



**UNIVERSIDADE DE COIMBRA
FACULTY OF SCIENCES AND TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING**

**Adequate Housing Provision in Latin America
Towards a sustainable future for informal human settlements**

Eduardo Naoru Pacheco Chin

M.Sc. Energy for Sustainability

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Dedicatory

I would like to dedicate this work to my family. Thank you mom and dad, for your unconditional love and support during my whole life, this experience would have been impossible without you. Thank you brother, for being such a great example of hard work and dedication, and for inspiring me to study abroad. You are a great person and I know you will have a great life.

I would also like to dedicate this study to my aunt *Paty*. We all miss you and you are in our hearts.

Abstract

Many cities in Latin America had an accelerated growth, especially during the second half of the twentieth century; however, they did it in a rather unplanned manner. Many of these urban centers suffer from serious problems, such as poor environmental conditions, socio-economic inequity, marginalization of the urban poor, violence and criminality, and lack of affordable and adequate housing. The human population is rapidly increasing and people are migrating to the cities at a fast rate, as they provide more and better opportunities for quality of life improvement. Latin America is one of the regions that has been struggling with the difficulties to provide adequate housing for all of its population. The great inequality of the region and the lack of affordable dwelling has pushed the most vulnerable part of the population to establish themselves in informal settlements, where precarious conditions prevail.

This study intends to be a source of information and a practical guideline to achieve a sustainable urban development (SUD) through an integrated approach. The provision of adequate and affordable housing for everyone is crucial for the development of the region and for a healthy urban environment.

This study presents a context analysis of the informal settlements, understanding the origins of these communities and the main problems that afflict the slum-dwellers. Methodologies to provide shelter to the urban poor are analyzed too, making special emphasis on the strategies developed by governments and professionals of Latin America.

Finally, the analysis of the different approaches is synthesized in a conceptual design of a slum-upgrading project, using architecture as the platform to apply the learned concepts. The area used for the final stage of this study is the neighborhood Cerro de la Campana, located in Monterrey, Mexico. However, the project is flexible and could be applied in other sloped informal settlements.

Key words: housing, sustainable urban development, slum-upgrading, Latin America.

Resumo

Muitas cidades da América Latina tiveram um crescimento acelerado, especialmente durante a segunda metade do século XX; no entanto, isso não aconteceu de uma forma planejada. Muitos desses centros urbanos sofrem de sérios problemas, como condições ambientais precárias, desigualdades socioeconômicas, marginalização dos cidadãos desfavorecidos, violência e criminalidade, e falta de habitação acessível e adequada. A população humana está aumentando rapidamente e as pessoas estão emigrando para as cidades a um ritmo acelerado, uma vez que estas proporcionam mais e melhores oportunidades para melhorar a qualidade de vida. A América Latina é uma das regiões que tem lutado com as dificuldades de proporcionar habitação adequada para toda a sua população. A grande desigualdade da região e a falta de habitação a preços acessíveis levaram a parte mais vulnerável da população a se estabelecer em assentamentos informais, onde prevalecem condições precárias.

Este estudo pretende ser uma fonte de informação e um guia prático para alcançar o desenvolvimento urbano sustentável através de uma abordagem integrada. A provisão de habitação adequada e acessível para todos é crucial para o desenvolvimento da região e para um ambiente urbano saudável.

Este estudo apresenta uma análise do contexto dos assentamentos informais, compreendendo as origens dessas comunidades e os principais problemas que afligem os moradores de favelas. Também são analisadas as metodologias para providenciar abrigo aos cidadãos desfavorecidos, dando ênfase especial às estratégias desenvolvidas pelos governos e profissionais da América Latina.

Por último, a análise das diferentes abordagens é sintetizada num design conceptual de um projeto de atualização de favelas, usando a arquitetura como plataforma para aplicar os conceitos aprendidos. A área utilizada para a fase final deste estudo é o bairro Cerro de la Campana, localizado em Monterrey, no México. No entanto, o projeto é flexível e pode ser aplicado noutros assentamentos informais.

Palavras-chave: habitação, desenvolvimento urbano sustentável, melhoramento de bairros informais, América Latina.

Acronyms List

IHS	Informal Human Settlements
IPCC	Intergovernmental Panel for Climate Change
LATAM	Latin America
PACN	Programa de Aceleração do Crescimento
PB	Participatory Budget
PUI	Proyecto Urbano Integral
SDGs	Sustainable Development Goals
SUD	Sustainable Urban Development
UNCHS-Habitat	United Nations Centre for Human Settlements
UN-Habitat	United Nations Human Settlements Programme

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1. Introduction

Adequate housing was recognized as a basic need for an adequate standard of living in 1948 Universal Declaration of Human Rights, and in 1966 by the International Covenant on Economic, Social and Cultural Rights. (Office of the United Nations High Commissioner for Human Rights, 2014). One of the main rights a person should always have is to have a decent place to live, and to protect him or herself from the aggressiveness of the natural environment; that said, from the most basic perspective of what a home should be. Unfortunately, not everyone has access to adequate housing conditions and, in some cases, the living conditions could even be considered sub-human.

Housing has been for a long time one of the most difficult challenges for the urbanization in Latin America (LATAM) and the global south in general. According to UN-Habitat, around 800 million people lived in informal settlements by 2010 (UN-Habitat, 2010). Informal human settlements (IHS), are also called “slums” by the United Nations, even when concerns about that word being pejorative have been expressed (Gilbert, 2007). Informal human settlements are known by different names throughout the LATAM region, some of these names are “*Villa Miseria*” in Argentina, “*Favela*” in Brazil, “*Campamento*” in Chile, “*Comuna*” in Colombia, “*Barrio*” in Honduras, “*Pueblo Joven*” in Peru, “*Cantegril*” in Uruguay, “*Rancho*” in Venezuela (Magat, 2015), and “*Jacales*” or “*Ciudades Paracaidistas*” in Mexico (Magat, 2015; United Nations Human Settlements Programme, 2005).

There are diverse definitions for what is a slum; some authors see slums from the spatial point of view, while others describe them as groups of households living under certain precarious conditions. More than helping to define and measure slums, the differences and contrasts between definitions make the task more difficult of understanding and addressing. However, the most widely accepted definition was established by the United Nations Human Settlements Programme (UN-Habitat) in 2003. It classifies slums as “a group of individuals that live under the same roof that lack one or more of the following conditions; access to improved water, access to improved sanitation, sufficient living space, durability of housing and secure tenure” (United Nations Human Settlements Programme, 2003a).

Giving housing the importance it deserves inside urban planning is fundamental, especially nowadays when the urban models of cities are turning them into places of exclusion rather than sources of opportunities for everyone. “Cities, especially in the developing world, are growing fragmented, unequal and dysfunctional with the current models of housing production and consumption at the core of these processes” (United Nations Human Settlements Programme, 2015).

Urbanization and access to housing are both important, and both offer opportunities for a sustainable development of cities. However, an integrated and holistic address of both has been missing in the national urban plans from the Latin America and the Caribbean region. By increasing the importance of housing in the national urban plan of the LATAM countries, it is possible to improve the socio-economic development of the region. According to the United Nations Human Settlements Programme (UN-Habitat), “a greater consideration of housing in urban development, to the extent that it results in diversity, mixed use and business opportunities, will also contribute to the prosperous growth of cities” (United Nations Human Settlements Programme, 2015).

The United Nations 2030 Agenda for Sustainable Development is based in 17 Sustainable Development Goals (SDGs) and 169 targets that seek the prosperity of the human race and the planet. This agenda intends to build on the Millennium Development Goals and achieve what they did not. One of the remarks of this new agenda of the UN is the existence of an exclusive goal that focuses on cities and human settlements. The goal 11 has the task to “make cities and human settlements inclusive, safe, resilient and sustainable” (General Assembly of the United Nations, 2015).

According to the fact sheet No. 21, which describes “The Right to Adequate Housing” established in the Universal Declaration for Human Rights, adequate dwelling should comply with the following characteristics: security of tenure; availability of services, materials, facilities and infrastructure; affordability; habitability; accessibility; location; and cultural adequacy (Office of the United Nations High Commissioner for Human Rights, 2014). In order to achieve sustainability in urban centers and neighborhoods that compose them, among other things, it is necessary to provide adequate housing for everyone, with all the characteristics that this term encompass.

The growing urgency to provide adequate housing to millions of people and the need to do so in ways that guarantee a sustainable future for cities, calls for a shift in housing policy and practice (United Nations Human Settlements Programme, 2015). Therefore, the main question that this study aims to answer is which is the best way to improve the living conditions in informal human settlements?

This study intends to understand the needs of the slum dwellers in the global south (especially in Latin America), and offer a slum-upgrading strategy that can change not only the physical conditions of these communities, but also to cross mental barriers of its inhabitants, and motivate them to adopt sustainable practices that are already being practiced in the formal city. Architecture is the cornerstone of this research and is used as the main platform to provide a holistic solution for the different circumstances that affect the urban poor. Even if not all the problems present in IHS are directly related to the built environment, architecture practiced in an interdisciplinary way, and through a participatory model, can be a powerful tool to improve the quality of life in informal communities.

Slum-upgrading programs, like the Urban Integral Project (PUI due to its acronym in Spanish for *Proyecto Urbano Integral*), the *Favela Bairro* program in Río de Janeiro, Brazil, and strategies followed by the Chilean architect Alejandro Aravena and Jorge Mario Jáuregui are analyzed in this study.

Following the analysis of the mentioned strategies, a conceptual design model is presented as a strategy to achieve a sustainable, resilient, flexible, and healthy urban environment in the informal city. The neighborhood *Cerro de la Campana*, in Monterrey, Mexico is used as example for this experiment. However, the model intends to be flexible enough to be applied in other communities located in sloped sites, which is the case of many informal settlements throughout Latin America.

According to Ward and Smith, sustainable housing applications have predominantly focused on middle and high-income neighborhoods. However, there is a growing recognition in middle-income developing countries such as Mexico and Brazil, that sustainable practices need to be incorporated in informal and low-income dwelling in order to gain traction (Ward & Smith Sr, 2015). This is one of the main objectives of the presented strategy in this study, in

addition to the provision of the basic services and structural retrofitting already present in most of the slum-upgrading programs.

Besides its relevance for the global well-being and for the accomplishment of the region's goals towards the 2030 Agenda for Sustainable Development, the theme of this research is of special interest for me because poor housing conditions is a reality that many people in the LATAM region, which my country (Mexico) is part of, struggle with on a daily basis. This research intends to be a reference for slum upgrading programs and, confidently, it will help to improve the living conditions of the urban poor in the Latin American region.

1.1 The migration into the cities

One of the main reasons of the proliferation of IHS is the incapacity of the governments to cope with the amount of people coming into the cities each year, and the poor housing policies management, which causes a lack of affordable dwelling for the poorest ones (United Nations Human Settlements Programme, 2015).

The first UN Habitat conference was held in Vancouver in 1976 and, one year later, the United Nations Centre for Human Settlements (UNCHS – Habitat) was founded in Nairobi. Both of these events marked a turning point towards a major focus on urban development rather than on a rural model like it was being done in the previous years (van Lindert, 2015). It became clear that it was more important to allocate resources to the cause of urban poverty. Even when the conditions of the quality of life in rural areas were being attended through investments in agriculture and other rural sectors, the migration into the cities is not being diminished (van Lindert, 2015).

Since the mid-1900s, the urbanization process in the LATAM region has progressed more rapidly than in any other region. One of the reasons was the poor living conditions that existed in the rural areas due to the concentration of land ownership in the hands of a few families and the low labor productivity of the peasants and tenant farmers (Lora, Powell, van Praag, & Sanguinetti, 2010). This migration process is still happening today in many countries in the region. Other reasons behind the rapid urbanization process in Latin America is the migration of foreigners into the region, like the case of Sao Paulo, Brazil, where some rich and

more educated people from other regions like Europe migrated into the city during the second half of the twentieth century, causing the destitute of rural workers (Lora, Powell, van Praag, & Sanguinetti, 2010).

Nevertheless, internal migration has contributed more to migration into the cities than the foreign newcomers have. The majority of the internal population moving into the urban areas are poor people without education, fleeing from armed conflicts and poverty in rural areas. Nonetheless, the number of poor people is larger in urban areas, although the poverty rate is higher in the countryside (Lora, Powell, van Praag, & Sanguinetti, 2010). Because most of the cities in the LATAM region are large cities, “the ability of the urban poor to escape poverty and improve their quality of life depends critically on the opportunities and conditions offered by and in large cities” (Lora, Powell, van Praag, & Sanguinetti, 2010).

