POLITECNICO
MILANO 1863

POLITECNICO DI MILANO

Scuola di Architettura Urbanistica Ingegneria delle Costruzioni - MI

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USAIDIZI

Mutual upgrade process Mathare

Urban and residential intervention in 4B and Gitathuru Villages

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Ai miei nonni Annamaria ed Arnaldo, ai miei genitori Maddalena e Giuseppe, a mio fratello Stefano

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Introduction

Informal settlements are housing forms with which urban communities will have to interface more and more in the immediate future. The intense urbanization and the birth boom, especially in developing countries are among the causes that most influence their growth.
In 2018, the estimation of worldwide population living in slums was 23.5%, which translates in an absolute number of 1 billion people, distributed in Eastern and South eastern Asia, sub-Saharan Africa and Central and Southern Asia.[1] It is also esteemed hat by 2030, 3 billion people (60% of the population) will require affordable housing and adequate services.[2]
It is a fact that today the urbanization and distribution of services (and therefore the construction of dignified settlements) are unlikely to have the same rapid pace as the increased needs of the population to which they must respond, so the presence and expansion of informal settlements seems to be an unstoppable phenomenon.
The present study will debate the case of Mathare, as Nairobi is the city occupied by some of the largest slums in Africa, like Kibera and Mathare and one of the biggest metropolis in Africa, expected to gain the status of 'Large City' by 2030, with the prevision of a population number of 14.3 million individuals.[3] The study aims to present and analyse the general context of the city of Nairobi and the slum of Mathare, its similarities and peculiarities of development in comparison to the common difficulties of informal settlements and the factors of influence which gave birth to such urban structure (chapter 1-2). It will then be presented a proposal of slum upgrade, lowered to the particular context of two villages of the Mathare Valley: Gitathuru and Mathare 4b.
In the first chapter will be presented the main events and influences that have outlined the current city draw and state of acts.
How the influence of historical events like the colonial urbanization in Nairobi and the racial and spatial segregation have influenced the distribution of the population, is among the questions of this study, as well as the influence of the 'after independence' Kenya, by which the freedom of movement and the bad urban control and design, the birth boom and the strong urbanization come along. The analysis of such forms of social and urban control deserve a close up, in order to understand what have influenced the formation of such big informal settlements.
Nairobi locates and hosts one of the few headquarters of the United Nations, which play a fundamental role in the monitoring and the analyse of informal settlement growth phenomenon around the world. Acts and international conferences today regulating the informal settlement control of the 21st century will be discussed, as they work as references for big interventions and regulations in all the informal environments, as well as for worldwide development projects and visions, which will be also discussed.
The Mathare slum is one of the oldest informal settlements in Nairobi. Its development started already during the English colonial period but the regularization of both services and its subdivision has never been adequately taken care of by the County of Nairobi. The result was the development of an informal settlement whose living conditions are much lower than some of the '**extreme poverty**' levels established by national and international community authorities.
In the second chapter, the focus will move to the settlement of the Mathare Valley, presenting its contextual, social and historical peculiarities, as well as its architectural characters, aiming to outline a portrait of this particular context and recognize what gives personality to the informal settlement of this area of Nairobi.
The third chapter will move the attention to the site of project. As a consequence to previous studies and researches, the aim of the architectural proposal will attempt to both a landscape proposal and an architectural one. It is necessary to develop methods to allow the communities them self, who best know the areas, to contribute to their improvement, strengthen communities and specialize the workforce, helped by a background of adequate service expansion. At the centre of the attention, the community is intended to act as the motor and beneficiary of any kind of slum upgrade and as the maintainer actor. On the other side, the environmental aspect of the site needs a urgent intervention, as the conditions of pollution and overcrowding are unimaginable and choking both for the community living them and the natural environment. A mutual relation approach is needed in the design, in order to restore a symbiotic and mutual relation between society and environment, instead of the current parasitism one.

1 UN Statistic Division (2018), Rapid urbanization and population growth are outpacing the construction of adequate and affordable housing,
https://unstats.un.org/sdgs/report/2019/goal-11/

2 Ibid.

3 Mairura Omwenga, Nairobi Metropolitan Region, 46th ISOCARP Congress 2010

The development in time of the project will be presented along with projects and visions proposed by other studies for the Mathare Valley, which are intended to work as 'big picture' and future expansion plans of the presented project.
Questions to be answered are:
How is it possible to develop functional conditions to create the habitat necessary for the autonomous and natural reconstruction of the communities residing in slums? How to develop a suitable solution to improve and maintain the quality of life of the residents?
The scope of the project is a proposal of a community slum upgrade in the particular context of these villages, able to answer the needs of the community, to provide a guiding structure to the local workforce and to absorb the local characters of the context, in consequence and respect of previous visions and projects which are or not already in action in the area.

Part One

Where

NAIROBI

01°1711”S 36°49’02”E
Capital of the Republic of Kenya
Enkare Nairobi
Fresh Waters in Maha

Source: https://www.eld-initiative.org/en/where-we-work/africa/kenya/

City area	City area population
696 km	4 397 073 inhab. (The Kenya Wall Street,2019)

Often westerners do not have, rightly or not, awareness of the nodal role that Nairobi had throughout the colonial period and the political and economic role that today it plays as the capital of the Democratic Republic of Kenya.
As a matter of fact, the city is a flowering place for all kind of business and life rhythm is the same that characterizes metropolises all over the world.
It is also one of the four sites hosting the United Nations offices, together with Geneva, New York and Vienna.

The charm that this city leaves in the visitor's heart results from its unique peculiarities: it is first and foremost a metropolis developed amidst a mysterious and wild landscape in a completely natural ecosystem. Its population is among the oldest multi-ethnic populations in the world. Nairobi is a meeting place for the many Kenyan tribes, for the descendants of the first colonizers who imported the Indians as labourers - so many that they merged into the native culture: Chapati, as an example, is a kind of bread, part of the Kenyan tradition, despite originated in India.

