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The Structure of Urban Informality:
Sustainable Strategies for Informal Settlements on Slopes

Being a Major Project in Sustainable Urbanism submitted to the faculty of The Built Environment as part of the requirements for the award of the MSc. Sustainable Urbanism at University College London, I declare that this project is entirely my own work and that ideas, data and images, as well as direct quotations, drawn from elsewhere are identified and referenced.

Cyntia Paulina López Rueda

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I would like to express my deepest appreciation to all those who provided me the possibility to complete this Major Research Project. I would like to give a special gratitude to my personal tutor, Catalina Turcu, whose advice and encouragement helped me during this academic year. Furthermore, I would also like to acknowledge the role of my supervisor Matthias Wunderlich for the useful comments, remarks and engagement through the learning process of this project. Finally, I would like to thank my parents who have supported me throughout the entire process in spite of the distance. I will be grateful forever, without their guidance and persistent help this research project would not have been possible.
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Over the last few decades, urban areas in the developing countries have grown rapidly, overtaking the planning projects created by local authorities. The presence of spontaneous occupancies is leading cities out of its established urban limits, where low prices of the land validate the risk to which these communities are exposed to. Unfortunately, strategies for achieving a sustainable upgrading are not yet used in the general urban planning, producing negative outcomes instead of contributing to the local economy. As a result, entire neighbourhoods are not only ignored but also rejected by citizens and local authorities, worsening the social, economic and environmental issues day by day.

This research project describes the urban dynamics of informal settlements located on slopes and how its rapid growth influences the morphology of the formal city. It then discusses the theoretical and empirical practices for upgrading these areas and illustrates the strengths of successful initiatives particularly on public spaces.

Through a design component developed in the San Jacinto de Atucucho neighbourhood in Quito, this research project proposes urban strategies on the public realm that could contribute to the upgrading process of informal settlements taking into account sustainability concerns. Finally, it concludes that the public realm has an important role in the improvement of urban informality and that key for the upgrading of these communities is to combine small and large scale interventions to provide visibility and integrate them to the formal city.
Introduction
I. Introduction

I.a. Context

During the last decades, cities in developing countries have faced an exceptional rate of urbanization and increasing poverty. Projections of the United Nations (2008), estimate that by the year 2050 the population living in cities around the world will be doubled, increasing from 3.3 billion in 2007 to 6.4 billion in 2050. Moreover, over than ninety percent of this growth will be originated in the urban areas of the developing zones.

Besides, cities are parasitic organisms that consume three quarters of the world's energy and cause at least three quarters of the pollution in the world (Rogers, 2000). In spite of the unsustainable characteristics of cities, according to the World Bank, eighty percent of the Latin American population is established in cities, while in Ecuador, more than seventy percent occupy urban areas (STHV, 2014). Moreover, in this area, at least one third of the urban population lives on informal settlements originated due to the unbalanced economic growth. Lack of basic services, reduced access to public infrastructure, land tenure irregularities and high-risk locations are some of the urban pathologies of these areas.

Although the Metropolitan District of Quito has more basic services coverage and superior habitability conditions compared to the rest of the country, the circumstances are not different from the reality of the rest of Latin American cities. Massive rural migration and the uneven economic growth have caused an increase in the urban poverty, which has become a national problematic.

In this context, the dynamic characteristics of informal settlements and its urban problematics should be evident for the formal city and projects that aim for the sustainable improvement of these ignored communities should be taken into consideration as part of the planning system of the cities.
Ecuador has suffered a political transformation in the last decade and there is an increasing concern on promoting strategies aiming towards equality and holistic sustainability not only in policy generation but also in the spatial outcomes. However, there is a gap between national development objectives and common practices particularly on the growing urban areas.

Quito’s planning policies consider informal settlements as urban dilemmas relevant to the whole city; yet in practice the strategies for upgrading these areas aim towards poverty alleviation through land regularization and ignore the national objective of equality and sustainability. Thus, it is necessary to analyze the existing policies and practices in order to integrate innovative strategies that could be applied on informal settlements with a sustainable and equitable approach.

**I.c. Research Question**

- Which strategies in the generation of public space on informal settlements on hill slopes could contribute to its sustainable upgrading?

In order to attempt to answer this question, a set of secondary questions are stated. These are:
- What are the principles of sustainability at the national level?
- What are the common practices in terms of informal settlements upgrading at the city level?
- Which is the institutional framework underpinning the common practices?
- What is the role of the public space in the urban fabric of informal settlements?
- Which kind of urban strategies can be considered synergistic and replicable at the neighbourhood level?
Methodology

This research will follow the Speculation Method described by Montague (2013), in which the outcome of the design component occurred intermittently during the research. The findings and experiences modified the following theoretical discussions. Therefore, there was not a predetermined method of research initially; however after several attempts of design, the one presented in this document is considered as the most suitable for answering the research question.

The method used in this research determined a theoretical framework that underpinned the design component. The first phase was an extensive literature review that provided the principles and trends dealing with informality at the global level. Moreover, documents, publications and researches allowed identifying the local and global trends for the upgrading of informal communities and evaluated the scale of urban informality at the city level.

To continue, the method complementing the literature review was a case study research, in which the units of analysis collaborated to critically evaluate the principles, methods, tools and outcomes of the upgrading approach in different locations with similar contexts to the settlement chosen for this research. As a result, the replicable principles used were identified regarding the scale and the approach applied. The case studies were chosen under two principles: the interventions must belong to a holistic system for informal settlement upgrading and must have the potential to be replicated in similar contexts. The examples chosen were the cable car transportation system in Medellín, Colombia and the Vertical Gymnasium in Caracas, Venezuela.

Next, the implementation phase of the project was based on the literature review, previous visits to the site and experience gathered in the process. The main objective was to generate a theoretical approach for informal settlements’ upgrading based on the city’s existing ideological framework of land regularization.

As a result, realistic strategies for the improvement of the neighbourhood in terms of sustainable urban development were created. It is important to state that the cultural identity of the inhabitants was considered as a crucial factor in order to generate specific urban solutions.