Cities represent one of the major contributors to economic and human development. According to a McKinsey Global Institute Report, today only 600 urban centers of the world generate about 60% of the global GDP (Dobbs, et al., 2011). In addition, since human beings started to build permanent settlements that became cities, these places became the centers of knowledge, innovation, productivity and services. “Cities facilitate creative thinking and innovation. High concentration of people in cities generates more opportunities for interaction and communication, promotes creative thinking, creates knowledge spillovers and develops new ideas and technologies” (Zhang, 2011).

Cities serve as catalysts of social, cultural, economic, technologic and political changes and advancement. According to a publication made by the United Nations, countries with high levels of urbanization tend to contribute to the strongest urban GDP growth. Some of the nations that are expected to have the biggest urban GDP growth by 2025 are China, United States, India, Brazil and Mexico. China will contribute to 31.2 percent of the global growth; United States, 10.7 percent; India, 3.7 percent; Brazil, 2.8 percent; and Mexico, 1.6 percent (Figure 1) (Zhang, 2011).

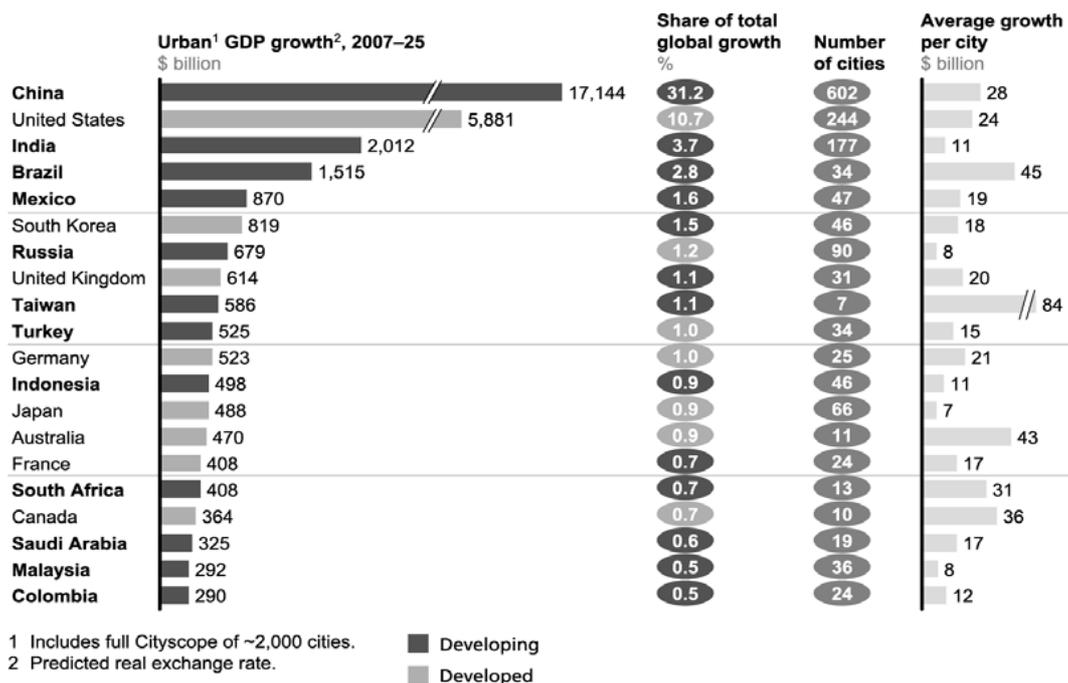


Fig. 1 - Expected GDP growth by the year 2025

Source: McKinsey Global Institute 2011

According to a research done by the World Bank, “Latin America has four of the world’s 20 cities with more than 10 million inhabitants, and 55 of the world’s 414 cities with more than 1 million people. Those 55 cities are home to 183 million people, one-third of all Latin Americans” (Lora, Powell, van Praag, & Sanguinetti, 2010). In addition, a position paper delivered by the United Nations Human Settlements Program (UN Habitat), 6 persons out of 10 are expected to reside in urban areas by the year 2030, and 90% of this growth will take place in Africa, Asia, Latin America and the Caribbean. Currently, 880 million people are living in slums in the developing countries (United Nations Human Settlements Programme, 2015).

According to the World Bank database, back in 1960, the world accounted a population of just 3.034 billion people; in 2017, the world’s population is 7.442 billion people (The World Bank, 2017). This population growth has been accompanied by transfer of rural population into the cities; even causing the emergence of new urban environments out of nowhere (García-Ayllón, 2016). This enormous growth has been massive in the developing world in the past 50 years, where the sprawling of slums in the low and middle-income countries has been the principal sign of a fast and unbalanced urbanization process.

More than half of the population of cities like Mumbai, Nairobi, and Mexico City live in informal settlements (Ezeh, et al., 2016). Latin America is one of the regions with the highest amount of urban population, where more than 80% of its residents live in cities (Ezquiaga Arquitectura, Sociedad y Territorio S.L., 2015). However, according to García-Ayllón, Latin American cities have not been able to respond to the changing socio-economic conditions. That summed to the existing inequalities has resulted in serious urban problems such as the lack of public services, environmental degradation of the landscape, poverty, overcrowding, social segmentation, and crime (García-Ayllón, 2016). This makes very clear the need for an immediate and practical solution for the rapid urban growth that is happening in the global south.

1.2 Cities and Climate Change

The Conference of Parties 21 (COP21) also known as the 2015 Paris Climate Change Conference is already part of the human history as every nation in the world recognized climate change as one of the main problems that the nations need to tackle immediately and agreed upon a target to limit global warming (Oberghassel, et al., 2016). According to a research held by the C40 and Arup, “of the 14,000 new actions that are required from 2016-2020, 71% should be taken by cities that need to immediately decrease per capita emissions” (Hurst & Clement-Jones, 2017). In addition, the Intergovernmental Panel for Climate Change (IPCC) fifth assessment (AR5) reported that urban climate change risks are increasing, and identified that “much of the key and emerging global climate risks are concentrated in urban centers” (Bigio, et al., 2014). It is a fact that as the population continues to grow, the cities around the world will do it as well. According to a report published by Arup and the C40, cities generate around 80% of the global wealth, measured by the GDP; they also consume over 2/3 of the global energy and are responsible of more than 70% of the global total greenhouse gases emissions (ARUP & C40, 2015).

In general, rural areas consume much less energy than urban areas, part of this is because globally, 32 % of the rural population lack access to electricity and other modern technologies that are energy consumers, compared to only 5.3 % of the urban population that do not have access to this service. This way, energy use and GHG emissions from human settlements is mainly from urban areas rather than rural areas, so the participation of cities and urban areas in

the mitigation of climate change has become crucial in the last few years. According to the IPCC, it is very difficult to estimate the total GHG emissions from a country or a region; this is because there are very few studies related to this issue, especially in the developing countries. There are also some challenges due to the difference between the chosen methods of the studies and the definition of cities' boundaries. However, all the studies analyzed by the IPCC agree that urban areas share more responsibility in climate change than the rural areas do (Bigio, et al., 2014).

1.3 The present and future of urbanization in Latin America

According to García-Ayllón, not all the fast-growing cases in Latin America resulted in flawed urban-centers; he uses the city of Santiago de Chile as an example of strong growth over the last decades. However, other cities like Panama, Mexico City and Rio de Janeiro have experienced different urban pathologies like gentrification processes, massive sprawl, accelerated consumption of the natural resources, and social dysfunctions; this due to the accelerated growth that occurred and that is still in process in the region (García-Ayllón, 2016).

According to the World Bank, the Latin America and Caribbean region is expected to grow again after six years of slowdown, and two of those, years of recession. "Latin America and the Caribbean are expected to expand by 1.2% in 2017, followed by 2.1% in 2018. Argentina and Brazil are coming out of recession, Mexico will keep growing, and Central America and the Caribbean will grow faster" (The World Bank, 2017). However, those six years of recession affected jobs and Latin-American's household incomes causing inequality to remain in the region, a slow-growing middleclass, and almost 40% of the population is still at risk of falling into poverty again (The World Bank, 2017)

Megacities that accommodated once more than 20 million people, like Mexico City or Sao Paulo, were some of the main motors for socio-economic development and progress in the LATAM region. Nevertheless, their uncontrolled growth and the short time lapse in which it happened, did not gave the governments and experts any time to stop and formulate an organized and sustainable plan. For this reason, these megacities are some of the main responsible for global warming, traffic congestion, social exclusion, and informal settlements today. Megalopolis might appear as the ones that require the most attention, due to their size and urban complexity. However, these urban centers are not the fastest-growing ones; other

middle-size cities are gaining more relevance in comparison to the biggest cities of the region, this due to their fastest urbanization rates.

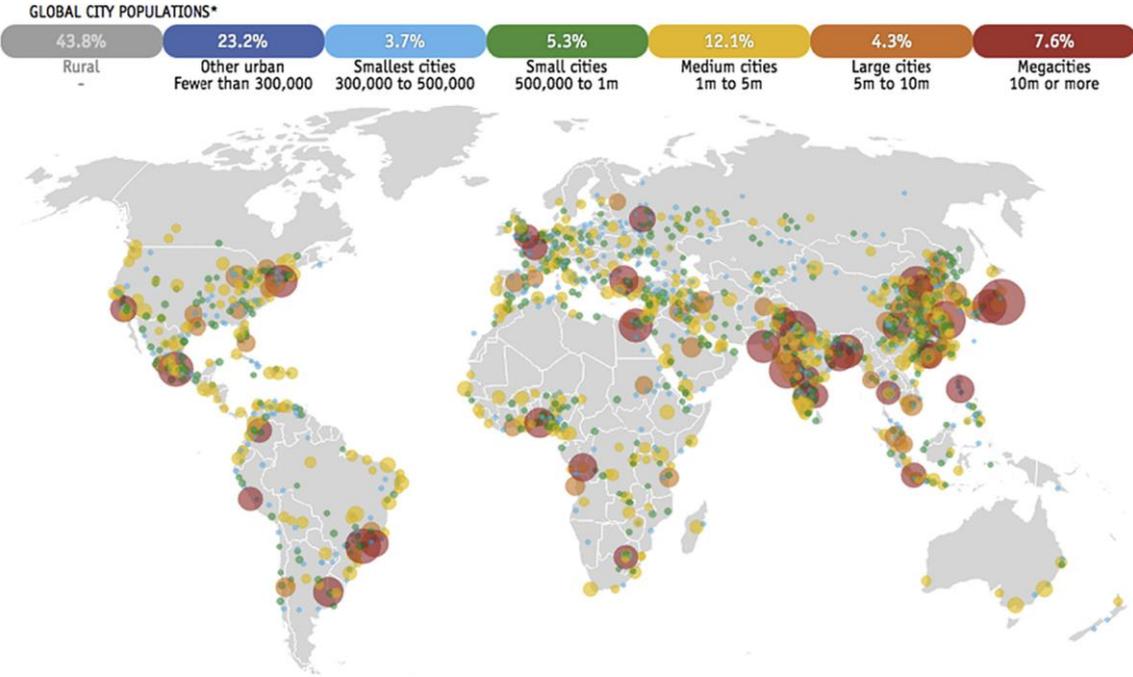


Fig. 2 – Global city populations

Source: (García-Ayllón, 2016)

According to a study made by the Inter-American Development Bank (BID for its acronym in Spanish for *Banco Interamericano de Desarrollo*), the urbanization processes are moving from massive agglomeration in megacities to secondary medium-size urban cities. These urban centers, referred as “emerging cities” (Fig. 2), are the home of 100,000 to 2,000,000 inhabitants and have the highest economic and demographic growth rates of the region. It is here where most of the urban growth is going to happen during the following years (Terraza, Rubio, & Vera, 2016). These are also the places with the most flexibility and opportunities to emend the errors from the past and develop a sustainable plan of urbanization.

1.4 Characterization of problems in informal human settlements

The physical and socio-economic characteristics of informal settlements have a direct impact on the quality of life of the inhabitants of these communities, affecting their personal and family stress, security, access to job locations, food and education (Wekesa, Steyn, & Otieno, 2011). This is why it is very important to understand the conditions and the problems

that exist in slums, always taking into account that every community has its own physical and socio-economic characteristics, and thus, their own priorities to be taken care of.

In this study, a characterization of the general and most common problems inside informal human settlements (IHS) is presented through a cross-table (Annex A) between the problems existing in IHS and some possible solutions for them. The information is organized in four main areas that are developed into more detail in the next sections of the study. The study fields included are the built environment, habitat and sustainability, socio-cultural context, and economy (Fig. 3). The characterization of the problematic in impoverished communities is the cornerstone of understanding the conditions that its inhabitants live under, and therefore, their real needs.

