered for each city in order to present the city in context. Based on findings, a set of recommendations was made in order to show case common things for each of the cities that proved to make their strategies more effective.

Results: Bogota, Cali, Manizales, and Medellin have made significant steps to reduce the vulnerability to natural disasters in urban settings. Key stakeholders have included the national and local governments, community members, and non-governmental organizations. Strategies have included holistic approaches that address more than just the infrastructure of the informal settlements, with an aim at addressing some of the root causes.

Discussion: One of the main things that makes Colombia unique in their risk reduction strategies has been the countries' ability to make decisions at the national level and put them in motion to the point where they are being carried out at the local level. While there is no one solution, effective strategies for reducing risks in informal settlements were found to be similar to those of development strategies: reducing vulnerability and increasing resiliency. Multi-level involvement, holistic approaches, community participation, and investment contributed to the effectiveness of the strategies.

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Definition of Terms

Emergency Management: seeks to make communities safe and less vulnerably to natural disasters. Typically, it is the managerial function responsible for creating the framework for the vulnerable communities. It "protects communities by coordinating and integrating all activities necessary to build, sustain, and improve the capability to mitigate against, prepare for, respond to, and recover from threatened or actual natural disasters (FEMA, 2017)."

Informal Settlements: used interchangeably with 'slums.' Areas of land where groups of housing units have been built that inhabitants have no legal claim to or are occupying illegally.

Mitigation: efforts taken to reduce loss of life and property by lessening the impact of natural disasters. For mitigation to be effective, action needs to be taken prior to a disaster. (FEMA, 2017).

Natural Disaster: any event that is catastrophic that is caused naturally or in nature. Severity differs but can be measured by the number of lives lost and economic loss. Examples include earthquakes, tornadoes and floods.

Risk Reduction: strives to identify, assess and reduce the risks in potential loss of life, health status, livelihood, assets and services that may occur in particular community (Suarez, 2011) during an emergency

Slums: used interchangeably with informal settlements. "a slum household as a group of individuals living under the same roof in an urban area who lack one or more of the following:" 1) permanent and sturdy housing that is strong enough to protect against extreme climate conditions, 2) Enough living space to have 3 or less people sharing the same room 3) access to safe water with ease to procure and pay for it 4) access to adequate sanitation that is shared by a reasonable number or people, toilets that are either private or public 5) Security from forced eviction (UN Habitat, 2007;Fernandez & Sanahuj, 2012). Occupants have no legal claim to these areas of land and are often occupying illegally.

Sustainability: the capacity that allows for a continuation of a certain behavior, indefinitely. Progress is also considered sustainable when needs are met in present time but when the things being done to meet those needs does not compromise the ability of future generation to meet their own needs.

Urbanization: refers to the increase in number of people living in urban areas as well as the physical growth of that particular urban area. Historically, urbanization has been a rapid transformation process, with people moving from rural areas to urban ones.

Urban Resilience: “the capacity of individuals, communities, institutions, businesses and systems within a city to survive, adapt and grow, no matter what kinds of chronic stresses and acute shocks they experience (Rockefeller Foundation, 2016).

Chapter 1.0: Introduction

1.1 Rationale

The Latin American and the Caribbean region is unique in that it consists of countries that are more urbanized than most high-income countries but has primarily medium-income countries. Latin America urbanized earlier than the developing countries of Africa and Asia. In the mid-1900s the cities in the region saw a massive influx of people who were attracted to a better quality of life and more job opportunities. As the cities continued to grow, so did the social and economic inequalities of the people living in them. Governments and planners were not equipped to accommodate all of their new inhabitants and many migrants were forced to live on land that was undesirable and inhabitable, in informal settlements.

In addition to being a quickly urbanizing region, Latin America and the Caribbean is also one of the most disaster prone regions in the world. While everyone in cities are at an increased risk of experiencing a natural disaster, those with stable housing, access to government services, and secure land have a better chance that those experiences will not be detrimental. On the other hand, those living in informal settlements are at increased risk because they often lack sound infrastructure, live on land that is not stable, and access relatively few government services or experience government involvement. The yearly increase in both natural disasters and the number of people living in informal settlements in Latin America creates a need to identify ways to mitigate the effects of natural disasters within informally settled communities.

1.2 Problem Statement

By 2025 the number of people living in cities in Latin America and the Caribbean is expected to

grow by 127 million (USAID, 2010). As these cities continue to grow, so will the informal settlements in and around them, creating an even larger vulnerable population. It is crucial to identify existing strategies that have worked in urban settings to protect those that are most vulnerable during emergency situations and to reduce the loss of life during natural disasters. Understanding the specific contexts in which these strategies worked with further facilitate how they might be replicated in other parts of Latin America.

1.3 Project Purpose

The purpose of this special studies project is to highlight the experiences of cities in one country in Latin America that has a relatively long and successful history of working to improve the conditions of people living in slums and lessen their vulnerability to disasters. Colombia is widely considered a leader in disaster risk management in urban settings in the region. This project will examine five cities in Colombia in order to showcase some of the projects that have worked well – and not so well - to provide a set of lessons learned based on these experiences.

1.4 Significance statement

These case studies will highlight some of the strategies used to address problems that have arisen in various urban slums within Colombia. Bogota, Cali, Manizales, Medellin and Barranquilla were chosen as the case studies because they are relatively large urban areas with many informal settlements, and the municipal governments have worked to address problems and vulnerabilities in the informal settlements. Documenting success stories in different cities

in one country in the LAC region can help to provide practical guidance with the possibility of transference in other cities in the region.

Chapter 2: Literature Review

2.1 Natural Disasters

As the temperature in the atmosphere continues to rise, the world is seeing an increase in natural disasters. According to the United Nations, there has been a five-fold increase in disasters such as storms, floods and heatwaves since the 1970s. While some of these things pose greater threats than others, all are linked to loss of life as well as social and economic destruction. As trends in data suggest, disasters occur mostly in places that are highly populated (Maynard-Ford, Phillips & Chirico, 2008). Without the presence of populations these events cannot necessarily be considered devastating or disastrous. A country's planning and preparedness for these events is crucial in its ability to mitigate loss of life and economic destruction. Currently, worldwide annual average losses from earthquakes, tsunamis, tropical cyclones and flooding count in the hundreds of billions of dollars (SDG Fund, n.d).

2.2 Latin America and Caribbean and Natural Disasters

Nine of the world's top 20 countries that are most exposed to disasters are located in the Latin American and Caribbean (LAC) region (World Bank, 2015), making LAC one of the most disaster prone regions in the world. While all of the disasters listed above occur in Latin America, not all of them occur in every part of the LAC region. Some of the more common disasters in the region include volcanic eruptions, earthquakes, floods and droughts. The Andean region, Central America and Mexico are particularly vulnerable to earthquakes, floods and volcanic eruptions. The Caribbean sees a large number of irregular but destructive hurricanes. Between

2005 and 2012, in Latin America, disasters caused more than 240,000 deaths, affected another 57 million people, and resulted in loses that equaled 85 billion US dollars (UNDP, 2014).

2.3 Urbanization in Latin America

In 2014 over 80% of the LAC's population lived in urban areas, making it more urbanized than Europe, Africa or Asia (Smith, 2014). Urban migration in Latin America is a reflection of many things: industrialization, food insecurity in rural areas, fleeing conflict and environmental damage, and the search for a better quality of life and more economic opportunities (McMichael, 2000). Rapid urban growth transforms the territory, fragmenting the natural landscape, and compromising both the biodiversity and the capacity of ecosystems to mitigate the consequences of human activity (Fernandez & Sanahuj, 2012). As a result, cities often grow in a disorderly manner, leading to the development of informal settlements or 'slums.' As rapid urbanization surpassed the cities' capabilities to offer adequate services, Latin American cities saw growing increases in economic and social inequities (Rice & Hancock, 2016) and new migrants were forced in to informal settlements, usually at the outer edges of cities and/or on undesirable land (USAID, 2010). The lack of government involvement in these areas, coupled with overcrowded living conditions and the absence of health care, clean water and adequate sanitation, make these areas particularly vulnerable to disease outbreaks, adverse health outcomes and emergency situations.

2.4 Slums

Informal settlements are a physical manifestation of a persistent and widening economic inequality that exists worldwide (McMichael, 2000). In the LAC region, informal settlements are

also referred to as slums, favelas, shantytowns, colonias, and villas miserias. As slums have grown more common, they have received more attention by international agencies and, in turn, a descriptive definition. The UN-Habitat defines “a slum household as a group of individuals living under the same roof in an urban area who lack one or more of the following:” 1) permanent and sturdy housing that is strong enough to protect against extreme climate conditions, 2) Enough living space to have 3 or less people sharing the same room 3) access to safe water with ease to procure and pay for it 4) access to adequate sanitation that is shared by a reasonable number or people, toilets that are either private or public 5) Security from forced eviction (UN Habitat, 2007;Fernandez & Sanahuj, 2012).

Slums vary in size and structure as well as in what resources are available to them. While overcrowded living conditions, limited access to basic resources and infrastructure, and poor population health are common traits among them, each slum community is different and complex. The complexity of each slum settlement stems from its unique history, political and socio-economic context. In addition to this, there are many unknowns because slums are often outside of the purview of the state. This means that streets, whether paved or unpaved, do not figure on official maps, and the population isn’t counted in the census or other state surveys. This lack of knowledge, includes things like population size and organizational structures, which, when coupled with the unique characteristics of each informal settlement, prevent policy makers from knowing how to intervene to improve the quality of life of their residents. Similarly, these unknowns can hinder the effectiveness of emergency planning and response.

Another common trait of slum communities is that they are often more vulnerable to emergency situations due to natural disasters for several reasons. First, slums tend to develop on undesirable land that has not been previously developed because it is on a flood plain or a mountain slope. Second, housing and the built environment tends to be informal and non-permanent, resulting in buildings collapsing and caving in more easily than structures built with permanent materials. Third, there tends to be a tenuous relationship between the slum communities and the state officials. A lack of urban land policies and basic support from the state allow communities to continue to grow without formalized streets, addresses, schools or health centers. These factors combine to make slum communities vulnerable, with – and without – a natural disaster.