Nairobi is one of the ten largest cities in Africa and its County counts, according to the estimates of the Africapolis[1] website, to date 5.877 million inhabitants, in a built area of 1 340 kmİ, which has expanded beyond 696 kmİ of the city's political borders[2] . It is outnumbered in population only by Cairo (9.6 mil. inhabitants), Lagos (8 mil. inhabitants), Kinshasa (7.2 mil. inhabitants), Johannesburg (5.6 mil. inhabitants) and Alexandria. (5.1 mil. inhabitants).
Thanks to the strong urbanization, as all large African cities, Nairobi has a population growth rate of about3.93 %[3] per year, a very high figure if we consider that Milan is 0.5%, and , on average, it counts a population density of 4 385 inhabitants per square km.
Nairobi is one of the greatest promises of the next decade.

1 Africapolis https://africapolis.org/explore

2 The estimated population of Nairobi may differ from the official one of 4,397,073, Kenyan Wall Street, November 4, 2019 , Kenya's Population Hits 47.6 Million,
Https://kenyanwallstreet.com/kenyas-population-hits-47-6-million/
This difference is to be referred to the impossibility to extract the exact number of inhabitants in the slums. The Africapolis website in this way is more reliable, compared to the official data.

3 Macrotrends https://www.macrotrends.net/cities/21711/nairobi/population

City of fresh waters

GEOGRAPHY

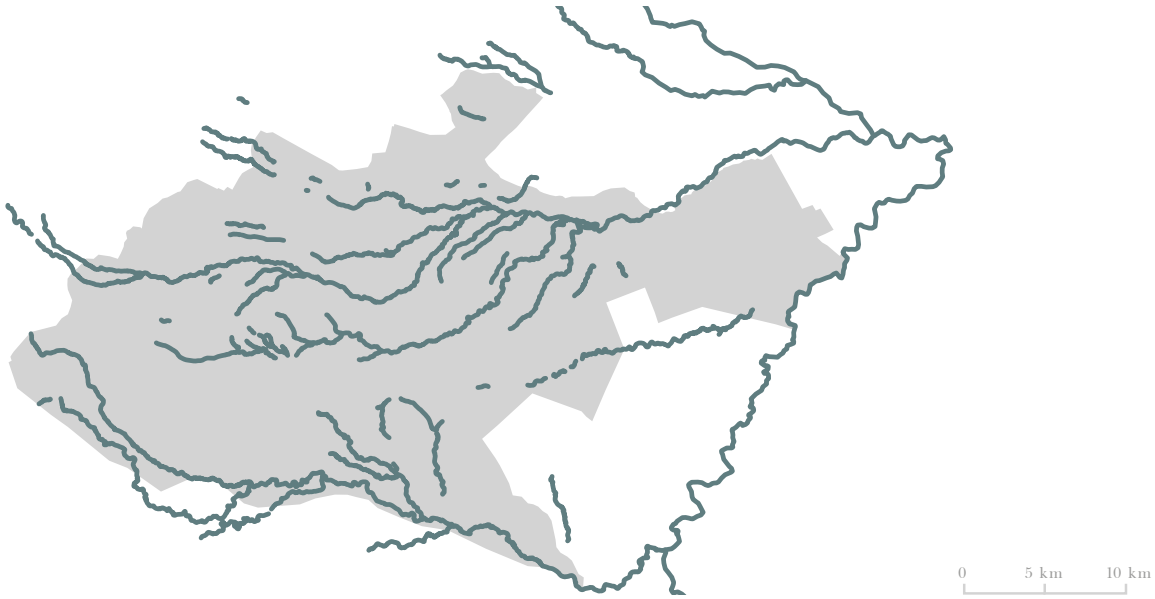
The name **Nairobi** comes from the Maha name **Enkare Nairobi**, meaning "fresh waters" in english. The city covers in fact an area of about 700 kmİ, mainly consisting of flatlands and low hills, crossed by many rivers used by tribes as herd's watering.
The western half of the Capital stands on the start of the Great Rift Valley, name that non-experts employ to indicate the divergent plate boundary that extends itself throughout Ethiopia, Uganda, Kenya and Tanzania. It is an area of land in which the splitting process of the african plate into separated ones is taking place, often causing small earthquakes in Nairobi.
Nairobi is located on a fertile and highly populated upland and the average height is 1662 m.

Nairobi in relation to its geographical habitat

BODIES OF WATER

Many are the rivers flowing eastwards in the city forming the 'Nairobi river Basin' the complex of parallel water courses merging in the Nairobi River, which joins the Athi river.

Together with the Tsavo river, these courses will eventually flow in the Indian ocean under the name of Athi-Galana-Sabaki River.
Most of these rivers suffer of great pollution due to plastic, organic and chemical waste. Many are programs which aim is the decontamination of the water.



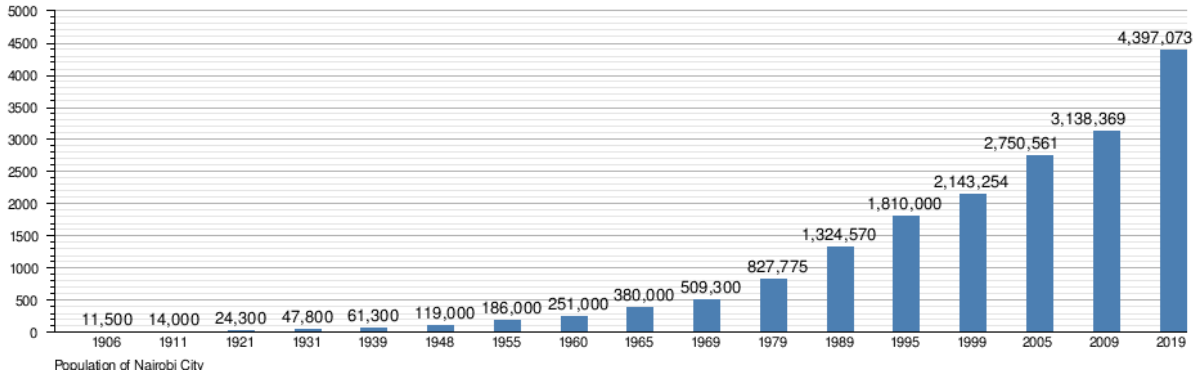
Rivers of Nairobi

CLIMATE

Nairobi is part of the African Savannah, the tropical prairie ecosystem with mild temperatures all year round and with the highest rainfall rate in the summer often causing floods. The climatic year is divided into dry season and rainy season, which scan the biological rhythms of the ecosystem .
The climate is mild for most of the year, with temperatures not exceeding the delta between 9 °C and 25 °C.

