

**ARTICULATING THE URBAN BOUNDARY**  
*Integrating Bogota with Los Cerros Orientales*

By

Juan Andres Bernal

Bachelor of Architecture  
The Boston Architectural College, 2009

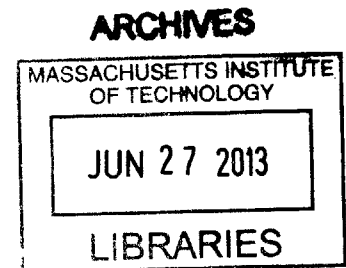
Submitted to the Department of Architecture in Partial Fulfillment of the Requirements for the degree of  
Master of Science in Architecture Studies

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## ABSTRACT:

*Los Cerros Orientales*, a ridge of mountains that spans the eastern edge of Bogota are the most iconic and monumental feature of the city. They were also critical in the city's history as they provided the resources to support the original settlements, supplied the materials to build the city and dictated its urban form. Because of their symbolism and visual prominence preservation policies have been implemented to protect them from urbanization. Starting in 1977 the government instituted an urban growth boundary to prevent urbanization in *Los Cerros*. However, the large rural to urban migrations that began in the mid-twentieth century created an erratic urban expansion that the boundary was unable to contain. Informal and formal developments have continued to expand into protected land regardless of the different containment policies that have been institutionalized.

The aim of this thesis is to reexamine Bogota's urban boundary in order to devise alternative strategies that can better address the inevitable urbanization of *Los Cerros*. The argument is rooted in the premise that social, political and economical conditions will prevent containment strategies to succeed. As a result, urbanization is acknowledged and used as a proxy to design strategies that will bolster and improve existing social and natural ecologies. Informality, infrastructure and architectural monuments are the lenses through which this thesis explores and articulates alternative strategies for the urban boundary.

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Fig. 1 Site Plan  
plus a plan showing the  
mountains, Bogotá's downtown and

# **1.STATEMENT OF INTENT**



## STATEMENT OF INTENT:

The goal of this thesis is to reexamine Bogota's urban growth boundary in order to devise alternative strategies that can better address the inevitable urbanization of *Los Cerros Orientales* (a range of mountains that span the eastern edge of the city). Instead of attempting to impede urbanization the aim of this thesis is to guide urbanization as a way to improve social and environmental ecologies.

The thesis first explores Bogota's history to understand the reasons for the urban expansion into the slopes of *Los Cerros*. It uncovers the different strategies that have been institutionalized as boundaries. It also establishes a theoretical framework in which to operate by investigating concepts of infrastructure, informality and monuments. Furthermore, it identifies objectives that design interventions can address by establishing a typical conditions and analyzing a particular site. Finally, it proposes an overall strategy and a set of interventions that target informal and formal issues separately.

*Los Cerros* are the most iconic and important natural feature of Bogota. The relationship of the city with *Los Cerros* has always been of importance for the subsistence and the collective imaginary of Bogota. *Los Cerros* provided the needed resources for the creation and development of Bogota, and at the same time heavily influenced the way in which the city has grown. This relationship became particularly contentious beginning in the mid twentieth century when rapid urban growth unleashed a process of informal and formal urbanization in *Los Cerros*. As a response to this phenomena the government created an urban growth boundary along the eastern edge of Bogota banning development, infrastructure and city services to be provided across the line. This strategy has been largely ineffective at preventing development and created a range of side effects that obstruct improvements in informal neighborhoods. The consequence is that problems such as lack of tenure, risk and absence of infrastructure are common place in the neighborhood settled at the base of *Los Cerros*.

In order to locate the argument amongst the relevant theoretical discourse the thesis is positioned as a juxtaposition of concepts on infrastructure, informality and monuments. Infrastructure is critical to the argument because of the influence it exerts in the location of future developments, as well as the fact that informal settlements tend to be deprived from it. The question of informality is identified as an inevitable process of



urbanization that needs to be supported by the government. Not by providing housing as many initiative have tried to, but in providing access to the resources and services that are available to the city at large. The final position is that the architectural monument is integral to the success of any strategy in the informal city. On the one hand they provide much needed civic amenities but more importantly because of the symbolic message of acceptance into the city that is broadcasted locally, nationally and internationally.

In order to identify issues found in the threshold between the city and *Los Cerros*, a site with informal, formal and mountain conditions was selected as typical. The site stretches east-west starting in the south side of the historic downtown, it climbs up the hill through the informal neighborhoods before arriving at the mountain forest. The informal neighborhoods primarily lack sewage infrastructure and a system for trash pick up. The consequence is that the sanitary discharges and solid waste ends up in the rivers and streams. These settlements are also at risk for landslides and flash flooding because of typical torrential rain events and geological conditions. Furthermore, there is an issue of overcrowded and deficient housing in the city at large and in the site. About 14 percent of the housing units in the locality are comprised of several households per unit, lack basic services or have poor structural conditions. On the other hand the issues presented on the formal side related to availability *Los Cerros* and their rivers as amenities for leisure activities.

The thesis concludes by proposing a strategy that can be applied indeterminately along the urban growth boundary and a set of interventions for the informal and formal sections. The strategy exploits the 53 rivers and streams that decent from *Los Cerros*. It proposes a civic spine that simultaneously acts as an infrastructure corridor that spans across the informal and formal city. The informal intervention propose an infrastructure corridor that provides sewage, manages flash flooding and stabilizes the slopes along the rivers. At the same time the infrastructural corridor is used to guide the location of future informal developments. Smartly locating future developments n particular is critical because of the risks in these areas. Lastly, the proposal calls for three buildings that introduce civic institutions paired with economic development programs. Most importantly the buildings are architectural monuments that symbolizes the investment of the city in the community and acceptance into the city at large.

**Fig 2 Map of Bogota**

Image illustrates the relationship of the mountains, Bogota and the river.





## **2. CONTEXT**



## CONTEXT

Bogota's relationship to Los Cerros Orientales (the Eastern Mountains) has been historically important because they are the most iconic feature of the city. Los Cerros and the Savanna at the foothills are the main geographical reason behind the original Spanish settlement of this area. Away from major trading posts between the Americas and Spain, settling such remote region in the Andes in the 16<sup>th</sup> century was probably due to the flat and fertile land next to the resource abundant mountains, a mild climate and the presence of the non aggressive Muisca people. Since the city's conception Los Cerros provided resources such as water, building material and food that allowed for the viability of the original village, future establishment as the capital city and expansion into a mega city. Later in the 20<sup>th</sup> century the relationship between the city and Los Cerros changed as needs and perceptions evolved. Resource extraction sites moved away from the immediacy of the city because of a larger need for water and building material. Concurrently Bogota's population begins to grow rapidly creating almost immediately a housing crisis. Marginal neighborhoods strong up around extraction sites in foot hills of Los Cerros, as workers built living quarters near by. These developments eventually became the epicenters for much of the informal growth in the City. The perception from the formal city shifted from Los Cerros as a resource to Los Cerros as the main landmark of the city, which needed to be protected and preserved. This relationship and tension continues with ecological and social arguments providing the foundation for the difference in the perceptions for how Bogota should relate and connect



**Fig 2.1 La Fundacion:**

Oil painting by Pedro A. Quijano. Depicts de Gonzalo Jimenez de Quesada founding the Santa Fe.

with Los Cerros.

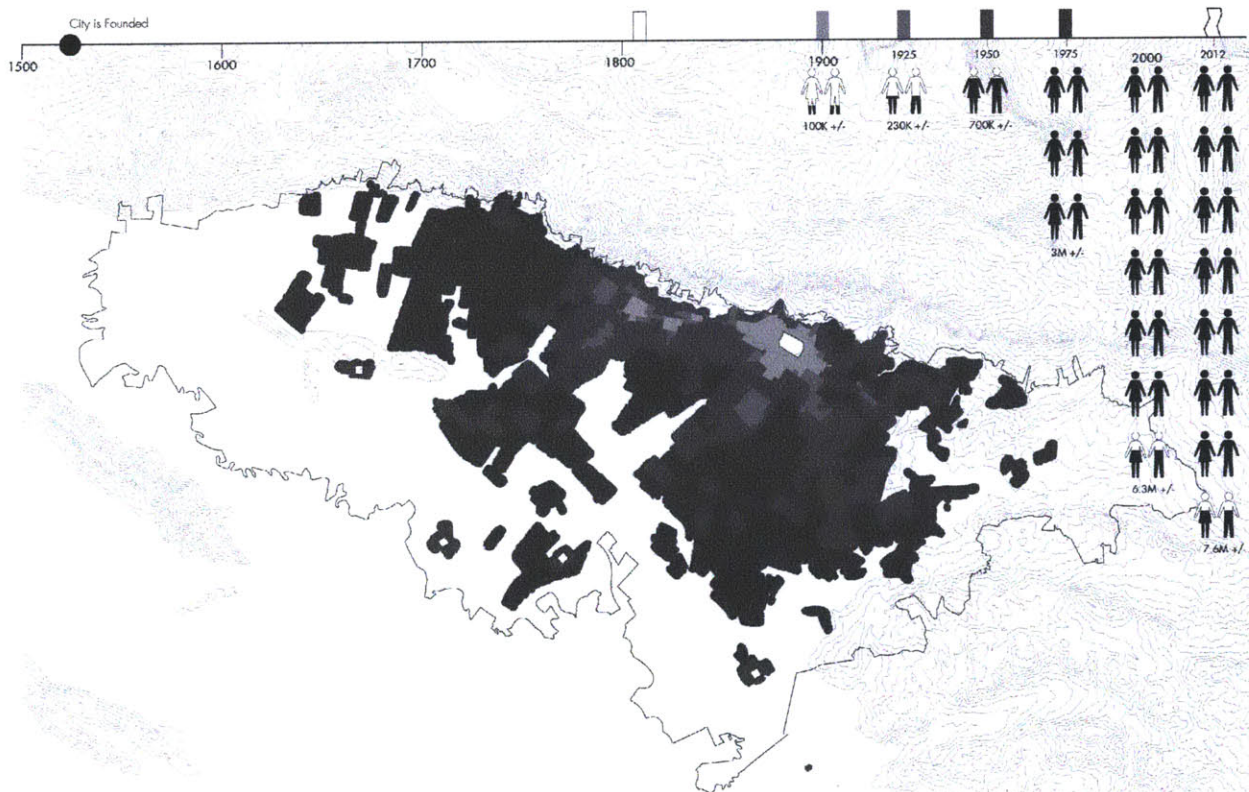
### 2.1 Brief History

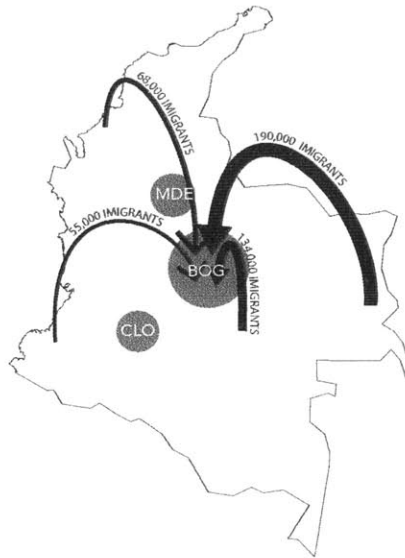
Bogota was founded in 1539 by Gonzalo Jimenez de Quesada. Similarly to other Spanish settlements in the new world it followed the Law of the Indies, basing its design in a grid with square blocks that roughly measure 115 meters. Through the colony and republic period the city was a managing post and did not hold much economic activity. Coastal cities such as Cartagena were much more economically active and important for trade. Because of its remote location in a high plateau at 7,800 feet above sea level and small economic activity the city kept a small population growth even though it operated as the capital. The population during the years of the declaration of independence in 1810 was the modest range 25,000+/- when European cities like London were around 1 million plus. Population growth continued at a relatively slow rate with sporadic spikes related to civil unrest in the countryside. Starting in the 50's violence in the countryside began and with it the rapid growth of urban populations all over Colombia and most notably Bogota. Besides the violence, the rural to urban migration was extenuated by an economic shift that centered around cities. Bogota as the capital also saw a rise to



**Fig 2.2 Population Comparison:** Compares the current population of Bogota with Colombia

**Fig 2.3 Bogota's Expansion** Diagram illustrating Bogotas population and area expansion



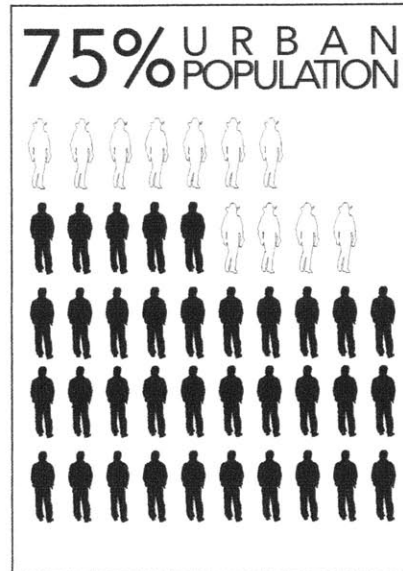


**Fig 2.4**

the top of economic activities, making it the most attractive destination for rural immigrants. The city's population in 1950 was around 700,000 and by 1964 it had grown by a million to 1.7 million.<sup>1</sup> Rapid growth continued through the late 20<sup>th</sup> century mostly due to continued periods of violence in the countryside. By 2000 the population had reached 6 million plus and currently is at around 8 million in the urban area and 10 million plus including the metropolitan area.<sup>2</sup> Currently Bogotá is the largest economic and political engine of the country and continues to be the preferred destination for immigrants. The population growth however is slowing down and it will continue to slow as the Colombian countryside has emptied for the most part. Colombia is currently an urban nation with 75% of the population living in cities. This 75:25 urban to rural ratio seems to be common among developed nations, which have minimum or negative native population growth. Based on this, similarities it is safe to speculate that the population in Bogotá will not continue its exponential growth. However, the city will continue to grow at a modest pace as it is the largest urban center with the strongest economy in the country.

### 2.2 Urban Design in Bogotá

Bogotá's urban morphology begins with the imposition of the grid based in the Law of the Indies located in the flatlands at the foot of Los Cerros.<sup>3</sup> The grid was laid-out perpendicularly to the Los Cerros and between Monserrate and Guadalupe mountains. The San Francisco and the San Agustín rivers descended from the mountains flanking the grid to the

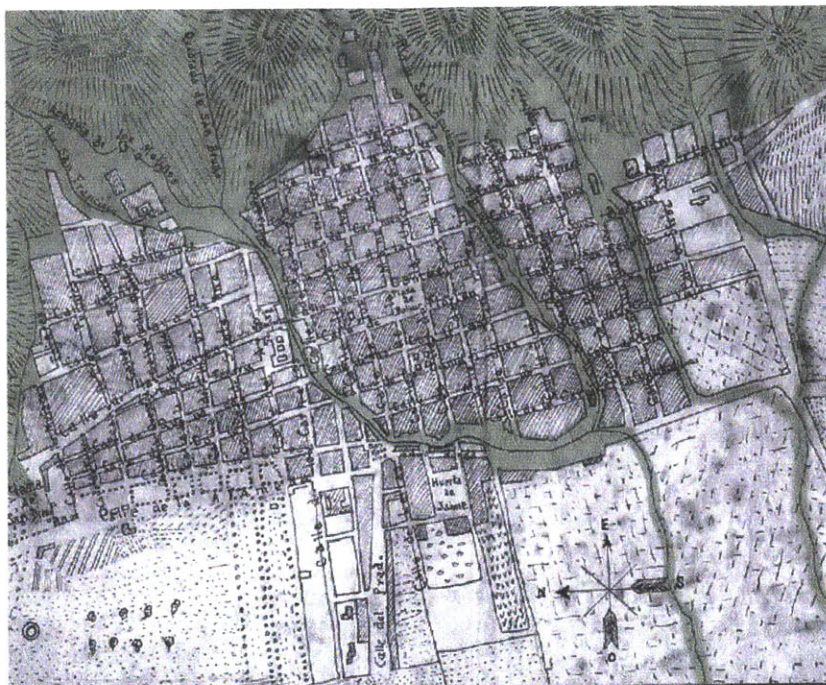


**Fig 2.5**

**Fig 2.4 Immigration Diagram**  
Bogota current immigration patterns

**Fig 2.5 Rural Urban Comparison**  
Comparison of current urban to rural populations in Colombia

**Fig 2.6 Plan of Bogota 1848:**  
Plan of Bogota drawn by J. Martinez



north and south. Both rivers were the only two elements that altered the rationally imposed grid. The blocks that were adjacent to the rivers took the necessary shape to allow the river to continue. At the same time the development in those adjacent blocks faced away from the water because from early on the rivers were not seen as an asset by the Spaniards but instead as a problem for urbanization.<sup>4</sup> To the west of the city flat and swampy lands extended for about 8 miles before arriving to the Bogota River. Although swampy, the west of the city was used mostly for agricultural purposes before and after the colony. Because of Los Cerros the pattern of growth for the city has been linear in the north-south axis. Social pattern in the morphology also became apparent as the wealthy settle towards the north, the working class towards the south/west and the marginal neighborhoods on the foot of Los Cerros. Even before the mining of raw material for brick and roof tiles, the slopes of Los Cerros were perceived as the undesirable land. Thus, marginal and informal settlements began to populate Los Cerros from the early period of Bogotá's history.

The city's colonial pattern does not really change significantly for the first four hundred years mainly because it stays as a remote and sleepy capital with small town qualities. Starting in the early 20<sup>th</sup> century, the population boom began to create new demands on the morphology of the city that required upgrading and modernization. The first major plan to modernize the city came in 1922-1925 with the *Plan Bogota Futuro* by Enrique

Uribe Ramirez.<sup>5</sup> Although not realized this first plan illustrates that the city was poised for modernization. The plan was followed by the *Plan Urbanístico Integral* in 1930 design by the American urban planner Harland Bartholomew.<sup>6</sup> As the full-time planner of St. Louis, Bartholomew was well known for introducing and accommodating the automobile in the city. The fact that he was asked to create a plan for the city shows that it was becoming evident that the traditional form of the city was presenting challenges. Even at the early stages of the population growth it had become evident that the city needed to integrate new technological advances like the car into the urban fabric. Yet, in the next urban design episode Bogota looks back at European traditional urbanism in the Austrian Karl Heinrich Brunner. Brunner moved to Bogota to teach at a local university while he is awarded different projects in South America. His proposal for the city argues for the continuation of the Spanish grid as the framework for growth.<sup>7</sup> From his proposal only the National Park (Parque Nacional) was implemented. The park that he envisioned is a continuation and clear connection between of Los Cerros and the city and to this day the park is one of the main features of Bogota. The park begins at Bogota's 7<sup>th</sup> Avenue with a traditional landscape and was decorated with classical European stylized pavilions. It extends to the east up the slopes of Los

**Fig 2.7 Proposal for Bogota 1934**  
Proposal By Karl Brunner for Bogota

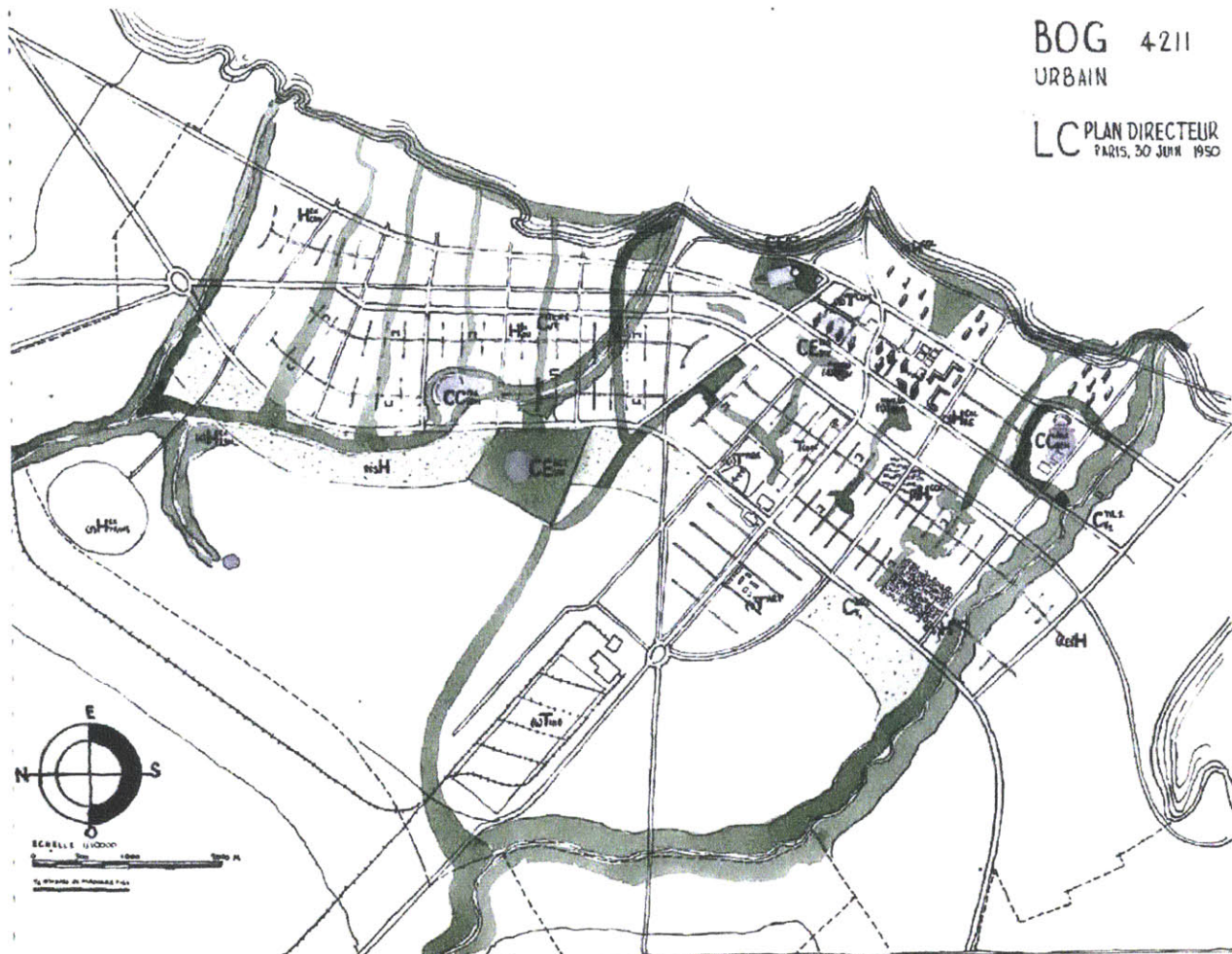


Cerros and it gradually loses the formal qualities to become the mountain forest. Brunner was well received by some sections of the intellectual circles but disliked young architecture students that by now are infatuated with modernism.