Finally, in the whole process, the topography of the area was a determining characteristic perceived as an asset for urban design in order to achieve sustainable results with limited budget.

I.f. Main objective of the research project

- To develop a sustainable urban strategy that attempts to improve the spatial conditions of the public realm on informal settlements located on slopes, considering the social capital, the location and the governance system as an asset for design.
Literature Review
II.a. Informality - Global context

Origins of urban informality

Urban population has increased significantly in the past 50 years and the developing world that has been predominantly rural, is rapidly becoming urban. Moreover, this accelerated process of urbanization has also revealed that national resources and local institutions are not prepared to manage such transformations. As a result, the demand in terms of provision for labor, housing and basic services overtakes the planning capacity of local governments generating areas with low living standards for rural new residents (UN-HABITAT, 2003, pp. XXXII).

For decades, residents of spontaneous areas of the city have been considered as temporary; therefore, regularizing the informal patterns of these settlements and provide equitable living standards has not been a concern for the formal city (Calderon, 2008). In addition, informal settlements formation is closely related to income inequality conditions resulting from the economic model of modern society. (See Figure 3)

According to the UN-Habitat, informal settlements are not only a consequence of the demographic change, but also are a result of a failure of housing policies, laws and delivery systems and national and urban policies (UN-Habitat, 2003, pp. 5). This situation is reflected in the growing cities, full of contrasts in the economic, social and spatial landscape with neighbourhoods without legal recognition and rights.

Based on the aforementioned circumstances, the physical impact of informal settlements in cities is considered to be a dynamic phenomenon that establishes singular spatial relationships in the urban fabric. While in the formal city the occupation of residences is a consequence of land tenure, road configuration and services provision; the process in urban informality is the opposite.

Firstly, there are displaced inhabitants looking for shelter that start a process of self-construction, therefore settlements are created around single family units with vacant space enough to configure informal roads. With these spatial conditions, settlements grow and develop with its own features that are only visible for the local authorities as disadvantages for the formal city. Finally, depending on the response of the planning process, some of these communities are able to access to basic services and infrastructure provision.

Hope and despair

These are the so called “slums of hope”, progressing settlements that are in the process of development, consolidation and improvement. On the other hand, cities also accommodate “slums of despair”, which are declining neighbourhoods undergoing a process of constant degeneration (UN-Habitat, 2003).

In general, in spite of the different definitions of urban informality depending on the context, there are some characteristics that define spontaneous settlements:

- Lack of basic services.
- Unregulated housing or illegal and inadequate building structures.
- Overcrowding and high density in the single dwelling.
- Unhealthy living conditions and hazardous locations.
- Insecure tenure; irregular or informal occupation.
- Minimum settlement size depending on the context of the city.
- Poverty and social exclusion.

(Beardsley, 2008; Carrión, 2003, Un-Habitat, 2003)

Finally, in order to assess the implications of informal settlements in the urban context, it is crucial to recognize that these areas have been the only large scale solution in the provision of housing for the economically depressed population. There is a need of exploring informal settlements as an economical asset for the formal city in order to integrate its constructive features with the visible parts of cities in developing countries.
II.b. Informality in Quito

Informality at the city level - Quito, Ecuador

Quito’s urban development has been shaped by its irregular geographical context with vast natural resources access and an increasing population since the decade of 1960’s. Therefore, the urban structure has been modified and conditioned by the unbalanced growth and the scarcity of flat land due to the topographic irregularities of the surrounding mountain system with abundant east-west hill slopes (DMQ, 2012).

Due to low land costs, the most recent settlements have been established in the northern and southern peripheries of the city with similar conditions of informal settlements at the global scale: dwellings built with inadequate materials, poor basic services and infrastructure provision, deficient internal and external connections and irregular land tenure without official approval for urbanization. The population of these settlements belongs mainly to the informal sector of the economy with a low level of education among heads of family and high level of unemployment (UN-Habitat, 2003).

Since 1993, the institutional framework concerning informal settlements on the urban and rural areas of the Metropolitan District has generated administrative changes based on decentralization. The local government has invested in projects of infrastructure and land regularization for illegal neighbourhoods located on hill slopes particularly.

Rural migration → Urban Informality

According to Carrión (2003), in Quito there are three main types of informal settlements:

- **Barrios periféricos** or popular neighbourhoods of the peripheries of the city. Most low-income households are located here due to the subdivision of agricultural plots and land speculation.
- **Conventillos** or deteriorated settlements in the historic centre.
- **Rural neighbourhoods** with low income population commuting to the urban area.

Since most of the informal settlements are located in areas with high risks of natural disasters, considering these areas as part of the planning process is not only a matter of social sustainability and equality, but also a matter of risk prevention for the formal city and the whole population.

Initially, the strategies adopted in order to upgrade these informal communities where oriented in providing security of tenure and regulating the prices of land (UN-Habitat, 2003). Later, the Municipality created alternatives for legalizing consolidated informal areas depending on the context and vulnerabilities. Currently, the Legalize your Neighbourhood Unit is the responsible agency for urban informality in the city; however, a clear action plan and conceptual framework for interventions is still missing.
II.c. Upgrading Approaches

Common practices: Past and present

In the last decades, many policy approaches have been attempted to tackle urban informality at the national and local levels. Depending on the context, a variety of interventions have been tested around the world; however, most of these attempts have been a reaction to extreme conditions more than planned processes aiming social balance. From passively ignoring urban informality to actively harassing spontaneous settlements, local governments have failed to eradicate the evidence of an unbalanced mode of social regulation.

In this sense, according to the UN-Habitat (2003) the most common approaches dealing with urban informality in the last decades were:

- **Negligence**: This approach was a common practice in most developing countries (including Ecuador) before 1970’s. Informal settlements were perceived as illegal and a temporary urban phenomenon product of the rural migration to cities. Therefore, economic development for these communities was the solution. Since the causes were not taken into account, heavily subsidized low-cost housing programmes were the policy solution for the elimination of informal settlements. In practice, these strategies were beneficial for the formal sectors of the society exacerbating urban inequalities.