POPULATION

It is one of the ten cities in Africa with the highest expected growth rate. According to projections, the five million inhabitants milestone is figured in 20251.
Unfortunately, the economic activities have not yet got such an acceptable stage to respond the needs of so many individuals.
As a result, the town is spotted of informal settlements, hosting the lowest income brackets of the population.



Population growth rate in Nairobi
Scheme source : Wikipedia

Brief history

Up to Colonial years: Nairobi - meaning in Maha language 'fresh waters' - is regarded by the native Masai and Kikuyu people as a strategic place for watering cattle herds. It is also considered the boundary between the two tribes' lands.

1899

1907

Edward VII

First proto-building assemblies: a work field is installed for the construction of the tramway that still connects Mombasa to Kampala, the communication line between Uganda and Kenya, completed in 1901.
The village of Nairobi becomes the capital of East British Africa.

1914

Beginning of the colonial period: Nairobi land is owned at 80% by whites. There is already a strong separation of ethnic groups.
In 1915 the British governement issues the Registration Ordinance to regulate travel to and from the city.

1921

Introduction of the African shilling.
Kenyan land is considered among the most profitable for agricultural exploitation
Population: 24 300 inhabit. (Census 1921) 59% African, 33% Asian, 8% European.

1936

1948

FIRST MASTER PLAN OF NAIROBI.
Urbanization is limited by a selection of transfer permits, filtered upstream on the base of applicant's income and working capacity.
The city is divided into 8 Division and 50 Locations.
Population: 108 900 inhab. (Census 1944)

Giorgio VI

1950

MAU MAU UPRISING
Military insurrection led by an anti-colonial Kikuyu group called Mau Mau and some members of the British militia, is totally suppressed in 1956.
Population 186 000 inhab. (Census 1955)

1952

Elisabeth I

1963

1963

INDEPENDENCE AND PROCLAMATION OF THE REPUBLIC OF KENYA
In 1963 a strong population growth, combined with the growing urbanization rate from the countryside due to the fall of the Registration Ordinance, put the area's infrastructures under pressure. Nairobi is proclaimed capital of the Republic of Kenya in 1964.
Population: 380 000 inhab. (Census 1965)

Jomo Kenyatta

1972

MASTER PLAN 'Nairobi Metropolitan Growth Strategy'
It was studied according to modernist dictates but never approved due to conflicting economic and political interests.
This version of the master plan also did not prioritize public spaces.
Population: 509 300 (census 1979)

1978

Daniel Arap Moi

1999

In 1999 the KENYA VISION / NAIROBI METRO 2030 program was drawn up.
Population: 2 143 254 (census 1999)

2002

2007

POST-ELECTORAL INSURRECTIONS DUE TO ALLEGED ELECTION RIGGING
Population: 3 375 000 (cens. 2009)

Mwai Kibaki

2012

2020

Population: 4 735 000 (estimated 2019)[2]

Uhuru Kenyatta

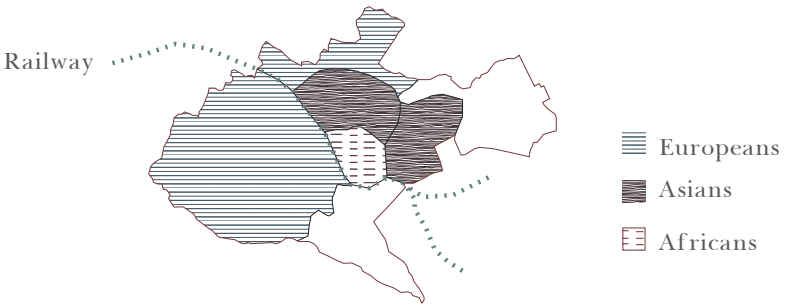
All the numeric data about the population censuses are drawn from the volume:
D. Kuroyanagi, Slum insider : Mathare, Nairobi, New York : Actar/NO MAD, 2013

2 Kenya International Boureau of Statistics, 2019 Kenya Population and Housing Census, Vol. I, Population by Couty and Sub-County

Brief history of urbanism

1948

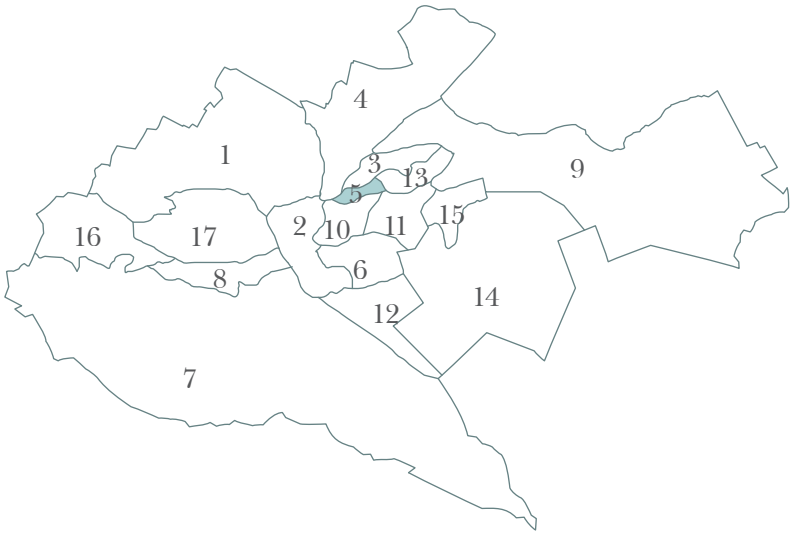
Masterplan based on racial separation. Europeans own 80% of the territories. Asians, mainly Indians imported as forced labourers at the railways construction, are housed near the building site areas, while the swampy and malarial lands of the south-east areas are left to the locals.
That masterplan, which until 2006 is the only version ever applied for the city of Nairobi, was well equipped of public and green spaces.
Unfortunately, the city uncontrolled expansion puts under pressure a urban plan intended for a small number of inhabitants (just over 250 000) which nowadays serves around 4 000 000 people.
27% of the areas was meant as public and green spaces, very few is remaining due to illegal occupation; private speculators, supported by local authorities, and deterioration over time, have gone to the detriment of both quality and safety of the spaces. The external areas of the city have been used for what is now called the 'green belt of the city', made up of parks, hunting reserves and forest reserves.