By the 40's Brunner's urbanism becomes harder to swallow because it becomes evident that the colonial fabric of the city is ill equipped to deal with the population growth. New strategies for modernization become high priority and consequently Le Corbusier is asked to help the city decipher its future. Le Corbusier arrives in 1947 and is receive by a large crowd of architecture students that were chanting "viva Le Corbusier, abajo Le academia" (viva Le Corbusier, down with the academia).<sup>8</sup> The reference to the academy suggests a dislike for Brunner's traditional work. Furthermore the chanting from the students expressed the desire to make Bogota a modern capital and Le Corbusier, the leading modernist urban designer, seemed to be the perfect fit.

Le Corbusier's proposal is divided into two, the *Plan Piloto* and *Plan Regulador*. The *Plan Piloto* was a sort of schematic proposal led by Le Corbusier

**Fig 2.8 Plan Director 1950**  
Le Corbusier metropolitan scale proposal for Bogota





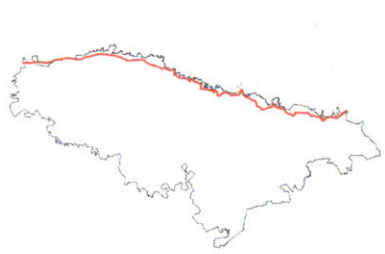
and the *Plan Regulador* was implementation plan headed by Josep Luis Sert and advised by Le Corbusier.<sup>9</sup> In relation to Los Cerros, Le Corbusier's proposal is visionary. His proposal at the city scale looks at the ecology of Los Cerros to derive the broader urban morphology. As opposed to seeing the rivers and streams as a problem the proposal uses them to articulate the neighborhood units the he proposed for Bogota and later applies in Chandigarh. In Le Corbusier's plan the rivers and streams were accentuated as linear parks and provided connections between neighborhoods as well as space for leisure. In this way the hydrological ecology of Los Cerros was for the most part allowed to operate as needed.

*El Plan Piloto* began in 1947 under a relative political stability and it was submitted in 1949 after Bogota had been partially destroyed in April 9 1948 in by riots that killed thousands. The riots know as El Bogotazo started because of the murder of a prominent presidential candidate but were also the exemplification of a larger political struggle for power. Later on in 1953 Sert's Plan Regulador met yet a different political scenario when submitted. This time it was a short lived dictatorship that didn't see value in the proposal. Because there was strong opposition by developers it was decided to shelf the entire project. At this critical junction in the 50s Bogota begins its largest population and development expansion without any vision. The result is evident in the city's haphazard growth pattern that amongst the chaos also allowed for much of the informal and formal developed in Los Cerros without care or oversight.

### **2.3 The Urban Growth Boundary**

The population and area expansion of the city in the decades of 50, 60 and 70 is dramatic. The population more than doubles each decade and by the late 70's the consequences of the erratic expansion is evident in Los Cerros. In the 70's most of the water for the city still came from Los Cerros, which made the prospect of urbanization and environmental degradation of Los Cerros a critical problem for the City. For this reason the government decides for the first time to take legislation action to create an urban growth boundary. Modeled after the boundary in Caracas to protect El Avila, the city government established the urban growth boundary to protect Los Cerros in 1977. The boundary was set at a height around 2,650 meters above sea level and stretched north and south for 42 kilometers. To the west of the line urban development is allowed while the east becomes preservation land. Later on in 1979 the same boundary

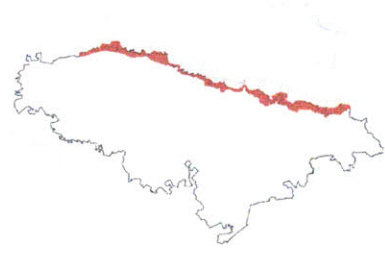
is used by City Hall to limit the urban services of the city. This means that infrastructure such as sewage, electricity, and trash pick-up do not cross this line. The boundary however does not prevent formal and informal settlements to continue to expand into Los Cerros. On the one hand informality on the slopes occurs because of the preexisting marginal communities and because the rapid expansion makes the city is incapable of governing remote areas of the city. On the other hand formal development for high-end clientele also occurs because of wide spread corruption in the city government. The same paradigm continues through the 80's and 90's with the exception of a suburban belt around the city created in 1990. The suburban belt wrapped the city and followed Los Cerros at the height of 2,700 to 2,800 meters. The uses in the belt were supposed to be transitional but it didn't have much relevance for Los Cerros because of the preexisting boundary. A decade later in 2000 the Plan de Ordenamiento Territorial (POT) once again reexamines the boundary and this time it expands the urban area into Los Cerros. The reasoning behind this growth was that some of the informal settlements had been granted semi legal status and this proposal sought to integrate the existing settlements into the city. Four years later the POT is revised and the 1977 urban boundary is ratified again and an ecological belt of 50 to 100 meters wide is created. This proposal sought to provide the government with tools to manage the growth of the city as well as to protect the ecology of the mountains. The problem with the 2004 POT scheme is that it disregards the existing settlements that have been granted semi legal status. To address this issue in 2005 the Ministry of the Environment, Housing and Territorial Development implement yet another strategy, this time is the called *La Franja de Adecuacion* Equalizing Zone. This zone is a continuous area along the 1977 boundary that includes the formal and informal developed areas of Los Cerros as well as the undeveloped areas in between that are adjacent to the urban boundary. The Equalizing Zone is subtracted from the reservation and the new strategy proposes ecological corridors and parks along the settlements. However, a public lawsuit is imposed in the Equalizing Zone stalling the development of the strategy up to now. Despite the lawsuit two other city institutions continue to endorse the Equalizing Zone by updating their policies. The entity in charge of managing Los Cerros, the Corporacion Autonoma Regional de Cundinamarca (CAR), rezoned the entire preserved area into conservation, rehabilitation and subtracted the Equalizing Zone from the preservation plan. Using the Equalizing Zone strategy as the basis for the



**Fig 2.9 Urban Growth Boundary**  
Legislated Boundary 1977



**Fig 2.10 Cerro Orientales**  
1990 Los Cerros Orientales Declared as a Preservation area



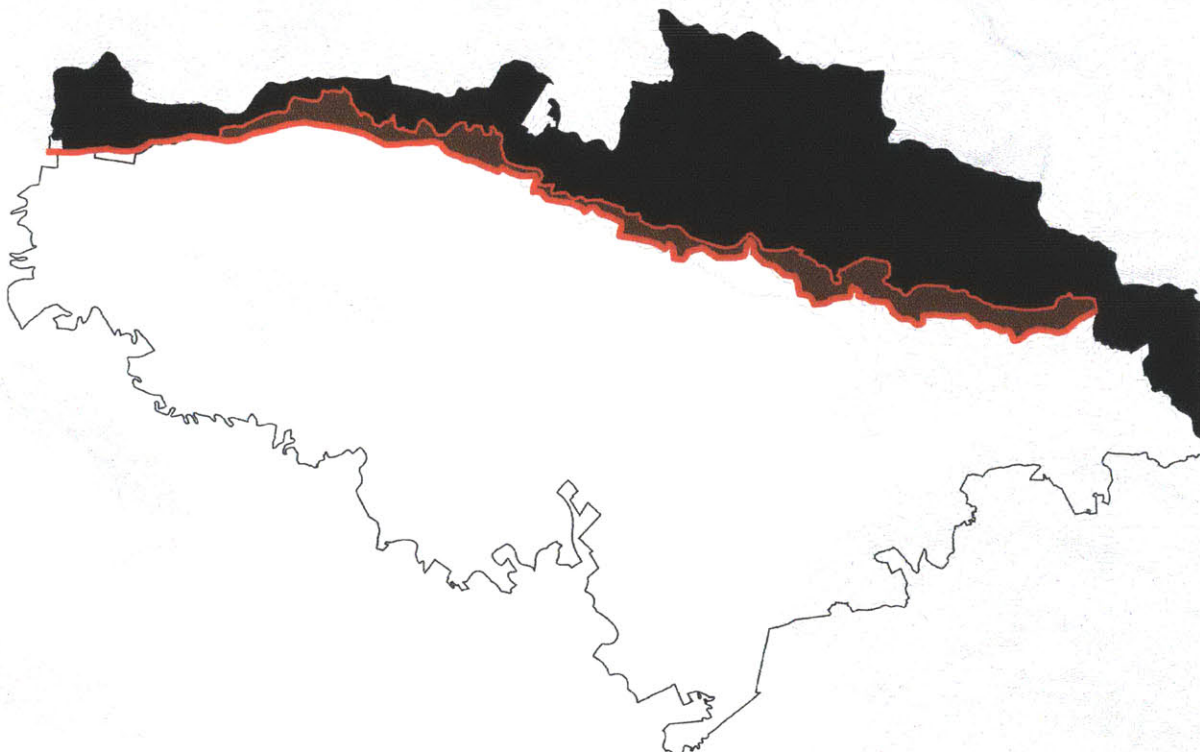
**Fig 2.11 Equilizing Zone**  
Proposal of the Equalizing Zone

policy, the City's planning agency developed specific policies to address the eastern edge of the city. The planning agency also commissioned the local landscape architect Diana Wiesner to develop a study of the area called el Plan Director.<sup>10</sup>

In the plan the Wiesner revisits the story of the boundary, divides the 48 kilometer stretch into four sections that relate to areas of the city and proposes a network of trails running north to south along the eastern edge of the Equalizing Zone. The trails are meant to provide residents of the city the opportunity to experience Los Cerros as an amenity for leisure activities. The strategy is also structured with an environmental and social agenda, but most importantly it is another strategy to halt urbanization from moving up hill.

While the Equalizing Zone continues to be in legal limbo, a parallel discussion in the current city administration has put a heavy emphasis in the hydrology of the city, opening new avenues to address questions related to Los Cerros. As water has taken front stage, the City's water and sewage company is now poised to rethink how the waterways that cross the city are used and perceived. As the land owners of the rivers and streams the Water and Sewage department is responsible for maintaining them. They have begun to revitalize some streams in the southern hills of the city. Along the 48 kilometer stretch of the boundary between Bogota and

**Fig 2.12 Urban Growth Boundary**  
Comparison of the different policies implemented at Los Cerros Ori-



Los Cerros there are 53 rivers and streams that engage both sides of the boundary. All these waterways represent an opportunity to devise strategies that can be replicated along the stretch of the boundary. The rivers and streams are not integrated to the city as an asset. To the contrary, they are mostly used as sewage and seen as undesirable elements. The opportunity to change this paradigm is one of the goals of this thesis. Revitalizing the waterways to be used as corridors to provide basic infrastructure and public amenities to settlements in Los Cerros rises as sensible strategy to articulate the urban boundary. It not only responds to the hydrological ecology but also to the social ecology, both which are currently in dire need to be reimagined.

(Endnotes)

1 Departamento Administrativo Nacional de Estadística. *Boletín Censo General 2005 Bogotá*. Census, September 13, 2010. [http://www.dane.gov.co/files/censo2005/PERFIL\\_PDF\\_CG2005/11001T7T000.PDF](http://www.dane.gov.co/files/censo2005/PERFIL_PDF_CG2005/11001T7T000.PDF)

2 Ibid

3 Frontado Saavedra, Jose Guillermo. "Las Leyes de Indias: observations of its influence on the physical space in the Latin American colonial cities", 1980.

4 Grauer, Oscar. "Principles, rules, and urban form: the case of Venezuela", 1991.

5 Hernández Rodríguez, Carlos Eduardo. *Las ideas modernas del plan para Bogotá en 1950: el trabajo de Le Corbusier, Wiener y Sert*. Bogotá: Alcaldía Mayor de Bogotá : Instituto Distrital de Cultura y Turismo, 2004.

6 Ibid

7 Ibid

8 Ibid

9 Ibid

10 Weisner, Diana. "Plan Director del Corredor Ecológico y Recreativo de Los Cerros Orientales". Alcaldía Mayor de Bogotá, Secretaria de Planeación, 2007



**Fig 2.13 Bogota's Hydrology**  
Comparison of Bogota's hydrological system with buildings and Urban growth Boundary



**Fig 3 Water Infrastructure**  
Photograph of existing water infrastructure in Bogota

# **3.**

# **FRAMEWORK**

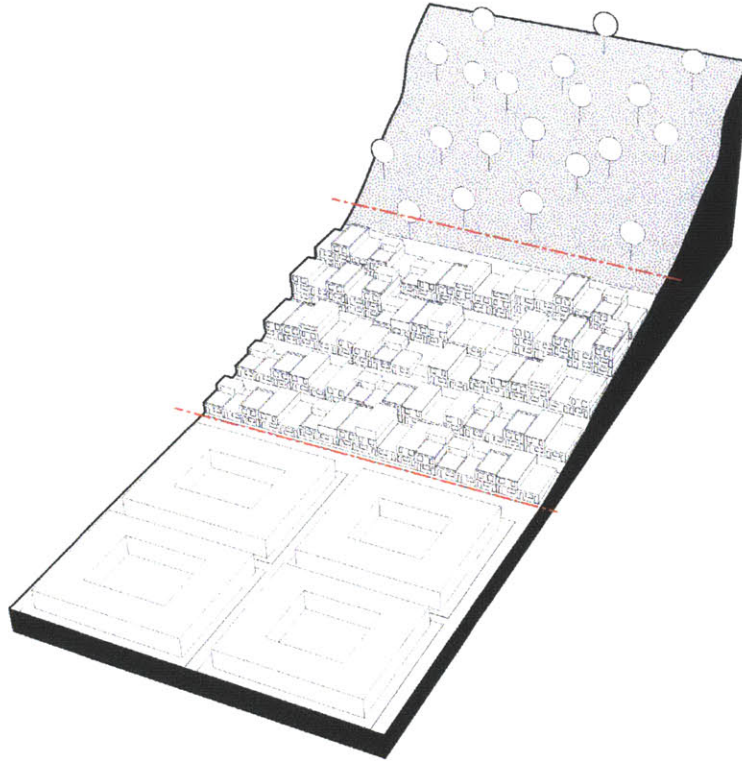




### 3. FRAMEWORK

Over the 48 kilometer span of the Urban Growth Boundary a number of different relationships are found between Los Cerros and the city. On the slopes the most common uses are informal settlements, high-end housing and a few old resource extraction sites. All of these uses meet the formal city on the western edge of the boundary. From the historic downtown towards the south, Los Cerros mostly consist of disadvantaged communities and towards the north the informal and high-end developments are found intermittently. Thus, the conditions along the boundary can be categorized as: mountain-informal-informal, mountain-informal-formal and mountain-formal-formal. The challenges that the informal areas present are more critical for the city as the risks and sheer number of people is much larger. Bogota's dramatic social contrast of wealth tends to create urban interventions that are directed towards a single segment of the population. Numerous improvement projects sponsored by the World Bank and the city government have been deployed in marginal communities targeted at disadvantaged populations with little attention paid at creating space for all people to enjoy. Similarly countless modern urban projects have been developed north of the city in more affluent communities, that have no effect in the marginal areas. The solutions proposed in this thesis aim to address the social contrast of the city by creating strategies that are relevant for both affluent and marginalized communities. For this reason the condition of mountain-informal-formal is used as the basis to develop the conceptual framework. The purpose of focusing on this specific condition is to yield strategies that can be applied in any number of sections along the boundary. At the same time the mountain-informal-formal condition creates transition points that present an important opportunity for both social realms to find a common ground in a city that historically has been divided along social lines.

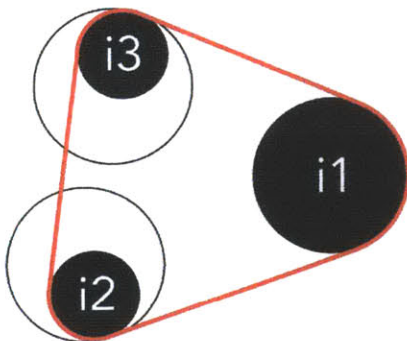
The exploration and development of strategies for the thesis are divided into formal and informal emphasizing the transition areas. In the formal side, which for the most part is within the boundary, Los Cerros are perceived as an amenity and as the icon of the city. The main question from the formal side of the city is how to access the largest natural feature of the city which although adjacent, for the most part it is inaccessible. The other concern is the environmental degradation, which has led to the preservation approaches implemented in the urban growth boundary. In the informal sector Los Cerros are perceived as a place to live and



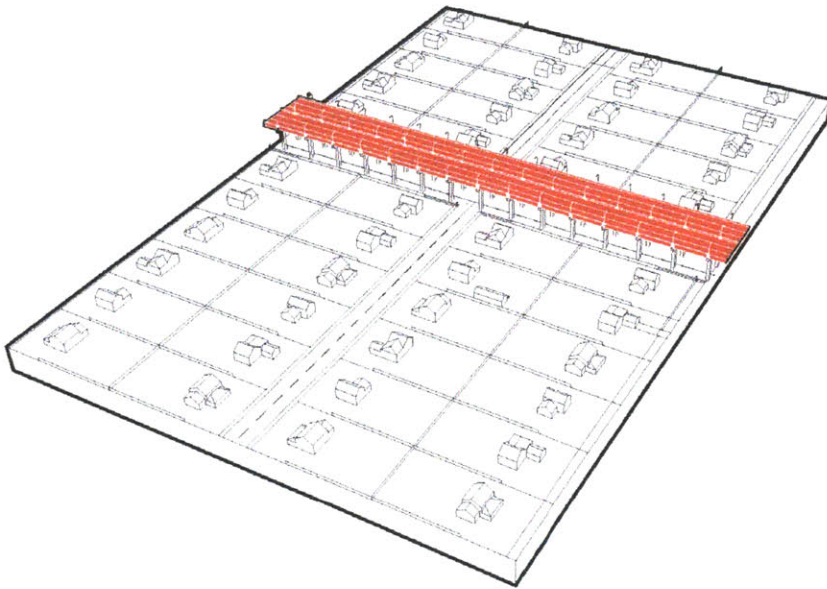
**Fig 3.01 Typical Condition**  
Abstracted relationship of the mountain, informal and formal

as a recourse for subsistence. At the same time they represent a number of hazards such as landslides and flash flooding; all of which are seen as common place. The theoretical framework for the thesis aims to locate the proposals at the intersection of the perceived and existential needs found along the boundary, in the formal and informal city. The solutions also create avenues for both realms to have public places of common interest that are primarily functional but also enhance the livelihood of residents of both realms.

To address the issues of quality of life, access to opportunities, and the environment, the framework is divided into three main arguments: infrastructure, informal and investment. The framework is based in the idea that infrastructure is the common necessity for the formal and informal city. Infrastructure is used to guide urbanization and address risk and environmental concerns. The investment argument reflects the strengths of the recent Proyecto Urbano Integral (PUI) projects in Medellin. The case is made for investment in monuments in marginal locations as a strategy to create ownership and self-worth in destitute communities. The informal portion of the framework explores previous approaches to informal settlements that are not based on housing but instead on the support of economic and incremental potential of the communities. This three argu-



**Fig 3.02 Theoretical Framework**  
Diagram illustrating theoretical diagram



**Fig 3.03 Infrastructure Diagram**  
Abstracted relationship of the mountain, informal and formal

ments are overlapped and applied to Bogota's boundary as the thesis and the projections for urbanization in Los Cerros.

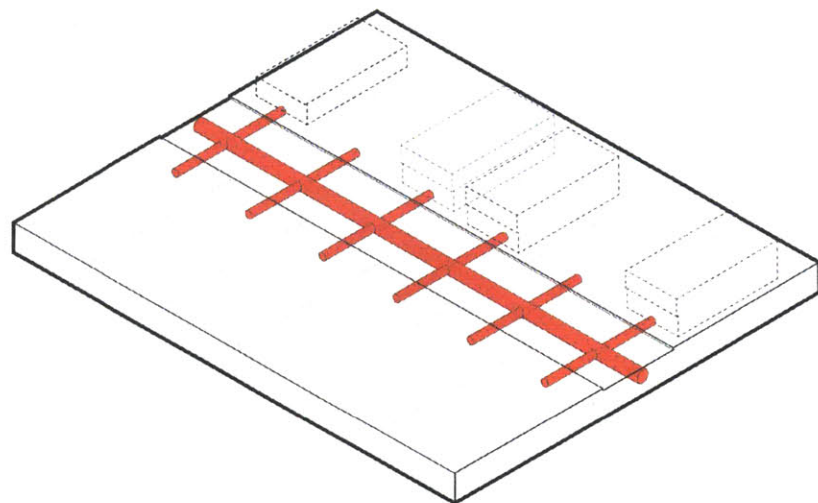
### 3.1 Infrastructure

Although mostly rooted in the American context the approach to infrastructure builds its foundation in the work of Stan Allen and makes a connection to the Bogota context through the work of John F.C. Turner. Allen's proposition put forward in his essay *Infrastructural Urbanism*, is that "infrastructural work recognizes the collective nature of the city" by "fixing points of service, access and structure"<sup>1</sup>. In the case of Los Cerros the lack of infrastructure in the informal area denotes a need to provide those points of service. The questions of where to locate the points of service and how to design them become more relevant as it is only a matter of time before the need combined with the political strength of these communities will demand such upgrades. The concerns of the urban designer thus is in how to apply these systems in such a way that they will organize the territory, use the interventions to provide as many benefits as possible as well as design them in such a way that they are adaptable to changes in the city.