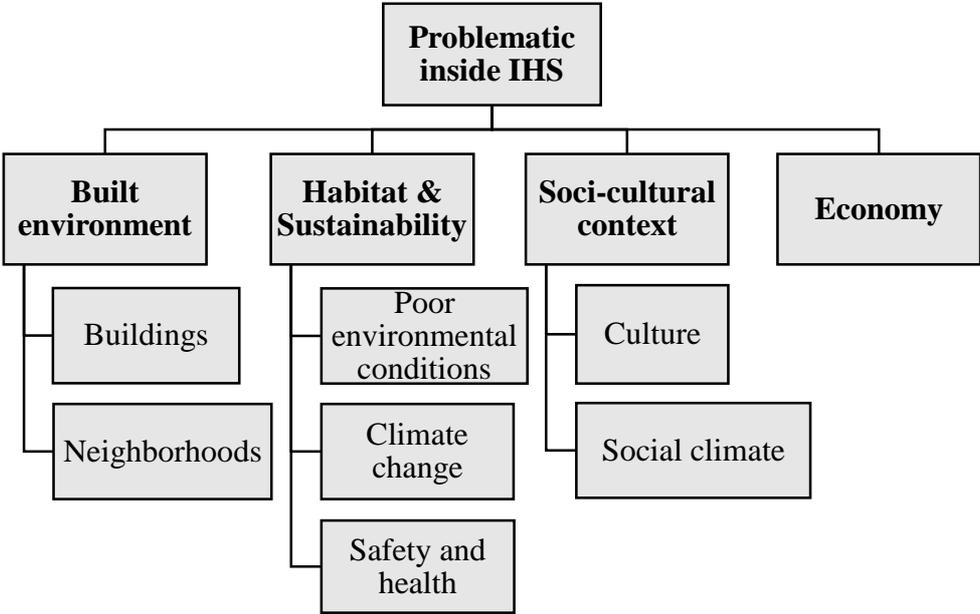


Fig. 3 – Study areas included for the analysis of the problematic in informal human settlements.

1.4.1 The built environment

A study revealed that the provision of an adequate physical environment is the top priority in slum upgrading projects around the world and is attended with more frequency than legal, social, and political upgrading, which can be considered as complementary projects in some cases (Olthuis, Benni, Eichwede, & Zevenbergen, 2015). It is very difficult for a person to achieve a good quality of life and develop as a healthy human being without an adequate environment; thus, physical infrastructure is an integral part of any human settlement and is the primary element of a slum-upgrading project (Abbot, 2002).

The physical characteristics of a space, especially a house, play a major role in providing safety and comfort to the people living there. According to the Declaration of Human Rights a house that is considered as adequate to live in should have “availability of services, materials, facilities and infrastructure”. This means that a housing unit “is not adequate if its occupants do not have safe drinking water, adequate sanitation, energy for cooking, heating, lighting, food storage or refuse disposal” (Office of the United Nations High Commissioner for Human Rights, 2014). Another requisite for adequate housing is the habitability of it; this means that a house “is not adequate if it does not guarantee physical safety or provide adequate space, as well as protection against the cold, damp, heat, rain, wind, other threats to health and structural hazards” (Office of the United Nations High Commissioner for Human Rights, 2014).

Notwithstanding, most of the slum dwellers live in houses without appropriate conditions to protect themselves from the environment. Some of the houses have dirt floors, poor quality roofs, and use waste materials such as cardboard, tin, and plastic to build the walls (Galiani, et al., 2016). These conditions do not provide any comfort at all, and much less comply with the building codes and minimum safety conditions established by the law. Many of these settlements even lack of basic services such as clean water, sanitation, and electricity (United Nations Human Settlements Programme, 2003b).

In addition to the lack of basic services mentioned before and the poor quality of the housing units in slums, there is also a need of public spaces and green areas. Green space is an important aspect of urban development because it is an indicator of quality of life. Improving the access to these spaces for all citizens, without segregating informal settlements is a way to improve equality in urban areas. In fact, lack of public green spaces has been related to higher levels of crime and lower quality of life for the citizens (Wright, Zarger, & Mihelcic, 2012). Besides the improvement in the physical condition that a park can provide to the urban residents, the mental well-being is also a positive asset of public open space (Wood, Hooper, Foster, & Bull, 2017). Open public space plays a major role in the social interactions and productivity of informal settlements; both are highly dependent on the capacity of public space to absorb and enhance the economic functions that take place in the community on a daily basis, and that represent the source of income of many families (Dovey, 2014).

Overcrowding is a common problem in slums. Many families share the same housing unit, and sometimes even numerous persons live in the same room, which is frequently used

for various activities such as sleeping, cooking, living, and other day-to-day activities of a family (Magat, 2015). Unlike their parents who in many cases were the first migrants and were part of the beginning of the settlements, the second and third generations were raised inside the slum and rarely intend to build a new house outside of the community or move out of it. The dwellings of IHS can take many forms and can share lots; in some cases, the households may build a small room in another section of the lot in order to live in it, or they can share the same housing unit and the basic appliances and services in it, like kitchen and bathroom (Ward & Smith Sr, 2015).

One of the major challenges for the slum-upgrading initiatives is to design and implement interconnections between the informal and the formal city. Social and physical discontinuity between slums and the surrounding areas is a major characteristic and a serious problem for the inhabitants of informal settlements; it can be social, physical, and/or spatial (Abbot, 2003). The isolation of these communities results in a lack of social mix that affects the identity of its inhabitants in a negative way; it perpetuates the poverty of the place. This insulation also serves as a safe place for criminal organizations, which take advantage of the remoteness, and abandonment by the State to operate freely and hidden in the informality (Dovey, 2014). In order to have an inclusive urban environment that provides development opportunities with equity, it is essential to avoid urban policies that treat informal settlements as isolated communities who are not part of the city. To the extent that the policies related to the urban development are developed thinking in the most vulnerable sectors of society, a more healthy city will be the result, benefiting everyone.

Mobility is one of the most relevant issues in urban centers; it is one of the main contributors to economic activity and social development. A more central location or a good connection to public transport makes a neighborhood more attractive for its inhabitants and real estate developers. Latin America is an interesting case of study in terms of public transport, given that in the late 20th century there was very little government regulation and investment in this matter, resulting in informality and dispersed-ownership that contributed to a high discomfort and unsatisfied customers (Paget-Seekins & Tironi, 2016). Differently from North America and Europe, in Latin America, suburban and urban peripheries have been inhabited by the poorest dwellers and most of these urban fringes consist of informal settlements. The availability, as well as the quality of public transport and public space in these peripheral areas is very different than it is on the central locations of the cities; priority has been given to the

wealthier groups as the policies are customized by them and for them, this is a way of exclusion of the urban poor. (Lukas & López-Morales, 2017).

The urban landscape of many Latin American cities has suffered an intense transformation in the last decades; the growth velocity and the economic imbalance between its citizens have played an important role in the different phenomena that happens in the urban centers of the region (García-Ayllón, 2016). One of the most common phenomena in the LAC region is urban sprawl, and informal human settlements contribute to worsen this problem. A remarkable example of this happens in Mexico City, where its metropolitan zone now comprises three different entities: Mexico City (formerly known as Federal District), the State of Mexico, and a small portion of the state of Hidalgo. In the recent years, the population of Mexico City has developed a diminishing growth rate, while its metropolitan periphery in the State of Mexico and Hidalgo had an increase in its growth rate. Much of this growth is related to the increase of informal settlements and poor neighborhoods in the outskirts of the city; in the second half of the 20th century, slums multiplied in Mexico City's urban space (Fig. 4). The policies implemented by the government have failed to solve the IHS problem occupied by the poorest citizens, and has even motivated the increase of these urban fringes (Aguilar & Santos, 2010).



Fig. 4 - Suburban tapestry of Mexico City. Source: <https://mexicocity2013.jimdo.com/paraca%C3%ADdas-slums/>

1.4.2 Habitat and sustainability

Many slums do not have a proper excrement and urine management system. They are usually disposed in pit latrines, in bags that are later disposed onto the environment, or simply

into the open space. Diseases such as cholera, dysentery, diarrhea and malaria occur in slum areas because of poor sanitation conditions, which in addition contribute to the presence of breeding areas for flies and mosquitoes (Katukiza, et al., 2012). Clean water and sanitation provision are both a priority when investments are made in basic services and infrastructure for slums (Olthuis, Benni, Eichwede, & Zevenbergen, 2015). Provision of adequate sanitary facilities and proper hygiene practices complement each other in preventing slum dwellers suffering from diseases that directly affect child mortality in these communities and in the loss of workdays on adults (Table 1.) (Katukiza, et al., 2012). Unsanitary conditions that prevail in informal settlements have a direct effect on human health, and the environment; this results in a vicious circle in which the productivity of the dwellers is reduced and therefore the impoverishment of these communities continues to worsen (Genser, et al., 2008).

	NCSS 2012	DHS 2014				
	Nairobi slums	All rural	Rural poor	All urban	Nairobi	National
Neonatal mortality rate	14.4	21	20.5	26	39	22
Infant mortality rate	39.2	40	38.2	43	55	39
Under-5 mortality rate	79.8	56	53.3	57	22	52

All mortality rates are per 1000 livebirths. Neonatal mortality rate is the probability of dying within the first month of life. Infant mortality rate is the probability of dying before the first birthday. Under-5 mortality rate is the probability of dying between birth and the fifth birthday For the comparison of early childhood mortality among slums, rural poor, all urban, and national populations, we used data from slum surveys and the DHS. Data for slums were extracted from the NCSS 2000 and 2012,²⁴ and for all other residential domains, data were extracted from DHS 2003 and 2014.²⁵ NCSS=Nairobi Cross-sectional Slum Survey. DHS=Demographic and Health Survey.

Table 1 - Comparison of levels and trends in early childhood mortality in slum and other sub-populations in Kenya, 2012-2013
 Source: (Ezeh, et al., 2016).

One of the main sufferings in slum areas are diarrheal diseases, these are a major child health problem in the developing countries, and especially in the growing urban areas (Kosek, Bern, & Guerrant, 2003). The urban poor are the most vulnerable sector to suffer of diarrheal diseases and is closely related to lack of sanitation and the poor or lack of a waste management system in informal settlements. A study made in the city of Salvador, capital of Bahia state in northeastern Brazil, revealed that sanitary interventions such as the project “Bahia Azul” have an effect on diarrheal diseases occurrence by reducing the exposure to unhygienic factors such as feces in water streams, excreta on the streets, and open puddles. The project’s main objective was to increase the amount of population with access to adequate sewer, (Genser, et al., 2008). Besides diarrheal diseases, other ailments like malaria, and parasite-related diseases are more frequent in poor urban areas than in urban areas; several studies analyze health problems in informal settlements in detail and offer several strategies that could be or are being implemented

to improve health conditions in slum areas. (Ezeh, et al., 2016; Lilford, et al., 2016; Riley, Ko, Unger, & Reis, 2007).

Other factors besides the poor waste management and water pollution contribute to the poor health of slum areas inhabitants as well as to the degradation of the environment. The geographical condition is also a major risk in slum areas; many of these settlements are located in polluted or flood-prone areas, on slopes or ridges, and other inhospitable locations that affect the people's quality of life and more important, represent a danger for their own safety (Galiani, et al., 2016). According to Dewan, flooding is "the most expensive and devastating natural hazard" (Dewan, 2013). As climate change continues to worsen water-related disasters, flooding will continue to be a concern for slums, especially for those located in low-lying areas, floodplains, or close to water bodies. These risk factors aggravate with the poor structural quality of the buildings, the lack of proper drainage, and the overcrowding present in slum areas (Wamsler, 2008; Jankowska, Weeks, & Engstrom, 2011). Even though their proximity to water heightens the risk on these settlements, some of them have learned to take advantage from these conditions, while others have found a way to adapt and even grow onto the water, such are the cases of slums in Lagos, Nigeria, in Iquitos, Peru, or Dhaka, Bangladesh (Olthuis, Benni, Eichwede, & Zevenbergen, 2015). However, according to Glaeser, people are willing to live under those conditions if that allows them to be close to the city center, and therefore, close to the income opportunities (Glaeser, 2011).

As it has been mentioned before, there is a lack of public space and green areas, summed to this, there is an absence of community facilities that can help slum dwellers to improve their quality of life and their integration as a community, and moreover their physical and mental health as well. The provision of schools, recreational centers, sports facilities, or places that could serve not only as meeting points or learning facilities, but also as shelters in case of natural disasters is a key player in maintaining the population away from vices and crime (Samper, 2012). A good example of this last point is the PUI, carried out in the city of Medellin, Colombia.