Masterplan 1948

1963

After independence, the city is divided into a series of Constituencies.
Each one is further divided into wards, for a total of 85.



1. Westlands
2. Starehe
3. Ruaraka
4. Roysambu
5. Mathare
6. Makadara
7. Langata
8. Kibra
9. Kasarani
10. Kamukunji
11. Ebakasi West
12. Embakasi South
13. Embakasi North
14. Embakasi East
15. Embakasi Central
16. Dagoretti South
17. Dagoretti North

Constituencies of Nairobi

1972

Metropolitan Growth Strategy
Masterplan is drawn following the modernist precepts, but never approved due to internal political disharmonious interests. Some of the proposal are realized, though on local scale.

1999

Nairobi Metro City 2030
Following the Millennium Development Goals, Nairobi will be improved and presented as the new lantern of Africa and the economy leader in the world. See *'Towards 2030', page 23*

United Nations in Nairobi

In 1974, thanks to the stability brought to the country by the recent independence, Kenya stood out of the neighbouring countries. Nairobi is chosen by the UN organs as one of the four cities in the world, together with Vienna, New York and Geneva, to host the United Nations Headquarters.

Of course the existence of such an important organization in the international city, influences the environment it populates, affecting the whole urban transformation.
With the mutual support of international NGOs and of the local government, various actions have been possible both on a local (mainly thanks to NGOs) and a super-local scale.

BLUE ZONE

The urban footprint left by these offices is highly evident, and carries the name of **'Blue Zone'** also known as one of the safest parts of the city.
This highly secure area is the tragic inheritance of the 1998 (Nairobi, Dar es Salaam, Tanzania) and 2003 (Baghdad) attacks to UN headquarters.
Despite the origins of such a strict surveillance, the Blue zone area thrives today as it benefits

of services and well planned infrastructure and as it is mostly populated by foreigners and wealthy members of the society of Nairobi.
It comprehends the areas of the Gigiri compound, occupied by the offices and adjacent residential areas of UN's officers.
Ironically enough, these areas mostly coincide with lands occupied by colonists back in the days and the wealth they benefit of enhances profound disparity with neighbouring areas.

PRESENT U.N. AGENCIES

Many organs of the United Nations are settled in the city.
The most relevant ones to this study, are listed here below:

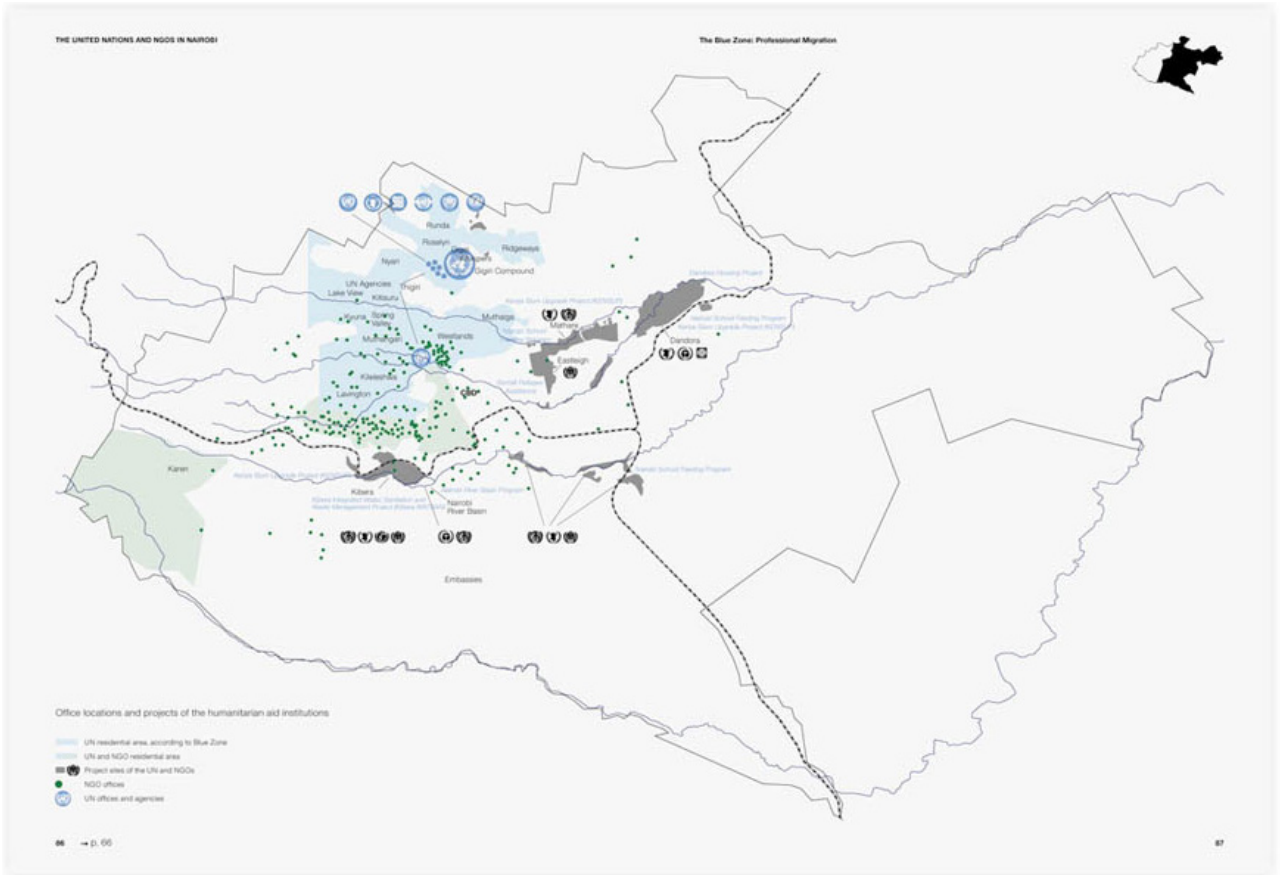
- United Nations Office at Nairobi
UNON is is the UN's Headquarters in Africa.