- **Eviction**: When the economic development of the formal society did not meet the informal communities’ needs, public authorities opted to eradicate these areas justified by the implementation of urban renewal projects during the decades of 1970s and 1980s. In reality, instead of reducing informal settlements, this approach relocated the people to distant, often peripheral sites with no access to services or infrastructure, increasing poverty and destroying their social cohesion in the process.

On the other hand, what could be perceived as a failure in some contexts has been acknowledged as an opportunity in others; thus, planning interventions that aim at protecting the rights of informal communities and assisting them to improve their living environments is not a utopic reality anymore.

There has been an evolution in the methods for urban upgrading that goes beyond the eradication of the physical consequences of urban poverty to addressing the underlying causes of it (Beardsley, 2008; Brillembourg, 2010; Un-Habitat, 2003) and currently, the upgrading of informal settlements in situ is now a common practice (Abbott, 2001; UN-Habitat, 2003).

However, since urban informality is constantly changing and spontaneous settlements are mostly heterogeneous, there is still not an agreement on a standardized successful approach. In Huchzermeyer Ph.D. thesis, (as cited in Abbott, 2001), two main methodological approaches are described: (See Table 1.)

<table>
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<th>Methodological approach</th>
<th>Main characteristics</th>
<th>Best known practices</th>
<th>Weaknesses</th>
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| Externally Designed Comprehensive Upgrading | Interventions that trust in the abilities of the communities and increase their opportunities instead of providing for them. Driven by government or non-governmental organizations (NGOs). | Government initiated:  
- Million Houses Programme, 1984 - Sri Lanka.  
- Holistic Planning Development of the Favelas, - Belo Horizonte, Brazil.  
NGO initiated:  
- Orangi Pilot Project, 1980 - Karachi, Pakistan. | Serious failings once the actors who financed the strategy leave the community without monitoring the results. Therefore, the initiatives are not replicable. |

Table 1. Methodological Approaches for informal settlements upgrading

Derived from the Support-based interventions, the Community driven development is considered as the most appropriate mechanism for upgrading according to Huchzermeyer (1999). However, there are several weaknesses mainly due to the fact that settlements cannot be isolated from the city of which they are part and should not make all the decisions. There are different arenas of participation that should be taken into account. (See Figure 7)
II.c. Upgrading Approaches

Community driven development isolates informal settlements from the city, while a partnership between communities (formal and informal) and local authorities reinforces the networks in the city (Abbot, 2001; Beardsley, 2008; Brillembourg, 2010; Un-Habitat, 2003).

Furthermore, according to Abbott (2001) there are a variety of thematic approaches that can be identified depending on a conceptual or empirical method of application. Each of these approaches has successful results (if the method can be replicated in other contexts and realities) and weaknesses that limit the outcomes.

<table>
<thead>
<tr>
<th>Thematic approach</th>
<th>Main characteristics</th>
<th>Best known practices</th>
<th>Weaknesses</th>
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<tr>
<td>Empirical Approach</td>
<td>Is based on practices that determine appropriate methods of operation in order to implement a programme afterwards.</td>
<td>- Best Practices Programme, Developed by UN-Habitat</td>
<td>Deficiencies and failures are analysed in retrospective. Practices are only sustainable if a theoretical framework underpinning the process is included.</td>
</tr>
</tbody>
</table>
| Theoretical Approach    | Creates a theoretical framework that explains the process in order to replicate it. Theory and practice work together. Creates partnerships between communities and local authorities. | - Integral Urban Project (PUI) - Medellin, Colombia.  
- Upgrading Settlements of Caracas Project (CAMEBA) - Caracas, Venezuela.  
- Slum to Neighbourhood Project (Favela Bairro) - Rio de Janeiro, Brazil. | Relatively new practices that should be analysed in the future. Latin American cities are considered as an urban laboratory to test these practices (Beardsley, 2008). |

Moreover, security of tenure is considered to be one of the essential actions of informal settlement upgrading according to UN-Habitat (2003). However, scholars also recognize that land regularization is not considered to be an upgrading process by itself, but is perceived as a basis for improvement that responds to a capitalist model of individual ownership of land (Abbot, 2001; Cueva, 2011; Verguel, 2010).

In summary, the upgrading process has evolved mainly due to the recognition of informal settlements as an asset that has been understood and incorporated in the urban reality. Large-scale clearances and relocations are currently avoided by the majority of local governments due to the massive social disruptions caused and scarcity of vacant land.

Furthermore, the academic research of the subject states that successful interventions depend on the capacities of the communities and increase their opportunities; hence, there are no external providers in the successful examples.

However, there is a need of partnerships between different parties since informal settlements belong to an urban network with dynamic behavior. All in all, there is an agreement that a replicable initiative is more than a collection of good practices. It rather be considered as a network of diverse actions and actors that deliver a logical framework with a common goal.
Case Studies

Medellín is the capital city of the Antioquia prefecture and the second largest industrial city of the country; however, the prosperity of the city is veiled by the unequal distribution of resources and social injustice that leads to disparities about the quality of life between the population in the formal urban area and the inhabitants of the surrounding settlements located on the hills (Blanco, 2009).

Similar to other Latin American cities, Medellín faces strong social stratification due to a process of informal development without territorial order ignored by the formal planning of the city. More than 300 neighbourhoods existed in the year 2012 and from these; more than 100 belonged to the lowest levels of social stratification, facing the challenges of everyday poverty (Alcaldía de Medellín, 2012).

In the beginning of the XXI century, informal settlement’s areas occupied more than 30% of the urban fabric of the city (Arango Escobar, 1991) and were identified by the Planning Department as land invasions and illegal subdivisions that produced high densities unplanned settlements with minimum public facilities and lack of proper infrastructure.