Informal settlements and the buildings in them may vary in terms of structural quality; they can be simple shacks or structures that are more permanent. On the other hand, the access to basic services and infrastructure is usually very limited or inexistent in the worst cases. In order to improve the living conditions in slums, it is crucial to improve the access to electricity

in these communities. The lack of these basic services has a strong impact in education, and productivity in income generation activities. The electrification of slum areas is still a problem given the fact that most of the slum dwellers cannot commit to a formal service, due to their inconsistent income. Most of the urban poor's earnings come from informal businesses or temporary jobs that do not allow them to pay regular bills; for this reason, many of them appeal to share a meter with a neighbor or turn to unlicensed electricians or locals that provide the service illegally. Due to the virtually free service, the consumption of electricity in informal settlements is inefficient and irresponsible (Butera, Adhikari, & Facchini, 2016).

1.4.3 Socio-cultural context

Latin America as a region is a world leader in terms of urbanization. However, it is also a front-runner, in a negative sense, in terms of crime and violence. While levels of violence since 2000 have decreased everywhere else in the world, in terms of homicides, the LAC region is still an exception (PNUD, 2013). Many Latin American cities are characterized for being unequal in terms of urban development; this means that housing, infrastructure, and public transport are unequally distributed between the population, but most of all, the development opportunities are not the same for the rich and the poor.

The difference between the physical and social environments of the formal and informal city, has repercussions on many levels. One of them is the creation of an ideal space for drug bosses and gangs to establish their criminal organizations in slums. The physical insulation of these communities serves as a lair for criminals as they can operate more freely and can easily take control of the community. This situation generates a sense of insecurity in the whole city, but moreover in slum areas which become stigmatized neighborhoods; the rest of the urban population develops a prejudice towards the poor, relating poverty with crime. A vicious circle is engendered then, as governments try to eradicate violence through physical insulation of informal settlements, worsening the problem. The urban poor, become socially excluded citizens that do not have a sense of belonging to the society; their lack of proper education and poverty represents a difficulty for finding a job. Especially the young people living in slums, that see the criminal organizations and gangs as the only way out of poverty, but furthermore as a way to survive (Glebbeck & Koonings, 2016).

Besides the physical isolation of informal settlements, there is also a political and social exclusion of these communities. Lombard argues that there are gaps in understanding informal settlements in academic and policy fields, excluding certain perspectives and maintaining negative interpretations of places and people of these communities (Lombard, 2014). The people that understand better the needs of informal settlements are the ones that live in them. Each community is different at many levels, from their location and surrounding geography to the cultural settings of their inhabitants. This is why it is crucial for any slum upgrading project to involve the population in the decision-making processes. A successful example of this is the slum upgrading project via Participatory Budget (PB) implemented in Porto Alegre, Brazil.

The PB is a system of resource allocation that transfers the decision-making power in terms of capital expenditure from the city council to public assemblies. In this way the PB recognizes the slum-dwellers' right to participate in decision-making processes and receive the benefits of government support. Architects and planners work together with the residents rather than alone, and given its bottom-up mechanism, this system acknowledges and addresses the real housing needs of the people residing in slum areas. (Pimentel Walker, 2016).

1.4.4 Economy

One of the key roles in a family's stability and income growth is played by the housing sector, especially in low and middle-income households. As it has been discussed in this study, informal settlements continue to grow at alarming rates and it is a threat to the sustainability and development of countries, especially the Global South countries, which host the most vulnerable populations. In addition, many slum-upgrading projects are unaffordable for most of the developing countries (El Menshawy, Shafik, & Khedr, 2016).

Lack of affordability is connected with shelter poverty, this is related to household's inability to keep with non-housing needs (food, clothing, medical care, transportation ...etc.) at the basic level after housing payment (Stone, 2006). This is a growing problem in the housing markets for the low-income families, due to the continuous growth of construction costs; this has a direct impact in the uncontrollable urban sprawl due to informal settlements increase (El Menshawy, Shafik, & Khedr, 2016).

According to Litman (Litman, 2015), some of the most effective and beneficial policies that could be implemented to increase housing affordability are:

- Minimize fees for lower-priced housing.
- Expedite development approval and permitting.
- Identify parcels suitable for affordable-accessible development.
- Provide free inexpensive land for affordable housing.
- Brownfield remediation.
- Targeted tax and fee discounts.
- Address neighborhood concerns.
- Improve building design.
- Resource efficiency design.
- Improve affordable transportation.
- Discourage rental restrictions.
- Affordable housing maintenance and rehabilitation programs (Litman, 2015).

In the economy sector, other problem for the urban poor is the lack of formal business opportunities. Most of the slum dwellers depend on the informal economy to generate income for their families; however, these are irregular and uncertain and the unemployment rate is very high. Previous research has shown that some of the negative effects of unemployment are personal and family stress, depression, low quality of life, lack of basic needs such as food and clothes, overcrowding, inadequate housing, among others (Wekesa, Steyn, & Otieno, 2011). The lack of a consistent income in informal settlements generates a vicious circle, very difficult to escape from for slum dwellers.

A study was developed in the municipality of Cubatão, in the state of São Paulo, Brazil. This study consisted in relocating several families residing in informal settlements located in a protected area of the Atlantic Forest to the new social housing complex Rubens Lara; it is known as the *Serra do Mar Project*. After the relocation of the families, several interviews were done in order to know the opinion of the residents about the pros and cons of leaving the “*favela*” and moving to the new complex; one of the most notorious advantages, according to the residents, was the greater access to job opportunities and vocational positions (Table. 2) (Cavalheiro & Abiko, 2015).

Contribution of social work according to residents.

Categories	%
To increase my income	1.0
To enhance my education or vocational training	4.0
To help me adapt better to my new life	20.9
To participate in discussions and decisions in my community	5.5
To raise awareness of my rights and duties	14.4
To integrate me with neighbors	4.5
To help improve the environment	5.5
To solve problems with utility companies, CDHU or the construction company	11.4
Other	11.4
Nothing	43.8

Table 2 Contribution of social work according to residents Source: (Cavalheiro & Abiko, 2015)

Living in houses without formal property rights is a common characteristic among slum dwellers (Jaitman & Brakarz, 2013). The predominance of illegal occupation by squatters has sometimes become an obstacle in the improvement of informal areas. Public authorities sometimes deny to provide basic services to these communities, including security and vigilance; even worse, the state can perform arbitrary police invasions and remove slum areas without previous notice, ignoring the slum dwellers’ rights (Handzic, 2010).

According to De Soto, the economic effect of property rights comes from two different channels. The first one is through the promotion of private investment by owners that feel secure about making long-term plans and improvements to their property. The second channel is related to the income generation using the property rights. These rights allow the home owners to their properties to secure loans that can be invested in other projects that increase productivity and income (De Soto, 2001).

1.5 Analysis of the problematic in informal human settlements

Only by understanding the origins and the real needs in informal settlements, it is possible to plan and take actions that can help these communities. In the previous section of this study, the different problems that afflict slum dwellers were analyzed into detail. This analysis of the most common and important needs of slum dwellers, led to establish an order of priorities that can help to achieve the objectives of this study; always taking into account that architecture is taken as the platform to offer a strategy towards slum-upgrading.

Table 4 contains the problems associated with the built environment, while Table 5 contains the problems related with the natural environment, the socio-cultural context, and economy in informal settlements. In both tables, the problematic is crossed with possible solutions or strategies, creating a grid that allows to have a visual idea of which problems require more attention due to their higher negative impact on the community, and which strategies can improve even more the quality of life of its inhabitants. According to the number of problems and the level of impact (direct or indirect) that the presented strategies can have on them, they are classified, either as a base strategy or as a complementary strategy. A color scheme guide is provided as visual support. (Table 3.)

Table 3 – Color scheme guide for tables 4 and 5

	Base solution
	Complementary solution
	Direct impact
	Indirect impact

This exercise revealed that the strategies that have a bigger impact are the ones related to the provision of basic services, mainly the access to clean water and sanitation. The provision of basic infrastructure and services is crucial for the development of human beings as individuals and as a community. As mentioned before, it is very difficult, if not impossible, to improve the quality of life in slum areas without the minimum conditions for any human being. Therefore, the starting point of a slum-upgrading project should be the provision of adequate physical conditions that can ensure the safety and health of slum dwellers. Environmental, social, and economic problems are relevant as well; however, by providing a proper “physical core” to these communities, many of these issues will show some important improvement. The four study areas included in this research are connected and are relevant for the well-being of

the inhabitants of these communities. Nonetheless, the habitat, the social climate, and the economy of informal settlements depend in great part on the quality of the built environment.

Between the possible strategies presented in Tables 4 and 5, it is noticeable that the public sector has more responsibility than the slum dwellers in the task of improving the informal settlements. The government has a financial and regulatory role; it should provide as well, the basic infrastructure for land development. In this sense, the government acts as a facilitator during the upgrading process. Its actions should be able to encourage investments from the private sector and self-determination of the community to participate in the upgrading of their neighborhoods (Amado, Ramalhete, Amado, & Freitas, 2016). The involvement of the local government, and more importantly, the community itself in the decision-making processes, is essential for the success of slum-upgrading projects.

The grid generated by crossing the problems in IHS and the possible solutions for them, revealed several relationships. One of them is between health (physical and mental) of slum dwellers and the economic status of their families in terms of productivity and employment. As the table shows, if a person is healthy it means that he/she is able to work and provide the basic needs for his/her family. This remarks the importance of a healthy environment, not only to avoid health problems, but also to be able to escape from poverty by generating income.

Another remarkable relationship that is observed is between the amount and quality of public space and social issues such as crime and violence, as well as the sense of inclusivity and self-esteem in slum dwellers. Aggressions and criminality rates can be reduced by increasing public spaces and green areas that promote healthy interactions between citizens. These spaces increase the sense of belonging in the urban poor.

Colombia is a remarkable example for the region in terms of reducing violence and acts of crime. The criminality rate in Colombia was 82 per 100,000 population in the beginning of the 1990s; however, starting in 2002, the criminality rate has constantly being reduced each year, reaching a still-high but remarkable improvement of 40 per 100,000 population in 2006 (Soares & Naritomi, 2010). An important part of the improvement made in Colombia with the crime problems, took part in the city of Medellin, under the leading of the former mayor Sergio Fajardo between 2004 and 2007. The city of Medellin had lower homicide rates than the rest of the country (Fig. 6).

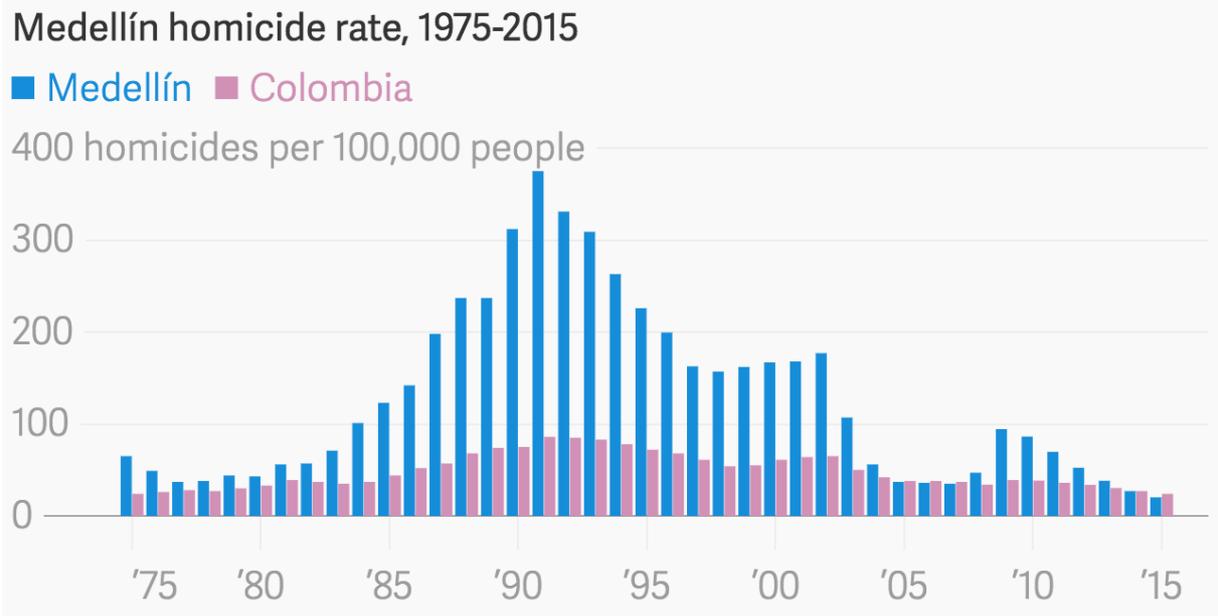


Fig. 5 – Homicide rate in Medellín, Colombia from 1975 to 2015

Source: (Colombia Reports, 2016)

Successful slum-upgrading project in the Latin American region should be based in the following principles: structural quality of the buildings, adequate infrastructure and basic needs, resilience of the community, and risk control. However, these principles fulfill just the basic necessities of any community. Other strategies that are generally exclusive of the formal city, such as renewable energy technologies or rainwater collection systems, should be encouraged in order to push the boundaries of slum-upgrading measures towards a more sustainable future of the informal city.