- United Nations Environment Programme
UNEP is to provide leadership and encourage partnership in caring for the environment. It is a lead UN actor in the fight to adapt to and mitigate climate change.

- United Nations Human Settlements Programme
UN-Habitat is the United Nations programme working towards a better urban future. Its mission is to promote socially and environmentally sustainable human settlements development and the achievement of adequate shelter for all.

- World Bank
It provides loans and grands to developing countries. The World Bank Group works in every major area of development. It provides a wide array of financial products and technical assistance, and it helps countries share and apply innovative knowledge and solutions to the challenges they face.

© http://yabaha.net/dahl/travel/t2015/Nairobi_GEO/Nairobi.html



Project sites of UN and NGOs
UN and NGO residential area, according to Blue Zone
NGO's office

Office locations and projects of the humanitarian aid institution

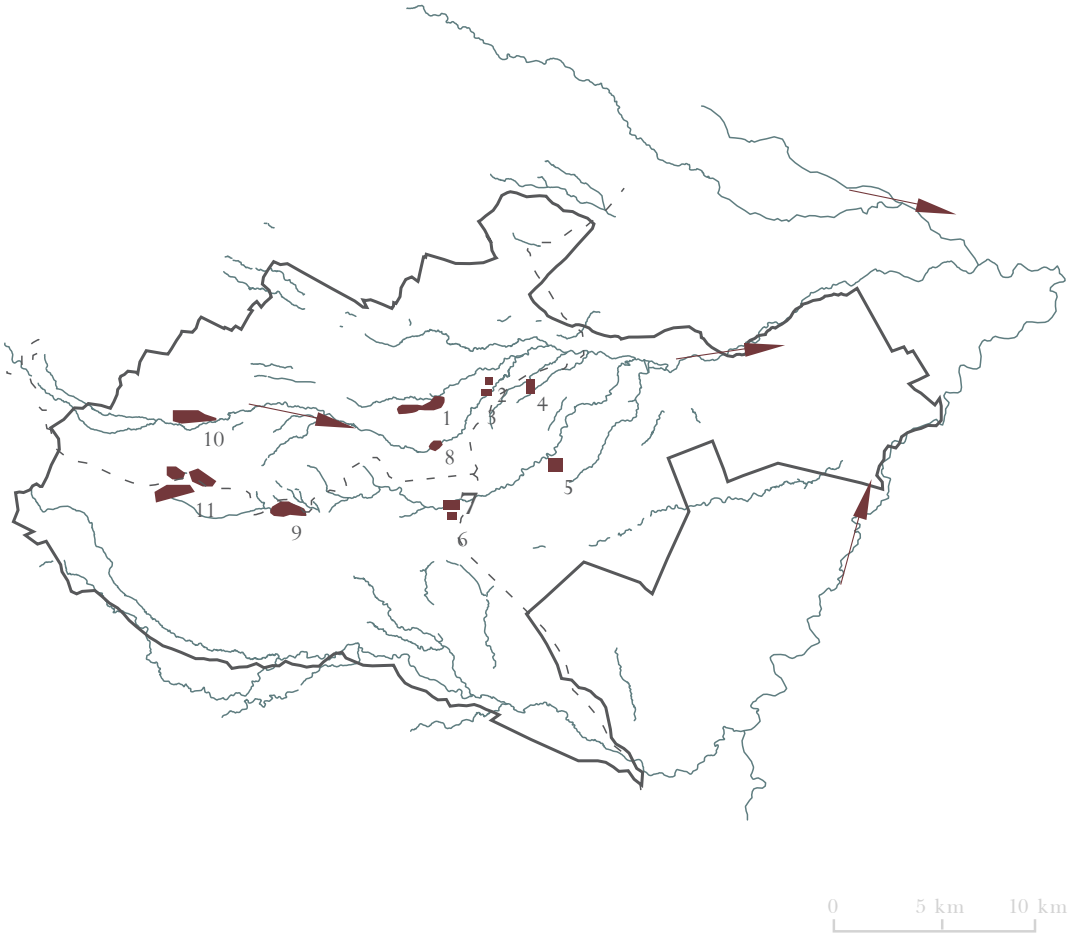
INFORMAL SETTLEMENTS

Informal Settlement:
Area with 'inadequate access to safe water, inadequate access to sanitation and other infrastructure, poor structural quality of housing, overcrowding, and insecure residential status.

Slum:
United Nations's definition
Household or a group of individuals living in an urban area who lacks one or more of the following:

- Durable housing of a permanent nature that protects against extreme climate conditions
- Sufficient living space which means not more than three people sharing the same room
- Easy access to safe water in sufficient amounts at an affordable price
- Access to adequate sanitation in the form of a private or public toilet shared by a reasonable number of people
- Security of tenure that prevents forced evictions.

Slums of Nairobi



1. Mathare
2. Korogocho
3. Uruma
4. Dandora
5. Soweto
6. Viwandani
7. Mukuru
8. Pumwani
9. Kibera
10. Kangemi
11. Kawangware

As mentioned in the first chapter 'Nairobi', the population growth has reached such a high level, that economy and city's infrastructures can't balance. This, together with the high rate of immigration from the land, causes the urban phenomenon of informal settlements in the city.

It is estimated that 60%[1] of Nairobi's citizens are squeezed in 5%[2] of the urban territory, and lives in informal settlements.
This part of its population has to face up every day to so many difficulties.
The resident of a slum fights to survive and to get to the end of the day, leaving no space for projects and long term programs as further described in this chapter.

The major Informal settlements of Nairobi are Kibera (1 mln inhab.), Mathare (800 000 inhab.), but many others as, Mukuru, Kawangware, Dandora, Kangemi, Soweto, Korogocho, Huruma, Pumwani/Majengo - to quote slums with a population of 100.000 people or more - are scattered in the urban territory in better or worse conditions.

1 Archgis
2 Archgis

FROM THE UNIVERSAL DECLARATION OF HUMAN RIGHTS

In such difficult conditions of life, many are the human rights that can't often be fully respected and sometimes completely ignored

[3]{...}**Article 17**
(1) Everyone has the right to own property alone as well as in association with others.
(2) No one shall be arbitrarily deprived of his property.