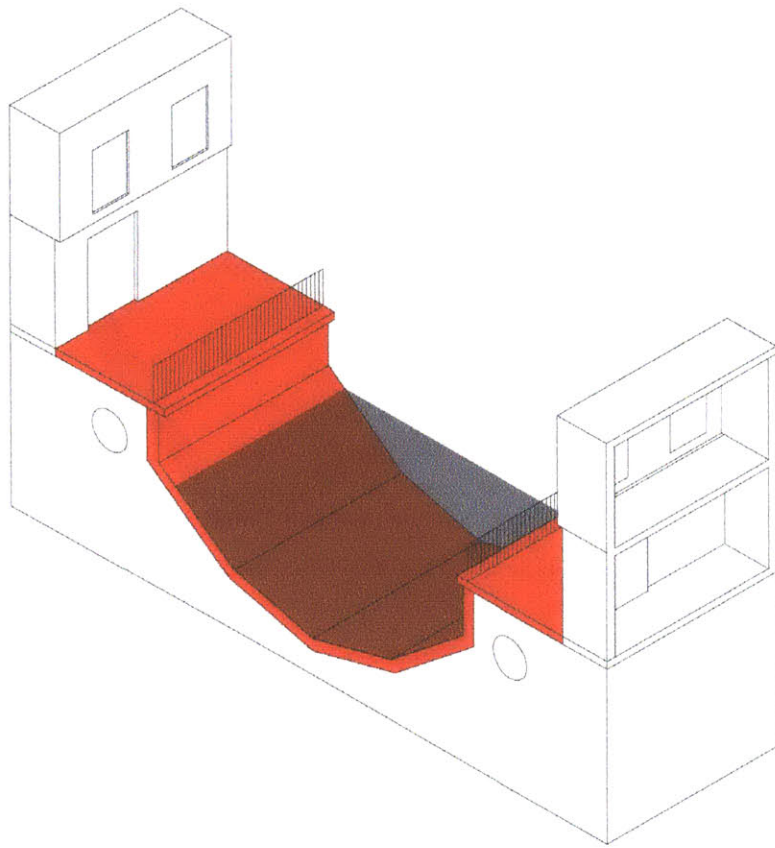
The adaptability of the systems is critical because the marginal neighbor-

hoods are an extremely dynamic entity. They are built on a day-by-day basis by thousands of different and uncoordinated decisions. There is no master plan to guide such operation and even though the communities are well organized the changes in the territory will occur fast and in a chaotic pattern. In many ways these neighborhoods act as micro cities that are exponentially more dynamic than those of the formal areas of the city. Because of such rapid growth the current needs might change at the turn of a coin, making it critical for large investments to be as adaptable as possible. This is in particular relevant for cities like Bogota that are politically inconsistent, lack funds and suffer from corruption.

Organizing the territories, another quality of infrastructural interventions is also very useful in dynamic and hectic settlements. Organizing does not mean to create rules for development as this will be damaging. Instead it means that the decisions to locate and provide access to the infrastructure will in fact guide patterns of development. In the formal city this usually means that where highways are introduced developers will follow with housing and commercial projects. In the informal sphere developments tends to be located in unwanted or ungoverned land with out services and infrastructure. However these same services and infrastructure will eventually be provided, as neighborhoods gain political strength. This same phenomena was seen in the slums of the now developed world such as London and New York. In other words infrastructure will ultimately be provided, the question is when, where and at what cost. This proposition has been well understood by many organizations and academics that have studied informality since the 70's. In the book *Slums are for People*,



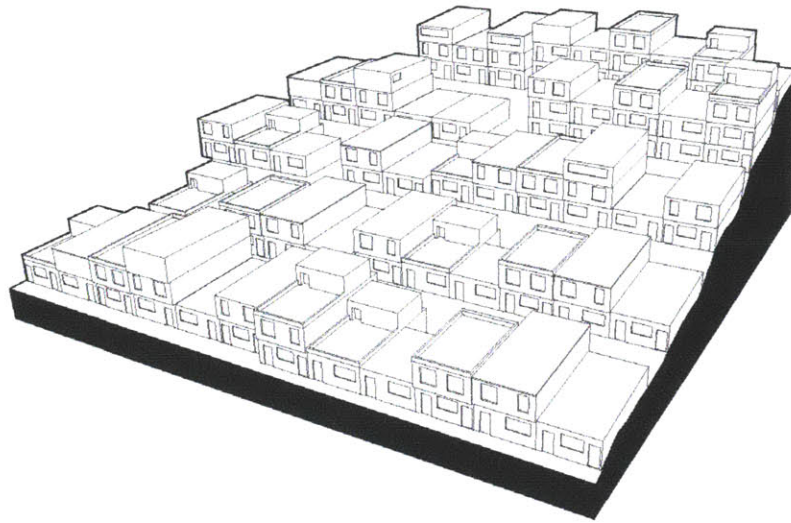
**Fig 3.04 Preemptive Infrastructure**  
Diagram illustrating the site and services concept use in the Proyecto Urbano Nuevo Usme



**Fig 3.05 Jardim Esmeralda**  
 Section Diagram illustrating the  
 infrastructural concept applied in the  
 Jardim Esmeralda project in Brazil.

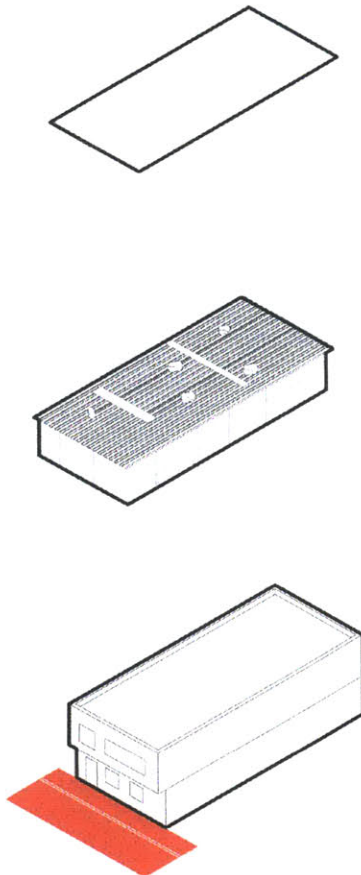
Aprodicio Laquian is one of the first that proposes strategies to address this phenomenon.<sup>2</sup> He introduced the concept of Site and Services which has been used by the World Bank for decades. The concept of Site and Services is to preempt informality –to find a location where it is acceptable and to build the infrastructure before the settlements happens. In other words it takes the model of the development of the formal city and applies it to the informal. In this case, instead of developers, the lots are given to new comers to take control and incrementally build them up. The difference for the city agencies is that they don't have to come-back to the neighborhoods down the line and provide infrastructure for a much larger price tag when communities acquire political strength, and construction costs will be higher due to the area already being inhabited. Installing infrastructure first prevents families from living in precarious conditions.

The practice of Site and Services however was abandoned and Slum-upgrading took over as the prominent strategy. In the book *Arrival Cities* James Saunders argues that the reasoning for the change was that the cost of providing the services raised the prices of the land to a level that poor rural immigrants could no longer afford.<sup>3</sup> Saunders also maintains



**Fig 3.06 Informality**  
Diagram illustrating Informality

**Fig 3.07 Incrementality**  
Diagram illustrating John F.C. Turner's idea of incremental building in informal settlements.



that Site and Services as an idea is useful but perhaps the problem was in the implementation. He cites an example in Bogota, Pereira, Colombia and Porto Alegre, Brazil as cases that essentially are performing Site and Services with a successful implementation. Operacion Urbanistica Nuevo Usme, which is the example in Bogota, will provide 53,000 foundations to be self-constructed and impact approximately 200,000 people in over 900 hectares.<sup>1</sup> The innovative value of this operation is that the price of the lots will be competitive to the price of the empty pieces of land available in the illegally marked to be informally constructed.

Ideas of preemption, adaptability and organization of space through infrastructure are relevant in Los Cerros, particularly in the informal sections. When considering implementation two it will be important to consider two questions; one, how should infrastructure be implemented in existing communities? And two, should this intervention take into account and anticipate future development? The position taken in this thesis is that the infrastructural interventions in the existing settlements east of the boundary will essentially act as slum-upgrading projects. Yet the investment in this infrastructural project should not aim only at providing services to those currently settled in these locations but instead preempt future expansion. Following the model of Operacion Urbanistica Nuevo Usme, the interventions should be designed to allow and guide future developments. As such, the position of this thesis is that urbanization will continue to expand in Los Cerros regardless of the type of boundary legislated. Therefore strategies should concentrate on guiding growth in a more efficient, sustainable and humanistic way.

Having identified infrastructure as the main intervention the next inter-

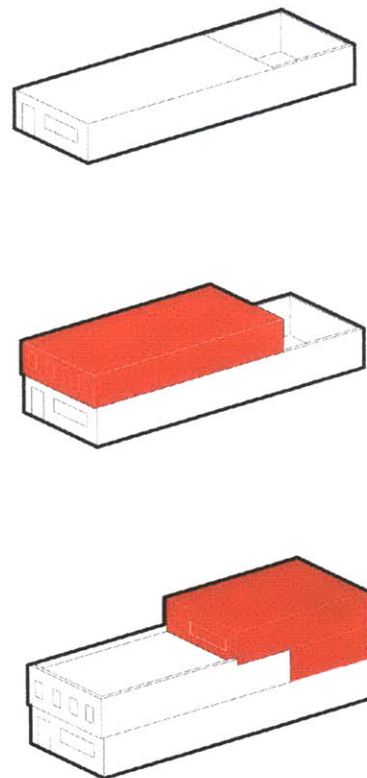
rogation is what type is the most appropriate. The implication of having one type of intervention that works universally is dangerous as needs between neighborhoods can be dramatically different. In the case of Los Cerros most informal settlements are composed of populations of diverse backgrounds and different immigration eras. Although not dramatic on paper, these differences would yield a wide range of perceptions of what the correct intervention could be. Nonetheless, the use of Los Cerros' hydrological system as sewage infrastructure provides an opening for a strategy that could be applied in a similar way along the length of the Boundary. Fifty-three (53) rivers and streams descend from Los Cerros and in the informal settlements they are used as the conduit for the discharge of waste. At the same time the city has evolved keeping the corridors clear along the rivers. The need to provide sanitary infrastructure is then coupled with the opportunity of having these preexisting corridors that could be used for a number of different activities. A strategy to intervene in these corridors is therefore indeterminate and could be applied to one, some or all the rivers and streams as a way to articulate the Urban Growth Boundary.

Similar examples of slum-upgrading and stream rehabilitation have been implemented in Medellin, Colombia and in Sao Paulo, Brazil.



**Fig 3.08 PREVI House Photograph**  
Photograph of a house in from the PREVI competition decades after completion. (left)

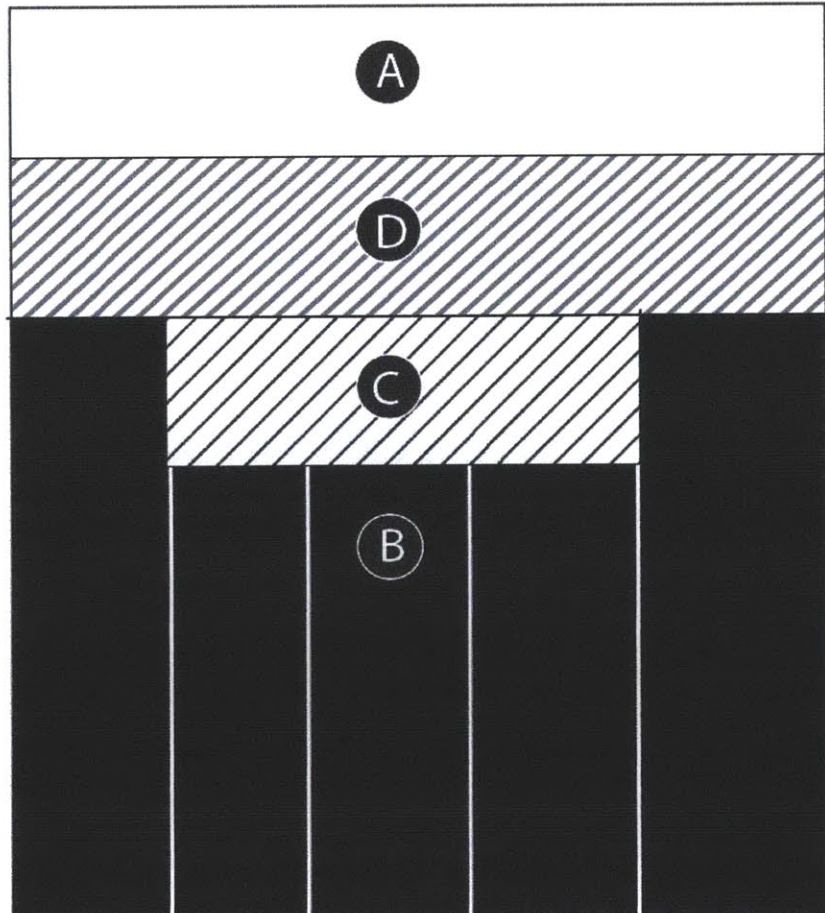
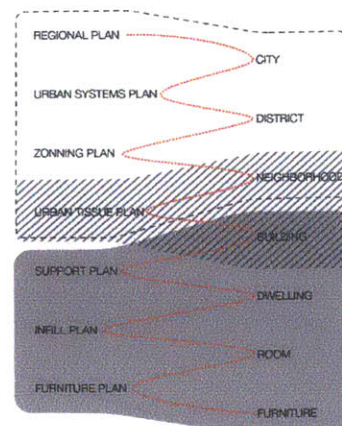
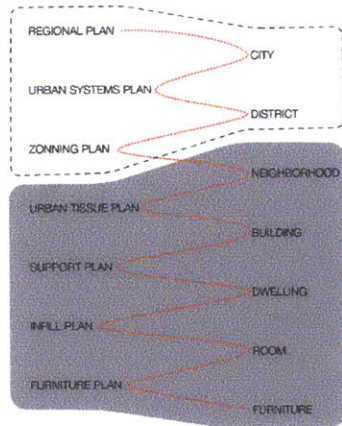
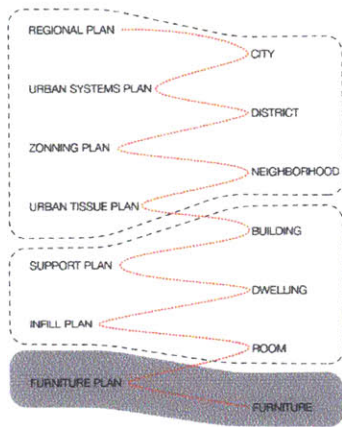
**Fig 3.09 PREVI Diagram**  
Diagram illustrating incremental building of housing after the PREVI competition (bottom)



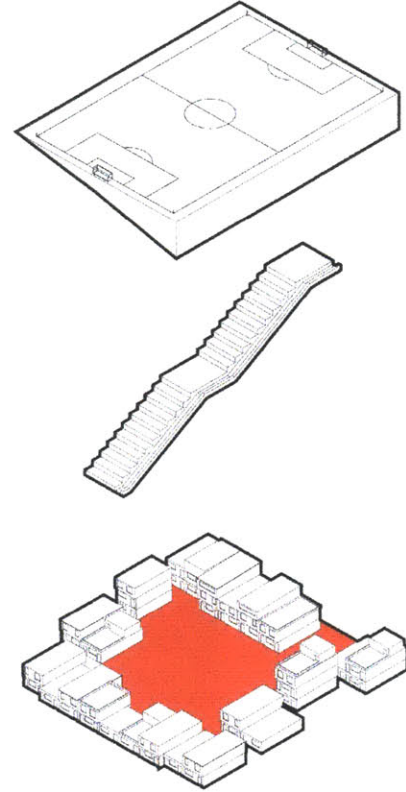
### 3.2 Informality

The argument for informality in this thesis is based on the works of John F.C. Turner, James Saunders and John Habraken. The essential position is that informality is not a problem to be solved but rather an early symptom of rapid urbanization that will be beneficial in the long term to the city. This is evident in what were considered slums or squatter settlements in city's such as London, which with some time have become very attractive parts of the city. What the old slums of London have in common with contemporary informality is that there is a large population that is willing to live in substandard conditions to afford a shot at middle class living in the city. James Saunders explores this idea in detail in his book *Arrival Cities*. Saunders argues that the arrival cities, which are the city neighborhoods where immigrants first arrive, while unappealing are the best shot at middle class status.<sup>5</sup> Through case studies in developing and developed countries Saunders asserts that middle class is not a pipe dream for people in living in the arrival cities. In fact many have moved

Fig 3.10 Territorial Control Diagram





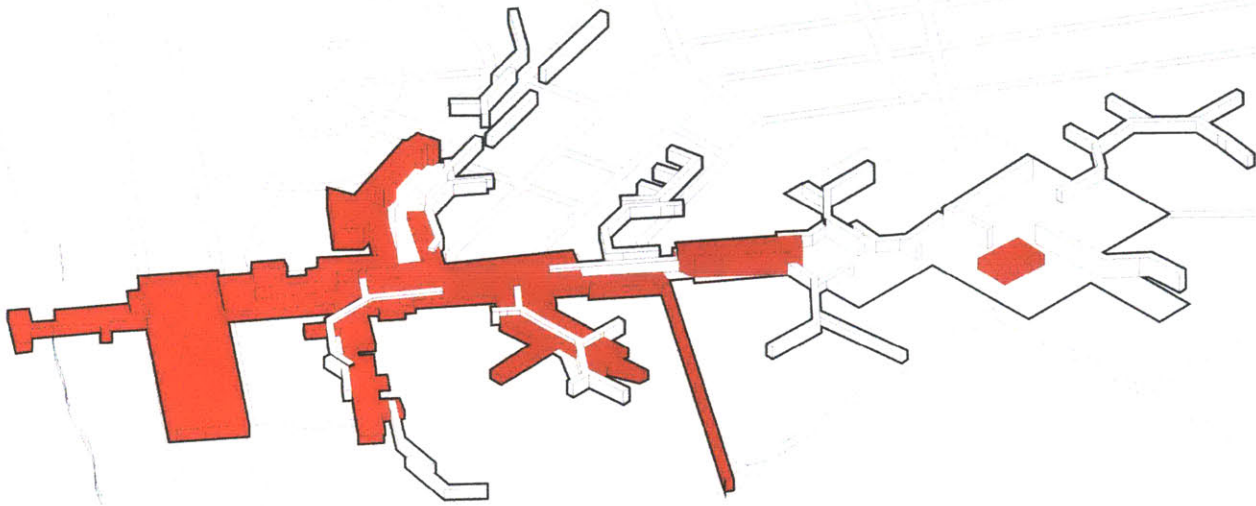


**Fig 3.11a Public Space Upgrading**  
Diagram of upgraded public spaces at Cerro Toro

**Fig 3.11b Cerro Toro Photograph**  
Image of upgraded steps and public space by Mobil Arquitectos

up or out of the slums to join the ranks of the middle class. Others stay in the arrival cities and through entrepreneurial spirit or sheer need turn them into important epicenters of economic activity.

Much earlier but in a similar fashion John F.C. Turner demystified the perception of slums as an urban cancer while celebrating the capability of informal communities to autonomously organize and build their residences.<sup>6</sup> In *Housing by People* Turner claims that “government [should] cease to persist in doing what it does badly or uneconomically – building and managing houses – and concentrate in what has authority to do: to ensure equitable access to resources which local communities and people cannot provide for themselves.”<sup>7</sup> This argument touches on two ideas that are critical positions of this thesis: one is that creating and providing public housing is ineffective as a strategy for informal settlement and two that the government intervention should instead concentrate in infrastructure. Thus the housing problem is seen not as a need to provide units but instead to provide the required support or infrastructure to al-



**Fig 3.12 The Stem**  
 Diagram of the N'Djamena project in Chad by Candillis, Josic and Woods.

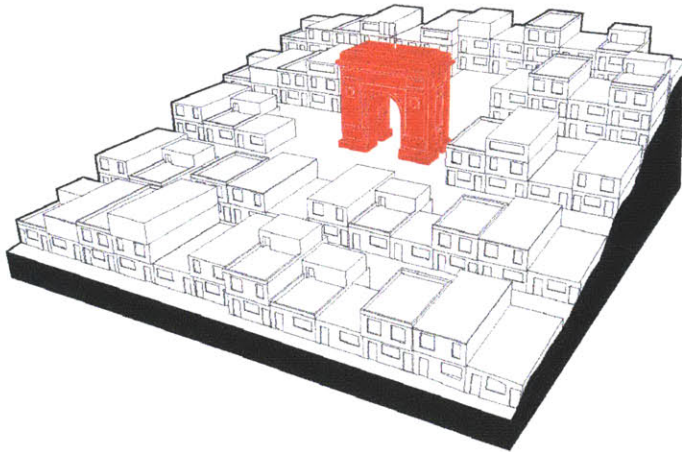
low self-building to take place.