Table 4 - Problematic in informal human settlements: the built environment.

PROBLEMATIC IN INFORMAL HUMAN SETTLEMENTS									
STRATEGIES		BUILT ENVIRONMENT							
		BUILDINGS		NEIGHBORHOODS					
Type	Description	Poor physical conditions	Technical-Constructive deficits	Lack of infrastructure and services	Overcrowding	Lack of public space	Lack of green areas	Poor mobility and isolation	Uncontrolled spread and growth
PRIVATE POLICIES AND SELF-MADE SOLUTIONS	Better, innovative, durable and affordable materials	X	X						
	Self-consciousness about energy-use, materials, waste disposal, water resources, etc.	X	X						X
	Nature-based solutions (e.g. green roofs/walls)	X	X			X	X		
	Improvement of facades (thermal performance and aesthetics)	X	X						
	Re-configuration of the spatial characteristics of houses and public space	X			X	X	X	X	X
	Improvement and building of neighborhoods' main nodes	X		X	X	X	X	X	
	Distributed Generation technologies			X	X				
Have an internal job board in the community or service-trade system									
PUBLIC POLICIES AND GOVERNMENT -PROVIDED SOLUTIONS	Participatory model of decision-making processes	X	X	X	X	X	X	X	
	Providing basic services and infrastructure (energy, clean water, sanitation, waste disposal)	X	X	X					
	Provide structurally-safe incremental housing with basic services included	X	X	X	X	X	X		X
	Structural retrofitting to provide resilience and safety	X	X						
	Risk control measure	X	X	X			X		X
	Provide infrastructure for excreta and waste disposal	X	X	X					
	Provide clean energy, rainwater collection systems, and healthy cooking systems			X					
	Provide public space and green areas	X			X	X	X	X	X
	Revision of the minimum construction requirements to increase housing affordability	X	X	X					
	Better connections between the formal and informal city	X		X	X	X			X
	Provision of accessible and sustainable public transport systems and mobility infrastructure			X		X			X
Multi-use policies in the land-use regulations					X	X	X	X	
HEALTH AND EDUCATION	Build well-equipped and flexible public buildings and service stations (e.g. public W.C.)	X	X	X	X	X			
	Develop capacitation and learning facilities for the community			X	X	X		X	

Table 5 - Problematic in informal human settlements: habitat and sustainability, socio-cultural context, and economy.

PROBLEMATIC IN INFORMAL HUMAN SETTLEMENTS														
STRATEGIES		HABITAT & SUSTAINABILITY						SOCIO-CULTURAL CONTEXT				ECONOMY		
		POOR ENVIRONMENTAL CONDITIONS		CLIMATE CHANGE		SAFETY AND HEALTH		CULTURE		SOCIAL CLIMATE				
Type	Description	Waste pollution	Water pollution	Energy inefficiency	GHG emissions	Risk areas	Poor health	Lack of public buildings and services	Lack of Education	Crime and violence	Lack of inclusivity and low self-esteem	Unaffordability of proper housing	Insecurity of tenure	Unemployment and poverty
PRIVATE POLICIES AND SELF-MADE SOLUTIONS	Better, innovative, durable and affordable materials			X	X						X	X		
	Self-consciousness about energy-use, materials, waste disposal, water resources, etc.	X	X	X	X	X	X		X					X
	Nature-based solutions (e.g. green roofs/walls)		X	X	X		X				X			X
	Improvement of facades (thermal performance and aesthetics)			X	X					X	X			
	Re-configuration of the spatial characteristics of houses and public space	X				X	X			X	X			
	Improvement and building of neighborhoods' main nodes							X		X	X			X
	Distributed Generation technologies			X	X							X		
	Have an internal job board in the community or service-trade system									X				

STRATEGIES		HABITAT & SUSTAINABILITY							SOCIO-CULTURAL CONTEXT				ECONOMY		
		POOR ENVIRONMENTAL CONDITIONS		CLIMATE CHANGE		SAFETY AND HEALTH			CULTURE		SOCIAL CLIMATE				
Type	Description	Waste pollution	Water pollution	Energy efficiency	GHG emissions	Risk areas	Poor health	Lack of public buildings and services	Lack of education	Crime and violence	Lack of inclusivity and low self-esteem	Unaffordability of proper housing	Insecurity of tenure	Unemployment and poverty	
PUBLIC POLICIES AND GOVERNMENT - PROVIDED SOLUTIONS	Participatory model of decision-making processes	X	X			X	X	X	X	X	X	X	X	X	
	Providing basic services and infrastructure (energy, clean water, sanitation, waste disposal)	X	X	X	X	X	X	X					X	X	
	Provide structurally-safe incremental housing with basic services included	X	X	X	X	X	X	X				X	X	X	
	Structural retrofitting to provide resilience and safety					X	X						X	X	
	Risk control measures					X	X						X	X	
	Provide infrastructure for excreta and waste disposal	X	X			X	X							X	
	Provide clean energy, rainwater collection systems, and healthy cooking systems	X	X	X	X	X	X								X
	Provide public space and green areas			X	X	X	X				X	X			X

STRATEGIES		HABITAT & SUSTAINABILITY							SOCIO-CULTURAL CONTEXT				ECONOMY		
		POOR ENVIRONMENTAL CONDITIONS		CLIMATE CHANGE		SAFETY AND HEALTH			CULTURE		SOCIAL CLIMATE				
Type	Description	Waste pollution	Water pollution	Energy efficiency	GHG emissions	Risk areas	Poor health	Lack of public buildings and services	Lack of education	Crime and violence	Lack of inclusivity and low self-esteem	Unaffordability of proper housing	Insecurity of tenure	Unemployment and poverty	
PUBLIC POLICIES AND GOVERNMENT - PROVIDED SOLUTIONS	Revision of the minimum construction requirements to increase housing affordability			X	X	X	X				X	X	X	X	
	Better connections between the formal and informal city				X	X	X	X		X	X			X	
	Provision of accessible and sustainable public transport systems and mobility infrastructure				X			X		X	X			X	
	Multi-use policies in the land-use regulations							X	X		X	X	X	X	
HEALTH AND EDUCATION	Build well-equipped and flexible public buildings						X	X	X	X	X			X	
	Develop capacitation and learning facilities for the community						X	X	X	X	X			X	

2. Housing provision methodologies

As Payne has suggested, the growth of slums is inevitable in developing countries (Payne, 1977); in addition, the current economic imbalance situation happening in the world, suggests that slums are a permanent “solution” for the urban poor as the governments have not been able to provide an alternative solution, as stated by Abrams (Abrams, 1964). Governments in Latin America, the most unequal region globally, have not been able to cope with this situation, as informal settlements continue to establish as the solution for millions of poor families in the region. Both of these authors see informal settlements as a vicious circle and as a problem that is far away to be solved.

Other authors have adopted positive perspectives towards informal settlements (Steyn, 2004; Turner, 1968). Turner alleges that slums may be noted as a successful solution to the lack of housing and job opportunities. The urban poor have been able to build places that not only serve as shelters, but are also able to provide an income through informal businesses (Turner, 1968). Steyn as well, claims that, despite the low-quality buildings and self-made configurations, informal settlements are able to respond to the socio-economic conditions of the poorest citizens, and they even form part of their own identity and positive values (Steyn, 2004). Both authors agree that the self-help building process practiced in these communities is one of the most sustainable outcomes, in combination with the use of available local materials, which are frequently recycled (Steyn, 2004; Turner, 1968) (Fig. 7).



Fig. 6 – Self-construction by slum-dwellers in Medellin, Colombia Source: (Empresa de Desarrollo Urbano, 2015)

Informal settlements have several positive aspects that should be rescued when developing a slum-upgrading strategy. Many of these features depend on socio-cultural aspects, such as constant interaction and support between neighbors, the informal economy and self-determination (Amado, Ramallete, Amado, & Freitas, 2016).

“The urban poor have to solve a complex equation as they try to optimize housing cost, tenure security, quality of shelter, journey to work, and sometimes, personal safety. For some people...a location near job is even more important than a roof. For others, free or nearly free land is worth epic commutes from the city edge to the centre. And for everyone the worst situation is a bad, expensive location without the municipal services or security of tenure.” (Davis, 2006). Roberts and Sykes affirm that slum regeneration problems attempt to improve physical, environmental, social, and economic conditions in informal settlements. However, the complexity lies in the particular characteristics in each area and the scale of the problem. For this reason, it is important to provide a strategy that tackles these issues through an integrated approach, instead of focusing on one area (Roberts & Sykes, 2000).

Several methods towards providing adequate housing to the urban poor have been suggested, such as public housing provided by the state, site and service schemes, and slum upgrading. (Table 6.)

Public housing is a common approach that surged in the 1950s. This strategy is based on the resettlement of slum dwellers in public housing. In this case, the public sector is the main provider of financial support (Keivani & Werna, 2001). However, this approach has severe weak points. Given the fact that the responsibility of the project relies completely on the public sector, problems such as bureaucracy, lack of financial resources, corruption, and political instability might compromise the projects. The lack of financial capability of the state frequently drives to a poor quality of the buildings, as well as cheap but peripheral locations of these projects, leading to the isolation of these communities and the estrangement from the employment opportunities. Cultural adequacy is also a major setback in this strategy, given that the architectural solutions are imported and do not adjust to the local features, giving priority to the economic interests (Wekesa, Steyn, & Otieno, 2011).

Table 6 – The changing views on urban development and policies

Source: (van Lindert, 2015)

Agenda Setting	Concepts	Strategic Focus	Policies & Practices
1960s	<ul style="list-style-type: none"> • Modernization 	<ul style="list-style-type: none"> • Physico-spatial planning and public sector social housing • Spatial engineering 	<ul style="list-style-type: none"> • Blueprint planning • Housing supply for the middle classes • Eviction of squatters
1970s 1976 <i>Habitat -1</i>	<ul style="list-style-type: none"> • Self-help housing school 'Housing as a verb' • Affordability • Cost Recovery • Replicability 	<ul style="list-style-type: none"> • Housing priorities • Housing needs • Support for self-help initiatives • Security of land tenure • Recognition of the informal sector 	<ul style="list-style-type: none"> • Sites and services • Settlement upgrading • Subsidies for land, housing, transport • Tolerance of squatter settlements
1985			
1986	Urban Management Programme	<ul style="list-style-type: none"> • Strengthening of markets • Strengthening of financial sector 	<ul style="list-style-type: none"> • Urban management • Capacity building
1990	Global Shelter Strategy	<ul style="list-style-type: none"> • Private sector construction • Neighbourhood-based enterprises 	<ul style="list-style-type: none"> • Institutional strengthening • National Housing Banks
1991	The Urban Agendas for the 1990s	<ul style="list-style-type: none"> • Community-based action 	<ul style="list-style-type: none"> • Public-private partnerships
1992 <i>Unced -1 (Earth Summit)</i> 1995	<ul style="list-style-type: none"> • State withdrawal • State as 'enabler' – not 'provider' <p><i>'Enabling Housing Markets to Work'</i></p> <p>Local Agenda 21</p>		
1996 <i>Habitat -2 (City Summit)</i>	Habitat Agenda	<ul style="list-style-type: none"> • Holistic planning frameworks • Nation-wide and city-wide strategies instead of project- and neighbourhood focused interventions 	<ul style="list-style-type: none"> • Urban governance • Metropolitan municipal cooperation • Integrated development planning
<i>Poverty Reduction Strategy Papers</i>	<ul style="list-style-type: none"> • Good local governance • Sustainable urban development: <ul style="list-style-type: none"> - Poverty reduction - Urban productivity - Environmental management 	<ul style="list-style-type: none"> • Collaboration between local governments and with central government • Institutionalised multi-stakeholder, multi-sector consultation mechanisms • Best practices 	<ul style="list-style-type: none"> • Strategic planning • Capacity strengthening • Participatory planning • Partnerships and networks • Microfinance
2000 <i>Millennium Summit</i>	<ul style="list-style-type: none"> • Millennium Development Goals (MDGs) • 'Cities without Slums' 	"Slumfree Cities"	<ul style="list-style-type: none"> • 'Scaling up of slum upgrading' • 'Right to the City' • Evictions & resettlement
2001 <i>City Summit+5</i>	<p>Urban Development and Local Government Strategy</p> <ul style="list-style-type: none"> • Liveability • Good governance and management • Competitiveness • Bankability 	<ul style="list-style-type: none"> • Environment, Safety, Security, Health • Integrity of local government • Efficient factor markets (land, capital, labour) • Municipal finance 	<ul style="list-style-type: none"> • Non-subsidised service provision • Performance based urban management • Improvement of productive environment • Competent and transparent management of municipal budgets • Participatory budgeting
2002-2014 <i>World Urban Fora</i>			