Every country in the LAC region has its own agency for emergency management, some more effective than others. Challenges for emergency response are amplified in areas where there are large populations living in informal settlements (USAID, 2010). For this reason, trends in emergency management have shifted to emergency planning and disaster risk reduction. With over 80% of people living in cities in Latin America (USAID, 2010) and a quarter of the urban population living in slums (Gencer, 2013), cities need to be prepared for emergencies in order to mitigate their effects.

2.5 Risk Reduction

In the last 30 years, the approach has shifted from emergency response to emergency preparedness and risk reduction. Previously, efforts focused on emergency response and relief

activities and had little focus on mitigating the potential impact of emergencies before they took place (WHO, 2007). Disaster risk reduction (DRR) strives to identify, assess and reduce the risks in potential loss of life, health status, livelihood, assets and services that may occur in particular community (Suarez, 2011) during an emergency. DRR calls on both the public and private sector to collaborate with the most vulnerable to help prevent emergency situations from becoming more catastrophic events than they need to be. As a part of DRR planning, risk and vulnerability assessments are carried out frequently in towns and cities, as well as rural areas (Twigg, 2015) in order to reduce the negative impacts of emergencies by building communities' capacity to lessen their levels of vulnerability. In urban settings, disaster risk increases as a result of poorly planned/managed urban development, poverty, and degraded ecosystems (ELLA,2012). LAC has experienced a growing incidence of disasters over the past decades and has the second highest annual average number of disasters in the world, after Asia (UN Habitat, 2007). More than 80% of losses from disasters in Latin America occurred in urban areas (ELLA, 2012).

2.6 Risk Reduction in Slums

As early as the 1950s bulldozing and evictions were the main strategies used to address the problem of urban slums (Gencer, 2013), based on three justifications: 1) to beautify the city 2) to get rid of centers of crime and health problems and 3) to redevelop the area for public projects (Satterthwaite,2011; Gencer, 2013; Harody, 2014). Sometimes the demolitions were carried out in combination with resettlement projects, which have typically been unsuccessful (Gencer, 2013). Slum populations were often resettled to areas further away from the city,

making it harder for people to get to work (Gencer, 2013). Resettlement projects resulted in simply transferring the problems of the informal settlement from one place to another (Satterthwaite,2011; Gencer, 2013; Harody, 2014), which continued to lack amenities and job opportunities, but were even farther away.

The approach shifted to slum "upgrading" projects in the early 1970s, based on the premise that people could upgrade their own living conditions if given assistance with things like security of land tenure, low interest loans, building materials and technical assistance (Gencer, 2013). Policies focused on three main areas for slum upgrading: 1) provision of basic urban services 2) provision of secure tenure for slum dwellers and 3) innovative access to credit (UN Habitat, 2007; Gencer, 2013). Other terms to describe slum upgrading include participatory slum improvement, integrated slum upgrading and urban upgrading (Gencer, 2013). Regardless of the term, these projects take a holistic approach to slum improvement and risk reduction by considering the problems of the slum as a whole, addressing root causes, and involving both government and community (Gencer, 2013). While slum upgrading projects have shown to be an effective strategy to mitigate the effects of disasters in urban space, the sustainability is crucial. Stable support from the agencies involved, both international and nationally, is needed in order to give projects long term maintenance, build capacity within the community and local government, and create lasting change (Gencer, 2013).

Within the LAC region, Colombia is widely considered a leader in disaster risk management in urban settings, particularly those with informal settlements. Their implementation of policy and

legal frameworks enabled a comprehensive and multi sectorial approach (GFDRR, 2010) to disaster risk management by investing in three different levels of government: national, departmental, and municipal. The following will look at efforts made by Colombia on the national scale as well as display the efforts being made at the local level; particularly highlighting Bogota, Cali, Medellin, Manizales and Barranquilla.

Chapter 3.0: Methods

3.1 Research Design

Case studies within Colombia were chosen to showcase how Colombia has become one of the leaders in Latin America and what can be learned from their efforts. Highlighting several cities within the context of one country is especially helpful because of the nature of emergency management. It requires the collaboration of the local, municipal, and national government.

A case study approach seemed most appropriate for this special studies project for several reasons. First, case studies ask what can be specifically learned from a certain case (Stake, 1992). Second, case studies are well suited to answering "how" or "why" questions, especially when issued need to be traced over time, b) the researcher has little control over events and c) the focus is on contemporary phenomenon within a real-life (Yin, 2009). Lastly, case studies, like experiments, can be generalized to theoretical ideas, (Yin, 2009), indicating that what is learned from these Colombian cities can theoretically be proposed in other contexts in Latin America.

The cities that were selected as cases were Barranquilla, Bogota, Cali, Manizales, and Medellin. Multiple cities in particular were chosen for several reasons. First, multiple cases allow for stronger theorizing about the larger case of Colombia. By situating the case studies within the larger case of Colombia it is possible to focus on the variation in urban settlements, vulnerabilities to disaster, and approaches in city government within the national context. The variation in approaches in city government is especially important in order to understand how

city governments interface with other levels of government. Further, multiple cases allow a comparison of urban planning, geographic location, and the types and frequency of natural disasters within each city. These cities have been fairly widely written about, so there is more information available on their planning and efforts, allowing for a more thorough exploration of the "how" and "why" questions. Lastly, the use of multiple city case studies promotes the ability to understand how Colombia is, at a national level, addressing risk reduction in urban areas and mitigating disasters in those areas, in the context of very different urban contexts.

The national context of Colombia is first discussed in order to place each of these cities in the relevant context. The case studies follow, presenting first information about the geography and demography of each city, its economic base, informal settlements, vulnerabilities to disasters/emergencies, and efforts to mitigate disasters in informal settlements.

3.2 Limitations

One of the limitations of these case studies is that the majority of the information used was found in grey literature, making it difficult to assess any bias that might be present in the sources. Because many of these sources were published at the local level, there is also some inconsistency in the data available for each city. It was clear that some cities had more in depth information on their risk reduction efforts than others; the findings presented here are likely stronger in those cases.

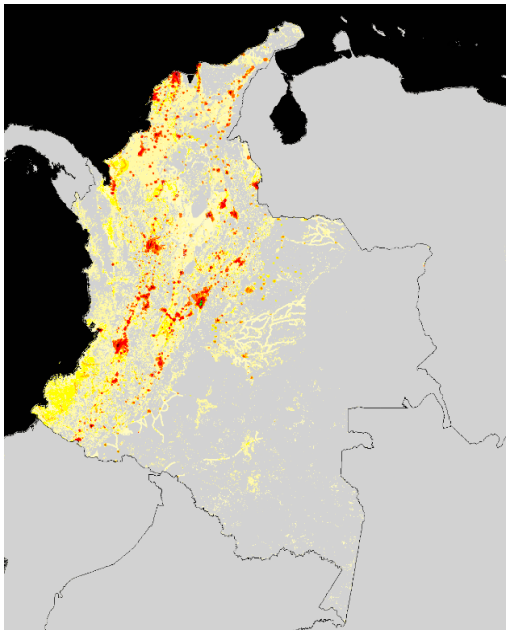
Chapter 4.0: Results - Case Studies

4.1 Colombia

Colombia has a population of 47 million people (World Bank, 2015) and is the 4th largest country in South America. Of its 47 million people, 76% live in urban areas (World Bank, 2015). It is the only country in the region that has coasts on both the Caribbean and Pacific Ocean and is divided in to 32 different Departments. There are three north-south Andean mountain ranges that separate the coastal lowlands from the eastern jungles. The Andean mountain ranges are also the reason that Colombia's population is concentrated in separated clusters in Caribbean lowlands and isolated mountainous valleys (Colombia Facts, 2015). The cities in the mountainous valleys of the Andean region are the center of national economics and political power and where the majority of the population reside (Parsons, McGreevey, Garavito & Gilmore, 2017).

(Univiersity of Texas, 2005)

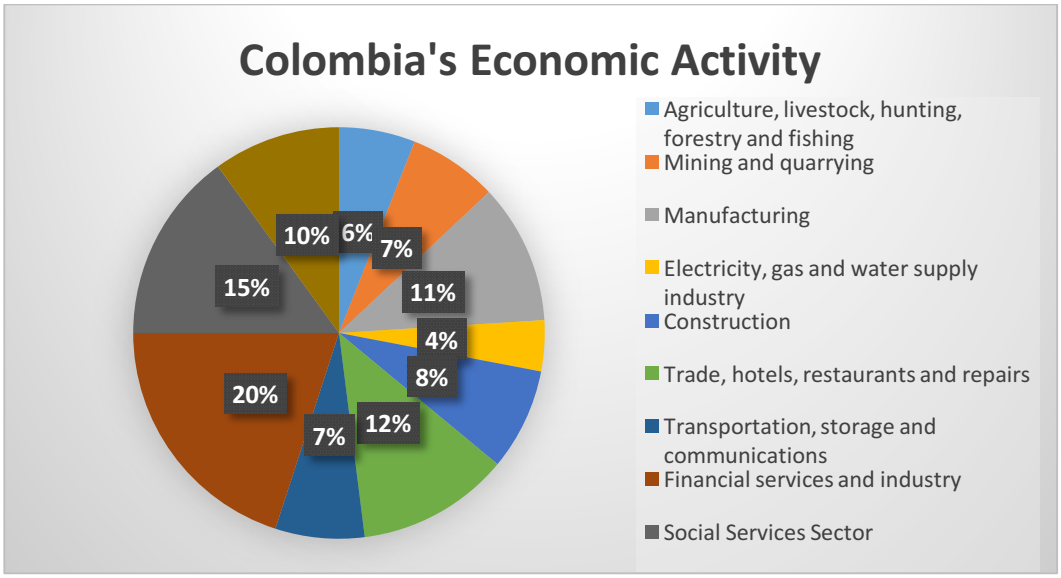
Figure 1: Physical Map of Colombia



(Arango, 2013)

Figure 2: Colombia Population Density

With a stable economy in recent years (Blackman, Morgenstern, Montealegre & Garcia, 2006), Colombia is known for coffee, produced primarily in the Andean slopes (Colombia Facts, 2015), which makes up a substantial portion of Colombia's legal exports. Colombia's economy is very dependent on commodities, making it vulnerable to changes in commodity prices (Samad, Lozano-Garcia & Panman, 2012). The vulnerability is intensified by the recent shift away from agricultural exports and towards energy (Samad, Lozano-Garcia & Panman, 2012). About 11% of GDP growth in Colombia comes from the mining industries and 6% from commerce, restaurants, hotels, and similar services with an additional 4.9% from manufacturing sectors (Samad, Lozano-Garcia & Panman, 2012). These statistics demonstrate that urban activities are fueling growth rates. On the other hand, agricultural activities have contributed little to these growth rates in the last 4 decades (Samad, Lozano-Garcia & Panman, 2012). With less lucrative activities in rural areas, cities are growing more quickly as people migrate in search for work. The pie chart below depicts the economic activities in Colombia.