The question that rise out arrival cities is how to bolster both the economic vigor and the autonomous systems without squashing its vitality. To address this question the thesis introduces John Habraken's ideas of territorial control in order to provide agency to residents while providing a platform that will support entrepreneurial ventures.<sup>8</sup> Lack of funds and space to start business such as carpentry shops or cleaning services can prevent them from ever getting of the ground. Solutions can perhaps be found under Habraken's ideas of territorial control. For Habraken the traditional organization of space is that of the public and private. However in many circumstances the line between both realms is blurred and other territorial orders emerge, which can simplistically be labeled as semi-private or semi-public.<sup>9</sup> These are the spaces in which informality exists; boundary lines that are not clear are taken over and controlled by individuals and or groups for some period of time. Conceivably the interventions in the informal sphere can be organized to provide space and resources that could be controlled by residents to support entrepreneurial ventures. To this end the programing and how the buildings operate along the interventions becomes critical. To Habraken these structures should be designed into buildings, which is the intention of the architectural intervention that is included in the strategies that this thesis proposes.

### 3.3 Investment

The agency of architecture and that of the civic monument are important for the successful implementation of the strategies. Urban design strategies that address many of the issues explored thus far have been

**Fig 3.12 Investment Diagram**  
The civic monument in the informal city



implemented since the 70's. Many have addressed sanitation and hydrological concerns as well as public space and territorial ordering of informal developments. Yet many while having positive effects in the immediate communities failed to generate recognition in the wider context and therefore their impact fades or is forgotten. To the contrary the case of the *Proyectos Urbanos Integrales* (PUI) in Medellín have generated wide recognition and lasting effect beyond the city. Many arguments pose this success story not in the buildings but in the integral part of the strategy. The PUI's are not only isolated architectural or infrastructural or upgrading projects, they are integral in the sense that all of the above are introduced into the informal communities as a comprehensive strategy. The need for infrastructural improvements, vis-à-vis bridges, stairs or public transit is paired with housing, public spaces improvements and most importantly capped with civic monuments.

Comprehensive strategies are not an innovation of the PUIs as pairing infrastructure, housing and public space improvements have been implemented elsewhere. An example of such interventions is the Cerro Toro project in Valparaíso, Chile by Mobil Arquitectos. While providing improvements of basic needs in a comprehensive strategy Cerro Toro doesn't capture the imagination of a larger audience and at the local level it does not provide a strong sense of ownership and pride. The agency of the civic monument, which is usually afforded only in the formal city is not exploited. The consequence is not necessarily apathy towards the improvements but rather a perception that the neighborhood still is marginal to the city. Introducing the civic monument into the informal city implicitly broadcasts the message that the informal is accepted into the city negating the perception of marginality. The message of opportunity

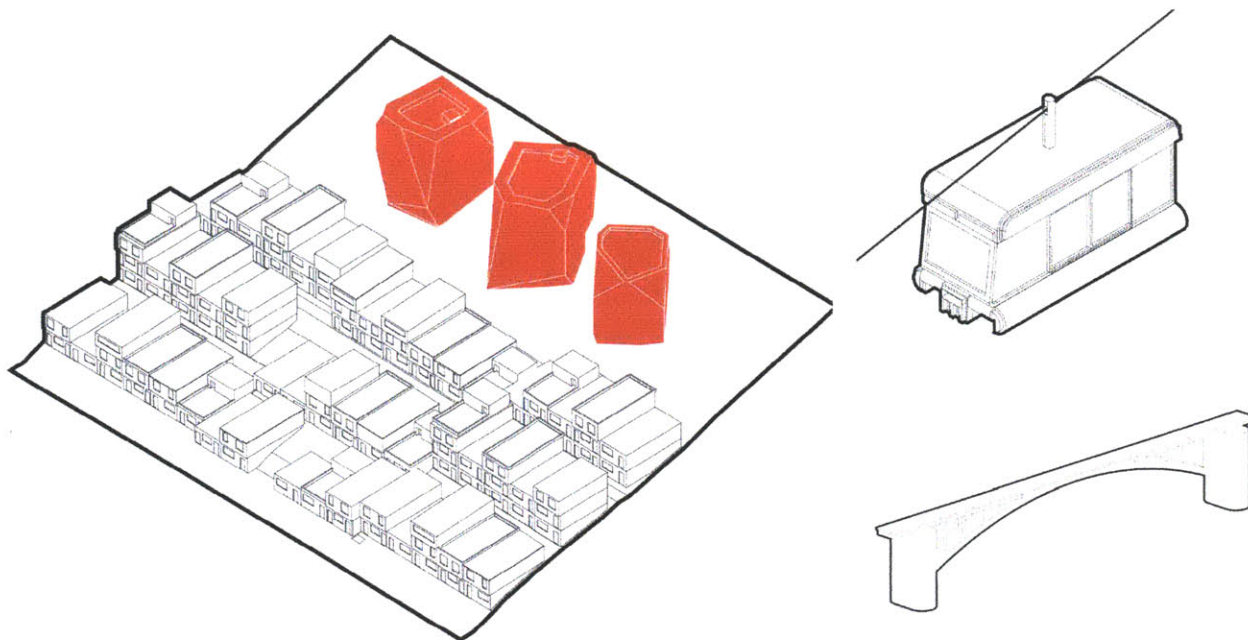


**Fig 3.13 Medellín Escalators**

The Medellín escalators is one of the signature projects developed as part of a PUI.

and of self-worth has had tremendous positive effects in Medellín neighborhoods that were plagued with violence and strife. Therefore the real innovation of the PUI can be attributed to the agency of the civic monument.

The civic monument as proposed by the PUI thus underpins the theoretical framework beyond a basic slum-upgrading. Yet, as implemented a civic monument such as a library is not adaptable and could become obsolete fairly quickly. Ever-changing communities might have different needs in the future or changes in technology might render the use obsolete. Thus, elaborating on how the monument is programmed and occupied has the potential to provide an adaptable yet useful intervention. The architectural monument for instance can be paired with programs that are practical yet necessary for the community. For instance a library can anchor the monument with a market. Serving both purposes not only allows for adaptability but also doesn't make it a library or a market, it becomes a civic monument without denomination, allowing future repurposing. Anchoring the monument with specific uses also allows for the introduction of Habraken's ideas of flexibility in buildings. The anchor programs



**Fig 3.14 PUI Interventions**  
Diagram illustrating the different type of projects that are included in a PUI.

will provide financial and organizational structure and at the possibility of creating spaces with enough flexibility for resident to control as needed. In this way as entrepreneurial ventures are organically developed by residents, spaces will be available to support them. The control of the spaces could be managed by the anchor programs or by community organizations. The advantage of this approach is that the monument supports not only the perception of the neighborhood but also the economic potential of the residents.

(Endnotes)

- 1 Allen, Stan. *Points + lines : diagrams and projects for the city*. New York: Princeton Architectural Press, 1999
2. Laquian, Aprodicio A. *Slums are for people: the Barrio Magsaysay pilot project in urban community development*. Manila: Local Government Center, College of Public Administration, University of the Philippines, 1968.
- 3 Saunders, Doug. *Arrival city : how the largest migration in history is reshaping our world*. New York: Pantheon Books, 2010.
- 4 Ibid
- 5 Ibid
- 6 Turner, John F. C. *Housing by people : towards autonomy in building environments*. New York: Pantheon Books, 1977.
- 7 Ibid
- 8 Habraken, N. J. *The structure of the ordinary: form and control in the built environment*. Cambridge, Mass.: MIT Press, 1998.
- 9 Ibid



**Fig 4 Stream in Bogota**  
Photograph of Quebrada  
Lina in Bogota

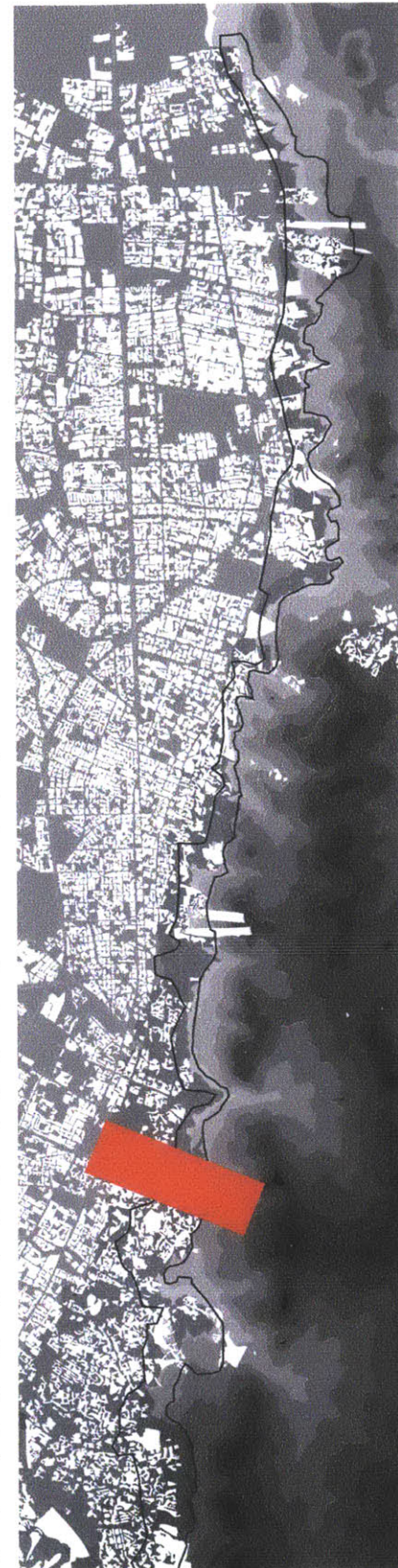
# 4. CONDITIONS





## CONDITIONS

The focus of this thesis is on the mountain-informal-formal condition which repeats a number of times along the 48 kilometer stretch of the Equalizing Zone. One site was selected in order to focus on specific issues that design interventions can address. This site will also serve to generate a strategy for design intervention that could be replicated and will be design as if it was given to urban designer or architect. The selected site is located in the historic downtown area of Santa Fe. To the west, the site begins at Tercer Milenio Park, crosses the colonial grid, climbs up the mountain beginning in the Egipto neighborhood and along the Manzanares brook ending in the neighborhood of San Francisco Rural. Tercer Milenio Park is a newly constructed park that housed a large homeless population as well as the largest illegal drug trade of the city. The area's precarious structures were bulldozed to make room for the park with the idea that this will disrupt the city's epicenter for drug activity and make the area safer. To the contrary, the drug distribution simply moved to the edge of the park and insecurity still is an issue in the area. Below the park the San Agustin River and San Francisco Rivers converge before they merge into the Fucha River which is one of the three largest rivers that cross the city. This thesis focuses on the corridor of the San Agustin River, which meanders below Calle 7 on the south end of the colonial grid. Many of the rivers were channelized and covered to build roads but the urban fabric still preserves the meandering path of the river, which contrast with the orthogonal grid of the colonial period. Towards the east, once the corridor crosses Carrera 3E, which is an arterial road the river is uncovered between the Egipto and Belen neighborhood. At this point of the corridor runs along the Manzanares Brook that descends from Los Cerros at a slope of approximately 15 percent before it arrives at the San Cristobal Rural Neighborhood. Along the corridor the informal neighborhoods are found at the high points of the slope and the formal city on the flatter areas. Most of the issues in the river corridor are found in the informal neighborhoods. Conditions of environmental degradation, housing shortages are prevalent in the informal side of the corridor. On the formal side the issues are of a different nature and similar to those of cities in the developed world. Los Cerros are a great amenity that is largely inaccessible because of the presence of the informal neighborhoods. The covered rivers represent a missed opportunity to provide amenities and green space to an area of the city that lacks them. The problems found



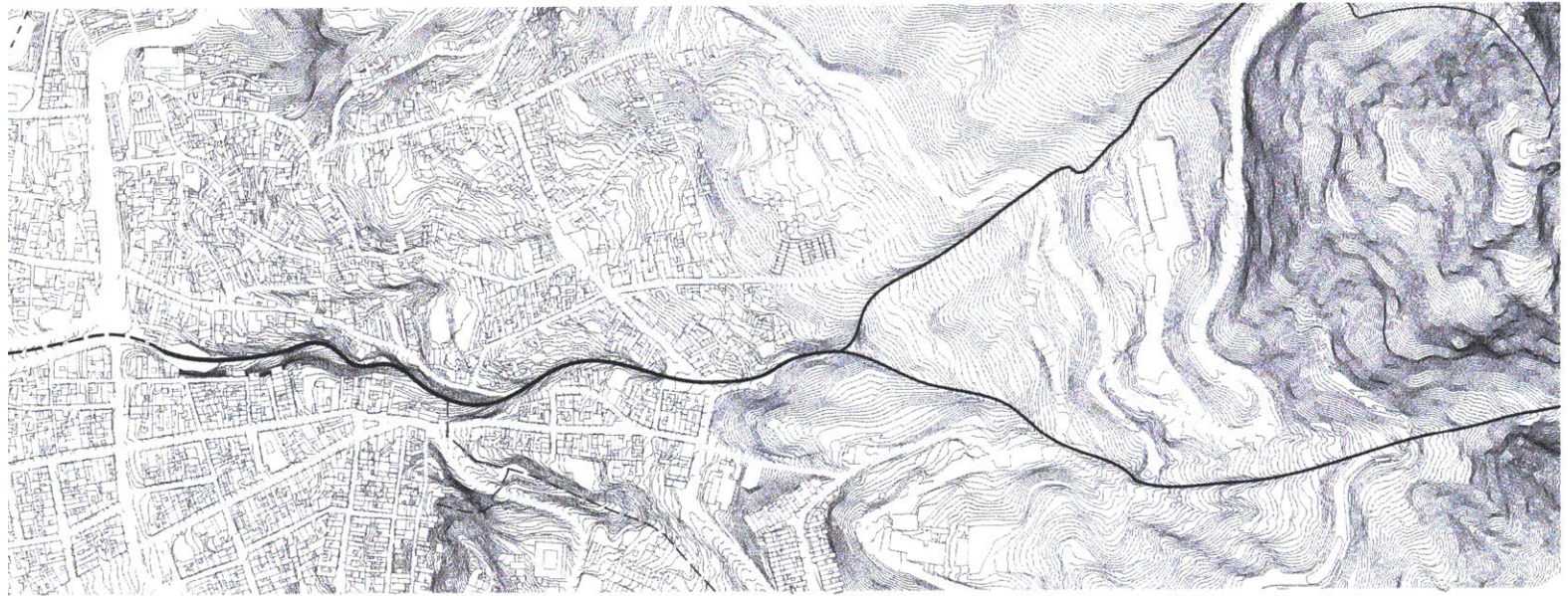
**Fig 4.01 Location of the Site**  
Map illustrating the site in the context of the city and the mountain.



along the corridor are contrasting, yet the informal section presents a larger problem because of the lack of infrastructure and support provided by the government. This thesis focuses on the problems in the informal section of the site but extends into the formal city as a strategy to generate connections between these two seemingly different cities.

#### **4.1 Housing and Immigration**

Similarly to other Latin American capitals Bogotá's rapid growth began in the mid-twentieth century. Due to economic opportunities in cities as well as a sort of civil war in the country side, large waves of migration began and continue to move into the city. Currently Bogotá still is the largest receiver of rural immigrants but there are also many immigrants from other cities. Between 1993 and 2003 there was a spike of internal migration from 7.1 to 8.1 million. Out of this internal migration 31.2% had Bogotá as a final destination. In the period between 1998 and 2003 Bogotá received 494,000 immigrants, 68,000 from the Atlantic region, 190,000 from the East, 134,000 from the Central region, 55,000 from the Pacific and 44,000 from other countries. In other words Bogotá received a population the size of Toledo, OH in 5 years and this in a period when immigration is at the lowest it has been in 60 years. Most immigrants move to Bogotá with no intention of returning to their place of birth.<sup>1</sup> The consequence of such migrations is that Bogotá is the largest and most heterogenous city of the country. Compared to Medellín the second

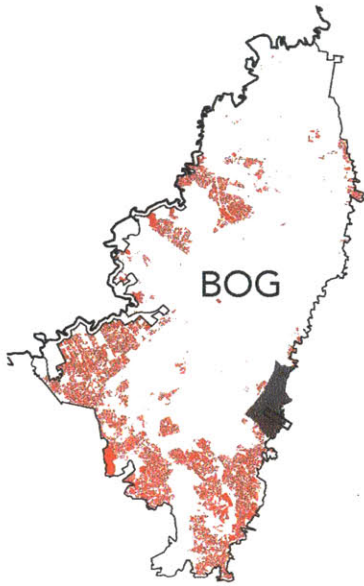


largest that continues to have a homogeneous cultural identity based in its region, Bogota is composed of all the regions of the country. This is evident as 40 percent of the current population are immigrants.<sup>2</sup> Bogota is therefore a reflection of the country's diversity, strife, different cultures and opinion. The population size and diversity complicates decisions at the political level as many competing visions for the future clash making decisions to add infrastructure and services very difficult.

Absorbing such large populations in a city with a developing economy also brings a number of issues, among them a housing deficit. While the city has expanded in area with a number of high density social housing projects have being built to accommodate modest salaries, large populations have been unable to find or pay for housing. It is estimated that Bogota has 2.1 million housing units and has a deficit of 245,000units.<sup>3</sup> The deficit is manifested in problems of overcrowding which mean multiple households per one housing unit, unsafe structures or lack of basic services. What this deficit translates to is that 23 percent of the population is forced to provide housing for themselves in an informal way.<sup>4</sup>

The site selected for this thesis exhibits some of the same issues seen at the city level. The site is located in the locality of Santa Fe, which encompasses the historic downtown that for the most part is composed of commercial uses. Most of the housing is located on the slopes of Los Cerros in marginal communities that are informal or have informal histories. Within the locality of Santa Fe it is estimated that there are 35,000 housing units, 5,000 of which are deficient.<sup>5</sup> Out of the deficient housing

**Fig 4.02 Plan of the Site**  
Plan of the site with topography lines, buildings and rivers.



**Fig 4.02 Bogota's Poor**  
Diagram of Bogota's locating the poorest areas of the city.

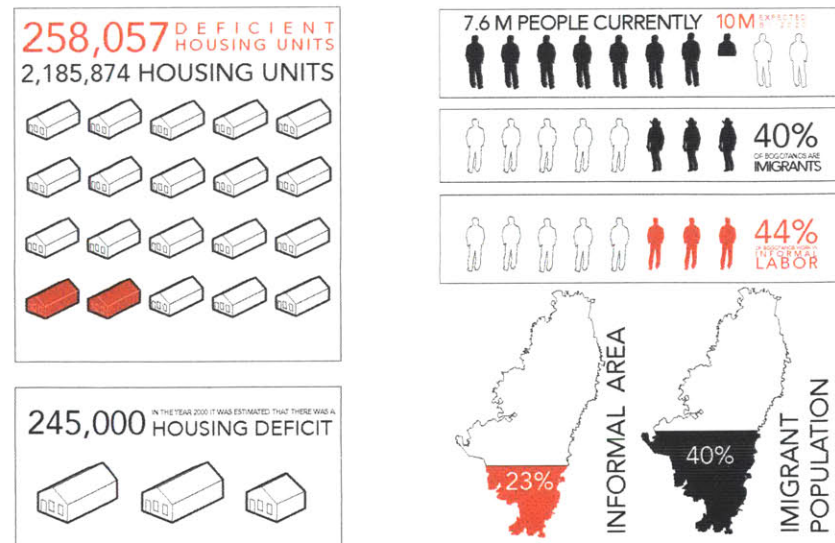
2,600 units are in overcrowded conditions and 2,400 lack services, have structural issues or both.<sup>6</sup>

The housing crisis in the city and in the locality of Santa Fe points out that the needs have not been met by the efforts of the city administration. Therefore informal developments will continue to occur because the government lacks the resources, will, or the organization to provide sufficient housing alternatives to marginal communities. Discounting social housing as a possible solution and acknowledging the inevitability of informal developments, suggest that the government should concentrate on strategies that can support the development of these communities. Governmental support should concentrate in providing infrastructure, services and resources as these are needs that cannot be informally built. These services need large investments and machinery that can only be provided by professional construction services.