Site and service schemes emerged in the 1970s in response to the failure of public housing directly provided by the state. This strategy is a combination of public housing provision and self-help. It consists in the provision of sub-divided land with access to basic public infrastructure, such as clean water, sanitation services and electricity, as well as social facilities. People are encouraged to build their own homes in these places. The public sector actions are limited to the provision of land, public facilities, and infrastructure, while the people build their homes in a self-help context (Greene & Rojas, 2008). However, this strategy requires cheap land as well, alienating these neighborhoods to the outskirts of the cities, similarly to the experience in public housing provision. Another issue is the technical quality of the dwelling units, the lack of technical skills of the people and the lack of support from professionals, led to similar unhealthy conditions as the ones prevailing in informal settlements (Amado, Ramallete, Amado, & Freitas, 2016). Withal, the participation of the population in this scheme

is a major improvement from the initial strategy, which involved exclusively the direct provision of public housing, giving the whole responsibility to the public sector.

Slum upgrading schemes represent what might be considered as a low-cost option in comparison to the previously presented strategies. Instead of demolishing slums and relocating families to new-built facilities, slum upgrading envisages the upgrading of the built environment in these communities (Wegelin, 2004). The upgrading of informal settlements began with the physical improvement, involving the public sector and the population's self-determination to help themselves and improve their quality of life substantially. This scheme has had an important evolution, as it began focusing the efforts in the provision of the basic infrastructure and security of tenure, adopting later a more integrated approach, by including environmental, social, and economic issues in its agenda (Wekesa, Steyn, & Otieno, 2011). This approach requires full collaboration and organization between various stakeholders, including the citizens, local authorities, and community groups. Nonetheless, one of the main issues of this approach is the lack of security of tenure in developing countries, as most of the population do not have a title of property, meaning that they do not have any document that can protect them from sudden evictions. The absence of this crucial asset, compromises the full cooperation of the population and therefore, the quality of the dwelling upgrading (Khalifa, 2015).

Slum upgrading is one of the few approaches that appear to work. Several NGOs and the World Bank itself have adopted this strategy as their core approach towards adequate housing provision. It seeks to improve the living conditions of the urban poor through social and economic empowerment. In addition, it strengthens the idea that social housing needs to be built for and by the poor themselves; and this can only happen by empowering these communities. It is proven that the urban poor are capable of building their own homes, as long as strings such as rigid regulatory systems are revised and adapted to self-help schemes (van Lindert, 2015).

2.1 Slum upgrading initiatives in Latin America

At the beginning of the 1980s, Latin America began a democratization process, as popular elected governments began to replace military regimes, and by the start of the new millennium, all the countries of the LATAM region had elected governments and a multi-

parties structure established. An important step in the democratization process of the region was the introduction of municipal elections, as new administrative and territorial jurisdictions were defined. The decentralization of the power in Latin American countries marked the beginning of the redistribution and empowerment of local governments and communities. Big metropolises in the region, such as Bogotá (Colombia), Monterrey (Mexico), Buenos Aires (Argentina), Montevideo (Uruguay), and Curitiba and Porto Alegre (Brazil) have demonstrated promising experiences of public management. In this frame, the region offers interesting experiences of local government capacity to plan and administrate resources, showing their openness to involve local communities in decision-making processes (van Lindert, 2015).

Some of the LATAM regions' most notorious slum upgrading programs and strategies have adopted participatory models as their core-approach, acknowledging the importance of the empowerment of local authorities and the urban poor in the informal settlements regeneration goal. Local governments, such as the mayorships of Medellín and Rio de Janeiro, as well as the architects Alejandro Aravena and Jorge Mario Jáuregui have contributed with different approaches for urban regeneration and adequate housing provision in informal settlements.

The authorities of Medellín, under the orders of its former mayor Sergio Fajardo, developed a plan called Urban Integral Project or PUI, which was one of the main strategic programs for the Medellín's development Plan 2004-2007. This project was based under a holistic intervention model, which took very seriously the participation of the community in decision-making processes and the coordination between the different institutions at all levels of the government. The main goals were housing promotion, public space and mobility improvements, collective facilities upgrading, and environmental recovery of the surrounding areas. The Northeastern communes of the city were selected as the area where the plan was developed. These "*comunas*" were the main scenarios of the late 1980s' and 1990s' crime intensification due to the conflict between the Medellín cartel, paramilitaries and urban militias; these events generated a stigma over this area of the city. Some of the projects developed for this strategy were the construction of a cable car transport system known as *Metrocable*, pedestrian bridges, urban walkways (Fig. 7 and 8), a development center called *Cedezo*, housing and environmental improvements, the *Herrera* Park and other public squares, as well as a new school and a modern library. The *Metrocable*, besides serving as an effective public transport medium, it allowed slum dwellers to recognize their own community and to create a sense of



Fig. 7 - The before and after of an urban walkway in Northeastern Medellín. Source: <http://worldlandscapearchitect.com/harvard-gsd-announces-winners-of-the-2013-veronica-rudge-green-prize/#.WjQB5WigJPZ>

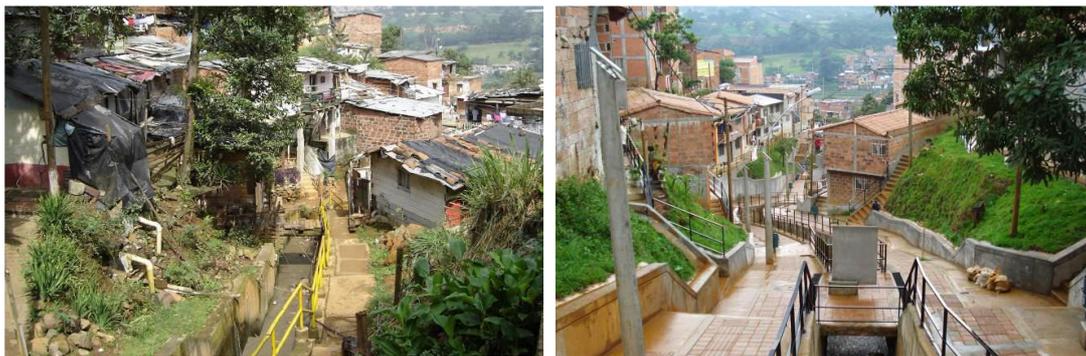


Fig. 8 – The before and after (2005 and 2008) of the public space in Northeastern Medellín. Source: (Empresa de Desarrollo Urbano, 2015)

belonging in them. The PUI initiated a huge transformation inside and outside of the community; a great part of the population from the formal city changed their perspective towards the communes involved in this project; high quality institutional buildings were built along these neighborhoods, and the formal city inhabitants began to recognize these communities as part of the city (Blanco & Kobayashi, 2009). Nowadays, some of these slum areas are considered as an opportunity to develop tourism in the city, and the communes receive local and foreign visitors; Hernandez-Garcia studied this phenomenon in detail (Hernandez-Garcia, 2013).

The *Favela-Bairro* program is the Rio de Janeiro's government approach to improve the living conditions in the informal city. When *favelas* began to be a topic for eradication policies in Brazil, the families began to be displaced and relocated into new housing facilities supplied by the state. However, the problem of informal settlements was already too severe to

solve it through social housing provision for all the slum dwellers. At least 500,000 people lived in *favelas* by the end of the 60s in Rio de Janeiro (Andreatta, 2005).

By the middle of the 70s the public institutions in Rio began to diagnose the problem through a more systematic approach, by quantifying, qualifying, knowing the prevailing living conditions in slums, where they were located, establishing the physical boundaries of these places, understanding their topography, building techniques and existing infrastructure. This marked the beginning of the acceptance of the fact that these places were part of the city, and that the inhabitants of these communities were citizens despite their illegal establishment of their homes. This way, an open dialogue between the local authorities and the community was created, marking the beginning of the regeneration of these communities. The government in 1993 launched the *Favela-Bairro* program. (Andreatta, 2005).

The main objectives of the program were: clean water provision, provision of a sewage system to every house, a sewer system for the whole community, slope stabilization, reforestation, establishing boundaries to avoid massive expansion, a road system, a garbage collection service, energy and street lighting, community facilities, identification of the economic and social potential, and security of tenure (Fig. 9). These projects were planned and executed together with technical teams and professionals.



Fig. 9 – Before and after of public space as part of the *Favela-Bairro* Program.
Source: <https://scenarijournal.com/preemptive-v-retroactive/>

Alejandro Aravena is a Chilean architect and winner of the Pritzker Prize (most recognized award for architects) in 2016. The jury praised Aravena for the way in which he has “risen to the demands of practicing architecture as an artful endeavor, as well as meeting today's social and economic challenges.” (Franco, 2016) The Chilean’s dedication to improve

the urban environment and cope with today's economic and social challenges through architecture were key facts to award him with the prestigious prize.

Alejandro Aravena runs an architecture office called Elemental, and as its name says, it focuses on the people's basic needs, leaving outside what is not essential. Aravena thinks that architecture should be born directly from someone's real and expressed necessity. He sees buildings as a combination of needs and desires. His office develops projects of social interest and that have a social impact; the city, CO2 emissions, and the response after natural disasters are topics that make up Elemental's portfolio core. The 2016 Pritzker winner is a believer that architecture has the capacity of addressing not only problems with the physical environment, but also social, environmental, and economic issues. That is what he calls "the power of synthesis" of architecture.

One of Elemental's main strategy towards the provision of adequate dwelling for the poor is through incremental housing. This approach envisions the provision of a housing core with a rigid structure and the basic services that any household needs, which can be expanded later according to the dwellers needs and resources. Incremental housing could be a solution for one of the setbacks of the site and service methodology, serving as an assisted self-help scheme (Aravena & Iacobelli, 2013).



Fig. 10 – Villa Verde project in Santiago de Chile, Chile (2013)

Source: ELEMENTAL

Aravena and his team have developed some of the most successful social housing projects, following the incremental construction process. Some of these projects are: Villa Verde in Santiago de Chile (Fig. 10), Quinta Monroy in Iquique (Fig. 11), and Monterrey in Monterrey, Mexico (Fig. 12).



Fig. 11 – Quinta Monroy project in Iquique, Chile (2004)

Source: ELEMENTAL



Fig. 12 – Housing project in Monterrey, Mexico

Source: ELEMENTAL

The Argentinian architect Jorge Mario Jáuregui has also done remarkable work in informal settlements. He left his native country for political reasons at that time, and arrived to Rio de Janeiro, where years later established his architecture office, *Atelier Metropolitano*. Jáuregui has more than 20 years of experience working in architectural projects for the informal city.

Most of his work is part of the *Favela-Bairro* program, the Growth Acceleration Program (PAC for its acronym in Portuguese for *Programa de Aceleração do Crescimento*), and the *Morar Carioca* program, which is the continuation of *Favela-Bairro*. His approach intends to transform slums into habitable places through the provision of basic infrastructure and social facilities to these communities. He believes that the inclusion of slum dwellers into the city is not the real problem, because they are already citizens, the real challenge is to grant them the same right to the benefits of the formal city (Jáuregui, 2013).

The Argentinian mixes architecture with other study areas such as philosophy and psychoanalyses. He states that the overlaying of different disciplines in slum upgrading projects can help to discover real connections and potentials that are invisible at simple sight. Jáuregui praises that projects in the informal city should be guided by the local conditions and by listening to the inhabitants demands. It is necessary to find the key points in these communities and connect them inside and outside the informal city; this way the whole urban environment of a city can enjoy the benefits of a slum-upgrading project (Jáuregui, 2013). His approach in particular has been successful because of has worked within the logic of the *favela*, recognizing them as neighborhoods with their own organizational and support structures, that should be enhanced and protected whenever possible.