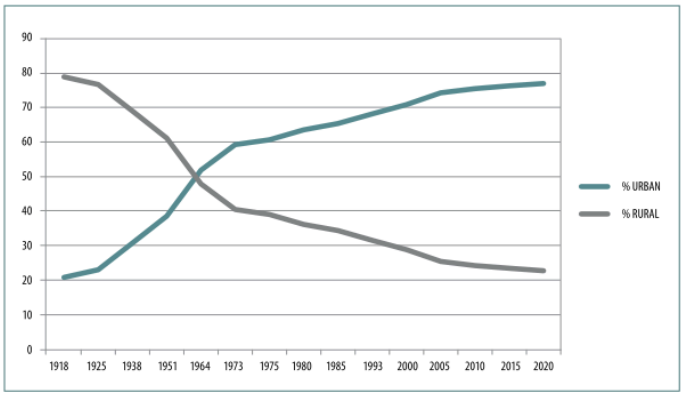


(Adapted from ControlCorV, 2015)

Figure 3: Economic activities that contribute to GDP in Colombia

Urbanization in Colombia

Internal migration within the country is, and historically has been, high. Like other countries in Latin America, Colombia has had a large increase in its urban population in the past 50 years (GFDRR, 2010). From 1950 to 2005, Colombia's urban population increased from 39% to 73% (GFDRR, 2010). It is projected that 80% of the population (approx. 43 million people) will live in urban areas by 2020 (GFDRR, 2010).



(Campos et al, 2010)

Figure 4: Urban vs. Rural population over time + projected

Urban growth in Colombia has been partially driven by the search for better living conditions and employment, and partially by Colombia's unique history of guerilla warfare and drug cartel related violence in rural areas. The interior of Colombia saw political unrest beginning with the 1930 presidential election when the power shifted from the Conservative to the Liberal party (World History Context, 2014). Conservatives were angry about how the shift in power occurred from governors all the way down to appointed city mayors, and even more about liberal reforms that gave government the right to expropriate property, prioritizing squatters over land owners and reducing the power of the Catholic Church (World History Context, 2014). The Liberal vote was split between candidates in the 1946 election and Conservatives were voted

back into power and instituted a series of harsh reprisals against the Liberals (Parsons, McGreevey, Garavito & Gilmore, 2017). In 1948, the popular Liberal candidate who was favored to win the 1950 election, ushering in a period called “La Violencia” (World History Context, 2014). Several Colombian leaders tried to end the violence, first through the introduction of a fascist state, and later by a populist leader who was driven from office through a military coup in 1957 (Parsons, McGreevey, Garavito & Gilmore, 2017; World History Context, 2014). The period of La Violencia ended in 1958 (World History Context, 2014), however the violence continued for many years to follow.

Following the coup, the National Front government was created, with Conservatives and Liberals agreeing that the two parties would alternate the presidency as well as share the ministerial and government posts with equal representation on all executive and legislative bodies (Parsons, McGreevey, Garavito & Gilmore, 2017). Within this agreement, the government attempted to reduce violence through both political and military means (World History Context, 2014). This arrangement did little to address the social unrest between the parties (Parsons, McGreevey, Garavito & Gilmore, 2017), and Colombia slowly became economically dependent on the US while high rates of unemployment and low coffee prices continued to hurt the economy. By 1962 the economic growth in Colombia had almost come to a standstill (Parsons, McGreevey, Garavito & Gilmore, 2017). The precarious state of Colombia lead to the formation of Marxist guerilla groups across the country, including the well-known Ejercito de Liberacion Nacional (ELN) and the Fuerzas Armadas Revolucionarias (FARC). In the 1970 presidential election, voters were so disgruntled by the National Front that their

Conservative candidate almost lost the election (Parsons, McGreevey, Garavito & Gilmore, 2017). Colombia's population had become more urban than rural, and this migration had created larger lower and middle income working classes who felt unrepresented by the traditional Conservative and Liberal parties (Parsons, McGreevey, Garavito & Gilmore, 2017). In 1973, another guerilla group, the 19th of April Movement or M-19, formed, and began carrying out militant actions including the murder and kidnapping of public officials, and holding hostages from wealthy families for ransom (Anderson & Van Atta, 1988).

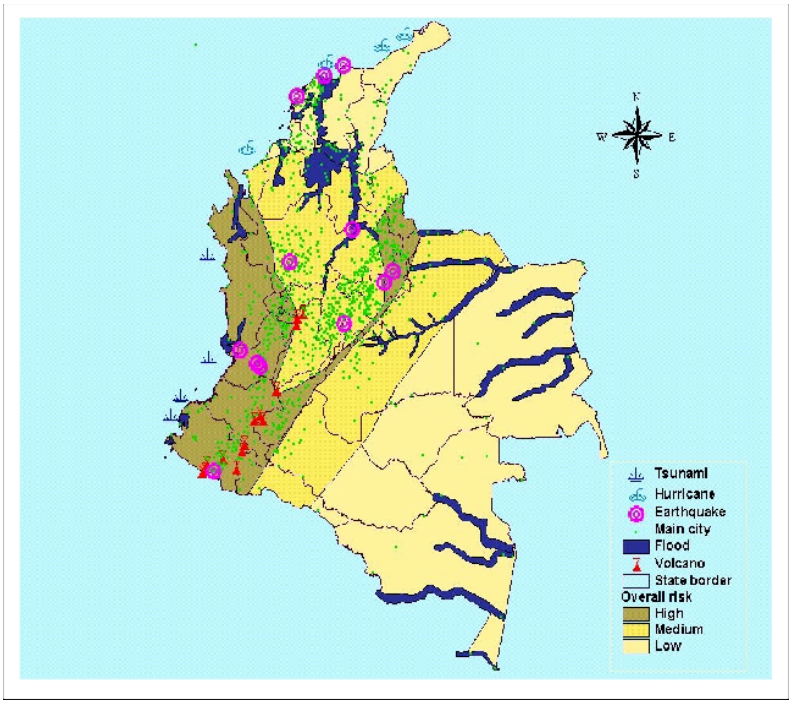
1974 marked the end of the National Front, as another problem was growing: the smuggling of Narcotics. By 1975 Colombia provided as much as 70% of the marijuana that was imported into the United States (Parsons, McGreevey, Garavito & Gilmore, 2017). As marijuana smuggling expanded into cocaine, two rival drug cartels developed: the Medellin Cartel and the Cali Cartel. The politics and strategies of both guerilla groups and the cartels took place in rural settings, leading the often violent expulsion of farmworkers from their farms, forcibly displacing them into nearby cities. The urban growth was, in large part, unplanned (Campos et al., 2010), leading to the development of informal settlements on the outskirts of major cities. The unplanned urban growth disproportionately increased Colombia's vulnerability to natural disasters (GFDRR, 2010). According to the 2005 census, 18% of the residents in four of Colombia's main cities (Bogota, Medellin, Cali and Barranquilla) lived in informal settlements – approximately 1.3 million homes (Campos et al., 2010). "Of these homes, 63% suffer from poor construction quality, and 20% are located in high risk areas. It is estimated that 17% of homes are in such inadequate quality or high risk that it is not possible to retrofit them (GFDRR, 2010)."

Colombia and Natural Disasters

Colombia is exceptionally vulnerable to natural disasters (Blackman, Morgenstern, Montealegre & Garcia, 2006), with the tenth highest risk for three or more hazards in the world (GFDRR, 2010). The country's climate, topography, hydrology and location on the Andean fault line make it particularly susceptible to floods, landslides, earthquakes, and volcanic eruptions (Blackman, Morgenstern, Montealegre & Garcia, 2006). The following highlight some of Colombia's particularly vulnerable characteristics:

- The country is situated where three tectonic plates meet: The Nazca plate, the Caribbean Plate and the South American plate (GFDRR, 2010), putting most of the country in areas that are considered to have high or very high seismic activity.
- Colombia has six active volcanoes scattered along the central mountain range: Nevado de Ruiz, Galeras, Done Juana, Purace, Tolima and Huila.
- Colombia's principal rivers (Magdalena, Cauca, Sinnu, Atrato and Putumayo) make a lot of the land susceptible to floods in the lower basins and valleys.
- Landslides are the most frequently occurring disaster in Colombia, caused by the softening of the ground after periods of heavy rainfall and when bodies of water experience flooding (GFDRR, 2010)

About 84% of the population live in areas that are exposed to at least two of the mentioned natural hazards (GFDRR, 2010). The country is also affected by El Niño, which occasionally causes severe droughts and flooding (Blackman, Morgenstern, Montealegre & Garcia, 2006).



(Geographic Information Systems in Health 2000)

Figure 5: Mapping Colombia's Vulnerability to Natural Disasters

Colombia and Disaster Mitigation

Colombia's implementation of policy and legal framework has enabled a comprehensive and multi sectorial approach (GFDRR, 2010) to disaster risk management by investing in three different levels: national, departmental, and municipal. This approach was triggered by two catastrophic events happened in Colombia in the early 1980s that resulted in increased concerns about disaster planning and management: the Popayan earthquake in 1983 (Blackman, Morgenstern, Montealegre & Garcia, 2006) and the eruption of the Nevado de Ruiz Volcano in 1985 (Blackman, Morgenstern, Montealegre & Garcia, 2006; Harody & Velasquez Barrero, 2014). These events triggered the creation of the National Disaster Prevention Management System in 1988 (Harody & Velasquez Barrero, 2014) which represents Colombia's most important national disaster regulation (Blackman, Morgenstern, Montealegre & Garcia,

2006). This system incorporates a broad range of activities, including building code enforcement, municipal programs, and introducing science and technology into public policy-making (GFDRR, 2010), to create an approach that simultaneously plans for sustainable development while addressing disaster prevention issues (ELLA, 2012).