This article is often ignored by the evictions that took place in the slums in the history of Nairobi

Article 25
(1) Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.

The lack of economical resources and funds makes it impossible to reach all the care needers who populate the slums. The extreme poverty they suffer exacerbates this situation.

(2) Motherhood and childhood are entitled to special care and assistance. All children, whether born in or out of wedlock, shall enjoy the same social protection. {...}

Mothers are often the only parental figure of the families. They are therefore forced to work and give less care to children.

Article 26
(1) Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit.

Public Schools are among the basic services slums lack. Therefore parents are forced to send children to private schools, often choosing not to due to their costs.

(2) Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. It shall promote understanding, tolerance and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace.
(3) Parents have a prior right to choose the kind of education that shall be given to their children.

Article 27
(1) Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits. {...}

Although the community in slums is strong and socially active, there aren't many possibilities that make changes possible.

FOOD

One of the most serious concerns for slum dwellers is the insecurity of being able to guarantee themselves and their family one meal a day. According to the Household Food Insecurity Access Scale, 85% of families in Korogocho (150/200.000 inhab.) suffer from food insecurity, of which 50% severely[4]. According to the study, only 15% of families enjoy food security in the slums[5].

Among the factors that influence these numbers: family earnings, house size, dependency rate (illness, perceived insecurity et al.). Residents usually identify the mere need for survival in meals and therefore little attention is paid to the quality of the food. During times of crisis, such as in 2007-2008, food prices rise and residents face even more difficulties than usually in order to put a plate on the table. Even the slightest price movement has strong consequences on the purchasing capacity which has strong consequences on the state of health of people and on infant and adult mortality.

The degree of reliance on street food to eat is quite high, even though 87% of families still use cooking at home.

3 Universal Declaration of Human Rights

4 E. W. Kimani-Murage et al., 2014, Vulnerability to Food Insecurity in Urban Slums: Experiences from Nairobi, Kenya, African Population and Health Research Center, Nairobi, Kenya,

5 E. W. Kimani-Murage et al., 2014

Usually, an adult individual feeds only once a day, endeavouring, if necessary, to give the second meal to any children. People often try to get children to eat and it is not uncommon for them to be asked to bring some food home to help their parents.

EDUCATION

The government has planned few social and community services in degraded areas such as slums. Since families therefore have to rely on private institutions, when they find no place in the crowded public schools, they are forced to give up education of children and young people due to expenses.
The consequences can be seen in the juvenile crime rate, which will be discussed below.

DRUGS

It is the almost unsustainable problem in urban slums. Usually young and very young use toxic substances, and the rate rises dramatically in youth gangs.
The most used, at a very low price, are shoe glue, which is sold by shoemakers in plastic bottles, and aircraft fuel, stolen by airport employees and sold to slum dealers who bribe the police who consequently are not disposed to offer help to the weakest.
These substances are highly toxic but they have an immediate, powerful but very short-lasting effect. Children and adults live by inhaling these substances through soaked rags all day long. In the Fanpage[6] 'Zombies of Nairobi' reportage , the interviewed boys claim that by 'sniffing' they forget the stress of hunger.

WATER

Here is presented an abstract of 'World Bank Water Global Practice, 2015, Leveraging Water Global Practice knowledge and lending: Improving services for the Nairobi water and sewerage utility to reach the urban poor in Kenya'

The lack of appropriate water networks benefits independent private activities who have the control of the water outlets of the existing network, or have diverted the course with precarious means. They sell then the precious necessity at a very high price (about 5 Ksh).

The rate of access to water networks falls from 84% of the homes in the upper-middle income neighbourhoods to 36% in the low income ones.
Although the supply of poor areas is considered a priority, as much so as to have drawn up an article in the specific Kenyan constitution: the Art. 43, , it is always very complex and difficult to get the success of the projects. such as the lack of data on the income of the areas, data on hydrophone system losses, lack of funds (only 1% of Kenyan public expenditure is destined for investments in hydrophone services№).
Good practices:

- **Nairobi Water Supply Master Plan_The World Bank, AFD**
- **Maji Mishinani_NCWSC:**

According to the Nairobi Water Supply Master Plan, counting and payment of water consumption are carried out through a multi-level project, a social connection policy, a micro loan scheme and the use of a virtual platform (Jisomee Mita). The prototype of this working method succeeded in Kayole Soweto in line with the projects of the Water and Sanitation Service Improvement Project (WASSIP) and of the Kenya Informal Settlements Improvement Project (KISIP)

HEALTH

Exposure to viruses and chronic diseases, as well as the lack of sanitation, is one of the causes of absenteeism in the schools. Furthermore, the cognitive defects developed by babies during their mothers' pregnancy and their childhood hinder their good results.

6 Fanpage, Zombies of Nairobi

©Dominic Kirui

Source: Emily Jacobs, Mathare Slum, 2010

Among the major factors of female absenteeism, however, is the menstrual period. Since the schools usually don't have separate female toilets, napkins exchange is not possible and girls decide to avoid school in that week.

In the slums, the lack of correct water distribution causes a poor distribution of properly functioning public toilets, the overcrowding of spaces and the absence of sewage services worsens the state of the population wealth.

Infant mortality in Nairobi slums has been studied to be around 151 out of 1000 individuals, 33% of the child population suffers from diarrhoea, and 14% of the population of Kibera is affected by HIV / AIDS[7].

Hygiene and health[8]: More than half of the residents live structures with a dirty floor and 80% have no permanent walls. Most residents use public services, the cost of which is 5 KSh per use.

It is easy to understand that in such poor areas the obligation to pay for toilet services inhibits many of the residents from using them. Of the existing toilets, almost no one in Mathare is connected to the city sewer system. Human excrements are left to rot in public areas or even in the houses themselves, due to the concatenation of factors such as the remoteness of services and the danger of night time slots, during which the risk of being attacked by criminal gangs is very high.

Infections and chronic diseases[9]: all sections of the population of the Slums are affected, but it is women and girls who live in these areas who pay the most.

90% of cases of diarrhoea are derived from faecal contamination in water considered to be drinkable. Continuous exposure to these types of pathogens in childhood leads to brain development problems and cognitive limitations. Women, who need closed environments and private areas, especially in the menstrual period, have fewer opportunities to use public services and this leads to frequent urinary tract infections and constipation. The change of menstrual accessories during the monthly period is another delicate topic, as it is a source of shame.