Fig. 13 - Rambla Manguinhos project

Source: Jorge Mario Jáuregui

Some of the most remarkable projects developed by Jorge Mario Jáuregui are: *Rambla Manguinhos*, which is a form of connection between the formal and the informal city (Fig. 13), *Complexo do Alemão* (Fig. 14), which includes a cable car system inspired by the one in Medellín, and a social housing building inside the *Rocinha* (the biggest *favela* in Rio de Janeiro) (Fig. 15).



Fig. 14 - Cable car in Complexo do Alemão Source: Jorge Mario Jáuregui



Fig. 15 – Social housing complex in Rocinha Source: Jorge Mario Jáuregui

All of the presented initiatives are valid and present positive actions for the improvement of the quality of life in informal settlements. One common thing that they share is that if even if they offer formal solutions, they also try to conserve certain informality in their approach by including the community in the process and respecting their real needs. They also reflect the collaboration between the local governments, private organizations, and the population.

3. Development of an architectural slum-upgrading project

The problematic analysis and the review of the successful slum-upgrading programs and initiatives accomplished in Latin America, presented in this study, can serve as a guide for governments, NGOs, IGOs, professionals, and the population itself on how to proceed when developing an urban regeneration project. In this frame, this study presents an approach that uses architecture as the main platform to synthesize the four main areas that were analyzed: the built environment, habitat and sustainability, socio-cultural context, and economy. The site chosen to apply this experiment is the neighborhood *Cerro de la Campana* (Fig. 16) located in Monterrey, Mexico. However, the concept is flexible enough to be adapted in other informal settlements with a sloped topography. This informal settlement is located in a high-slope hill with two water bodies passing at the base of it. In addition to this, it has a central location inside the city, with proximity to one of the most important universities of the country, commercial areas, and even one of the wealthiest municipalities of Latin America. However, the physical conditions in this community are very different from its surrounding areas; this has had social and economic repercussions in its inhabitants, and a high deterioration of the natural habitat, especially the water bodies that run beside it.



Fig. 16 – View of Cerro de la Campana and Monterrey’s city landscape (left) and living conditions in the community (right)
Sources: <https://www.economiapersonal.com.ar/monterrey-anticipa-la-ruptura-del-nafta/>
<http://www.elhorizonte.mx/local/buscan-regenerar-el-poligono-de-altamira-y-la-campana/1662089>

Considering all the facts previously presented, a successful approach begins by doing a context analysis of the area to be regenerated. This includes an assessment of the natural risks, mobility in and around the area, available infrastructure, housing stock, legal status of the properties, economic activities, available social facilities around the area, heritage or important places for the community, and social structure prevailing in the community (Amado, Ramalhete, Amado, & Freitas, 2016). On-site surveys and direct observation are good ways of

doing a context analysis of an area; however, they could miss important information about the physical environment and the variety of conditions prevailing in the community. Techniques that incorporate remote sensing can provide a fast analysis of the area and the spatial distribution of informal settlements (Kohli, Kerle, & Sliuzas, 2012). According to Chakraborty et al., there is a need for more free access or open urban data that improves the amount and quality of information about informal settlements (Chakraborty, Wilson, Sarraf, & Arnab, 2015).

A healthy physical environment, at single-house and urban level is crucial for the wellness of the habitat, as well as for a healthy social environment and economy. This is reflected on the amount of physical infrastructure upgrading projects, which are far more frequent when compared to other areas like social infrastructure and economic improvements (Fig. 17). There is a need to provide, not only adequate living conditions, but also a sustainable, resilient, and flexible environment to the growing urban-poor population.

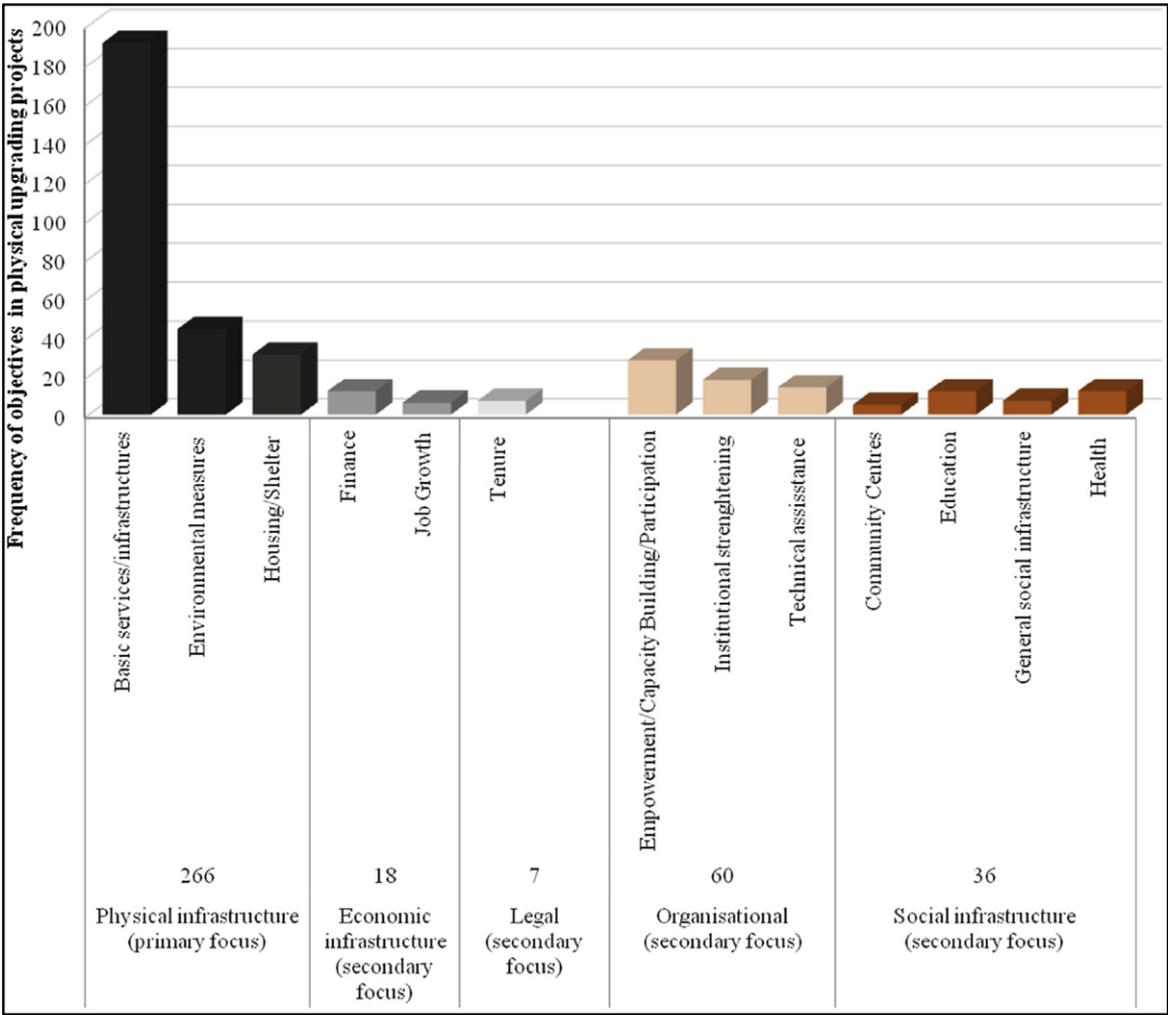


Fig. 17 – Issues targeted in physical slum upgrading projects Source: (Olthuis, Benni, Eichwede, & Zevenbergen, 2015)

Therefore, the base of this approach is to provide basic infrastructure (clean water, sanitation, waste disposal systems, and electricity), strong and flexible housing, and risk control measures against landslides and flooding, which are the most common natural disasters in these communities.

As stated previously in this study, informal settlements offer several positive characteristics that should be protected and enhanced whenever possible. The self-building scheme used for construction is a remarkable characteristic in terms of sustainability. In most cases, the building materials are supplied by local sources, reducing costs and promoting the reusing of these (Amado, Ramalhete, Amado, & Freitas, 2016). This ability of the urban poor, to repair and expand their houses by themselves, offers the possibility to use incremental housing as a strategy to provide affordable and adequate housing for these communities. The advantage of this approach is that households are able to decide when to expand their houses or when to improve them accordingly to their own capabilities and priorities (van Lindert, 2015).

This project envisions a housing core provided by the State, composed by the main structural elements (columns, beams and floor slabs), and the infrastructure needed for the installation of sanitary and cooking equipment. This structure can be occupied by slum-dwellers, which extremely poor housing conditions, or high-risk area location of their former dwellings force them to be relocated. The housing core structure and the infrastructure that comes with it, is designed to be flexible enough to be expanded by the population itself, according to the characteristics of each family, and to their economic possibilities (Fig. 18). Each module consists in a 6 by 3 (meters) structural frame, which can be joined to other modules by simple construction methods. The envelope of the structure can be done with masonry units and other simple materials that are suitable for self-help construction. In order to ensure the high quality of the envelope that will cover the provided structure, the households should receive professional assistance to guide them towards the best functional, esthetic, and sustainable configuration. In addition to this, the State could provide thermal insulation materials, in order to provide a better thermal performance of the dwellings.