Currently, Medellín is divided into 16 “Comunas” or districts that are composed of several neighbourhoods. Some of these districts are characterized by a severe topography, lack of connection with the formal area and illegal land occupation that includes some of the most dangerous areas of the city due to its relation to the drug cartels (Calderón, 2008). Particularly the Northeastern district, composed by 2 areas: Popular and Santa Cruz, was considered as a symbol of danger and isolation by the rest of the formal city.

The development of the aforementioned settlements created a new urban pattern in which adaptation to the topography was the main concern for the inhabitants. Therefore, roads, public space and public facilities where underestimated resulting in overcrowding areas with squatter conditions in steep slopes (Calderón, 2008).

During the municipal administration 2004 – 2007, The Integral Urban Project (PUI) was one of the main strategic programs included in the Medellín’s Development Plan. This strategy is based on the implementation of policies, projects and programs aiming to improve the quality of life and decrease social exclusion of areas that had the lowest human development indexes (IDH) in the city. The city government with conceptual and methodological collaboration from the Urban Development Enterprise from Medellin (EDU) selected the Districts 1 and 2 to apply the first PUI. In practice, the PUI is considered as the project that represents the principles of “Social Urbanism”.
II.d. Case Studies

Northeastern Integral Urban Project

The Northeastern district presented several problems derived from informality, particularly the isolation of the settlement from the formal city. Difficulties in transportation and communication influenced in the decision of the Municipality in order to introduce a new system, interconnected to the Metro, called the Metrocable that started functioning in 2004. (Alcaldía de Medellín, 2012).

The Metrocable started serving the district allowing 67,000 people every day to access to a faster and less expensive connection with the rest of the city. In addition, the program constructed new public spaces in order to increase the internal connectivity of the district.

Finally, the Metrocable Stations became activity poles in the settlements encouraging around them new developments specially in terms of stores and commerce (Dávila, 2012).

Social urbanism aim to combine actions at the large and small scale to improve the relationship of design with its context and mitigate the problems of inequality and segregation in growing cities (Castro, 2011).
II.d. Case Studies

**Vertical Gymnasium - Caracas, Venezuela**

Venezuela's capital shares its dramatic settings with some South American cities. It is located in a long, narrow valley that runs from the east to the west, surrounded to the north by the uninhabited slopes of Avila National Park and to the south and east by heavily populated hills that give a visually desolated impression to this 4.7 million people city, the most densely populated in Latin America.

Shaped by several oil booms, it is also a city of contrasts. “Barrios” in Caracas refer to informal settlements in which about 60 per cent of the population lives, in heterogeneous self-built constructions that occupy about a third of the metropolitan district area (Hernández, F; Ketllet, P and Allen, L. 2012. pp. 119, Beardsley,2008). These informal districts grow outside the city limits in sites that are often hazardous with serious problems of access and lack of basic services and infrastructure. Moreover, due to the topography, the informal city is also vulnerable to mudslides and flooding and with limited space for expansions.

Currently, Caracas is divided into 5 “Municipios” or districts composed by several neighbourhoods. La Cruz neighbourhood, part of the Chacao district was perceived as one of the most problematic in terms of social and physical exclusion due to the extreme topography.

The consolidated neighbourhood has been developed on a steep hill during the last 60 years, sharing the problematics of almost every informal settlement in the world. The lack of urban connections and public facilities was aggravated by the one of the highest crime rates in the city (Navarro-Sertich, 2011).

To take advantage of an underused land plot in the area was a challenge for the architecture firm Urban-Think Tank, designers of the project on 2004. The requirements of the municipality were to keep the current function of the plot and generate a new public space for the people of the neighbourhood.

The project, first created for La Cruz as part of an upgrading program financed by the municipality (CAMEBA Project), was transformed into a replicable prototype that can be assembled in different contexts on informal areas. It is based on the premise that space is scarce on informal settlements, thus, the infrastructure takes advantage of the plot area multiplying the functional space. Verticality, a conventional construction strategy on the formal city, provides an alternative for public space with social value on the informal city.
II.d. Case Studies

Since 2004, three other vertical gymnasiums have been built on other informal settlements of Caracas as part of the upgrading project. The efficient variety of spaces, the adaptability to different contexts and the standardization of the construction technique have brought new opportunities for healthy social activities among the marginalized population of the “barrios”.

CAMEBA (Upgrading Settlements of Caracas Project) was a partnership between the national government of Venezuela and the World Bank. The goal was to integrate informal zones to the formal city through the execution of upgrading plans regarding to pedestrian and vehicular access, basic services supply, environmental upgrading and public lighting distribution. Community centers, relocation of housing under ecological and structural risk and other minor interventions were supervised by neighbourhood inspectors trained by the municipality.

Key lessons

Infrastructure is not perceived as a product, it is a process aiming social integration (Navarro-Sertich, 2011).

- **Connectivity**
  - Location in the border of the formal and the informal city generates a social connection in the population

- **Productivity**
  - Improvement of productive residences near the project.
  - Stimulates local economy with the generation of new urban centralities and activity poles.
  - Reduction of crime rates in the area.
  - Maximize initial investment due to verticality.

- **Adaptability**
  - The infrastructure prototype can be adjusted to different contexts with similar results.
  - Future expansions of the system are possible.
  - Constructive system allows variety of functions.
II. Similarities

Similarities in successful initiatives

A generic sustainable upgrading for informal settlements is still considered an experimental process with consequences that must be assessed in the future. However, successful practices identified in the literature and interventions analysed in similar contexts, share design intentions that match sustainable projections and often emerge intuitively.

In spite of the lack of a general consensus, the replicability of some interventions demonstrates that these strategies could become a successful approach for an informal settlement’s upgrading that responds to sustainable concerns. Interventions that promote connectivity with the formal city and are adaptable to different contexts are likely to significantly improve the quality of life of the population. Moreover, to encourage community participation and future engagement with urban processes is also crucial for the success of the upgrading methods. Finally, to boost the productivity of the population and provide visibility to these processes seem to guarantee a sustainable development in the future.