National programs became decentralized through active participation from regional agencies and local governments (World Bank, 2014) with new approaches that focused on the identification, reduction and transfer of risk (World Bank, 2014). The decentralization process that was implemented in Colombia transferred both responsibilities and resources to lower levels of government at a scale that was not common in the rest of Latin America (Harody, Pandiella & Barrero, 2011). The new system includes both public and private agencies with responsibilities for mitigation of risks, prevention, and emergency response and recovery (Harody, Pandiella & Barrero, 2011). Examples of agencies include universities, municipal offices, public-private consortiums, and community organizations, among others. Operation funds come from the National Calamity Fund (FNC) which was created in 1983 using resources from the national budget (minimum of 500 million pesos, equivalent of $174,450 USD), loans, internal debt bonds and grants (Blackman, Morgenstern, Montealegre & Garcia, 2006) FNC funds are to be used to:

- Provide financial support to deal with disasters
- Control the effects of disasters, particularly when they involve epidemics
- Support reconstruction of basic sanitation facilities
- Finance information systems and equipment needed to diagnose and control disaster

- Preventative actions to mitigate the effect of disasters (Blackman, Morgenstern, Montealegre & Garcia, 2006)

The allocation of these resources is overseen by a board consisting of the Minister of government, Minister of Finance, Minister of Health, Minister of Transportation, Minister of Agriculture, the banking superintendent, the director of Civil Defense, experts in insurance who are presidential representatives and, as of 1993, the Minister of the Environment (Blackman, Morgenstern, Montealegre & Garcia, 2006).

In 1997 the 'Territorial Ordering Plan' (POT) was created as a zoning plan that was compulsory for all big cities in the country (Koch, 2015) and are the primary tool in which land use development and its existing problems are defined (Bocarejo & Tafur, 2013). Essentially, the POT defines the vision for the city and identifies strategies to reach it in way that is consistent with the city's economic, social, cultural and environmental development expectations (Bocarejo & Tafur, 2013). The plan requires cities to map out the upcoming 12 years (three terms of office) in a municipality for the expansion areas – areas located outside of the urban structure and not yet a part of the core city – and define land-use categories. The POT gives landowners the right to construct on their plots according to certain specifications and is the basis for building permits (Koch, 2015). The plan requires that a planning council, consisting of representatives of civil society and environmental concerns (Koch, 2015), approve development plans, with a goal of achieving urban development processes based on tolerance, democracy and justice (Koch, 2015). POTs are organized to guide medium to long term investments and land regulations, although their orientation tends to be more short term and reflect the preferences of elected officials (Samad, Lozano-Garcia & Panman, 2012). Although there were

some problems with establishing POTs in Colombia, they were generally well received (Kock 2015). Problems included communication between municipalities, coordination between POTs and other development plans, something that was historically a new mayor's political agenda (Koch, 2015), and a lack of clarity between instruments and institutions between POTs (Samad, Lozano-Garcia & Panman, 2012).

Recognizing the toll of disasters on the local authorities, Colombia made disaster risk management a national development priority in 2001. One of their most successful strategies was the decentralization of disaster risk management responsibilities (GFDRR, 2010). In 2001 the *Sistema General de Participaciones* was created to promote, fund, and/or cofund projects of municipal interest particularly relating to natural disasters (Blackman, Morgenstern, Montealegre & Garcia, 2006) while also addressing development concerns. This established that municipalities and departments work to create projects that prevent and manage natural disasters occurring within their jurisdiction with a particular focus on households in high risk zones (Blackman, Morgenstern, Montealegre & Garcia, 2006). Funds are allocated towards education, the health sector (Maynard-Ford, B. M. C., Phillips, E. C., & Chirico, P. G. (2008) and resources for investment in basic sanitation and potable water (Blackman, Morgenstern, Montealegre & Garcia, 2006).

While Colombia is considered to be a leader in urban risk reduction approaches and measures, "the task remains to address existing disaster risk through corrective actions, while simultaneously improving planning processes to avoid unreasonable accumulation of new vulnerability" (GFDRR, 2010, p. 36). Nonetheless, the following case studies highlight some of

the success Colombia has had in addressing risk to natural disasters, particularly relating to urban settings with a high number of residents living in informal settlements. Many of the innovative solutions to urban disaster risk reduction in Colombian cities was coming from the city level, yet there was considerable support coming from the federal level.

4.1 Bogota

Bogota, located in central Colombia, is the Capital and largest city in Colombia, with 8 million residents and some 11 million in the metro area (World Population Review, 2017). It is also the capital of the Cundinamarca Department, and is located on a high plateau about 2,640 feet (8,860 meters) above sea level on an Andean plateau known as the “Sabana de Bogota” (Rueda-Garcia, 2000). Bogota has always played a key role in the country’s history. Being the country’s capital, it is the main political, economic and cultural center of the country. The majority of Bogota’s GDP comes from Finance and real estate (38%) followed by social services (18%) and trade and small businesses (16.7%). Manufacturing (10%) and Transportation and communications (8%) also make up a smaller portion of the GDP with construction, energy and water and oil and mining contributing to the rest (Colombia Reports, 2017).

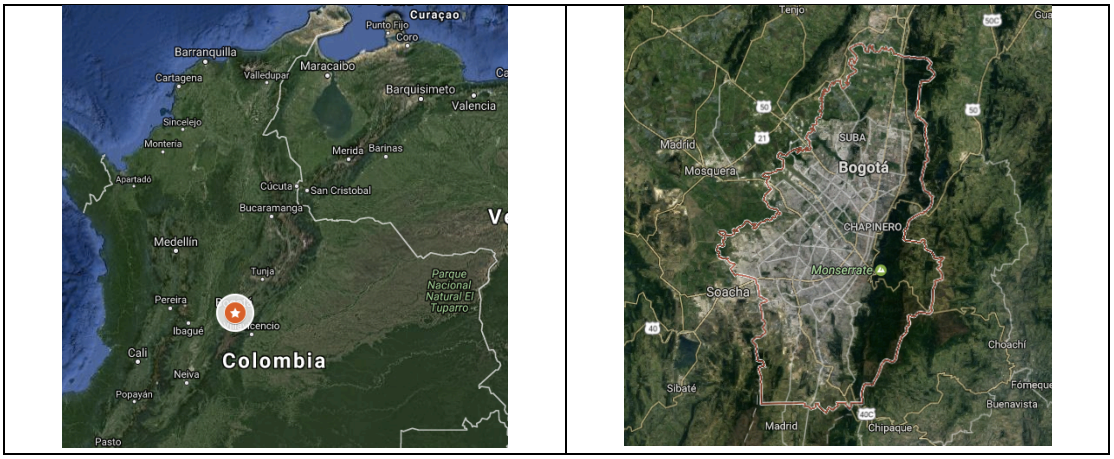


Figure 6: Bogota (Google Maps, 2017)

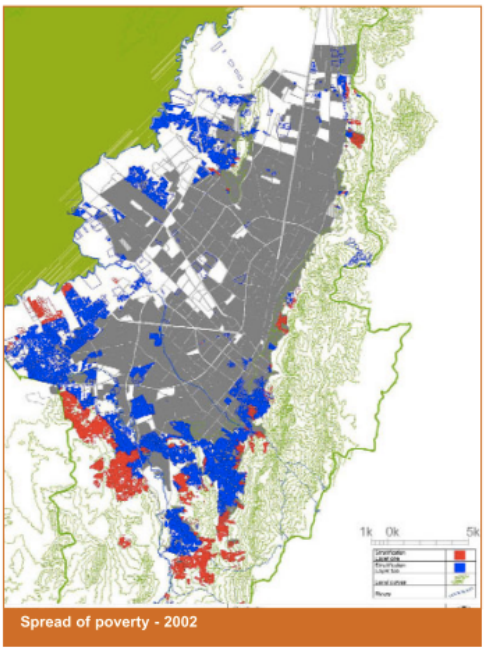
Bogota has not seen a proportional increase infrastructure with migration, which has led to an imbalance in population, education, health and recreational services (Rueda-Garcia, 2000). Many of the informal settlements in Bogota stem from the illegal processes of urban sub-division that took place on the peripheries of the city (Rueda-Garcia, 2000). The city grew quickly during the later part of the 1900s because of the violence in the rural areas. Arriving to the city without jobs or places to live, the informal settlements began expanding farther onto land that was not suitable for stable housing, usually on steep slopes, adding to the vulnerability of people living in the informal settlements. Due to its geography, Bogota is particularly susceptible to natural disasters such as landslides, floods, and earthquakes (Gonzalez, 2004). Bogota sits on a part of the Andean mountain range, making it particularly vulnerable to earthquakes (World Bank, 2014). World Bank modeling exercises revealed that a major earthquake in Bogota could result in losses of more than US$10 billion dollars with a considerable amount of social and economic repercussions for humans as well as the Colombian economy. Several rivers run through the city to converge and form the Rio Funza, also known as the Bogota River. The city is also located in a complex seismic zone in close proximity to the Borde Llanero, Romeral, Salinas, and Suarez fault lines (Gonzalez, 2004).

The localities in Bogota with the highest concentration of urban poor populations are Bosa, Usme and Ciudad Bolivar. It is in these localities where the majority of the informal settlements are located (Rueda-Garcia, 2000) and those that have received the most attention with upgrading. All are located to the South and East of Bogota. Ciudad Bolivar is one of the more

recent informal settlements in the city and has extended onto the slopes that surround the city with more limited access to public services or roads than other localities (Rueda- Garcia, 2000).

(Hataya & Gilbert, 2007)

Figure 7: Bogota Localities



(Rueda-Garcia, 2002)

Figure 8: Bogota Spread of Poverty

Bogota Disaster Mitigation

In 1987, the city government created Bogota's Emergency Prevention and Response Fund to address prevention and risk mitigation (Gonzalez, 2004), adapting the country's National System for Prevention and Disaster Response (SNPAD) to fit the municipal level (World Bank, 2014). The Fund helped make substantial progress in these fields by raising awareness about risks, regulating zoning processes, mitigation efforts, relocating families at risk, reinforcing weak structures, providing education, and engaging community participation (Gonzalez, 2004 It

brought together public, private and community organizations under the leadership of the Mayor (World Bank, 2014).