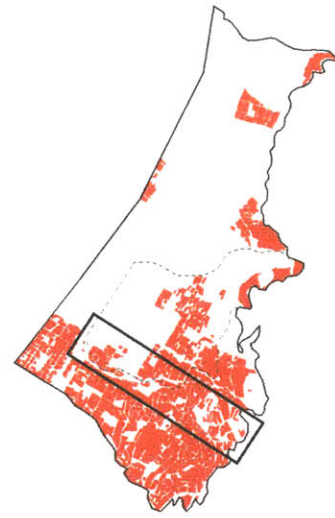
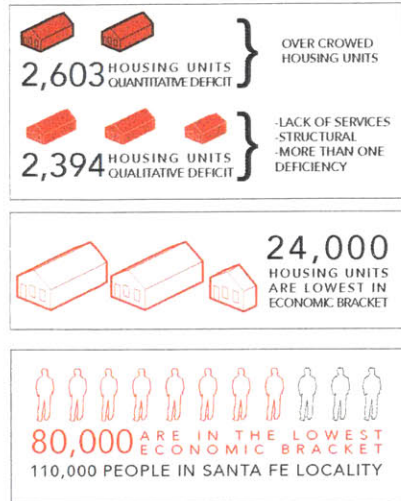
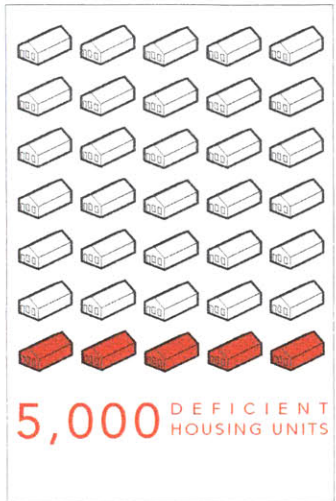
#### 4.2 Environmental Condition

Over the 500 plus years of Bogota's history, Los Cerros have gone through a significant ecological changes and for the most part have suffered environmental degradation. Rivers, fauna and forests are currently highly contaminated, decimated or are drastically altered.

There are 53 rivers and streams that begin in the high moors of Los Cerros and descend down the slopes meeting the city as they cross the Equalizing Zone. All these water ways merge into one of the three major rivers Salitre, Fucha and Tunjuelo that cross the city perpendicularly before flowing into the Bogota River. The origin of the Bogota River is the



**Fig 4.03 Bogota's Housing Crisis**  
Infographics representing Bogota's housing crisis and informality.



**Fig 4.04**

**Fig 4.05 Santa Fe's Poor**  
Map illustrating the poorest areas in Bogota's locality of Santa Fe's

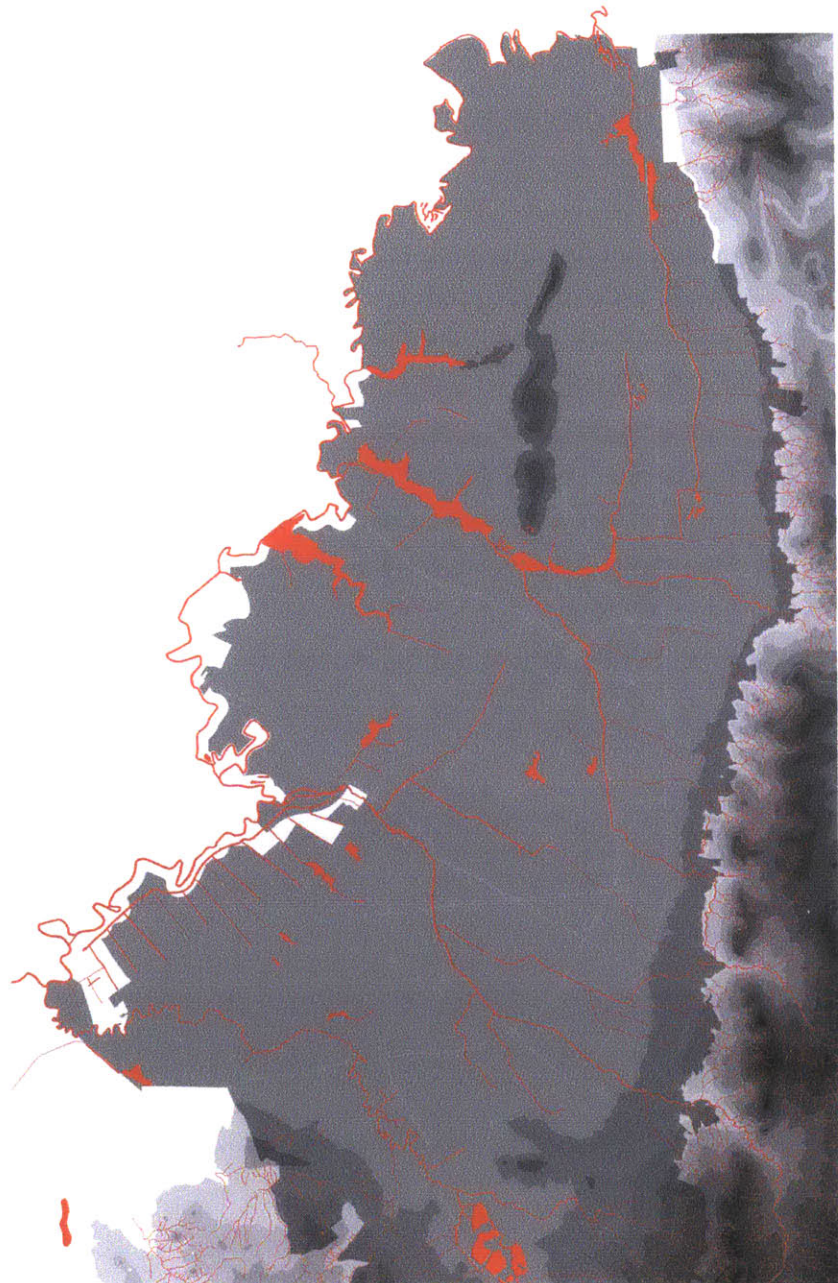
**Fig 4.04 Santa Fe's Housing Crisis**  
Infographic representing Bogota's locality of Santa Fe's housing crisis.

Guacheneque moor in the town of Villapinzon northeast of the city. The river flows southwest across a number towns before crossing Bogota's western edge, at which point it begins a steep decent of over 2,000 meters before arriving to the Magdalena River. The Bogota River is highly contaminated because the majority of the sewage waters of Bogota, adjacent towns as well as agricultural and industrial outflows are dump directly to it.<sup>7</sup> Roughly 50 percent of the sewage of the city is processed at a sewage plant; the remaining 50 percent flows directly into the river. For instance the Fucha River presents 189 mg/l of suspended solids, 0 mg/l of dissolved oxygen and high levels heavy metal such as led and copper. This level of contamination does not permit any level of aquatic life to the contrary the hydrological system operates primarily as a sewer system.<sup>8</sup> The contamination problem of rivers that cross the city begins in Los



**Fig 4.06 Bogota's Informality**  
Photograph of an informal settlement in Bogota.

Cerros as soon as the water ways cross the first informal neighborhoods of city. There are two main problems: first, that rivers are used as sewer and two, they are used as trash dumps. The problem of sewage is similar to the rest of the city. The majority of the residences in the informal neighborhoods have plumbing but the lines flow directly into the closest water way. Fairly recently the city built the sewage treatment plant of El Salitre which deals with 50 percent of the sanitary waste of the city and there are plans to build others to process the remainder. There are also plans to build a sewage system that runs parallel to the main rivers with separate sanitary and a stormwater systems. If these two proposals are



**Fig 4.07 Bogota's Hydrology**  
Map illustrating Bogota's rivers,  
brooks and streams.



**Fig 4.08 Trash in the River**  
Photograph of trash found in  
Quebrada Lima in Bogota.

built they will not do much if the informal neighborhoods continue to discharge their sewage into the closest brook, stream or river. The problem of the hydrological contamination needs to be addressed first at the origins and continue down stream -otherwise pollutants will continue to flow in the system.

On the other hand the problem of trash will also need to be addressed. Because the urban growth boundary prevented services and infrastructure to be provided to the informal neighborhoods in Los Cerros, many households do not have a place to dispose of their trash. In particular the highest and most remote neighborhoods lack trash pickup because there are no roads for the trash trucks or simply because they are not supposed to go there. Thus it is common for some residents to use the water ways as trash dumps. At the same time remote and informal areas lack governmental presence, which is ideal for illegal dumping. The result is that these sites become attractive to get rid of waste that is expensive to dispose of . Besides the hydrological system Los Cerros have experienced a dramatic alteration of their forest. Out of the 13,154 hectares that comprise the protected land 96 percent of the green cover is not native.<sup>9</sup> Only 4 percent of the native high Andean forest is conserved the rest has been transformed by invasive species, altered, degraded or urbanized.<sup>10</sup> In fact the actual natural appearance of Los Cerros is not the same as what the Spanish first saw, most of the vegetation such as eucalyptus are non native. In a beautification attempt the government institutions planted large areas of Los Cerros with resilient but non native species.

**Fig 4.09 Makeshift Canal**  
Photograph of makeshift water infrastructure in an informal settlement and erosion around it.



### 2.3 Risk

The peripheral areas in the city that are most likely to be developed informally are those that are less desirable and in many cases this means that they are areas of high risk. This is true in the context of Bogota. The base of the mountains where the informal communities of Los Cerros have settled are at high risk for landslides and flash flooding.

Landslides occur naturally at the base of the mountain but are also a product of human interventions and negligence. In the process of urbanization forests and vegetation cover are removed to make room for housing. After urbanization, it is common for residents to use adjacent areas for grazing livestock. At the same time building practices are rudimentary which means that the houses are not structurally sound and that the storm and sanitary outflows are set up without any technical understanding. All of these haphazard human interventions are a product of a lack of knowledge in building techniques and access to necessary resources and tend to heighten the risk of landslides because they create problems such as erosion. It is also common for houses to be built too close to the rivers or on steep slopes. These construction types are of high risk because torrential rains, which are common place in Los Cerros. The rain destabilizes the soil beneath the structures making them collapse and slide down the slopes. Uses such as extraction or quarries are hazardous for landslides too. Some of these sites are inactive but they are still used informally as the rock is easily sold to builders in the formal city. It seems counterintuitive that the informal builders are not skilled in construction, however the reality is that most immigrants are skilled only in farming and have basic knowledge of construction - specifically construction for areas of high risk.



On the other hand there are issues of flash flooding in particular in low areas of the slopes. Torrential rain events are ordinary in the subtropical highland climate of Bogota. For the most part flooding is an issue that affects the banks of the Bogota River where other marginal communities have settled. Yet, because of the intensity of the rain, the steep slopes and the channelizing of the river in the formal city flooding is also an issue in low areas of Los Cerros. The rivers transition from a natural setting to the channels under the city in the lower areas of Los Cerros. These transition points can be easily overwhelmed by the amount of water in torrential rains and consequently flooding their vicinity. The low areas are also the most densely populated because they are the closest to the formal city. Thus many houses are built too close to the river regardless of the flooding and landslide hazards.

These issues are well know by the city and residents. The city agency in charge of risk, Fondo de Prevencion y Atencion de Emergencias (FO-PAE) have developed educational campaigns and attempts to assess risk conditions on a case by case basis. Social and technical workers visit informal communities provide technical help and identify houses that need to be resettled because of high risk. In a field visit to the neighborhood of Ciudad Bolivar, an area south of the city, I talked to a group of these workers that had assisted in resettling a number of houses to higher ground.<sup>11</sup> During the conversation they mentioned that two year prior a large number of houses had been purchased by FO -



**Fig 4.09 Landslide Risk**  
Diagram of the site illustrating the areas of high, moderate and low risk.



**Fig 4.10 Bogota Canal**  
Photograph of the Channelized Fucha River.

PAE in order to resettle the families to a safer area. By the time we visited the area that was deemed high risk it had been resettled again with a number of wood shacks built by a new wave of immigrants. In the same visit some community leaders and residents made a verbal petition to the Water and Sewer company of Bogota (El Acueducto de Bogota) to channelize the streams because they were flooding the neighborhoods in the low areas.

These two incidents illustrate the technical but also human complexities that are present in informal high risk areas. On the one hand resettlement of some areas are crucial because of their risk. Yet this same areas will get resettle because of the inability to continue to check and control them. On the other hand resident are well aware of the risks but are faced with no alternatives. From the City's perspective the scarce financial resource are not being used efficiently. Therefore future policies should take into account that informal development will continue as long as there is a need. Strategies will only be successful if they acknowledge the phenomena of informality and instead of controlling, they should support the



development of them by providing adaptable infrastructure that prevents risk but also provides basic services.

**Fig 4.11 Los Cerros From the Site**  
Photograph looking at Los Cerros from Calle 7.

(Endnotes)

1 *Evidencia Reciente Del Comportamiento De La Migracion Interna En Colombia a Partir De La Encuesta Continua De Hogares*. Departamento Administrativo Nacional de Estadística DANE, 2003.

2 Ibid

3 *21 Monografías de las Localidades - Localidad #3 Santa Fe*. Secretaria Distrital de Planeacion - Alcaldia De Bogota D.C., 2011.

4 Ibid

5 Ibid

6 Ibid

7 *Rio Bogota - Adecuacion Hidraulica y Recuperacion Ambiental*. Corporacion Autonoma Regional de Cundinamarca, n.d. <http://www.car.gov.co/?idcategoria=1206>.

8 Ibid

9 Weisner, Diana. "Plan Director del Corredor Ecologico y Recreativo de Los Cerros Orientales". Alcaldia Mayor de Bogota, Secretaria de Planeacion, 2007.

10 Ibid

11 Reyes Parra, Laidy Marcela. "Visita De a La Quebrada Lima, Ciudad Bolivar - Acueducto Aguas y Alcantarillado De Bogota", January 18, 2013.

# INFORMAL



Landslides



Trash



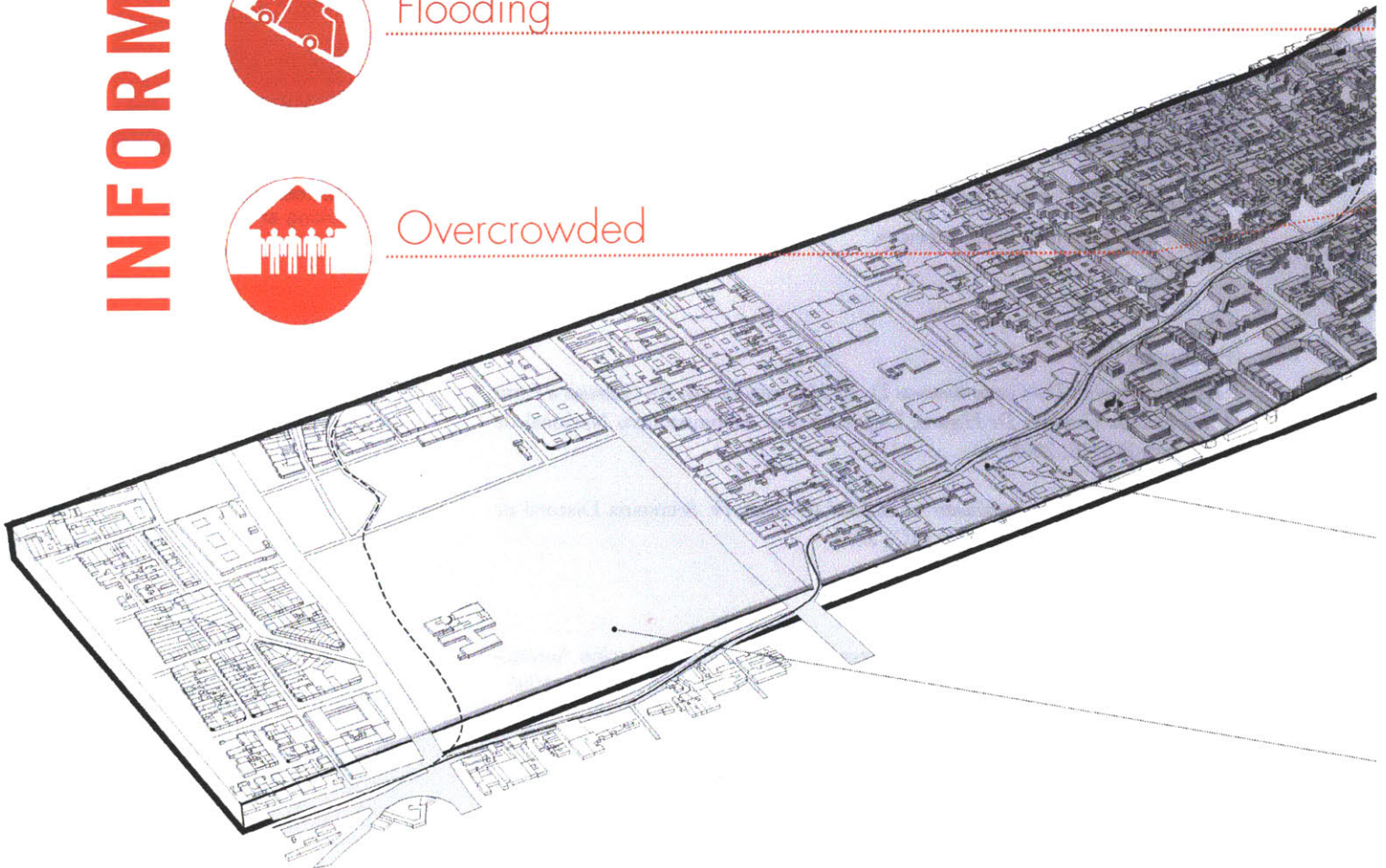
Sewage



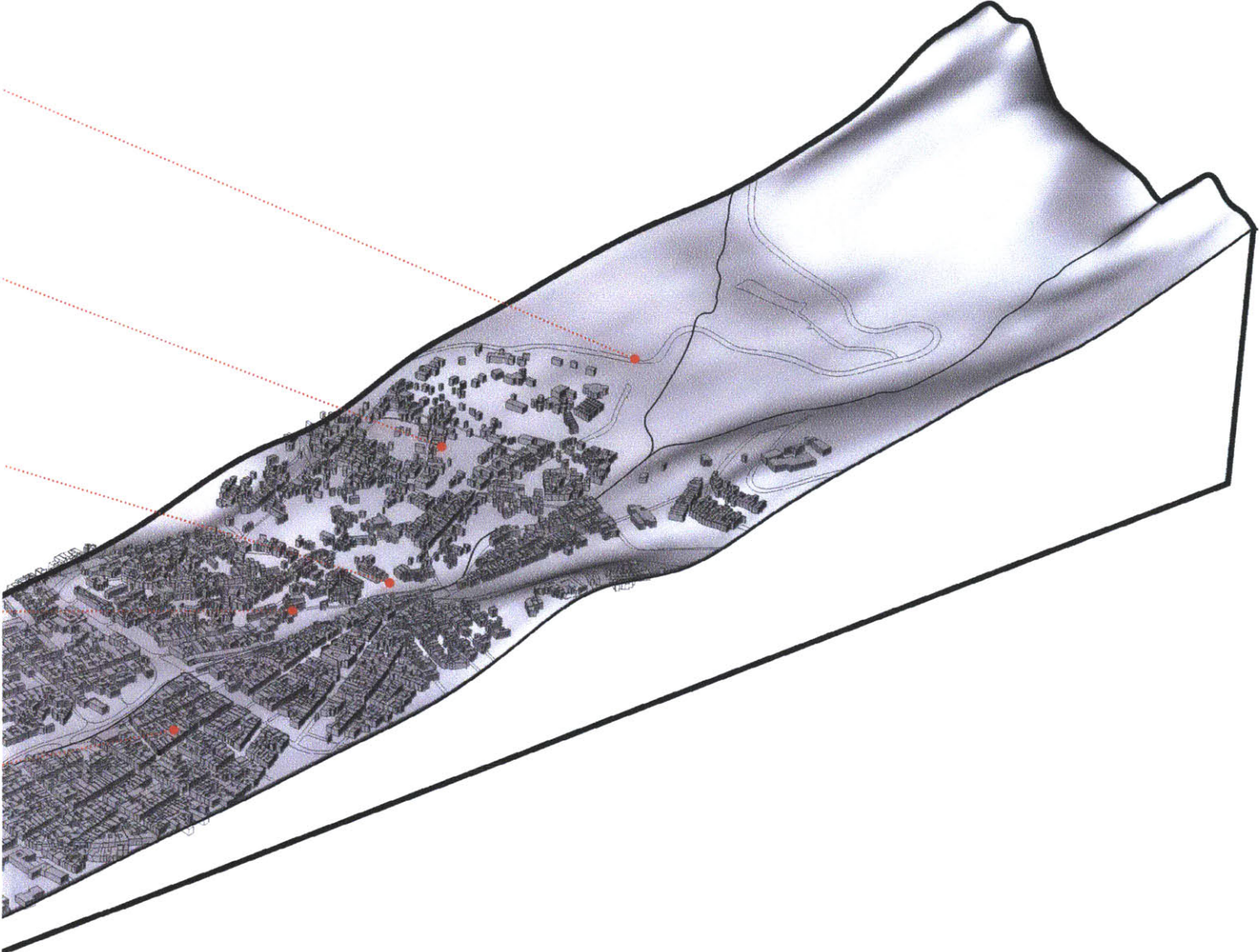
Flooding



Overcrowded



**Fig 4.12 Site Conditions**  
Illustration of the different  
conditions found in the site.



Covered urban river



Leisure



**FORMAL**

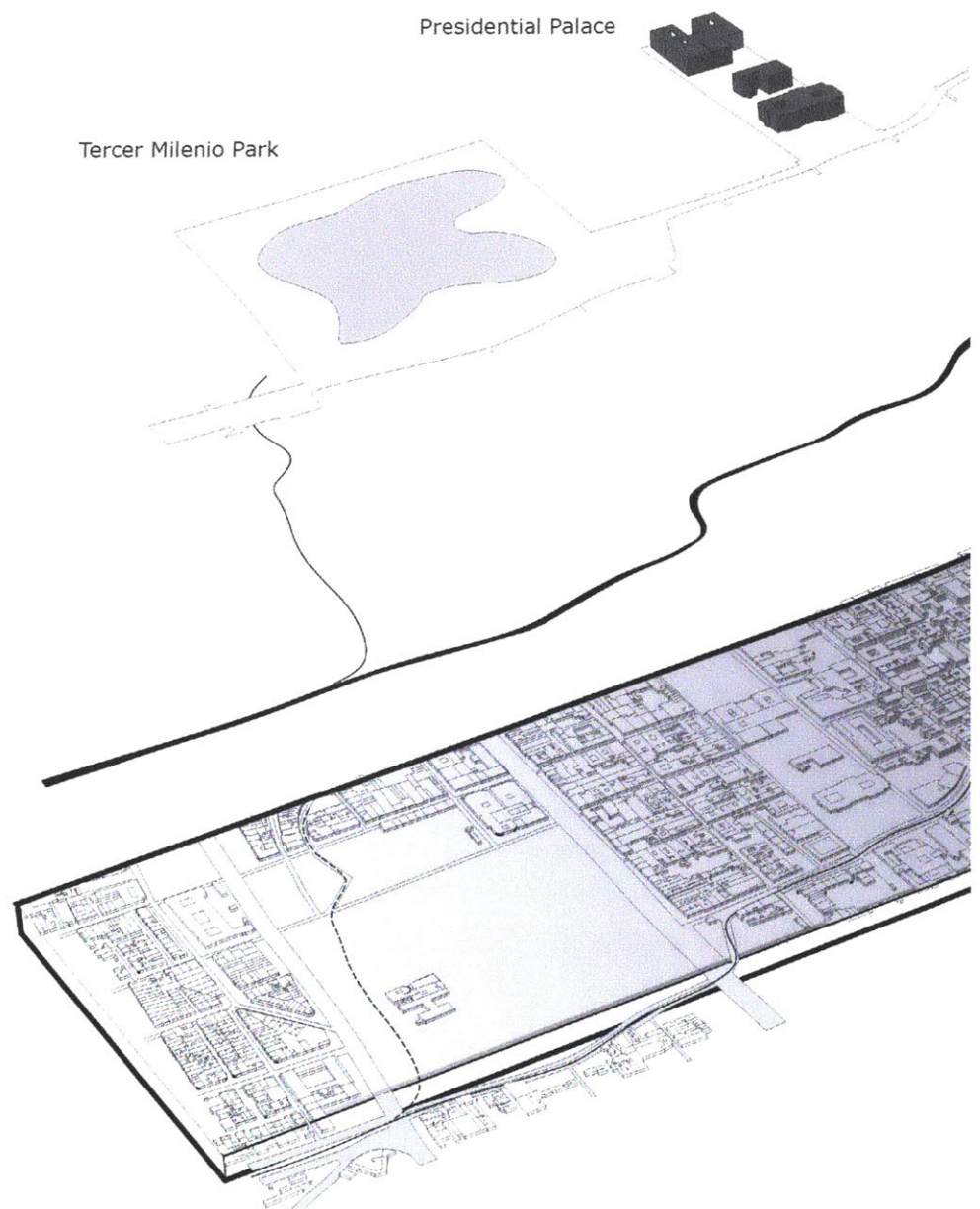


**Fig 5 Informal Formal Transition**  
Rendering of proposed architectural  
intervention at the informal formal transition.