In this context, the parameters that should be taken into account are the following:
In this context, the parameters that should be taken into account are the following:

Connectivity

- Level 1: Interventions that guarantee urban networks at a neighbourhood level.
- Level 2: Interventions that guarantee links at the neighbourhood and at the city level at the same time.

Productivity

- Level 1: Interventions that promote temporal activities with economic revenues.
- Level 2: Interventions that promote financial benefits at short and long-terms simultaneously.

Adaptability

- Level 1: Interventions that intend to be flexible to present conditions.
- Level 2: Interventions that have the potential to be adaptable to present and to uncertain future conditions.

Engagement

- Level 1: Urban initiatives that promote community participation in the future.
- Level 2: Urban initiatives started with the community as part of the decision making process and encourage the community engagement in the future.

According to Beardsley (2008), the multidisciplinary nature of the upgrading operations and the social pressures posed by their context produce new strategies uncommon for the urban design practices of the formal city. Despite the fact that the individual dwelling is the basis of spontaneous settlements, the influence of the public realm cannot be ignored. What in the formal city could be perceived as a residual space, in spontaneous settlements is perceived as a venue for vibrant communal activities with unique economic and social networks. Public space is considered as a common good where social, cultural and economic activities are articulated (UN-Habitat, 2012).

The improvised network of public spaces on informal settlements provides the basis for participatory interventions that are easily understood by every actor. Therefore, it can be said that the influence of the interventions in the public realm would have greater impact than private improvements to the dwellings. According to Brillembourg (2013), initiatives that are visible by different actors are more likely to initiate improvements of the individual dwellings.

To continue, it is important to state that the conceptions of public space in the formal city should be reinvented in order to achieve permanent transformations. Public areas are not spaces for passive occupation, but places for cultural expression and active recreation (Beardsley, 2008). Streets, community gardens, performance spaces, transport stops, etc. are zones in which the cultural richness and development of the population will be expressed.

Finally, some scholars state that low-income settlements could be models of sustainable development. Smaller environmental footprints, higher density locations and walkability are qualities that should be retained even after the upgrading process. Sustainability on the informal context acquires a new perspective that relates more to integration with the surroundings than an isolated model of environmental friendly practices.
Framework
The upgrading approach that will be used in order to improve the structure of San Jacinto de Atucucho is based on the Theoretical Approach identified by Abbott as the most successful strategy (Abbott, 2001). The Theoretical approach aims to generate a general concept leading the implementation of the strategy in order to replicate it.

With the concept of integration, the generation of urban strategies seek to transform the ideological framework of land regularization into a sustainable upgrading program.

Based on the Theoretical Approach, a sustainable upgrading of the settlement will be implemented on the public realm in 3 urban systems: location, urban connections and activity nodes. In order to generate a replicable strategy, the interventions should be based on the existing institutional framework of the formal city. Quito’s planning system responds to the national objective of sustainability and social equity.

Based on the literature review and the analysis of successful practices in similar contexts, it can be said that a sustainable upgrading for informal settlements can be achieved with projects that consider community engagement and urban connectivity as a goal. Furthermore, the strategies should promote the productivity of the neighbourhood and be adaptable to different contexts in order to promote the visibility of the area and therefore, the integration with the city.
Site Analysis
In order to develop a sustainable plan for informal settlement upgrading, it is crucial to analyse the institutional context that will shape the process. Such institutional analysis has two objectives: to identify the existing norms and regulations in the national and local context and to assess the challenges and opportunities of the built environment that will condition the elaboration of the project. In the local context of Quito, it is important to address the guidelines of the Metropolitan Plan of Land Management 2012-2022 (MPLM) and explore how it responds to the Good Living National Plan 2013-2017 (GLNP).

In addition, the Municipality of Quito is developing a design strategy that responds specifically to the Objective 7 of the GLNP at the district level and provides guidelines for the transformation of Quito into a national model of a sustainable city. Quito - Green Urban Network and Eco-Neighbourhoods (GUINE) also emphasizes the importance of public and green areas to achieve sustainability in cities.

The generalities found in the governance aspect of the literature review and in the successful practices of the case studies were compared with the local and national policies in order to develop a framework for the built environment in particular.

The formal city is covered in terms of appropriate policies for the development of a sustainable livelihood; however, a missing gap is found in the governance of the informal city. Theory and practice are significantly different with the approach of informal settlements upgrading.

### National Objectives

1. To consolidate democratic governance and construct the people’s power.
2. To foster social and territorial equity, cohesion, inclusion and equality in diversity.
3. To improve people’s quality of life.
4. To build citizen capacities and potential.
5. To build mechanisms to bring together and strengthen national identity, diverse identities, plurinationality and inter-cultural living.
6. To consolidate the transformation of the judicial system and reinforce comprehensive security, with strict respect for human rights.
7. To guarantee the rights of Nature and promote environmental sustainability globally.
8. To consolidate the social and solidary economic system, sustainably.
9. To guarantee dignified work in all forms.
10. To promote transformation of the productive structure.
11. To ensure the sovereignty and efficiency of strategic sectors for industrial and technological transformation.
12. To guarantee sovereignty and peace, enhancing strategic insertion worldwide and Latin American integration.

### Local Objectives

1. To promote the regeneration of public space and green areas.
2. To consolidate the urban limits and avoid unplanned growth in the district.
3. To preserve the natural resources.
4. To avoid land speculation.
5. To promote a sustainable and democratic land use across the district.

### Quito as a model of sustainable city

With:

1. A compact morphology.
2. A diverse organization.
3. An efficient metabolism.
4. Equitable opportunities.
IV.a. Governance Structure

The ‘Legalize your Neighbourhood’ Unit was created to assess the informal settlements upgrading at the city level. Its activities are focused on the regularization of land and relocation of housing located on high risk areas.

In order to become part of the regularization programme, the neighbourhoods must fulfill legal, technical and organizational requirements (Cueva, 2011). In spite of this initiative, a global approach that considers the dynamic process of informality is not taken into account.