The consequences in such an environment are barely imaginable: during the night, as they are unable to go to public toilets, families use a chamber pot, and changing towels is difficult, uncomfortable and noisy.

Women are also the most sensitive object to sexually transmitted diseases, about 38% more than men, increasing sensitivity in subjects to intestinal diseases, which can be lethal for the sick.

Female dignity and security[10]: 36% of women living in slums claim to have been rape victims, while in Kibera, the largest slum in Nairobi, and the largest urban slum in Africa, the death rate for other forced sexual acts is still 30% .

POLLUTION

Astract of Corburn Jason, and Karanja Irene, 2014, **Informal settlements and a relational view of health in Nairobi, Kenya: sanitation, gender and dignity**

Many of the Nairobi slums rise next to landfills and storage sites, where many of the residents find shelter, materials and jobs. The levels of inhaled gases resulting from the maceration of the garbage are really high and often toxic. Furthermore, since the construction of the settlements is not regulated by any urban plan, the urban spaces, usually foreseen to guarantee the healthiness of the environments, are absent.

This has a number of consequences:

- An often non-existent urban garbage determines the proliferation of landfill sites in the middle of residential areas or in the alleys between houses.
- The absence of water and sewage systems involves the use of outdoor latrines or flying toilets, with direct consequences on the spreading of diseases and on the contamination of the waters that are drunk by residents and animals.

As for domestic pollution, rooms often with no windows are rented to entire families and perform all the functions of an entire house: cooking then, entails a very high rate of fine dust

7 J. Corburn 2012, In. Karanja, 2014

8 J. Corburn, 2012, In. Karanja, 2014

9 J. Corburn, 2012, In. Karanja, 2014

10 Swart E. (2012) 38, 427–438

which remains in the air for a long time even after the end of meals, affecting the health of young and old.
The cooking of the food is carried out by means of coal or wood but, more often, by means of paraffin which is cheaper, increasing in all cases the air pollution in the whole house.

HOUSING

Slum hovels can be made of mud or sheet metal, but materials vary widely depending on the areas of the city.
Obviously, the choice of materials has consequences on the quality of life inside the huts based on the resilience of the material itself.
Having often sheet metal at a lower cost than mud, residents often live in overcrowded houses where it is very hot during the day and very cold at night. The common building we can find in slums is divided in two by a central corridor that connects the street to the rooms without opening or if there is a window, it overlooks an alley full of rubbish.
Each room fulfills all the domestic functions including hearth and latrine. [11]

The insecurity of possession constitutes one of the obstacles to improving these areas. Many residents have no guarantee against sudden increases in rent, unregulated restrictions against the use of the houses and lands they occupy or the expropriation, making their occupation perpetually precarious.

The guarantee of legal possession is one of the basic requirements for determining the "adequacy" of the accommodation.
Most of the lots are owned by the government or public, most of the tenants are therefore paying illicit rents to someone who does not actually own the residences, but the Kenyan law is so complex that it is not often easy to trace the rightful owner.
In addition, the boom of slums involves the construction and occupation of soils destined for roads, services and water quays, further limiting the possibility of development.

Among the causes, forced removals stand out: the most famous in Nairobi were those of Deep Sea, conducted without adequate precautions in order to respect human rights and safety, and those of the Nairobi River Clean-Up program.
Forced removals constitute a violation of the right to housing.

In the field of human rights, forced removal is only possible as a last resort, after taking into consideration any other possibility and having embarked on a genuine conversation and confrontation with the occupying community.
Governments should also ensure that no individuals are made homeless.

SECURITY

The security problem in Nairobi extends to both informal settlements and the rest of the city. There are several reasons pushing people to take the crime road.

1. *Limited opportunities for a profitable legal employment and consequently a fertile ground for lack of security and hope*
2. *The proximity of more affluent neighborhoods makes crime and robbery an attractive figure*
3. *3 Frequent evictions of residents from their homes*
4. *Ease of hiding because the police are weak and do not easily reach all areas of degraded areas*'.[12]

Crime is often seen as sub-culture in certain groups that represent a system of values directly opposed to those of society. Most of the crime acts committed in Kenya, according to the report written by Stravrou[13], are committed by young or very young people, of whom 82% of those arrested claim to have been previously attacked. Gangs that have, among others, the objective of protecting their affiliates, in a vicious circle that feeds itself.

The most famous of the criminal bands is defined by the name Mungiki, 'multitude, group of people', and takes inspiration from the Mau-Mau, who rose up against the conquering colonists in 1950. The oppressor against whom the Mungiki turn their efforts are law enforcement and the various symbols of western civilization.

11 R. Neurvirth, 2005, Shadow Cities, versione italina: Citta Ombra, Viaggio nelle periferie del mondo

12 Grace Masese, 2007, *p. 3*

13 Stavrou A., 2002

They have strong influence on elections as they control many voters. Their economic profits derive from extortion, theft and taxes imposed on poor residential areas. In exchange, residents are offered protection and administration, which seems to work in areas where the legal influence of the Assistant Chief does not come.

The hierarchical system is based on youth micro-gangs of street boys and girls defined as street-families, controlled by adults; they control prostitution and drug dealing. Adults are involved in more serious crimes such as rape and assault. The public has no mechanisms capable of coping with the situation, neither of action nor of prevention. According to the Citywide Victim Survey, 30% of the crimes in Nairobi are committed by street children, of whom nearly 60% perpetuate illegal activities even in adulthood[14].

Climate change and slums

Abstract from: ACCESS , ICCA , 2016, Research, Analysis of Climate Resilience Options for Nairobi Slums and Informal Settlements

Although climate change impacts the entire city of Nairobi, informal settlement's population encounters in many ways an exacerbation of the difficulties the urban one lives. Poorness, insufficient services, lack of adequate materials are among the principal reasons for such high damage rate.
Direct results are loss of livelihoods, temporary or permanent displacements incidences and diseases.