In the late 1990s the city government started modifying some of their policies and programs concerning informal settlements. Starting with the vocabulary that they used, government officials tried to avoid using words that evoked negative connotations and renamed neighborhood projects “Slum Upgrading Programs” rather than “Slum Eradication” (Rueda-Garcia, 2000). By redefining the way these programs were talked about, community members went from objects of the policies and programs to participants in a community being developed (Rueda- Garcia, 2000). Furthermore, with the National Calamity Fund having been created in 1984, governments were able to start allocating resources from the national level that they didn’t have before, to projects geared at risk reduction.

One of the most effective projects was the Metrovivenda project (Rueda-Garcia, 2000), which was created in December of 1998. It is a public company that was shaped by the Bogota City Council (Olivera, Narciso & Guadarrama, 2015) that allows the government to buy privately owned, open land on the peripheries of the city and sell it to experienced developers to construct “market rate” housing that is affordable for low income families (Cullen, n.d.). Funds earned in sales are used to reinvest in subsequent acquisition and development of more land (Cullen, n.d.). In addition to developing affordable housing, the project has created planned neighborhoods that include access to public transportation, roads, recreation areas, retail and education facilities (Cullen, n.d.). In addition to providing affordable rental housing for low

income families, Metrovivienda slowed down the informal expansion of Bogota (Olivera, Narciso & Guadarrama, 2015). It also streamlined and legitimized the legal priority housing market by facilitating planning in the different components of the housing system: provision of land, housing construction, environment, and community facilities, effectively channeling subsidies and savings and loans (Olivera, Narciso & Guadarrama, 2015).

In addition to improvements of the physical space occupied by lower income families, Bogota added programs to add basic services for its population. Bogota has three main district level programs that are in charge of programs offering assistance to the poor: 1) Administrative Departments of Social Welfare, 2) the Colombian Institute of Family Welfare, and the 3) District Institute for the Protection of Children. These are some of the city's most significant and effective institutions led by the district's administration to offer social assistance along with poverty eradication programs (Rueda-Garcia, 2000), addressing the informal settlements at the root cause.

Two projects worth highlighting include the "SUR con Bogota" Project and the "Community Corporation, RAICES" project. The "SUR con Bogota" project was started in 1998 by Bogota's Mayor through a bilateral cooperation program with the German government and coordinated with the District Administrative Department for Community Action (Rueda-Garcia, 2000). Their goal was to use community organizing and planning to make improvements in lower income neighborhoods in Bogota (Rueda-Garcia, 2000), specifically in the locality of Cuidad Bolivar (Hataya & Gilbert, 2007). Their main project objectives were to develop sustainable ways to

improve the quality of life in these communities and a create model that could be replicated in other parts of Bogota (Rueda-Garcia, 2000) and in Colombia. The program planned to do this through intervention in four main areas: the construction of physical infrastructure, the provision of social and communal buildings, community participation, and coordination between different institutions (Hataya & Gilbert, 2007). One reason for success the promotion of community participation in the decision making process, allowing local communities to feel invested in the proposed changes (Hataya & Gilbert, 2007).

Community Corporation RAICES is an NGO that was established in 1989 that works exclusively in impoverished neighborhoods in Bogota (Rueda-Garcia, 2000). Their efforts were aligned with the national government's initiative from the previous year, The National Disaster Prevention Management System that aimed to address sustainable development while simultaneously addressing disaster prevention. Their objective was to create a space for open dialogue between community members and the state in order to maintain an environmental balance throughout development projects that the municipality was proposing (Rueda-Garcia, 2000). Prior to starting their efforts, community-based research was done in the lower income neighborhoods. The organization's success was built by gaining acceptance within the community and developing sufficient knowledge of the social problems that existed in order to develop informed projects with attainable objectives.

In 2004 the development plan *Bogota Sin Indiferencia: Un compromiso social contra la pobreza y la exclusion* (Bogota Without Indifference: A social Commitment against poverty and

Exclusions) was created with the idea to create a more unified, inclusive and participatory city (Gonzalez, 2004). Because those who are most vulnerable to natural disasters are also those who are most vulnerable to economic, social, political and environmental threats, the plan put a priority on programs related to poverty (Gonzalez, 2004). “Bogota Without Indifference” also proposed that Metrovivienda direct more of its efforts towards increasing the number of type 1 housing that was constructed, allowing for a more diverse low income population to be able to afford the housing (Olivera, Narciso & Guadarrama, 2015). Type 1 housing consists of the least costly housing options while type 2 is still on the least costly side, but is less affordable. Initially, the majority of houses being produced were type 2 housing, one of the criticisms of the initial launch of the program.

Bogota’s first POT was decreed in 2001, yet it underwent several modifications by 2013 (Urrego, Calderon, Martinez, Builes, 2014). The 2001 POT focused on the city itself, failing to focus on the role of the city within the broader region as well as on the nearby rural areas. In 2003 the proposed changes strengthened the network of cities to develop economic, social, cultural and environmental conditions in the region. The idea of strengthening the region, Bogota-Cudinamarca, came after the recognition that failing to do so could lead to the depletion of resources (Urrego, Calderon, Martinez, Builes, 2014). In addition to the city-region model that was adopted, the 2003 changes also focused on controlling urban sprawl, preserving the ecosystem, expanding and improving road infrastructure, improving human security, and ensuring an adequate supply of food and raw materials for the city (Urrego, Calderon, Martinez, Builes, 2014). Ten years after adopting this regionally focused model, a lot

of short term achievement had been made but little had been done to integrate a long term regional strategy (Urrego, Calderon, Martinez, Builes, 2014). By 2013, the original POT had been updated and strengthened in order to include a regional component for each of its parts. Planning management and strategic instruments were incorporated to make sure that decisions on land use within the city and the region were made in collaboration with representatives from economic, social and territorial planning.

In summary, although Bogota did not start addressing problems that come with the development of informal settlements until the 1990s, the city has made significant progress. Their efforts brought public, private and community interests together in order to address not only the physical built environment but also the social services and basic support that is offered in more formally settled areas. The involvement of community members in a holistic approach that incorporated multi-level actors has helped make the resultant region-wide programs a success.

4.2 Cali

Santiago de Cali (Cali) is the capital of the Valle del Cauca Department and the 3rd largest city in Colombia. Cali is at an elevation of 3,327 feet (1,014 meters) above sea level and lies within the Cauca Valley. At a municipal level, Cali represents the largest population exposed to high seismic activity (Campos et al., 2010), with a population of 4.4 million (World Population Review, 2017). The city is unique in that it has a long established and large non-governmental sector, a lot of which is funded by local businesses (Davila, 2002). When measured in terms of

population growth, Cali is one of the most dynamic cities in Colombia (Davila, 2002) and is the 3rd largest urban mass and sustained a rate of population growth that was surpassed consistently only by Bogota (Davila, 2002).

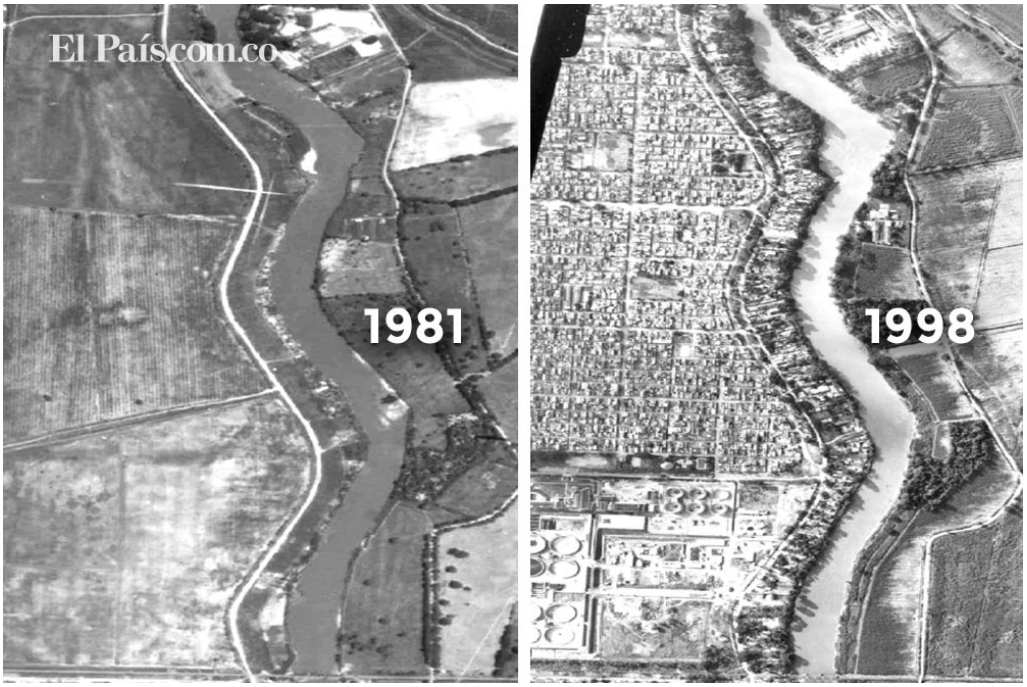
Google Maps. (2017).

Figure 9: Cali

Cali has greatly benefited from its location on the road and railway between cities in the interior Andean region and one of Colombia's largest ports on the Pacific Ocean, Buenaventura. Coffee passes through Cali, en route from the coffee triangle to Buenaventura and on to international markets. After Cali's rapid industrialization in the 1930s, Cali came to be a stop-over point for different imports including raw materials and intermediate and capital goods (Davila, 2002), before being taken to industrial centers. In addition, Cali was the third largest manufacturing center because of the nearby sugar cane farms.