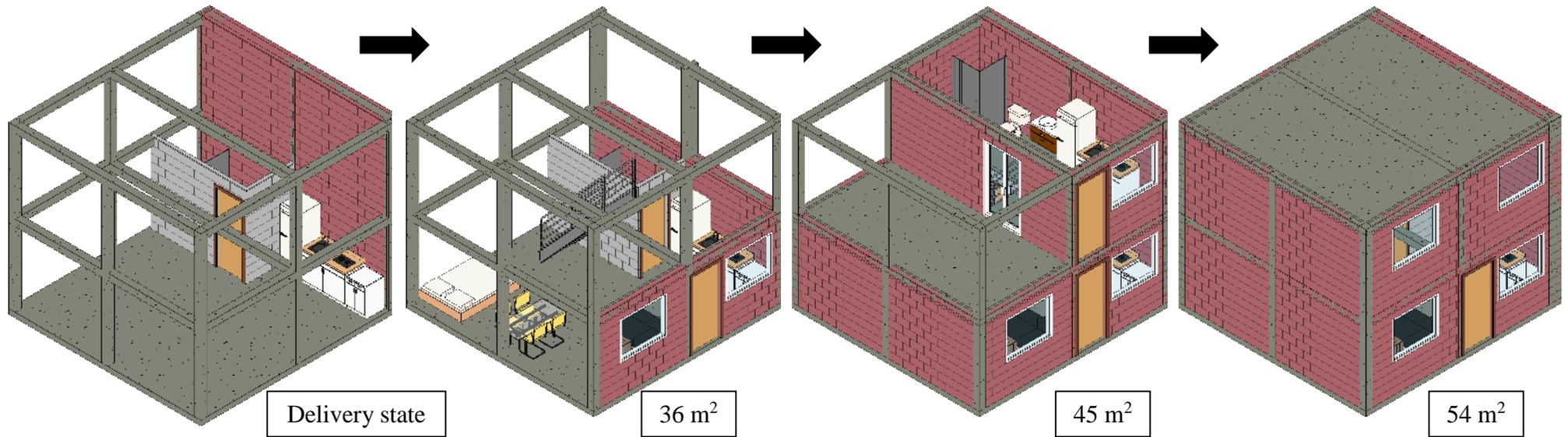


Fig. 18 – Incremental process by modules from delivery to final stage

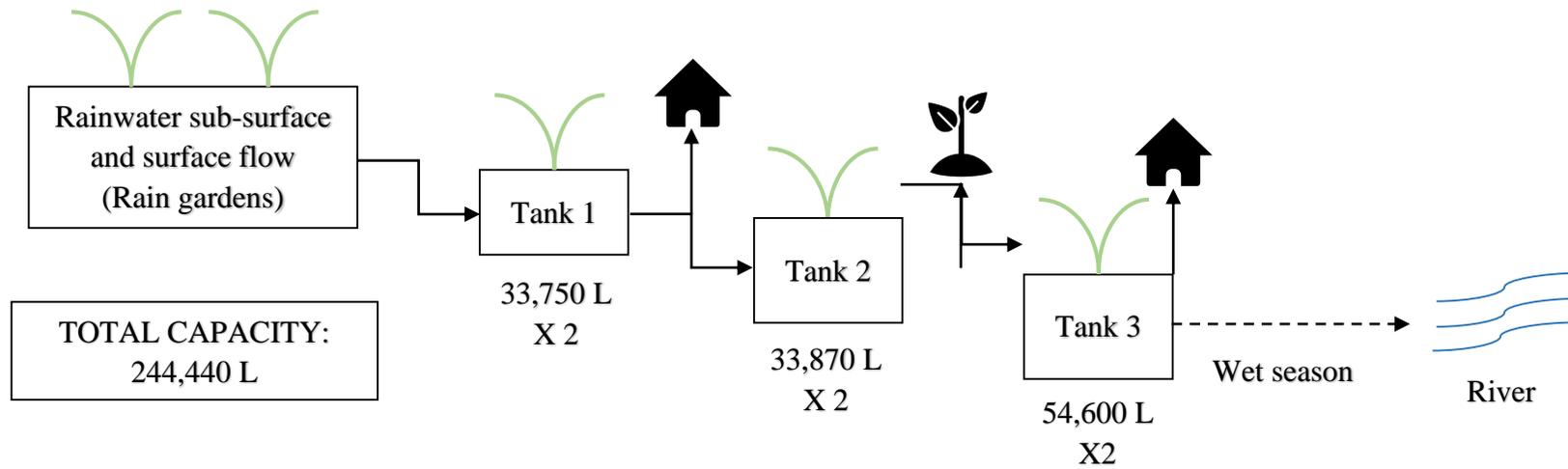


Fig. 19 – Rainwater collection system diagram

Public spaces and green areas play an important role as well. In addition to being places for recreation, social interaction, and economic activity, they serve as “eco-centralities” or “eco-nuclei”. By taking advantage of the sloped topography that many slums are located on, it is possible to canalize rainwater into rain gardens or tanks that can collect it, in order to be used by the dwellers for sanitary purposes, or by the state for the irrigation of the green areas (Fig. 19). The collection and canalization of the rainwater will help to avoid flooding and landslides, which are a major threat and a cause of loss of life. These green areas will also include stabilizing retaining walls to provide rigidity to the soil and avoid landslides.

The configuration of the public space in relation to the housing buildings is designed to promote social interaction between households, and to promote inclusivity in the community. These eco-centralities are intended to serve not only the neighborhood itself, but also the surrounding communities. These “*plazas*” offer an opportunity to boost the local economy by offering spaces for commerce, which is one of the main economic activities existing in informal settlements.

Another key aspect for this approach is the construction of social facilities that can provide education, cultural growth, and health to the population. Some of the proposed facilities included in this project are a school (basic education), a small library which can include donated books, a medical clinic, public toilets and showers, a locker room, a women and children protection center, and an open area for exercising and other sports. A commercial area and a space for offices for small startups is contemplated as well, giving priority to the inhabitants of the community that decide to become entrepreneurs. The government, social interest institutions and universities could provide assistance with this point.

In addition to the base objectives, which most of the slum-upgrading programs include, such as the provision of basic services, structural retrofitting, and housing provision and upgrading, this approach envisions sustainable applications. Some of the included technologies are rainwater collection systems to save water, solar panels and bio-digestion systems to provide clean energy to the community and to avoid waste accumulation in the public space. These sustainable applications, which are normally reserved for the formal city, could help to increase the self-esteem in IHS. Furthermore, they could teach its inhabitants about the importance of saving energy, taking care of water resources, and other environmental friendly practices, if accompanied by proper educational programs and initiatives.

One of the most important benefits of this project, is the creation a “eco-corridor” in the riverside of the community. When the community inhabitants learn about sustainable practices and become conscious about the importance of the protection of the environment, they stop harming themselves and their surrounding habitat, having a positive impact on the water resources of the whole city. A general layout of the project and some representative images are provided in the next images (Fig. 20, 21, and 22).

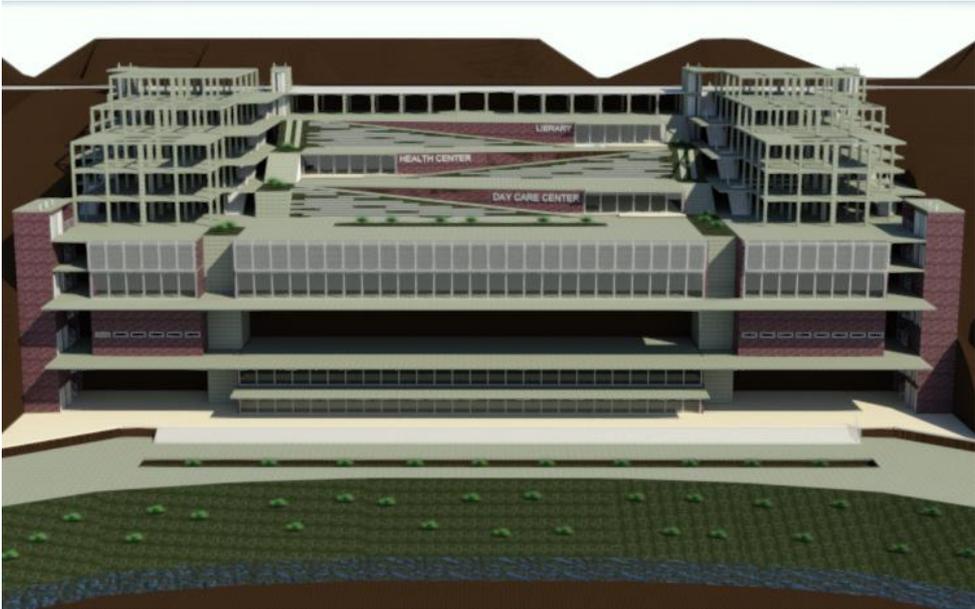


Fig. 20 – Aerial view of the project and contiguous stream



Fig. 21 – Rain garden, social facilities, and housing structure

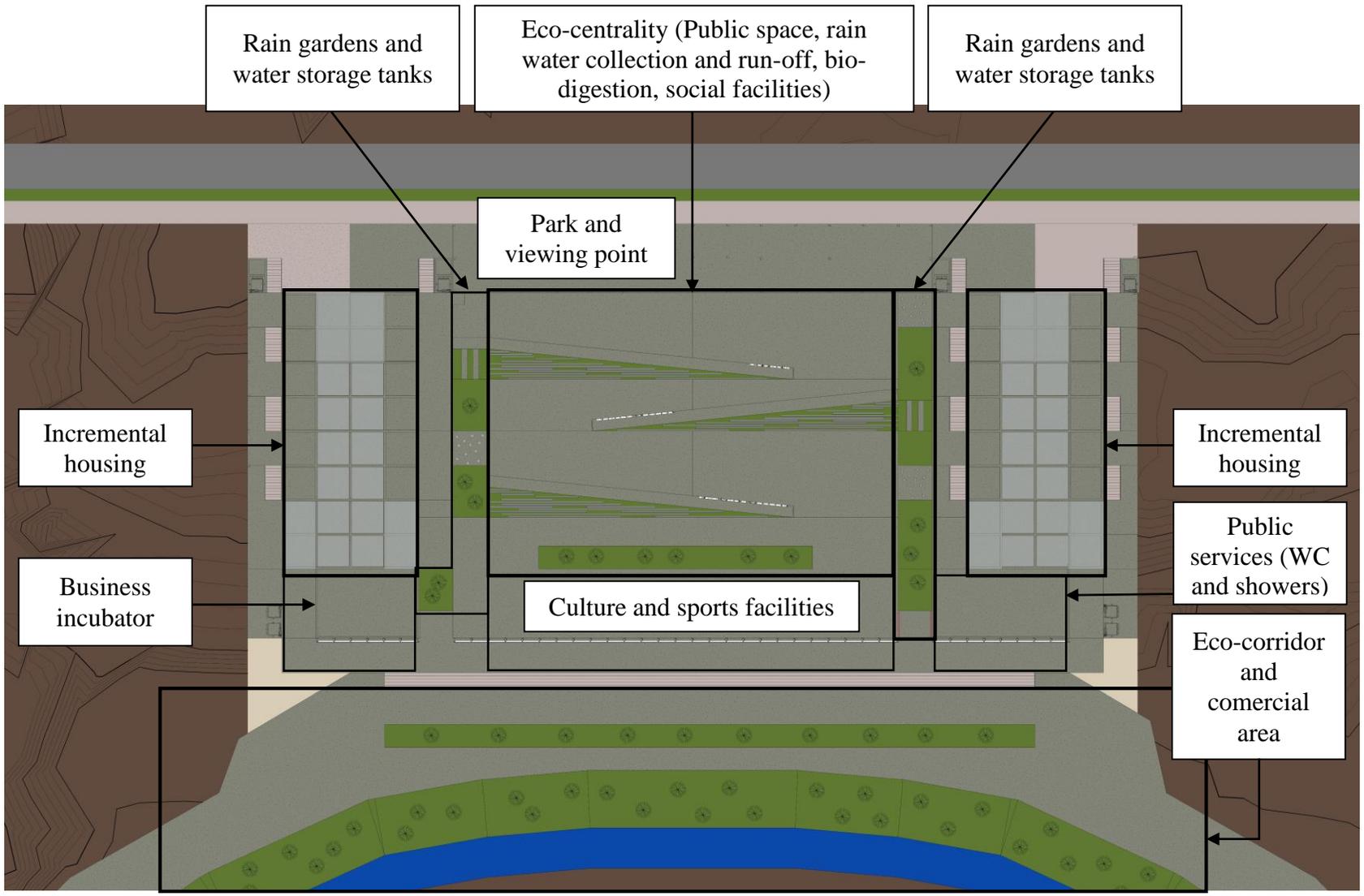


Fig. 22 – Proposed slum upgrading project layout

4. Conclusion

In conclusion, the informal human settlements could be considered as emergent solutions, created by the urban poor in response to the lack of adequate and affordable housing for them. These “emergent solutions” seem to be turning into permanent settlements, since more people continue to move into the cities and governments and institutions are still unable to provide affordable housing for everyone.

The precarious conditions that prevail in these communities affect the lives of its inhabitants at different levels. In most cases, the access to basic services such as clean water, sanitation, waste collection, and electricity is very limited or completely inexistent. This situation has a direct impact on the environment, the socio-cultural context, and in the economy of these places.

The governments and other organizations have followed different methodologies to provide adequate housing for the most vulnerable sectors of the population. Along the years, the approach has been changing since it became evident that building massive buildings or neighborhoods in the periphery of the cities was not the best solution. Instead of relocating families and breaking bonds that have been built through many years, slum upgrading has proven to be the most effective strategy towards housing provision. Beginning with the provision of basic services and structural safety, the quality of life in informal settlements can be improved by providing adequate physical conditions, as the built environment is directly connected to the social and economic context.

The *Favela-Bairro* program in Rio de Janeiro and the PUI in Medellin are successful examples of slum upgrading initiatives by the state. Professionals such as Alejandro Aravena and Jorge Mario Jáuregui, both architects, have made a name for themselves by attending the needs of the urban poor that live in informal settlements. Strategies such as Aravena’s incremental housing combine formal and the informal characteristics to provide affordable and adequate dwelling. Jáuregui has collaborated with the government of Rio de Janeiro to take formality to the informal city by bringing basic infrastructure into the slums. All of these strategies had success due to its participatory model and integral approach; they were based in the expressed needs of the population.

Architecture has the power to synthesize different issues and is able to provide solutions to improve the quality of life of slum dwellers by changing the built environment in these communities. It is important to provide flexible housing that adapts to the characteristics and needs of the urban poor population, given that each family is different and their needs change together with their family structure. The design and provision of good quality public space and green areas could diminish criminality and violence rates substantially, as well as improve the physical and mental health of slum dwellers. The construction of public facilities also plays a major role in slum-upgrading projects, especially to provide health and education to the population. By dignifying the space in informal settlements, not only the mentality of its inhabitants changes, but also the perception that the formal city dwellers have about these communities, creating a healthier urban environment for everyone.

Several sustainable applications have been used exclusively in the formal city, however, according to Ward and Smith, it is necessary to apply environmental friendly technologies in low-income dwelling. Certain paradigms could be broken by using “green” applications in the informal city, especially wrong ideas about the efficiency and thermal performance of slum dwelling. It is necessary to create a sense of belonging and increase the self-esteem that the urban poor feel for their houses, and promoting sustainability at individual and collective level is a good strategy to accomplish it.

Humanity is dealing with many problems due to the migration into the cities, especially in the developing countries from Asia, Africa, and Latin America, which hold the greater part of the world’s population and where the major problems are concentrated. Governments and institutions need to provide adequate shelter for all the sectors of the population, especially the most vulnerable ones. However, it is important to understand the real needs and let the urban poor express themselves; only by doing this, the adopted strategies will be successful.

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