After regularization, informal settlements are not recognized differently due to its dynamic organization. Moreover, land regularization is not considered as a first step of an integral project, but the final goal.
IV.d. Urban Pathologies

General

San Jacinto de Atucucho shares several problematics with other informal settlements located on slopes on the city. This fact influences not only the relationships developed within the members of the community, but also the built environment. As Metzger (2001, pp. 76) states, these urban pathologies in general terms include the isolation due to extreme topography, the rejection by the formal city, lack of specific planning strategies and the rapid unplanned growth.

- Settlement rejected by the formal city (Figure XX)
  The urban limit of the city is located on the border of the main road of the settlement; therefore it is not seen as a productive area for the formal city.

- Topographic isolation
  The settlement is isolated due to an extreme topography that influences the urban morphology of the neighbourhood.

- Not part of the planning strategies of the city
  Due to its location outside of the urban limits, the settlement is not considered in the planning strategies until the process of land regularization is completed, therefore it is likely to expand in the future without municipal monitoring.

The unusual process of consolidation of the settlement is taken into account to analyse the urban pathologies present in the area.

Mapping the existing settlement configuration is crucial to understand the dynamic processes existing in the area. Based on aerial photographs and on site analysis, it is possible to recognize the internal configuration of the settlement and the relationship with the formal city.

As a requirement for the land regularization process, a map of the area was given to the Legalize your Neighbourhood unit. This map was compared with the information from the aerial views and the visits to the site and a significant difference was found particularly in the internal connectivity of the site.
IV.d. Urban Pathologies

Location

According to Carrion (2003), historically in Quito, the low income population has settled in informal neighbourhoods mainly located on the edge of the urban area. Moreover, on the settlements located in areas of irregular topography in the northern periphery of the city, like San Jacinto de Atucucho, the geography determines the character and process of its development. According to DMQ (2012), San Jacinto de Atucucho is classified as Steep II due to the steepness of the land between 25 and 60% across the settlement. Currently, the topography is the most crucial problematic of the neighbourhood, since it has not been taken into account for the creation of the informal roads connecting the settlement internally and with the formal city.

Furthermore, the location of the neighbourhood has also climatic implications because of the erosion and the transformation in the morphology of the mountain that is vulnerable to floods and landslides.

In spite of the aforementioned aspect, the plots located in the ravine have residential function with difficult connection with the rest of the area.

Finally, in the center of the settlement is located a high voltage power line that has also residential function and is placed across the most recognized public space of the neighbourhood.
Location pathologies summary

- Extreme topography
- Isolated from the city due to topographic conditions
- Vulnerable to risks in the ravine area
- Topography not taken into account for internal connections
- High voltage power line influence

Figure 31. Urban pathologies in location diagram
IV.d. Urban Pathologies

Urban connections - External and internal

There are two informal roads that have been left in the area to link the settlement with the city; however, the steepness of these hinders the connection of the area with the public transport system.

Santa Ana Alta and Atucucho, the neighbourhoods located at the north and the east side respectively, have public transport connections located within walking distance from San Jacinto de Atucucho, which is beneficial for the population living close to these roads.

On the other hand, the residences that are settled on the south and the west part of the neighbourhood are isolated primarily because of the conditions of the pedestrian and vehicular internal roads.

Internally, the configuration of the settlement shows that the residences were set up in the flat terrain available and the informal streets are located on residual spaces. Therefore, the pedestrian connections are affected by the morphology of the hill and contribute to the isolation of certain areas.

In spite of the physical restrictions of the neighbourhood, the spontaneous streets generate a dynamic network crucial for the relationships present in the area. Every connection is necessary because they articulate and reinforce social, cultural and economic activities.

Figure 32. Connections with the city

Figure 33. Accessibility of the internal roads
IV.d. Urban Pathologies

Urban connections pathologies summary

A. Ineffective vehicular road example

Topography not taken into account for connections

Interrupted urban networks

B. Ineffective pedestrian road example

Figure 34. View, San Jacinto de Atucucho
Source: Cyntia Lopez Rueda, 2010

Figure 35. View, San Jacinto de Atucucho
Source: Cyntia Lopez Rueda, 2010

Figure 36. Urban pathologies in connections diagram

Site Analysis

The Structure of Urban Informality
The areas that are not occupied by dwellings are used as multifunctional public spaces for sport, educational and festival events developed by the neighbourhood and Santa Leticia during the year. The spaces are occupied differently depending on the event since the inhabitants of the zone have different educational and socioeconomic profiles.

The most recognized public area of the settlement is the space left under the high voltage power line. This group of plots is unoccupied due to planning requirements; however, it is used as a sports field and it holds most of the community events of the neighbourhood.

The streets left around the improvised sport court are also perceived as landmarks by the population. There is a residence that operates as a communal house but it is only used when the weather does not allow outdoor activities. Moreover, there are several productive residences in the area. This means that part of the ground floor is left for commercial activities, which satisfies the demand for basic products on the area.

There are not educational, cultural or health infrastructures present in the settlement; yet, the surrounding neighbourhoods cover the demand in emergency cases. The crucial problem is the commuting time due to the conditions of the pedestrian and vehicular roads. In general terms, it can be said that if the transport and pedestrian connections were improved, San Jacinto de Atucucho would have the community and public necessities covered.