Aguablanca, one of the biggest slums in Latin America, is located in southeast Cali and has close to 300,000 residents (Lombard, 2012). Aguablanca and other Cali slums formed as a result of

the mass migration into the cities during the 1980s and 1990s because of the violence in rural areas. Residents of Aguablanca as well as the rest of Cali, sit on high risk flood plain territory in the alluvial valleys of the Cali and Cauca Rivers. When the rivers overflow the water has no where to go but to flood its surrounding environment.



(El Pais, 2016)

Figure 10: Aguablanca, Cali – over time

(Dominguez & Negrete, 2012)

Figure 11: Cali localities and lower income neighborhoods

Cali Disaster Mitigation

Cali's non governmental sector has played an active role in social programs among lower income populations since the 1960s (Davila, 2001). During the 1980s, the non governmental sector began focusing their efforts on the growing informal settlements. The majority of these efforts sought to benefit the city's low income neighborhoods and households (Davila, 2002) through: 1) housing and settlement upgrading 2) Social services and recreation 3) and Income generation, training and entrepreneurship (Davila, 2002). Cali's informal settlements have seen a lack of government support and involvement. Before NGO involvement, the municipal government did not appear to be directing any of their efforts towards lower income communities (Lombard, 2012). In order to fill the gaps left by local government, NGOs and a small circle of liberal and progress-minded Cali elite as worked to outline directions and social agendas (Davila, 2002). NGOs have played such an important role in Cali that the next section will focus on the contributions of the Carvajal Foundation, as well as the Foundation for Education and Social Development and the Corporation for Popular Research, which developed projects related to housing and settlement upgrading, social services and recreation, and Income generation, training, and entrepreneurship**,** something that would later align with Colombia's National level Disaster Prevention Management system.

Housing and Settlement Upgrading

One of the first significant programs for improving living conditions for Cali's poor came from the Catholic Church in the 1960s (Davila, 2002). Cali's archbishop was responsible for creating parish centers in the newly formed, lower income neighborhoods of Cali. The parishes were

financially supported by the Carvajal Foundation, a printing house with the same name and one of the oldest and best known non-governmental foundations in Colombia (Carvajal, 2016). Recognizing the local government's lack of sufficient human and financial resources, the parish center provided a variety of services including health care, primary and secondary schools, stores with basic food and household items, basic sports facilities and community meeting halls (Davila, 2002). Well into the 1960s, the Caravajal Foundation was providing over 20% of the city's health services. In 1981, the Carvajal Foundation divested control of the parish centers to the Catholic Church, as most settlements were becoming established communities with adequate services and utilities. They had also started receiving social and monetary support from the municipality. The Carvajal Foundation decided to focus its' efforts in other areas where their resources were more needed: the Aguablanca district (Davila, 2002, Carvajal, 2016).

Between 1981 and 1985 the Aguablanca district grew from 28,000 to 177,000 (Cali). The Carvajal Foundation's efforts focused on housing and microenterprise development, and specifically sought to experiment with projects that might be replicated elsewhere (Davila, 2002). The Foundation enabled the formation of community development associations (Brinkerhoff, 2002) that were responsible for overseeing the construction of infrastructure inside of Aguablanca (Brinkerhoff, 2002) through the "self-help housing" programs (Davila, 2002). These self-help housing programs required that residents pay for all building materials over the course of two years (Brinkerhoff, 2002); materials were delivered through a Community Action Board (Brinkerhoff, 2002) which also provided technical training and

assistance (Davila, 2002), including the design, work inspections and a registered foreman (Brinkerhoff, 2002). In this ways, community members were able to build their own homes for less than market value, while also reducing transportation costs for community members (Davila, 2002). The technical assistance trainings focused in part on actual construction proficiencies, but also worked towards creating a positive community and collaboration. In addition to community organizing, technical assistance and training, and affordable building materials, the Colombian government provided a subsidy of $3000 to every household living in a dwelling that cost less than $14,000 (Davila, 2002). The monies earned from the Community Action Boards were used as seed money for Community Service Centers which sold basic foods at the same prices that were found in the city center as opposed to the higher prices from local retailers (Davila, 2002). Ultimately they provided essential goods and services, food, education, housing and health, while focusing on reducing the cost of living in the area (Carvajal, 2016).

The Foundation encouraged government agencies to also set up services in these communities. The first to arrive was the telephone company which responded by opening an office to make local and long distance calls. A notary public and a post office followed shortly after (Davila, 2002). CSC also hosted other organizations in the community, such as the World's Women Bank, an international NGO, which opened offices and provided funds and technical skills for women entrepreneurs. (Davila, 2002). Others provided spaces for things like holiday festivities, nursery care, activities for youth and computer skills training. Both the self help housing programs and CSC were considered a success, so much so that their model was replicated by

other foundations in Cali, elsewhere in Colombia, and in other countries in Latin America (Davila, 2002).

Social services and recreation

Several other private foundations have played a significant role in social services and recreation in lower income neighborhoods. The most significant in the health field came from the Foundation for Education and Social Development (FES) (Davila, 2002). FES ran a primary health program in Aguablanca between 1986 and 1997 (Davila, 2002), working with the municipality's health secretariat, the Universidad del Valle (Cali's oldest university), and other agencies. The program was later extended to other low income areas in Cali as well as eight other cities in Colombia (Davila, 2002). Now, a lot of the health care and research in Cali falls into the role of official institutions such as the municipality, the Ministry of Health, and the Universidad del Valle.

Another organization, the Corporation for Popular Recreation (CPR), was created in 1978 following a city-wide public opinion poll on perceptions of city problems that identified insecurity, unemployment, the cost of living, public housing services, and recreational facilities to be the top public concerns (Davila, 2002). CPR was created with joint funding from public (30%) and private (60%) sources. The city wanted to maintain some buy-in because it believed that the spaces would be more likely to be maintained and looked after properly. The CPR created parks and recreational units all over Cali with their more direct contribution to the

lower income neighborhoods was seen in the neighborhood parks (Davila, 2002). Like the Community Action Boards and the CSC, the CPR reinvested its profits into its operations.

Income generation, training, and entrepreneurship

The Carvajal Foundation is also a leader in business development that has contributed to increasing income and improving the distribution of wealth in the community (Carvajal, 2016), beginning with several cooperatives in the 1960 and 1970s (Davila, 2002). Later, Carvajal developed micro-entrepreneur programs to offer credit to community members who were not eligible to received loans from formal financial institutions, and provide training and technical assistance (Davila, 2002; Carvajal, 2016).

In summary, non governmental organizations have played a key role in addressing the issues facing informal settlements in Cali. Like Bogota, community involvement was an integral part of the process and the approaches were holistic in that they covered the physical space as well as the basic health and social services needed for a community to thrive. Something that is different about Cali's approach is that instead of approaching the situation from the perspective of emergency preparedness, their efforts were mostly geared at community development. The lessons from the two experiments in inter-agency coordination in the El Poblado I and El Vallado formed the basis for the housing program, with participation from the municipality, the private sector and foundations, and an active role for community members themselves, many of whom built their homes. By developing the informal settlements, they are making them more resilient and, in turn, less vulnerable to natural disasters.

4.3 Manizales

Manizales is the capital city of the Caldas Department in central Colombia. The city lies on the Colombian Central Mountain range, 2219 meters above sea level, and is situated near the Volcano Nevado del Ruiz as well as in the watershed of the Rio Chinchina and sub river basin of Rio Guacaica. The city's landscape consists primarily of steep slopes. It's physical characteristics and its mountainous terrain make the city particularly vulnerable to earthquakes, landslides, and volcanic eruptions (Manizales Municipal Profile, 2009). The city grew as a result of a thriving coffee industry, and in the late 1800s the city became an industrial center. In the mid 1940s the first of several universities opened, turning the city into a university town, which attracted more people (Manizales, 2015), along with migration due to armed conflict in rural areas in the 1990s (Manizales Municipal Profile, 2009). Today, the city of Manizales has close to 420,000 residents (Manizales, 2015).

Google Maps. (2017).

Figure 12: Manizales

Manizales is located in the coffee triangle of Colombia, and coffee production is the main economic activity in this region. Unlike the other cities discussed, Manizales had a booming coffee industry that was able to provide an income for migrants. In the 1970s the coffee growing areas greatly expanded due to a demanding market and many large cooperate coffee companies and exporters moved in to city (Manizales Municipal Profile, 2009). While the flourishing coffee industry had positive effects on the economy and employment, it was having very negative effects on the environment. The growing market expanded into different areas around the city and resulted in large scale deforestation and subsequent soil erosion (Manizales Municipal Profile, 2009). In recent years, other economic sectors have grown to include chocolate, liquor, rubber, shoes, detergents and soaps (Manizales Municipal Profile, 2009). In addition, the city has become a significant center for education and learning through an increase in higher education institutions (Manizales Municipal Profile, 2009).

A combination of conflict in rural areas and job opportunities in the coffee industry drove people into city and led the formation of Manizales's informal settlements. The coffee industry was able to provide jobs but the city was ill prepared to accommodate people in such large numbers. The city continued receiving migrants from rural areas and informal settlements grew on hillsides that were prone to landslides (Manizales Municipal Profile, 2009); these settlements in turn increased pressure on the already fragile ecosystem (Harody & Velasquez Barrero, 2014). In the last decade, the occupation of the steep slopes has increased the number of land slides, creating significant economic and infrastructure losses (Harody & Velasquez

Barrero, 2014). In addition, the eruption of the Nevado de Ruiz volcano in 1985 left 25,000 people dead and had devastating effects on the economy as coffee investors pulled out of the region (Harody & Velasquez Barrero, 2014). The city worked hard to develop other kinds of industry, however the increased industrial activity damaged the city's waterways (Manizales Municipal Profile, 2009) making the city more susceptible to flooding. The 1985 volcano eruption generated increased attention on disaster prevention, which has become a vital part of the urban planning approach in both the city and region (Manizales Municipal Profile, 2009).