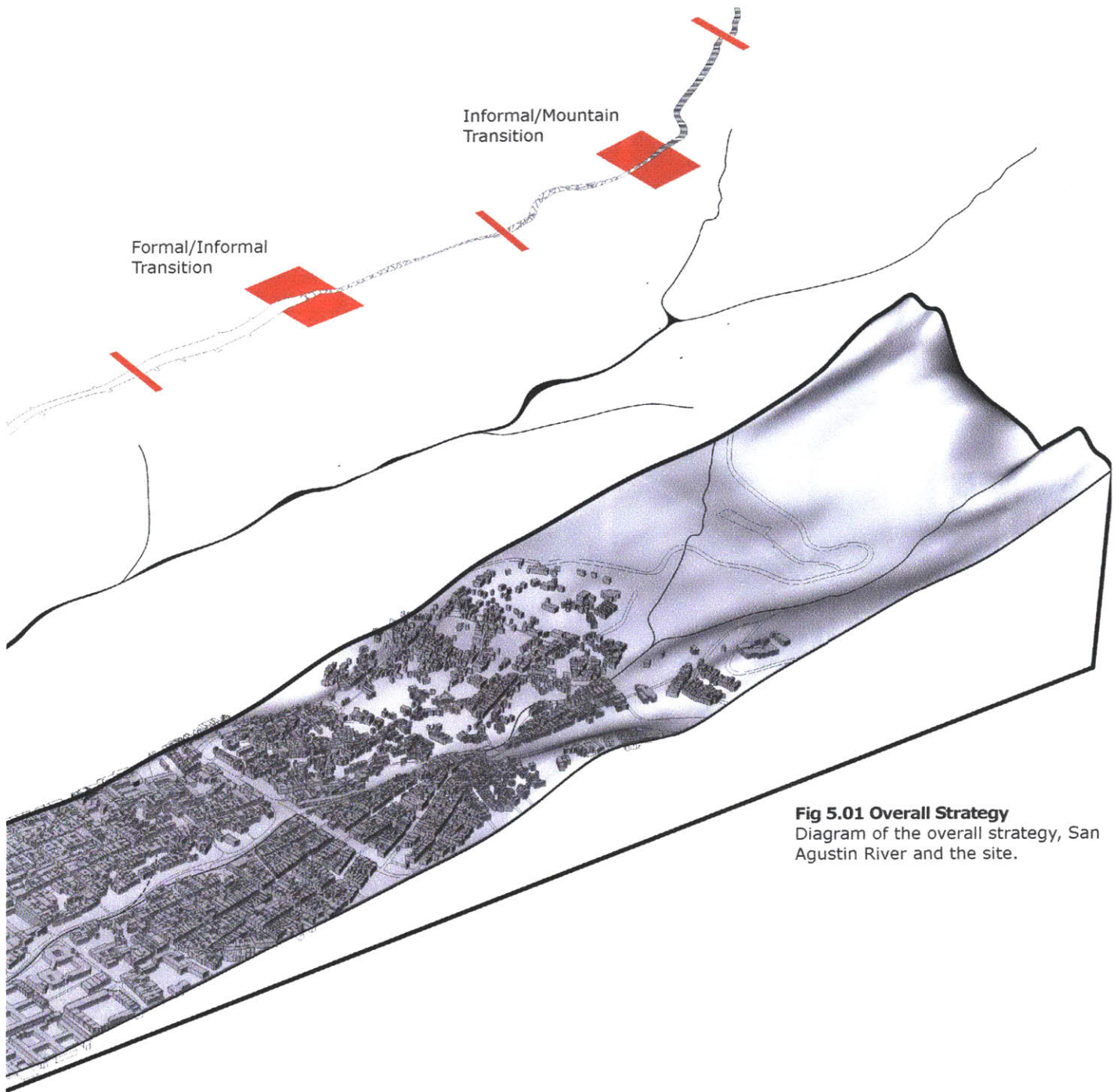
# 5. STRATEGY + INTERVENTIONS

## STRATEGY

The main goal of the proposal is to develop a strategy that can be replicated indeterminately along the equalizing zone. In this way the strategy could be adapted and operationalized at different times with different designs, but will continue to have the same effect on the communities that it serves. The site that was selected exhibits a set of typical issues in the informal areas and different set in the formal section. Thus, the site was divided into formal and informal and linked by an overall strategy that spanned both. As the connector the overall strategy will be a critical com-



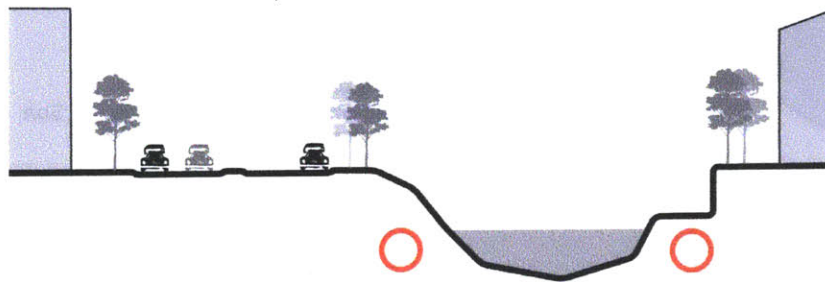




**Fig 5.01 Overall Strategy**  
 Diagram of the overall strategy, San Agustin River and the site.

ponent as it would operate in the formal and informal spheres. On the other hand the formal and informal proposals would have to be adaptable to respond to specific site issues that will change along the stretch of the equalizing zone.

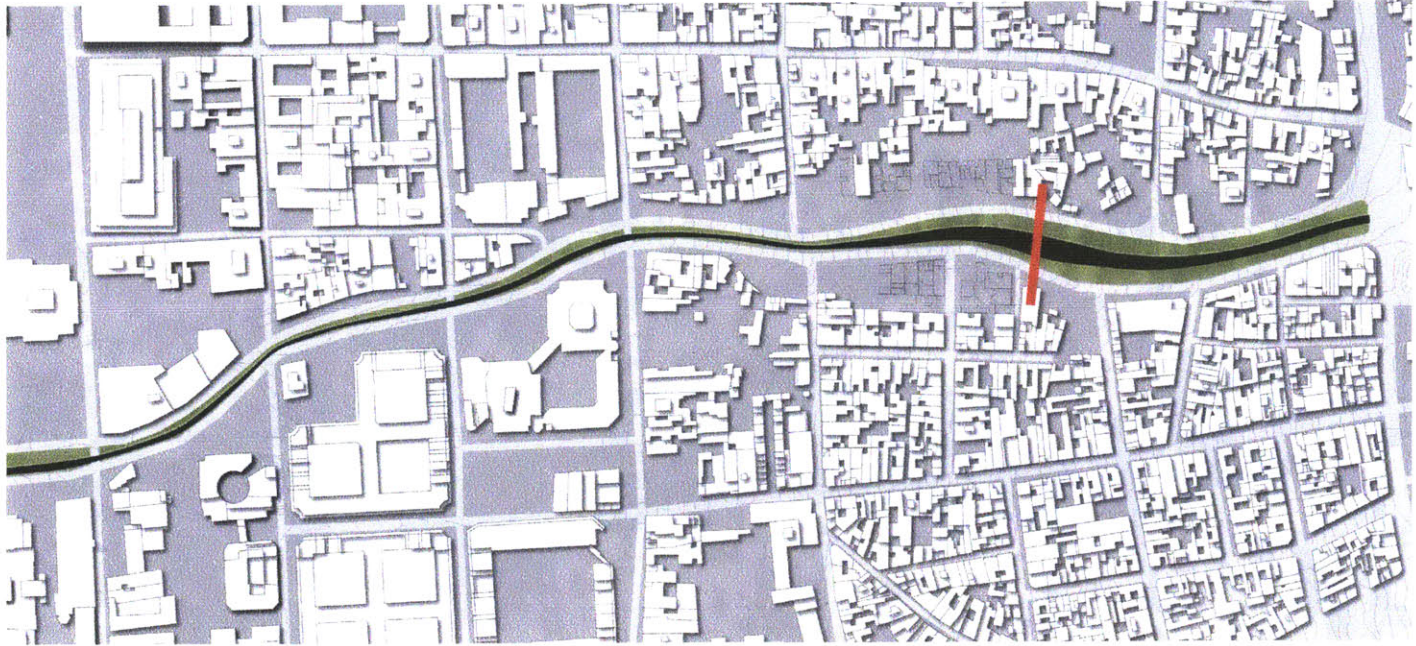
The overall strategy takes advantage of the hydrology of Los Cerros. The 53 rivers and streams that descend from Los Cerros are perhaps the most consistent feature that is found along the stretch of the equalizing zone. For the most part they exhibit similar issues of contamination but they



**Fig 5.02 Proposed Formal Section**  
Section illustrating the river day-lighting proposal

**RMAL: STREAM DAY-LIGHTING**

also represent an opportunity to reinvent the relationship of the city to Los Cerros. The rivers and streams cross Los Cerros and the city perpendicularly and while not celebrated and part of the collective imaginary they are present throughout the formal and informal city. Therefore the strategy is to use the waterways as corridors that connect the city with Los Cerros and the formal with the informal. The advantage is that this corridors are already present because for ease of construction the urban fabric has historically accommodate to them. The proposal is to provide infrastructural upgrades that separate the river, sanitary and storm flows as a strategy to revitalize the corridors along waterways. This underground strategy that will revitalize the rivers also changes the surface.

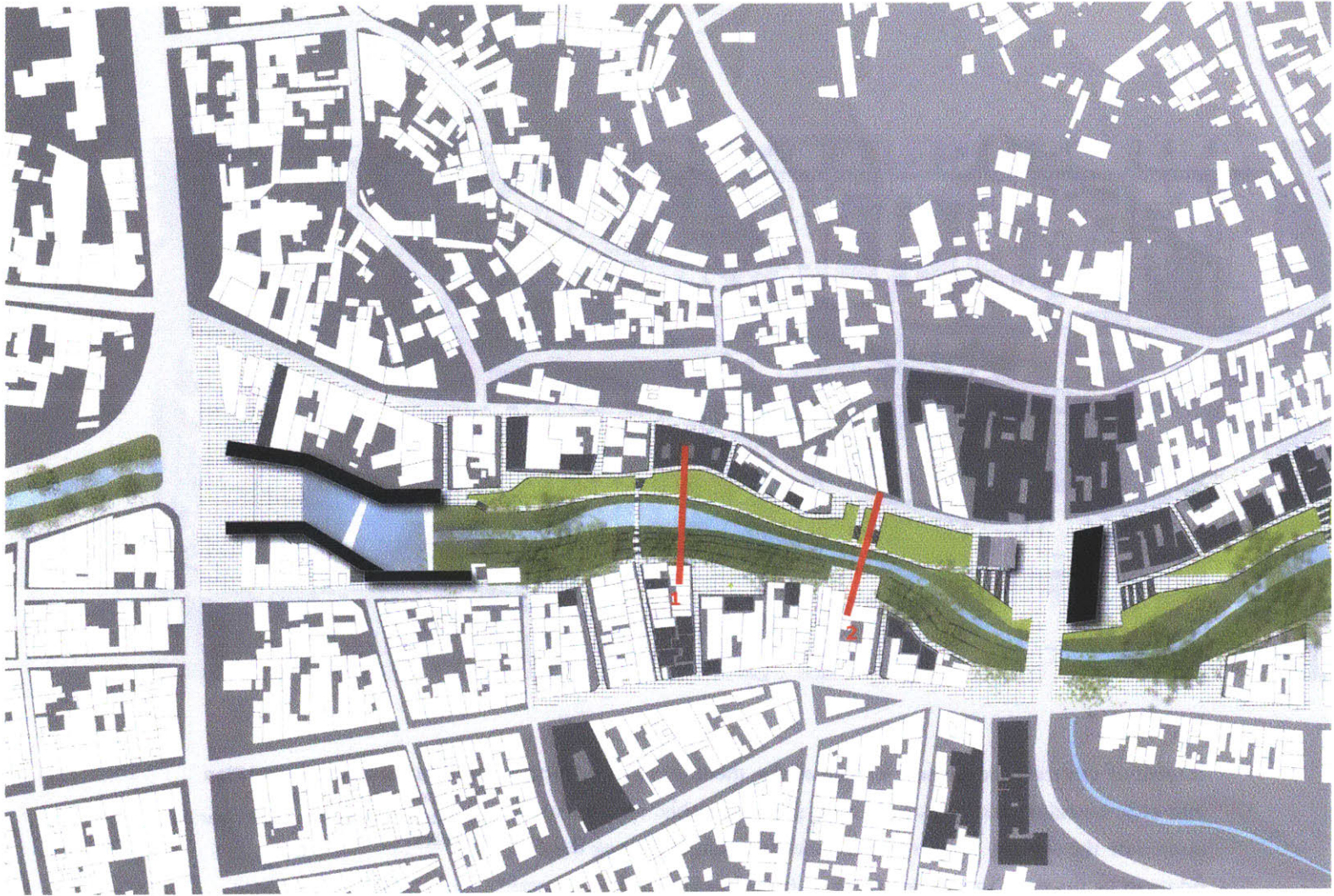


Instead of covering the stream or channelizing them they can be turned into civic corridor that operate as linear parks or public spaces. At the same time the strategy proposes that parks are identified along the corridors to be flooded. To address issues of flash flooding in the low areas of Los Cerros the corridors need areas to be used as regulating valves and release some of the excess water during torrential rain events. Finally the strategy proposes that the transitions between the formal to the informal and to the mountain should have architectural interventions that accentuate the corridors by introducing high quality civic building that act as monuments.

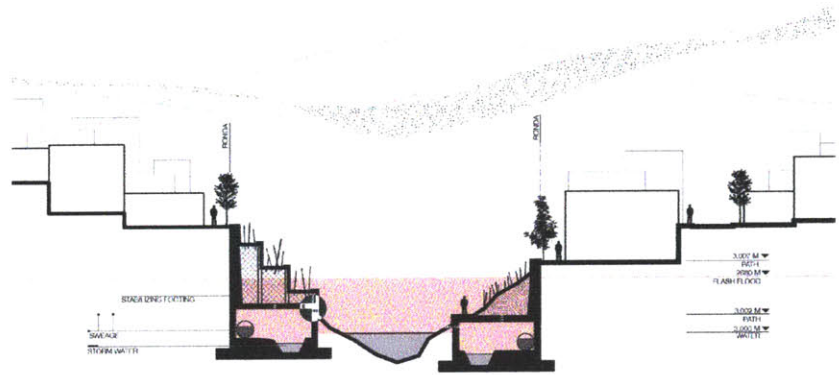
**Fig 5.01 Proposed Formal Plan**  
Proposed plan showing the infrastructure corridor, the river and the park.

## INTERVENTIONS

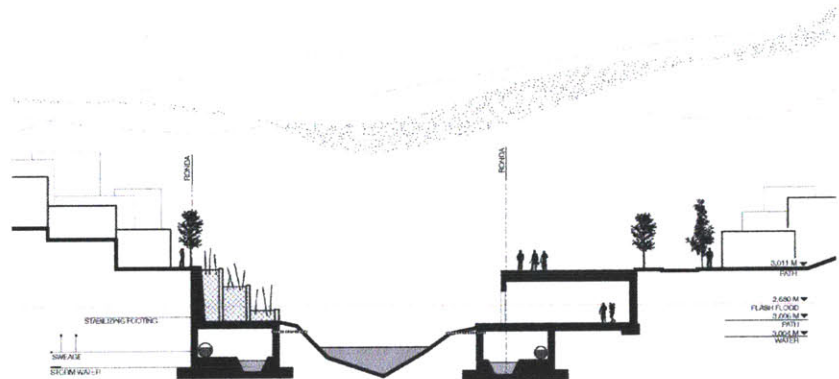
The goal of the intervention on the formal side is to provide a public amenity for leisure, address the covered river and extend the hydrological corridor of Los Cerros. The strategy begins by proposing to day-light the San Agustin River. This River, which once flowed across the city shaped the blocks of the colonial downtown. Because the blocks were arranged according to the river flow there are no buildings over it. Instead the river was covered to create a wider road for automobile traffic. The proposal takes advantage of the continues and wide right-of-way to daylight the river along side the roads. Day-lighting the rivers offers to possibility of