Even though the Rumihurco ravine has no public function at the moment, it is important to state that the population recognizes it as the landmark that identifies the zone.
IV.d. Urban Pathologies

Activity nodes pathologies summary

- Residual spaces used as multifunctional public areas
- Productive dwellings separated from activity nodes
- Streets used as nodes of activities
- Sports field located on risk area
- Lack of urban function for ravine

Figure 40. View, Sports field
Source: Maria Luisa Carrera, 2008

Figure 41. View, main street
Source: Cyntia López Rueda, 2008

Figure 42. Productive dwelling - Artisanal brick factory
Source: Cyntia López Rueda, 2010

Figure 43. Productive dwelling - Grocery shop
Source: Cyntia López Rueda, 2010

Figure 44. Productive dwelling - Grocery shop
Source: Cyntia López Rueda, 2010

Figure 45. Activity nodes pathologies diagram

- Sports field
- Communal house
- Productive dwellings
- Rumihurco ravine as a landmark
- Restricted zone under high voltage power line
- Community activities on streets
IV.d. Urban Pathologies

Current views San Jacinto de Atucucho

Figure 46. View 2  
Source: Cyntia Lopez Rueda, 2010

Figure 47. View 3  
Source: Cyntia Lopez Rueda, 2010

Figure 48. View 4  
Source: Cyntia Lopez Rueda, 2010

Figure 50. View 1  
Source: Cyntia Lopez Rueda, 2010

Figure 51. San Jacinto de Atucucho views.  
Source: Adapted from Google Maps (2014), https://goo.gl/maps/x3tb8
Implementation
## V.a. Urban Diagnosis

### Design intentions for sustainable upgrading

<table>
<thead>
<tr>
<th>Urban System</th>
<th>Design Intentions</th>
<th>Physical implications</th>
<th>Tentative assessment (*)</th>
</tr>
</thead>
</table>
| **Location**         | - Take advantage of the location of the settlement and use the topography as an asset for design.  
                        - Improve the consolidated areas as part of the upgrading and preserve the natural areas around.  
                        - Integrate the design to the city planning system                                      | Integration of the neighbourhood to Quito's Green Urban Network strategy               | ![Connectivity](Lv.1) ![Productivity](Lv.1) ![Adaptability](Lv.1) ![Engagement](Lv.1) ![Engagement](Lv.2) |
|                      |                                                                                   | Incorporate urban farming in critical areas as green limit                           | ![Connectivity](Lv.1) ![Productivity](Lv.1) ![Adaptability](Lv.1) ![Engagement](Lv.1) ![Engagement](Lv.2) |
| **Urban connections**| - Improve horizontal and vertical circulations inside the settlement in order to guarantee internal and external urban connectivity.  
                          - Promote the walkability of the settlement.                                           | Improvement of existing vehicular circulations                                       | ![Connectivity](Lv.1) ![Productivity](Lv.1) ![Adaptability](Lv.1) ![Engagement](Lv.1) ![Engagement](Lv.2) |
|                      |                                                                                   | Generation of terraced platforms in consolidated areas                               | ![Connectivity](Lv.1) ![Productivity](Lv.1) ![Adaptability](Lv.1) ![Engagement](Lv.1) ![Engagement](Lv.2) |
|                      |                                                                                   | Generation of terraced platforms in vacant areas                                    | ![Connectivity](Lv.1) ![Productivity](Lv.1) ![Adaptability](Lv.1) ![Engagement](Lv.1) ![Engagement](Lv.2) |
|                      |                                                                                   | Construction of independent stairs                                                  | ![Connectivity](Lv.1) ![Productivity](Lv.1) ![Adaptability](Lv.1) ![Engagement](Lv.1) ![Engagement](Lv.2) |
| **Activity nodes**   | - Preserve the settlement landmarks or relocate them in case of physical risk.  
                        - Create new urban centralities                                                      | Relocation of existing important landmarks                                          | ![Connectivity](Lv.1) ![Productivity](Lv.1) ![Adaptability](Lv.1) ![Engagement](Lv.1) ![Engagement](Lv.2) |
|                      |                                                                                   | Design of the Communal Centre as a new urban image.                                 | ![Connectivity](Lv.1) ![Productivity](Lv.1) ![Adaptability](Lv.1) ![Engagement](Lv.1) ![Engagement](Lv.2) |
|                      |                                                                                   | Proposal of a funicular system as a future projection                                | ![Connectivity](Lv.1) ![Productivity](Lv.1) ![Adaptability](Lv.1) ![Engagement](Lv.1) ![Engagement](Lv.2) |

Table 4. Assessment of interventions

* Note: See description of qualification in terms of connectivity, productivity, adaptability and engagement, page 12
V.b. Master Plan

Figure 52. San Jacinto de Atucucho, master plan
The neighbourhood can be integrated to Quito’s Green Urban Network as a strategy to prevent urban sprawl. The Green Urban Network (2014) has identified three categories of interventions in the city: metropolitan parks, emblematic parks and strategic ravines in order to respond to the national objective of promoting environmental sustainability.

The Rumihurco ravine is one of the chosen areas to implement the strategies that are being developed in the document (Secretaría General de Planificación, 2014). This research project proposes to include urban farming in order to integrate the neighbourhood to the city network and suggests that this approach could be replicated on other informal settlements located on ravines.

At the same time, these strategic areas are being connected with a network of public spaces across the city. In San Jacinto de Atucucho, the intention is to take advantage of the topography in order to improve the areas that are currently being used as public spaces.
Urban farming is proposed as a strategy to prevent the occupation of vacant land around the neighbourhood. The existing platforms occupied by dwellings in areas of high risk would be used to create a green productive ring and the dwellings established in the edge of the ravine and under the high voltage power line would be relocated in safer zones. In this manner, the inhabitants would be the guardians of their own environment and safety alleviating the burden on local authorities.

The space under the high voltage power line would be preserved as a landmark with a new fruitful purpose for the population of different ages and backgrounds. Moreover, the Rumihurco ravine, perceived as a strong image of the area, will gain visibility and a productive urban function, which will contribute to the integration of the settlement to the formal city.

At neighbourhood level:

Urban farming is proposed as a strategy to prevent the occupation of vacant land around the neighbourhood. The existing platforms occupied by dwellings in areas of high risk would be used to create a green productive ring and the dwellings established in the edge of the ravine and under the high voltage power line would be relocated in safer zones. In this manner, the inhabitants would be the guardians of their own environment and safety alleviating the burden on local authorities.
The crucial improvement planned for the settlement is to adapt the main informal roads to the topography in order to link the area to the surrounding neighbourhoods. Three main arteries organize the vehicular traffic and allow the waste collection. Priority is given to the existing pedestrian connections that create the internal network of the plots and organize the communal activities. Currently, the settlement is almost entirely restrained to pedestrian circulation due to technical difficulties and even though the vehicular traffic will be allowed for security reasons and service provision, the intention is to maintain the pedestrian character of the area. Moreover, the project will improve a road for activities related to the conservation of the ravine.