Manizales Disaster Mitigation

The development of Manizales's environmental policy began in 1990 as a result of the deteriorating environment and the need to include disaster risk reduction in urban planning. In 1993, (Harody & Velasquez Barrero, 2014) the city approved "Biomanizales," the city's environmental policy, and "Bioplan," the city's action plan to facilitate policy implementation (ELLA, 2012). This is the same year that the national government added the Minister of Environment on to the board of the National Calamity Fund, indicating more of an interest in the environment as a means to reduce risk. Manizales's disaster risk reduction plan was incorporated in to Biomanizales (ELLA, 2012), and brought together a variety of stakeholders including civil society and local universities. It emphasized the protection of hillsides through a set of indicators that were linked to environmental variables and sustainable development. Funding for the initiative came from the "sobretasa ambiental," a required tax of 1.2% on urban and rural properties in Colombia. By law, municipalities are required to invest the revenue in addressing key local environmental problems. (Harody & Velasquez Barrero, 2014). About two-

thirds of the revenue goes into programming aimed at environmental education and community training. The other third is spent on purchasing land to be used in projects aimed in environmental protection and conservation (Harody & Velasquez Barrero, 2014).

Aligned with the National Disaster Prevention Management System, the Manizales disaster risk management plan is part of the city's development and environmental plan (Gencer, 2013). Manizales's POT included university studies that focused on the areas that are vulnerable to landslides and produced a list of priorities for action where land was most prone to landslides. Priority actions included settlement relocations and hillside protection. The studies also lead to several programs geared at stabilizing the land and addressing those living on the land (Suarez, 2011). One of the program's main successes has been its' ability to bring "local and regional government, the private sector, universities and representatives of community organizations into a participatory process (Satterthwaite, 2011)." Together they worked to create innovative solutions to address the ongoing growth of informal settlements on land that is particularly vulnerable to landslides (Satterthwaite, 2011), relocating some residents to safer sites and converting the land into locally operated neighborhood parks that included measures to stabilize the slopes (ELLA, 2012).

Other initiatives were also important in monitoring environmental conditions. The BioPlan created a program called "Guardianes de Ladera" (Slope Guardians), which trained 112 head-of-household women living near high-risk zones on raising awareness, monitoring the slope stabilization project, reporting problems, and communicating their experience to others (ELLA,

2012). Supported by professionals and technicians, the “Guardianes de Ladera” received assistance from the Corpocaldas, the Municipality of Manizales, the Red Cross, Aguas de Manizales and the Institute of Environmental Studies (IDEA- Instituto de Estudios Ambientales) of the National University’s campus in Manizales (Satterthwaite, 2011). In addition, environmental observatories were established in each of the 11 comunas (wards) (Manizales Municipal Profile, 2009) in order to monitor the progress on environmental conditions and visually display the progress in “semaforos ambientales” (environmental traffic lights) (Satterthwaite, 2011). The environmental traffic lights allow for a visual representation of where, if any, environmental problems are concentrated within the city. Red, indicating there are problems; yellow indicating that there are warnings of possible problems; green, indicating good environmental quality. Other disaster risk reduction initiatives included tax reductions to those who proactively took measures to reduce housing vulnerability in high risk areas for landslides and flooding. A system of collective voluntary insurance was also developed to allow low-income residents have insurance on their buildings (ELLA, 2012; Satterthwaite, 2011).

In summary, the success of the city of Manizales in addressing informal settlements was linked with efforts made towards improving the environment. As a university town, Manizales had a lot of involvement from universities and a variety of other stakeholders who worked with community members to gain a sense of ownership over projects to reduce the vulnerability of both people and the environment.

4.4 Medellin

Medellin is the capital city of the Antioquia Department, located in Northwestern Colombia. It is Colombia's 2nd largest city at an elevation of about 5,000 feet (1,500 meters) above sea level. It is situated in the steep temperate Aburra Valley (Parsons, McGreevey, Garavito & Gilmore, 2017). Variability in rainfall and its location in the Aburra Valley (Improving slum dweller conditions) has made Medellin particularly susceptible to mudslides and flooding (Sustainable Development Solutions, 2016). The city of Medellin has about 2.4 million residents (World Population Review, 2017) and continues to grow. Like many cities in Colombia, Medellin grew quickly due to conflict in rural areas and because it has a large concentration of jobs, education, and opportunities (Betancur, 2007). Unregulated and informal settlements grew to be dense, lacking proper street systems, and had minimum public facilities and spaces. Nearly two thirds of people living in Medellin currently live in barrios that do not meet or comply with minimum city standards (Betancur 2007).

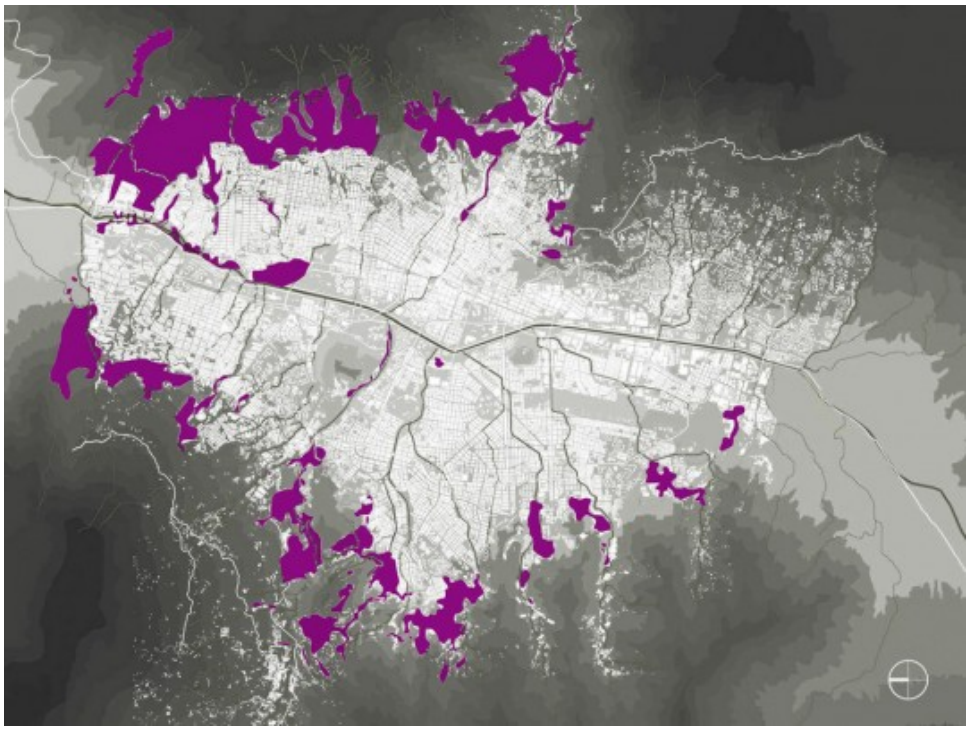
Google Maps. (2017).

Figure 13: Medellin

Gold mining and coffee production were a part of Medellin's initial wave of industrialization

(Betancur, 2017). Later, it became more reliant on on textiles. In recent years the city has been increasingly diversifying its textile dependent economy, specializing in prosperous sectors such as financial services and software development (Betancur, 2007). Although Medellin has generally mild weather throughout the year, the city's rainfall patterns are inconsistent. Periods of heavy rainfall combined periods of prolonged drought make the soil in the steep hillsides particularly treacherous. Long periods without rain makes the soil unstable and periods of heavy rainfall increase the likelihood of landslides (Volckhausen, 2014).

In 1987 a landslide covered Villatina, a neighborhood in Medellin. This neighborhood was considered a stable one and had road access and public services but the landslide killed 500 people and destroyed 300 houses. (Satterthwaite, 2011) In the years following the landslide there were two very detrimental cold spells, one in 1988 and one in 1989. Shortly afterwards, the Minister of the Environment was appointed to the board the National Calamity Fund. This chain of events highlighted the city's inability to manage the risk of natural disasters and led to the creation of the Municipal System for Disaster Prevention and Response (SMPAD), which would work to integrate disaster prevention into the city's development plan (Harody, Pandiella & Barrero, 2011).



(Geisinger, 2010)

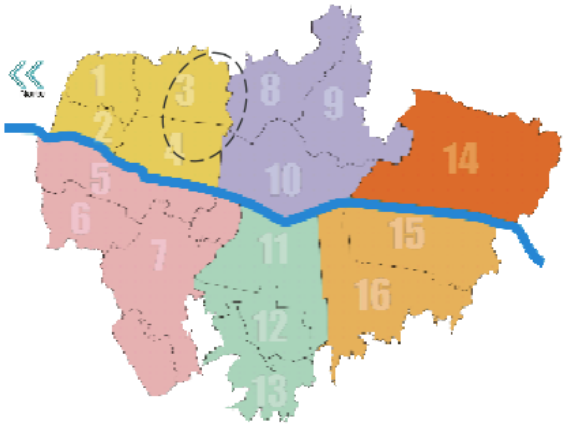
Figure 14: Medellin Low Income Neighborhoods

Medellin Disaster Mitigation

The Integral Program of Subnormal District Improvement in Medellin (PRIMED) was set up in 1993 to address the challenges faced by low income neighborhoods and slum communities; it was linked to the SMPAD. In the years preceding PRIMED, Medellin's urban population was growing rapidly due to armed conflict in rural areas. The growth of the Medellin cartel and guerilla activity in and around Medellin combined with a declining industry and unemployment, created a lot of safety issues in the city, particularly affecting low income neighborhoods and slum communities. Initially, PRIMED's main goals were to address violence and social unrest in the neighborhoods by targeting the built environment, securing land tenure, promoting civic participation and mitigating geological risks (Lucci, Bhatkal & Berliner, 2015). It started as a pilot program in 1993 through collaborated efforts between the Colombian and German government

(Betancur, 2007), the Ministry and Economic Development (BMZ), the German Development Bank (KfW), and the United Nations Development Bank (Local Government for Sustainability, 2014).

The program was planned to roll out in 2 Phases over the course of 10 years. Phase 1 was intended to last from 1993 to 1997 but was extended to 2000 due to unexpected delays and extra funds that became available (Lucci, Bhatkal & Berliner, 2015). PRIMED implementers classified the informal settlements in Medellin as Levels 1-3, based on the level of government intervention previously, with Level 1 being high levels of government intervention and Level 3 being zero history of government interventions (Betancur, 2007). The focus of Phase 1 of PRIMED was to move a set of 15 informal settlements from levels 2 to 1; the focus of Phase 2 (1998-2003) was to move another set of 15 informal settlements from level 3 to 2. The program lasted 7 years (Local Government for Sustainability, 2014) suffered from reduced economic and political support, and Phase 2 was never carried out (Kobayashi & Blanco, 2009). Program satisfaction was low, yet the program was able to make significant improvements to the physical conditions of the neighborhoods as well as increase the communities' participation in local planning and decision making (Bhatkal & Berliner, 2015). Higher levels of satisfaction came from home improvements, public spaces, and legalization of tenure (Bahl, 2011).