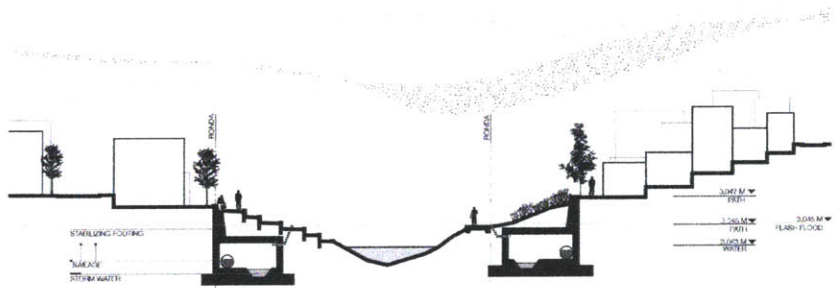


**Fig 5.04 Cross Section 1**  
Section in the lower areas of the corridor illustrating flashflooding.

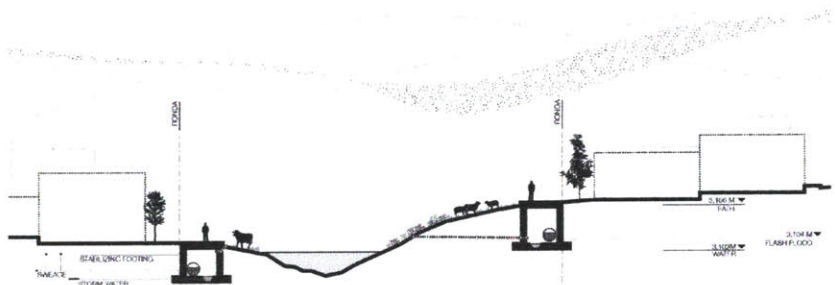


**Fig 5.05 Cross Section 2**  
Section in the lower areas of the corridor with public building.





**Fig 5.06 Cross Section 3**  
Section of the middle section of the corridor.

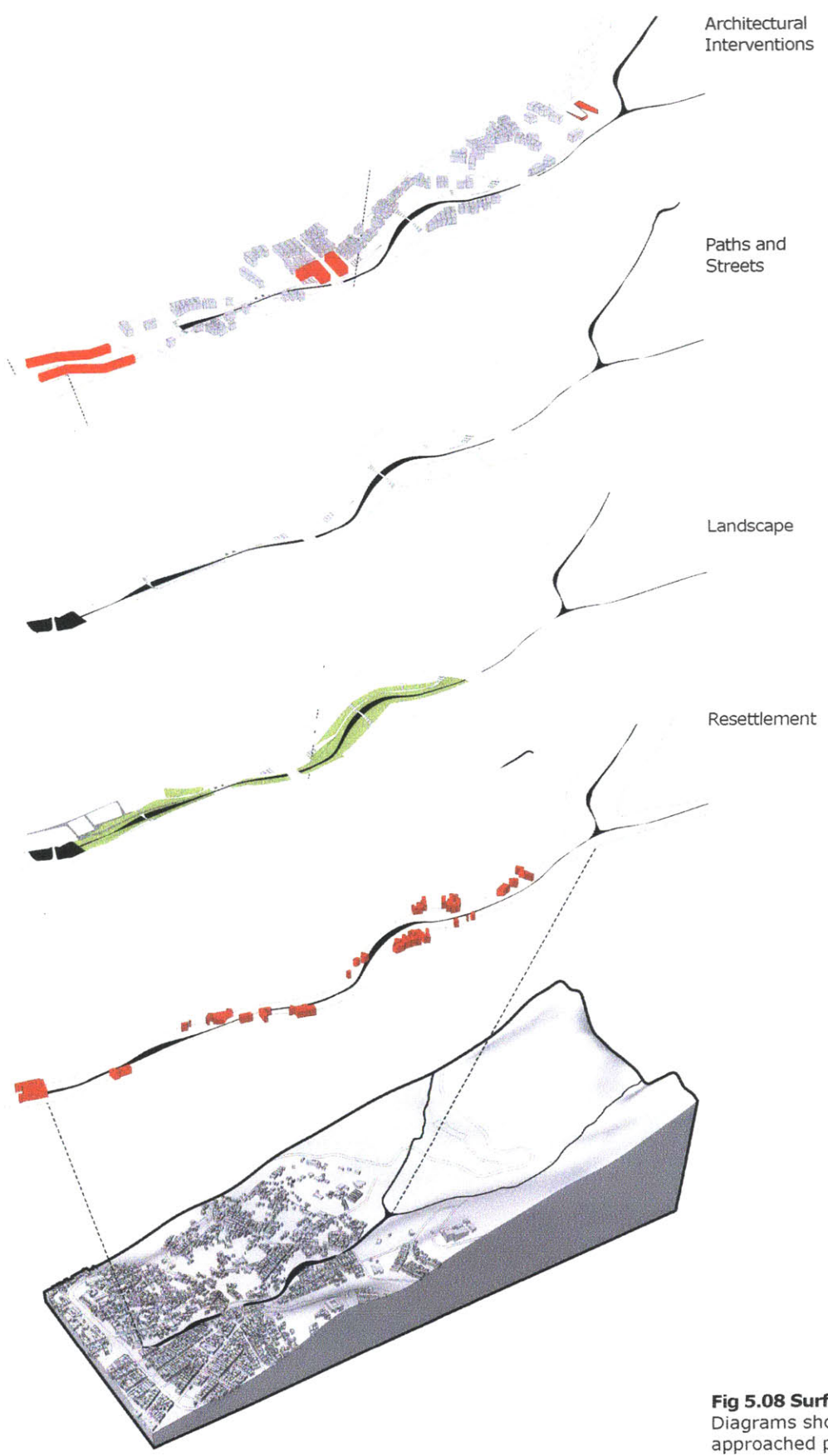


**Fig 5.07 Cross Section 4**  
Section at the high areas illustrating future informal developments.

creating a linear park along the corridor that could be for used for leisure or beautification of the city. Day-lighting the river is important to the strategy because it is the first step to revitalize the river and to provide a continues corridor between the formal and informal. Besides the day-lighting strategy, the sanitary, storm and river water are separated to isolate contaminant in separate sewage mains. The San Agustin River also runs south of Tercer Milenio Park before merging with the San Francisco river. The intent of the proposal is to redesigned the park to be flooded when torrential rain evens and potential flash flooding occurs.

In the informal side the intervention is more involved as there are a number of problems that need to be addressed. Beginning with the infrastructural intervention, the proposal's main intent is to provide sewage to current and future resident of the informal areas. However, since this intervention are highly disruptive and costly the proposed infrastructure is adaptable and multipurpose. Therefore instead of simply providing a sewage main, a concrete footing with a multipurpose box was proposed. The first goal is to provide sewage to current and future informal residents by providing access to the sewage main. Instead of burring the pipe line which will make it problematic for future developments to access, the pipe runs within a concrete box that informal builders can access and connect their new sanitary outflows. The footing also separates the sanitary mains from storm water and allows the river water to flow without sewage discharge. The storm water, which run within the concrete box also acts as a back up drainage pipe during flooding conditions. When rain events flood adjacent areas the box and storm water line receive excess water drain it out. The flood water flows in the box down the slope and gets discharge in the Tercer Milenio Park down stream. Flooding the park but preventing flash flooding in the lower informal communities of Los Cerros. On the other hand footing acts as a slope stabilizer. Since the sewage box has to run continuously along the river it can also operate as a footing along its length. Thus it provides structural underpinning to the river banks, which tend to create landslide.

Along the infrastructural intervention, there is an above ground strategy. The goal above ground is to formalize the corridor as a civic spine that connects the informal neighborhoods and the formal city. To formalize the corridor a safe offset distance need to be kept between the river an habitable structure. Since there are already numerous houses within the safe line or *ronda*, the resettlement of residents that are too close to

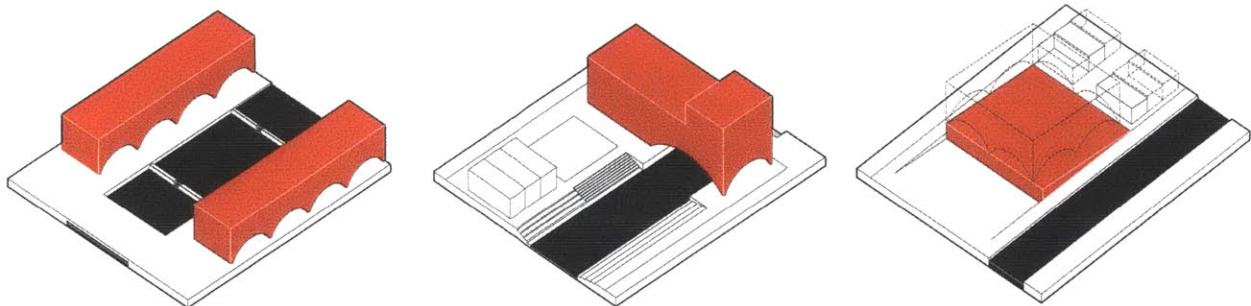


**Fig 5.08 Surface Strategies**  
 Diagrams showing the different  
 approaches proposed on the surface

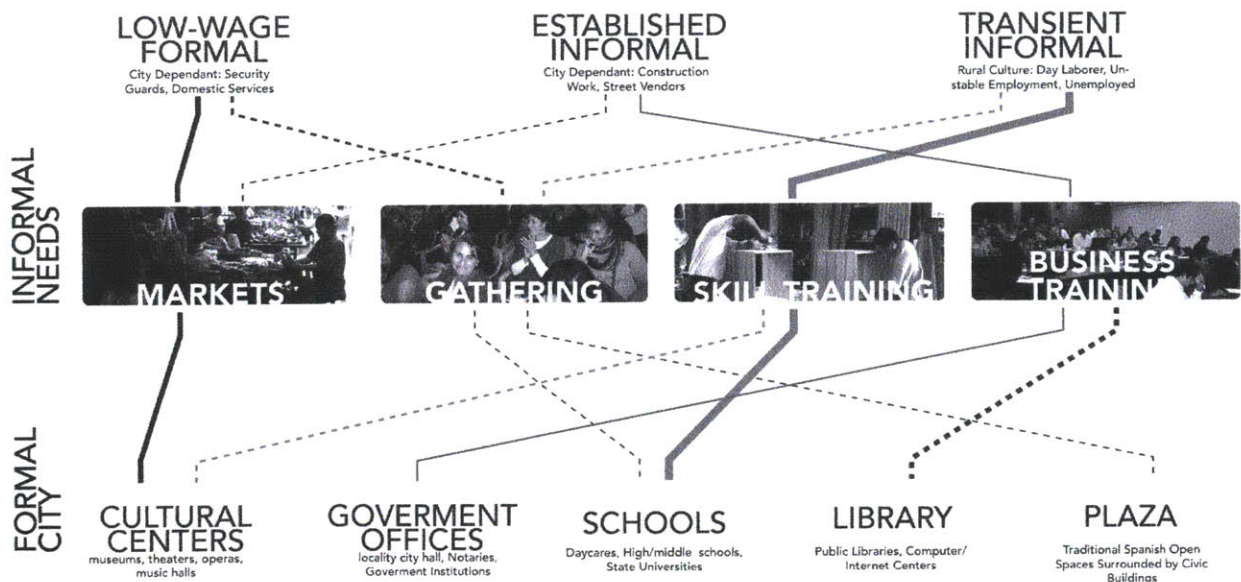
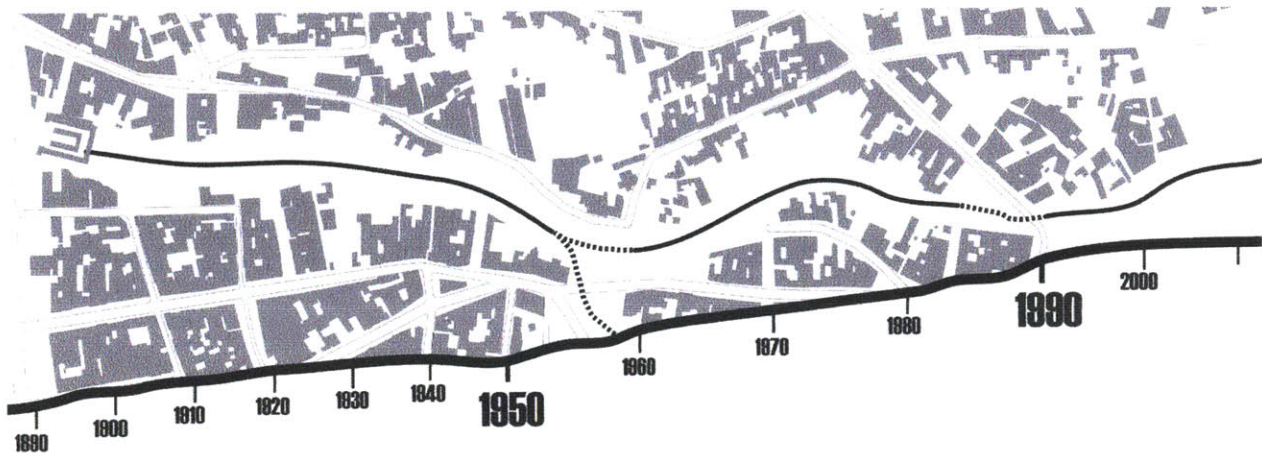
the river is necessary. Therefore all the structure that are in their majority within the safety line will have to be vacated and demolished. Instead of sending resident to other parts of the city lots are created along the formalized corridor and provided to the affected household with economic help for rebuilding. Clearing the safe zone of the river also allow for other infrastructural improvements to be built along the corridors. Lacking streets and paths are then introduced to the corridor, defining blocks and potential lots resettle houses and future housing. The areas immediately adjacent to the river are landscaped and programed for leisure activities. Because of the steep slope at the river banks some structure for recreational use are also added. This structures are non-habitable but provide shelter from different public events. Finally architectural monuments are introduced in order to introduce civic institutions to the marginal communities that don't have them.

The architectural monument is a critical component as they symbolize the government's investment in the community. This model follows the *Proyecto Urbano Integral* (PUI) that the city of Medellin implemented in a number of informal neighborhoods of the city. The PUI are interventions that are comprised of community outreach, infrastructural improvements, housing and signature buildings. Sergio Fajardo the mayor that began implementing the PUIs famously called for the "most beautiful building of the city to be build in poorest areas". The importance of the architectural monument is in message that is broadcasted by the interventions to the informal neighborhoods, the city at large and beyond. The message is of acceptance into the city. Before the buildings the informal neighborhoods don't belong, they are illegal and ephemeral. The buildings grant them permanence, acceptance and the message is broadcasted. Many slum improvements of infrastructure and public spaces similar to the PUI have been developed since the 1970 by governments and the World Bank. Most of these projects are unnoticed and fail to create the same response as the PUIs because they are perceived as partial interven-

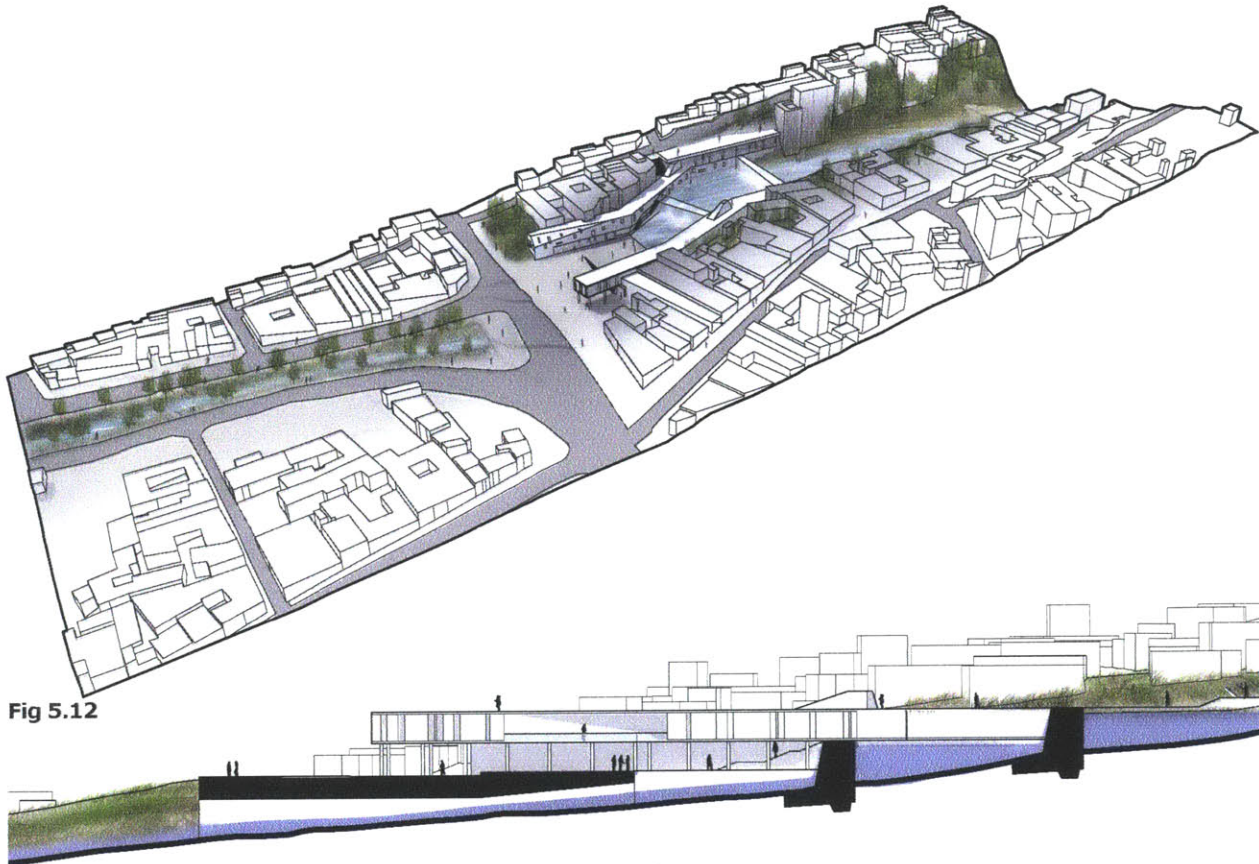
**Fig 5.10 Monuments**  
Diagram of the three monuments to proposed for the infrastructure corridor.







**Fig 5.11 Neighborhoods in the Site**  
 Diagram illustrating three neighborhood in the site and their different building stock, urban fabric, and needs.



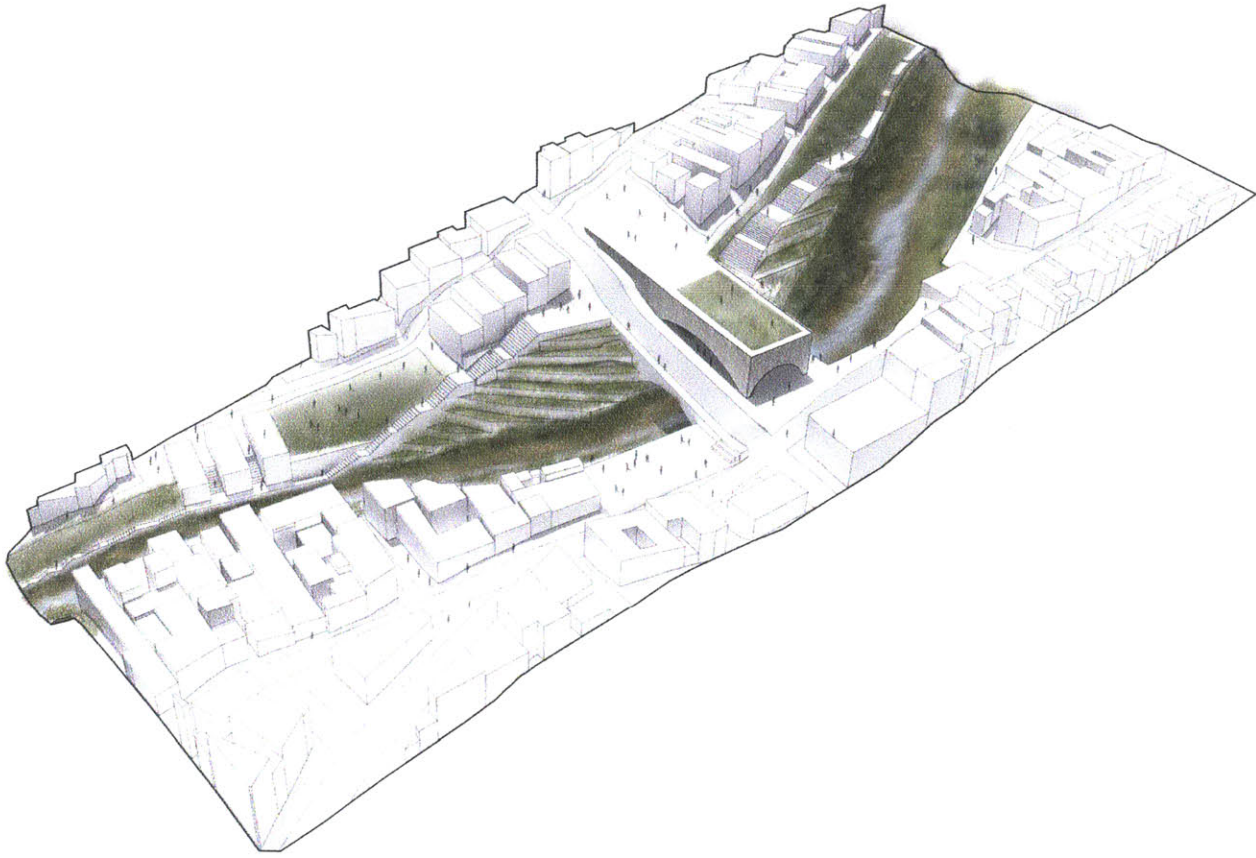
**Fig 5.12**

**Fig 5.12 Informal/Formal Aerial**  
Aerial view at the informal/formal architectural intervention

**Fig 5.13 Informal/Formal Section**  
Longitudinal section through the river showing the potential for mini-dams to create energy, aerial water and collect solids.

tion without most effect in the community.

Yet, the architectural interventions of the PUI are of singular in use and don't provide the adaptability that informal neighborhoods require. The great examples of the Public Libraries such as Biblioteca Parque España are civic monuments that can't easily adapt to changes in technology or different uses. They are rigid as they are design to be one thing –libraries. Based on the idea by John Habraken that buildings can or should be a framework in which the uses are flexible and adaptable; this thesis proposes a different architectural intervention. The civic intuitions are critical but buildings can house these uses as well as others that can support the development of the neighborhood. For instance schools can be paired with skill building workshops, government offices with community centers, or markets with cultural centers. The advantage of multiuse building is that they are not design with a singular use in mind that gets expressed in the architecture. Therefore, the building breaks the relationship between use and architectural expression making creating not a library or a theater but a monument. Furthermore, these two main uses can operate as anchors that support other adaptable spaces that can be use by



the community to start business. Because of the economic need and vitality of the informal neighborhoods many houses serve as the place where business begins and evolves. Some of this business however might require different spaces which can be provided and administered by the anchor programs of the buildings.