Streets are considered as a crucial tool for achieving physical improvements and integrating the settlement network to the formal urban fabric. Furthermore, by improving the internal circulations, the access to public transport will be possible and the community life and vitality of the area will deliver synergistic results in the surroundings.
Several possibilities were analyzed to solve the topographic conditions of the area. A combined solution of the possibilities was chosen in order to maintain the spontaneous character of the settlement and to allow the development of activity networks and pedestrian flows.

Option 1. Independent stairs

Option 2. Terraced squares

Option 2. Stair towers

There are two scenarios in which the urban system can be applied: where there are not constructions present and areas with consolidated dwellings.

Areas of implementation

There are two scenarios in which the urban system can be applied: where there are not constructions present and areas with consolidated dwellings.
V.d. Urban Connections

Implementation on existing dwellings

- Direct relationship with urban farming area
- Vacant platforms for communal activities
- Preserve the spontaneous character
- Adaptable modular stairs
- Relationship with natural terrain

Implementation on vacant land

- Direct relationship with new infrastructure
- Different sizes of platforms for multiple activities
- Connection of pedestrian and vehicular roads
- Modular elevation in platforms

Figure 62. Functioning of the proposal with existing dwellings

Figure 63. Functioning of the proposal in vacant plots
The intention of the system is to create horizontal and vertical networks of circulation through the construction of platforms with modular height. The modular height allows users to take advantage of the space available on the roofs and multiply the functional area in the settlement.
The intention is to create healthy zones for the settlement and for the neighbourhoods around in order to make the area visible to the formal city. The relocation of the sports field and the construction of a new landmark in the settlement respond to the necessity of integration with the city. It is well known that to construct new urban landmarks on settlements like San Jacinto de Atucucho would have synergistic results. The function of these spaces will contribute to the productivity of the population and therefore, to the social integration with the city.

The first intervention for the upgrading of the area is to relocate the sports field in a safer area that can be accessed by the majority of the population. Moreover, the concept of terraced platforms will be used to link this space with the natural morphology of the settlement. It is important to recognize that the area currently has flexible functions; therefore, by providing platforms that can be adapted to different needs the significance of the area is enhanced.

The communal infrastructure is conceived as a new urban centrality for the area and the surrounding neighbourhoods. The diversity of the population and the cultural heritage are considered as a tool to achieve physical, economic and cultural integration of the settlement. Moreover, the community organization will be the basis for the microenterprises that will be generated on the space. The function of the spaces is adaptable depending on the necessities of the population and the constant changes of the area.
Physically, the Communal Centre acts as an urban connector of the area due to the stair towers and the corridors that link the higher pedestrian street with the main vehicular road. Moreover, it has a direct relationship with the terraced squares proposed and will enhance the productivity of the settlement. The training and skills learned in the workshops would be an investment for the population because they would be applied in the area with financial and communal benefits. According to the literature review, it is likely that the presence of a public landmark encourages the sprawl of productive residences in the surroundings.

The Communal centre is not considered as an isolated building, it is rather a part of a dynamic urban system. Therefore, community engagement is essential for its operation and maintenance. The functions that will be developed in the venue should be adaptable to future changes.
With the implementation of the terraced platforms, the informal settlement would be densified and transformed into a recognized neighbourhood. However, informality is a process that involves not only physical pathologies, but also cultural behaviors born out of necessity.

To avoid informal means of transportation in the future, the project proposes a small scale funicular system that will be used mainly to transport goods and waste from the higher zones to the main vehicular road. In spite of the improved pedestrian circulations, construction materials and heavy goods will still be difficult to transport due to the topography; therefore, it is suggested as part of the sustainable upgrading to contemplate the future needs of the area.
Conclusion
Conclusion

It is clear that urban informality is now perceived as a complex phenomenon that will not be eradicated with economic growth. On the contrary, informal settlements are a consequence of years of uneven resource distribution; therefore, it has become a crucial concern for the planning process to include the commonalities of these areas into de urban dynamic in order to address its necessities.

Over the last decades, several attempts have been made in order to transform these dwellings into neighbourhoods of the formal city. Latin America is now considered as an urban laboratory to test and validate these initiatives. However, it is clear that alleviating urban poverty does not necessarily include permanent upgrading of informal settlements and it is also clear that this process is much more complex than the implementation of isolated successful practices.

To continue, in the context of San Jacinto de Atucucho, there is a need to generate a concept that leads the implementation of the upgrading process in order to replicate it in similar realities. It is also crucial to base the proposals on the existing institutional framework of the formal city that responds to the national objective of sustainability and social equity. The planning system referring to informal settlements must be transformed: from an ideological approach of land regularization, to a theoretical framework that underpins the development.

Moreover, in the aim of integrating these areas to the formal city, the role of the public realm is crucial. Interventions that address the urban dynamics and networks of the settlement are more likely to be successful than isolated proposals. The public realm seen as the remaining space left after the location of the dwellings has the potential of generating permanent transformations in the urban fabric. However, the analysis of successful practices determines that these transformations must be based on community participation in order to be durable. Cultural richness and engagement should be taken into consideration as an asset for design.

In this context, sustainability acquires a new dimension on informal settlements. Economic, social and environmental concerns are covered by interventions that fulfill certain requirements: connectivity with the formal city, adaptability to future circumstances, community engagement and productivity of the area are a re conceptualization of sustainable practices when the area is seen as part of a greater urban system.

All in all, the combination of small and large scale strategies proposed would contribute to the sustainable upgrading of the area and could potentially bring enormous benefits for the population and the city in general. This research project intends to provide the basis for further studies in order to develop a generic approach adaptable to different realities that could only be evaluated in the future.
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