(Blanco & Kobayashi, 2009)

Figure 15: Plan for Medellin's communes and PUI location

In 1996, PRIMED was deemed an example of a "best practice" at the 2nd UN Conference on Human Settlements because of its intergovernmental coordination, provision of public service infrastructure and its land regularization efforts (Bahl, 2011). It marked a noteworthy precursor for the country because it included a complete social perspective that included training and community building strategies in addition to the physical components (Kobayashi & Blanco, 2009). One of the reasons PRIMED was considered a "best practice" is because the city was politically motivated and committed to including risk reduction in all parts of government operations. Furthermore, it was backed by the national government with the idea of supporting locally developed actions as well as national level actions that incorporated disaster risk reduction (Harody, Pandiella & Barrero, 2011). PRIMED implementers were convinced that if the community did not gain ownership, the program would not have much of an impact on effective integration of the area into the city, trust in government or its institutions, and the rule of law (Betancur, 2007). Even though it was never complete, the PRIMED pilot outlined guidelines for a new approach to urban marginality. Future projects would come to reapply

similar strategies including establishing a methodological structure, new management capacity and an innovative institutional coordination (Local Government for Sustainability, 2014).

In 2000, Medellin was seeing consistent waves of protest demanding change in the city's insecure and socially disjointed conditions (Local Government for Sustainability, 2014). To address the low quality of life and marginalized populations within the city, a renewed inter-institutional effort was developed (Local Government for Sustainability, 2014). The first Integral Urban Development (PUI) project spanned across several sectors – public, private, community, NGOs, and international organizations – to address the main issues in low income neighborhoods. Taking what was learned from PRIMED, the PUI incorporated broad community participation in order to ensure its sustainability. Efforts were focused in the Northeastern part of Medellin, the area with the lowest human development indexes in Medellin (Kobayashi & Blanco, 2009). The PUI plan focused on three main components to the intervention: institutional coordination, social conditions and physical conditions (Kobayashi & Blanco, 2009; Local Government for Sustainability, 2014). These three components were incorporated in the local administration development plans from 2004-2007:

1. **Institutional Coordination:** Inter-institutional and Inter-sectorial coordination was made a priority as a way to attract external investment and social acceptance. Multidisciplinary groups, NGOs and universities were gradually introduced as the PUI started and were organized in a way that would help address the specific to the goals of the PUI in a way that would not duplicate efforts (Kobayashi & Blanco, 2009).

2. **Social**: The social component focused on community participation and communication, eventually becoming the central axis of actions (Kobayashi & Blanco, 2009). This part of the PUI was aimed at strengthening community organizations through workshops, training community leaders, and holding regular open information sessions (Local Government for Sustainability, 2014). This part of the PUI gave residents a space to express ideas and wishes for their communities. This process didn't just diagnose and formulate the project. It also included skill training and an employment program in order to hire some residents to be a part of the labor force for the construction (Kobayashi & Blanco, 2009).
3. **Physical:** The physical component focused on public space and transport, housing, public facilities and the environment (Kobayashi & Blanco, 2009). This part of the PUI revitalized public spaces, constructed parks and squares, extended transportation systems, improved street and bridges, and constructed community elevators (Local Government for Sustainability, 2014). Perhaps one of the more innovative approaches to address transportation was the installment of the Metrocable cable car system which provided residents in underserved areas an affordable and timely option for transportation (Local Government for Sustainability, 2014).

Most recently, Medellin's 2014 POT has defined a long list of priorities for action to make Medellin a healthier city, both for its residents and its environment. The POT includes walkability and bike-ability, a public transportation system that pollutes less, equality, economic development, revitalization of the river life, the recovery of downtown, and

participatory management (Gaviria, 2013). One of the more elaborate projects of this POT is the development of an Urban Green Belt. Plans for the Green Belt will restrict future sprawl, including informal settlements, and offer communities alternative recreational areas that are not in the city center. Plans for the Green Belt are to encompass bike route, hiking paths and recreational areas for Medellin's residents who do not live in the city center. It is estimated that the Green Belt will cost close to 500,000 Colombia pesos (approximately $283 billion USD) and will take decades to complete (Alvarado, 2012) – but it will include 46 miles on the slopes of the Aburra Valley surrounding the city (Alvarado, 2012).

In summary, Medellin was successful because lessons learned from earlier attempts were applied later projects, and particularly, the PUI model. The PUI model has the potential to be replicated – entirely or partially – in other similar settings (Medellin- Integral). After the first PUI was implemented in the northeastern zone of Medellin, the model was replicated in four other areas of the city (Local Government for Sustainability, 2014). The PUI of Medellin demonstrated the importance of community participation and a holistic approach in addressing informal settlements (Kobayashi & Blanco, 2009).

Chapter 5: Discussion

The cities explored in these case studies provide some effective strategies for addressing disaster risk reduction in urban settings. Trends have shown that efforts geared at emergency preparedness and disaster risk reduction are crucial in saving lives and preventing economic and social loss due to natural disasters. In the urban context there is no single solution to disaster mitigation. Addressing informal settlements is particularly challenging because of how underdeveloped and unstable they are. Different strategies need to be applied that take the particularities of a community in to consideration.

One of the main things that makes Colombia unique in their risk reduction strategies has been the countries' ability to make decisions at the national level and put them in motion at the local level. With the exception of Barranquilla, the national decisions turned into local action model has proven to be successful. More research is needed to investigate the link between national and local governments in Barranquilla but, as shown, there are attempts underway. The following describe the similarities that were seen in the cities that helped them to be successful in their efforts:

Multilevel involvement

Good examples of strategies for minimizing the effects of disasters in city and municipal operations are often linked to support from high levels of government (Harody, Pandiella &

Barrero, 2011).Success stories of disaster risk reduction among vulnerable populations and informal settlements in cities in Colombia are attributed to a national government structure that supports working with local governments. Every informal settlement and their corresponding city has their own development issue that needs to be addressed. Often times federal governments are too far removed from a situation to have an impact. Decentralization and distribution of power and responsibilities to local governments allow for more effective work towards risk reduction in urban contexts. Even with decentralization, national risk reduction efforts should be supported at both the municipal and larger metro area level, by the national government (Satterthwaite, 2011). Manizales is an example of effective multilevel involvement that can be applied in other settings. Disaster risk reduction efforts were supported through engaged local and regional governments, the private sector, local universities and community organizations, with buy-in from members of the community in which they were working (Harody & Barrero, 2014). While their initial efforts had been in response to environmental sustainability and land degradation, in addressing this, they also were also reducing risk of natural disasters.

Community Participation

A strong emphasis needs to be placed on the participation of the community that is being addressed. As seen in the case of Cali, NGOs conducted needs assessments in order to identify what the community felt was a priority and built their projects based on that information. Community members were also required to buy their own building materials, at reduced costs, so that they felt ownership of the project and were more likely to stay in engaged. Without input from the community, root causes of problems can go overlooked. A lack of community

input can also run the risk of creating more damage than good. In addition to input, participation should seek to develop a sense of ownership of what is happening in their community. This will make strategies more sustainable for the future.

Holistic Approaches

Holistic approaches need to be adopted to address slum communities in the urban context. Projects need to include components that address root causes to problems and identify sustainable ways to improving them. As seen in the case of Medellin, programs addressed both the socio-economic and environmental aspects of the community. By not having holistic solutions, efforts made towards progress will be outweighed by other problems that are not addressed.

Investment

Risk reduction in urban settings is expensive and requires initial investments in order for it to be effective. Between 2002 and 2008, Bogota, Cali, Medellin and Manizales invested a significant amount of money at the municipal level (Campos et al., 2010) into managing disaster risk. The average per capita investment in risk management during between 2002 and 2008 is as follows: Bogota averaged Col$21,238, Cali averaged Col$10,713, Manizales averaged Col$16,981 and Medellin invested $14,712 (Campos et al., 2010).). On the other hand, Barranquilla only invested an average of Col$5,278 during that time period (Campos et al., 2010).). While money isn't the only reasons that projects were successful, they would not have been successful without the allocation of funds.

It is important to note the similarities between risk reduction and development: the two have an “interlinked and multifaceted relationship. They can mutually have a negative effect on each other (Gencer, 2013. p. 37)” but steps towards one are also steps towards the other. As discussed, multilevel involvement, community participation, holistic approaches, and investment are the economic and non-economic factors that need to be considered in addressing risk reduction in urban settings. Similarly, they are also things that need to be considered when starting a development initiative.

As learned in Colombia, if disaster risk reduction is integrated into national and local development plans, the impact of disasters on development gains can be decreased. In response to emergencies, there is a natural tendency to put more work into the response when more work is needed on the prevention side, focusing on risk and vulnerability reduction (Harody and Barrero, 2014). As countries continue urbanizing, vulnerability to natural disasters is also expected to grow.

The lessons learned about reducing risk from the case studies fit into relatively new international efforts of making cities resilient. As defined by the Rockefeller Foundation, city resilience is made by building the capacity of individuals, communities, institutions, businesses and systems within a city so that that they can survive, adapt and grow regardless of chronic stresses and acute shocks that they experience. With extreme weather events on the rise, building city resilience is key if we are to protect people and their social and economic activity. Satterthwaite (2011) also notes that, a city’s resilience to extreme weather events is rooted in

good development practices. In higher income nations, resilience is typically built by government agencies (Satterthwaite, 2011). In areas with little government involvement, particularly informal settlements, it is essential that local authorities work closely with civil society. If they do not work together, those outside of the informal settlements may propose actions that reduce risk and build resilience but do not relate to everyday conditions that low income groups encounter (Satterthwaite, 2011). Many of the conditions in Colombia exist in other countries in Latin America. What was learned in Colombia could have implications for the future of how other countries and cities could work together to reduce risk to natural disasters, improve the conditions of slums and build a city's' resilience.

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