Three architectural interventions are proposed for the site. Each building operates as a hybrid civic monument with multiple programs and design to support the overall strategy of the thesis. The first building is located in the transition between the formal and informal city. This building set as a market as a market and a cultural center also needs to open the informal neighborhood to the formal and create a gateway to the corridor. The building needs to provide clear access to the river and engage it in the public space that creates. By engaging the water the building can also create energy, aerate the water and filter the solid waste in the water. The proposed building creates a series of mini-dams that create waterfalls that generate energy by placing turbines at the bottom of the fall. The waterfalls aerate the water and the dams can filter the solid waste that is in the river. Hence the building performs multiple programmatic and practical

**Fig 5.14 Bridge Building Aerial**  
Aerial view showing the Bridge building along the corridor.



**Fig 5.15 Catalyst Building Aerial**  
Aerial view showing the catalyst building along the corridor.

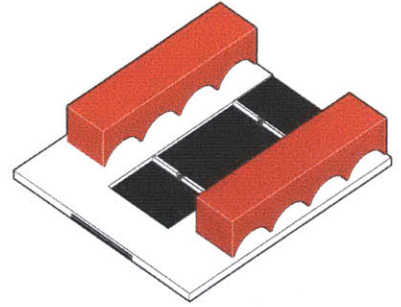
functions that support the overall strategy and the adjacent community. Up stream a second building is proposed. This building is located in an area with different housing stock, urban fabric and population. The building is used to bridge over the river because this area is composed of two neighborhoods separated by the rivers. The uses proposed are community centers with spaces for business training paired with government offices for the local mayor. Finally at the transition between the informal and the mountain another building is proposed. This building acts as a catalyst and guide the future informal developments on the slopes. Because this highest areas are comprised of the most recent migrations and future arrival of immigrants, the programs for these buildings concentrates in uses that can help in the rural to urban transition. Thus, a skill building workshop along with a schools are proposed for the building. The building should also be design to anticipate expansion. A buildings that is embedded in the topography is proposed as it provides the foundation for a larger building in the future.

## CONCLUSION

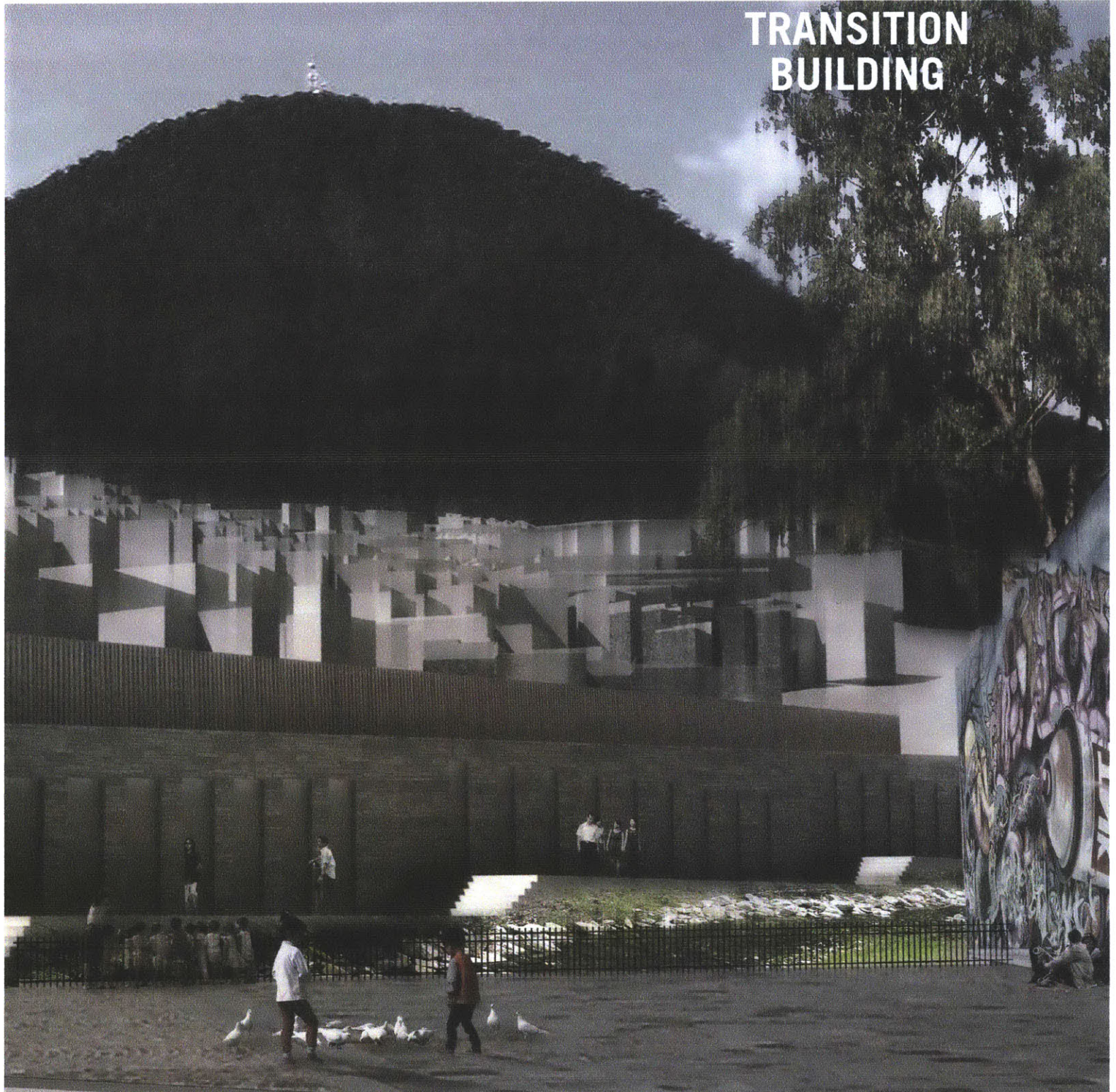
This thesis began as an enquiry about Los Cerros and their relationship to Bogota as their main natural feature. Similarly to the relationship cities in developed countries have with their rivers or shorelines the first attempts were to preserve Los Cerros and provide access to them as an amenity. The idea originated from the premise that in the past Los Cerros were the providers of resources to the city and that the city was ready to environmentally regenerate them. However this view of Los Cerros was developed from the formal city and not looking from the informal city above. Looking from above presents a range of issues that the city has not been able to address since rapid urbanization began in the mid twentieth century. Large populations have made Los Cerros their home and while squalid these communities are well organized, have dynamic economies and have the potential to become productive parts of the city. At the same time the environmental impact of informal growth in Los Cerros is matched by high end developments and other activities such as motor cross that are also expanding into the reservation. On the other hand the city still needs to grow because of the large housing deficit. Expanding towards the west and north is problematic because of the Bogota River and the issues that were made clear by the large floods of 2010. And to the south the city faces other mountains that are even more sensitive than Los Cerros. There is no clear direction in which to point the next phase of expansion. As a result of these circumstances the thesis took a more pragmatic approach to the question of the urban boundary. Hence the position of the thesis is that instead of preventing urban growth the boundary should be articulated with a strategy that would guide urbanization to generate outcomes that support natural and informal ecologies. At the same time, the thesis was developed with the understanding that there are a wealth of precedents that since the 70's have attempted to address similar issues in informal settlements. As such, its contribution is not an entirely new approach but rather a combination of successful strategies that are tweaked, overlapped and improved. The result is a strategy and a set of proposals to be applied indeterminately along the boundary that can be operationalized and implemented with the resources of the city government.



Fig 5.16 Formal Informal Building



# TRANSITION BUILDING



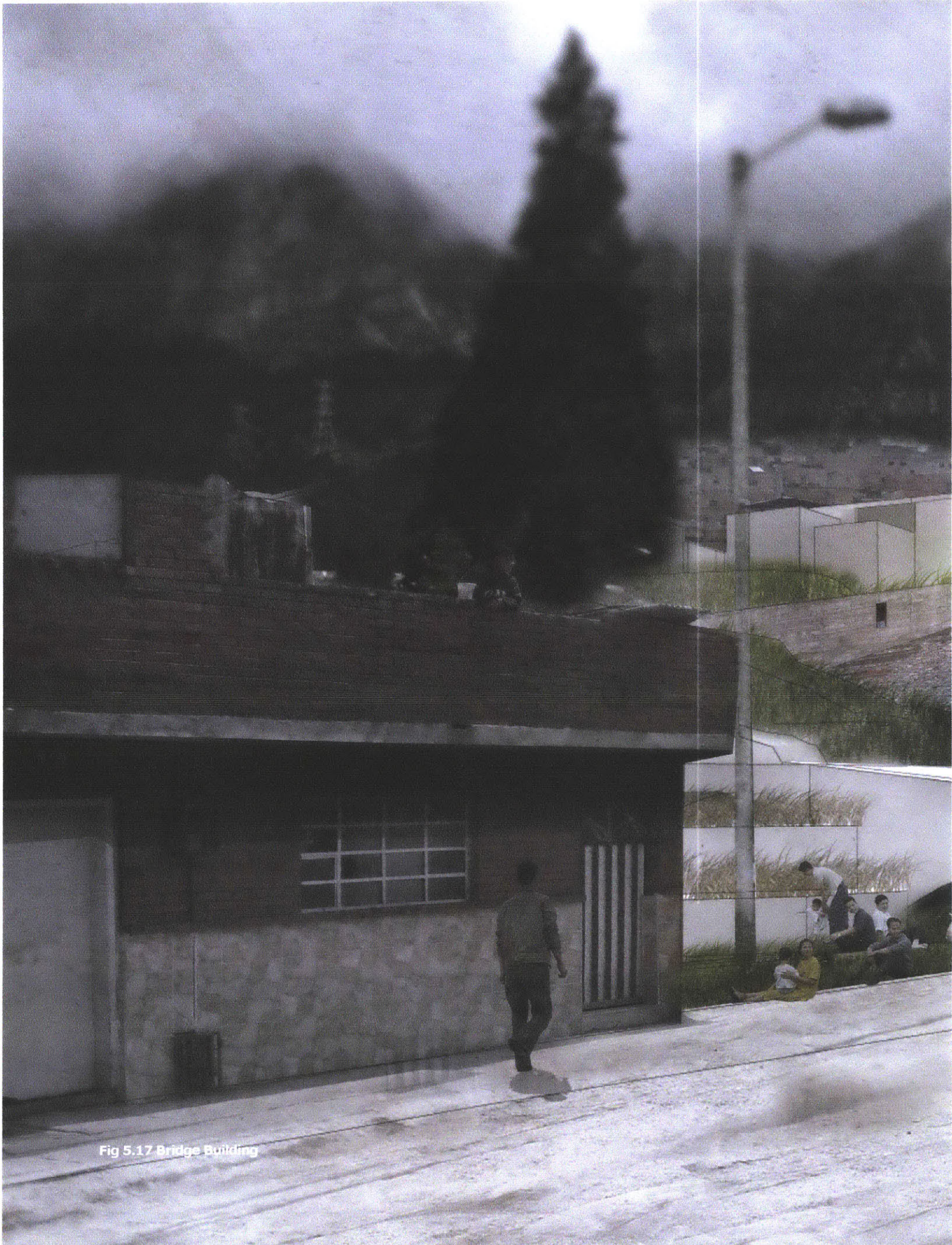
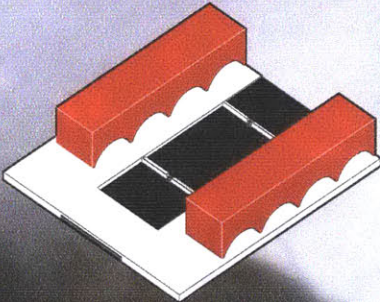


Fig 5.17 Bridge Building





# BRIDGE BUILDING



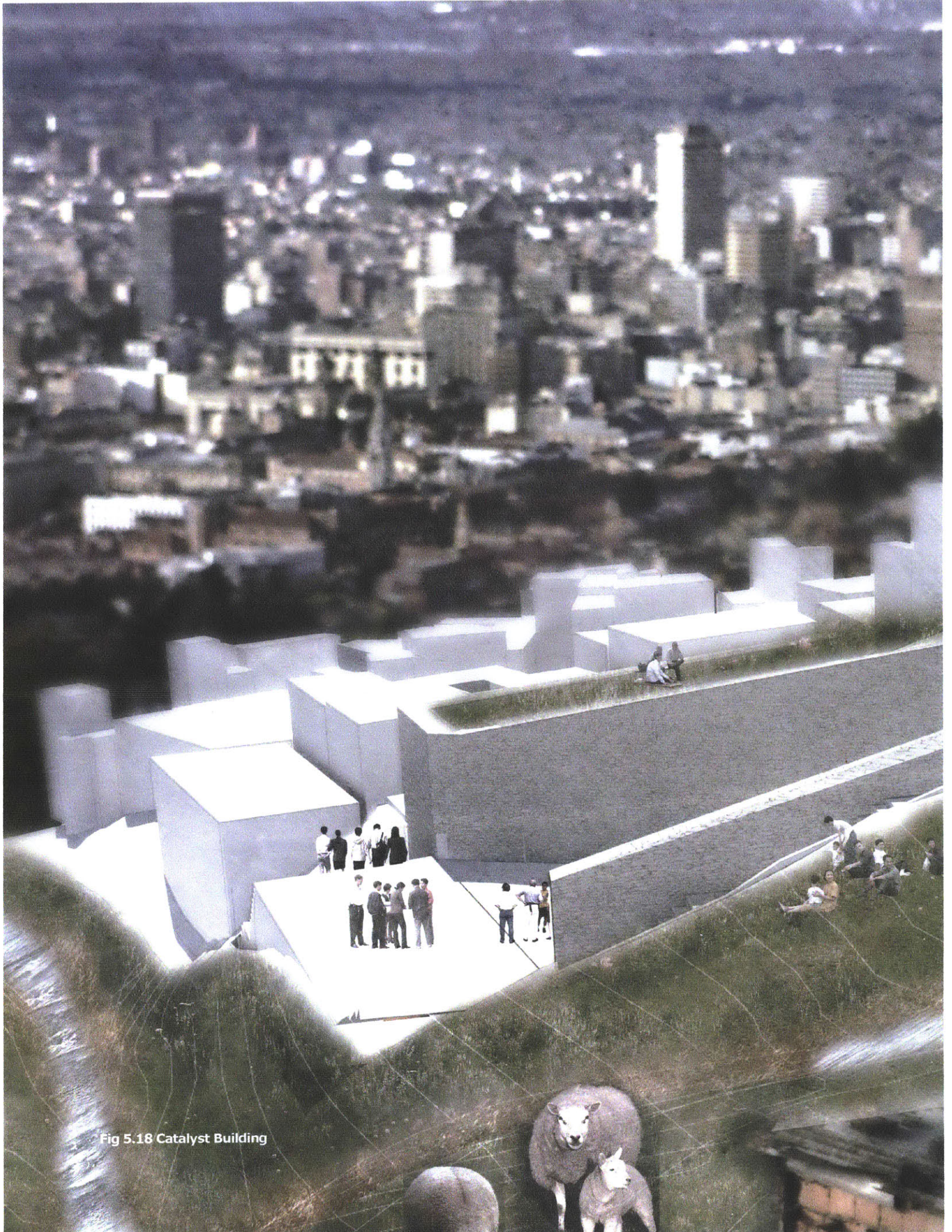
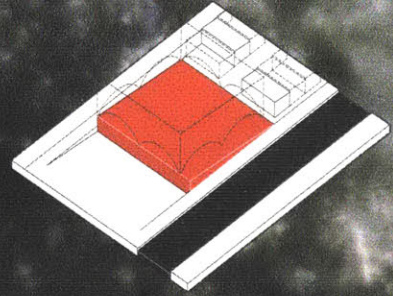
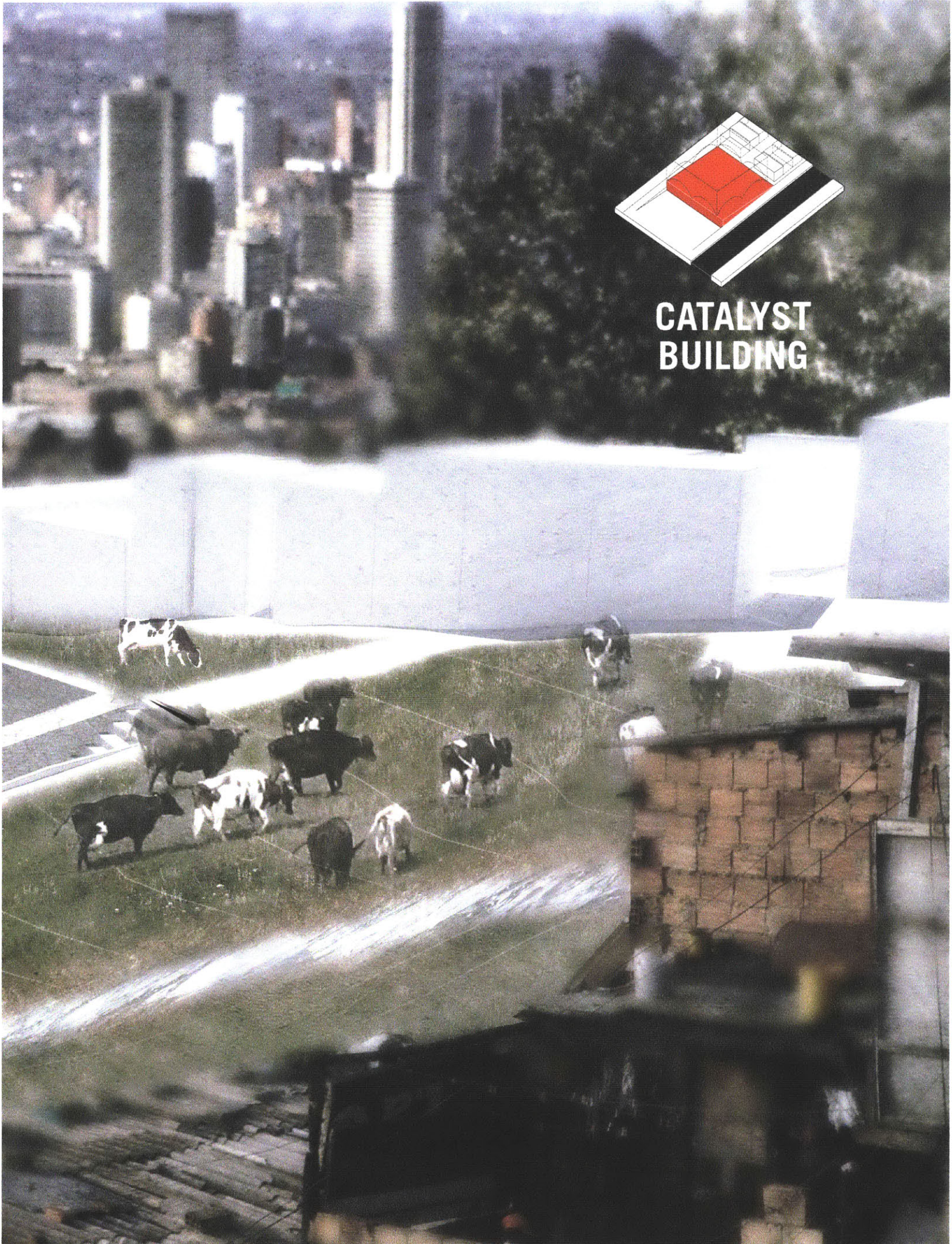


Fig 5.18 Catalyst Building



# CATALYST BUILDING





# 6. APPENDIX



## ILLUSTRATION CREDITS

Fig 1: By Author

Fig 2 : By Author

Fig 2.1: Historia De Bogota. Vol. Tomo 2 Conquista y Colonia. Salvat-Villegas, n.d.

Fig 2.2: By Author

Fig 2.3 By Author

Fig 2.4 By Author

Fig 2.5 By Author

Fig 2.6 Martinez, J. “Plano Topographico De Bogota”, n.d. <http://www.banrepcultural.org/blaavirtual/historia/galeria/regiones.htm>.

Fig 2.7: O’Byrne Orozco, Maria Cecilia, Director, Le Corbusier en Bogota: 1947-1951, Exhibit, Book, Website, <http://www.lecorbusierenbogota.com>, 2010

Fig 2.8: Ibid

Fig 2.9: By Author

Fig 2.10: By Author

Fig 2.11: By Author

Fig 2.12: By Author

Fig 2.13: By Author

Fig 3: By Author

Fig 3.01: By Author

Fig 3.02: By Author

Fig 3.03: By Author

Fig 3.04: By Author

Fig 3.05: By Author

Fig 3.06 : By Author

Fig 3.07: By Author

Fig 3.08: McGuirk, Justin, PREVI, <http://www.justinmcguirk.com/home/previ.html>

Fig 3.09: By Author

Fig: 3.10: By Author

Fig 3.11a: By Author

Fig 3.11b: Mobile arquitectos, <http://mobilarquitectos.cl>, <http://mobilarquitectos.cl/urbano/cerro-toro>, last accessed 05/23/1013

Fig 3.12: By Author

Fig 3.12: By Author

Fig 3.13: Skyscrapercity.com, <http://i82.servimg.com/u/f82/11/01/10/66/medell12.jpg>

Fig 4.01: By Author

Fig 4.02: By Author

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Fig 4.10: [http://upload.wikimedia.org/wikipedia/commons/thumb/c/ce/Bogotá,\\_r%C3%ADo\\_Fucha\\_hacia\\_la\\_kr\\_12.JPG/1024px-Bogotá,\\_r%C3%ADo\\_Fucha\\_hacia\\_la\\_kr\\_12.JPG](http://upload.wikimedia.org/wikipedia/commons/thumb/c/ce/Bogotá,_r%C3%ADo_Fucha_hacia_la_kr_12.JPG/1024px-Bogotá,_r%C3%ADo_Fucha_hacia_la_kr_12.JPG)Fig

4.11 [www.patiobonitoaldia.com](http://www.patiobonitoaldia.com), a<http://patiobonitoaldia.files.wordpress.com/2011/03/rc3ado-fucha.jpg>Fig

4.12 Site Conditions

Illustration of the different conditions found in the site. 61

Fig 5: By Author

Fig 5.01: By Author

Fig 5.02: By Author

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Fig 5.15: By Author

Fig 5.16: By Author

Fig 5.17: By Author

Fig 5.18: By Author



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