FLOODING

Cities are the major contributors of carbon emissions and at the same time, one of the most vulnerable areas to climate change.
Informal settlement's population, i.e. the most unfortunate urban inhabitant, live highly dangerous areas such as low-lying flatlands, steep slopes, ravines and other risky areas as a residential space. Moreover, these population slots cannot afford adaptive technologies like performative building materials, and political, cultural and economic limitations inhibit their ability to relocate somewhere else.

The high population density living along the stretches of the rivers that run through the slums of the city is the preeminent cause for the great danger of floods during the rainy season. Poor waste management and drainage produce flooding and partly limit the urban development capacity of these areas. The deficiency of infrastructures, such as bridges and passages, prevents the accessibility to escape routes.
Floods profoundly impact on informal settlements more than on other urban areas, due to the sub-standard materials housing and household assets are made. The water, flowing outside of the river banks, invades the sewer canals and gets contaminated, spreading diseases after the disaster and contaminating water supplies. Destruction of the built sites of the slum affects structures where inhabitants work since most of them find occupancy within the slum area. The poverty rate of affected families then increases, as they must move to roadsides or cultural buildings or schools in order to find a shelter.

SLUM RESIDENTS RESIGNED TO FATE AS EL NINO LOOMS

September 5th 2015

(Source: Nation Media Group)

In the informal settlements where a majority of the residents live near riverbanks or abandoned quarries, the lurking danger appears to have been largely ignored.

- On May 10th 2015 people died after the perimeter wall of the South B Mosque collapsed on shanties in Mukuru Fuata Nyayo slums at night.

- Another four people were swept away in Kayole and one in Ruaraka in June while dozens died when cholera broke out in Kibera.

The only policy today standing for flood protection is a 30 m riparian zone limit within no building should be present. Unfortunately, the amount of eviction necessary for the institution

14 Stavrou A., 2002

Source: Eight killed, 43 houses razed down in Kibra inferno, By Citizen Reporter For Citizen Digital, Published on: September 1, 2018 (EAT)

©SIMON MAINA/AFP

of such an area would be of 127 000 people along the Mathare, Ngong and Nairobi Rivers[15]

LACK OF WATER

Nairobi, as a rapidly growing city, will face significant water constraints, a problem already affecting the city's territory. In 2000, a massive drought, for example, saw the collapse of hydro-power system, causing long queues not only in the city but mostly in informal settlements. Of course, residents ended up paying higher prices for water supplies, then wealthier families.

HEAT AND TEMPERATURE'S GAIT

Affected by climate change, exacerbated by environmental factors like smog, degradation of green spaces, and increased greenhouse gas emissions, higher temperature increases the frequency and severity of heat-stress events.
Fire emergencies are quite common during dry seasons and water-shortage periods, especially in the most empovrished zones, where materials are not suitable for the function they're employed. Also, the constant traffic congestion and narrow roads inhibit the moving capacity of emergency wagons in informal settlements, making the fire containment impossible.

CONCLUSIONS

> *'The informal settlements in Nairobi are located in relatively low lying areas and are clustered along river banks, enhancing risk to flooding relative to other locations.*
> *Due to their high population densities, widespread poverty, closely clustered and poorly constructed dwellings, poor sanitation, illegal connections to electricity, water, and sewer lines, and lack of access to essential services, they are also prone to several anthropogenic-related disasters, and fire in particular. (...) Past El Nico events have had devastating impacts on the slum dwellers through a loss of lives and property, displacement, and high cost of rehabilitation, and that the flood risk is likely to increase both in frequency and magnitude as a consequence of climate change, thus enhancing the severity of the impacts'* [16]

A preventive approach to climate disasters seems crucial. Of course, the lack of services is one of the most pressing issues to address interventions, immediately followed by a cooperative adaptation of livelihoods of the slums.
One of the biggest obstacles to the infrastructure realization is the difficulty of doing a census of the slum inhabitants.
The collaboration and inclusion of residents in the scenarios are fundamental for a positive outcome of the countermeasure plan. Flood protection, Disaster management policies, waste management, access to potable water, sanitation, health facilities and shelter availability are among the institutional challenges the county of Nairobi must face.

Slums and politics

Mathare, like all Nairobi's slums, are high density living spaces, easy to control in case of danger but simultaneously big part of the electoral political basin. How is it possible such conditions of slums can be politically accepted given the fact that they contain such high concentrations of voters?

SPATIAL SEGREGATION

As British colonials limited the entrance and the zoning of poor dwellers in the city by racial laws, the city experienced a strong segregation which eventually led to a perceptible dualism even nowadays.
After independence, lands previously owned by the colonials were now occupied by the wealthier Kenyans while the poorest parts of the population remained necessarily in the eastern areas.
Tribalism is today the base of the contemporary spatial segregation the city is living. Ethnic

15 National Environmental Management Authority (NEMA), 2009

16 Africa Collaborative Centre for Earth Systems Science (ACCESS), Institute for Climate Change and Adaptation (ICCA) 2016

partition has not been eradicated as the predominant ethnic group in the contemporary Nairobi remains the Kikuyu tribe, counting 33% of the population, followed by Luo, Kamba and Luhya17.When new residents come to the city and look for housing, they appeal to their existing social connections, perpetuating tribe segregation.

LAND ALLOCATIONS AND GRABBING

After independence lands previously owned by the Crown were delivered to the Government of Kenya. The illegal allocation of land that took place after the 60s not only had a personal background but also political and strategic. The Ndugu Commission[18], 2003,found that many illegal titles have been created and used to favour the interest's line of specific groups. An elite of ministers, civil servants and politically connected businessmen is the beneficiary of this process[19].
This nonsense land administration and distribution has led to 60% of Nairobi's population currently living in slums and informal settlements but occupying only 5% of the land. The development of the slum can be therefore considered informal not only due to the spontaneous development of housing, but also due to the illegal land distribution.

EFFECTS

Although with no legal permissions to do so, provincial administrations allowed that unclaimed slum land was distributed to private and institutions who charge residents of illegal rental obligations. It follows that the rent paid by dwellers not only has no legal basis, but it is also a lease for a land plot located on public fields.
As it is impossible to build any kind of structure in a slum without the permission of the Chief's authority, besides the ability to pay, it is critical to have political relevance and contacts, in order to acquire land and build in informal settlements.
Nairobi's slum's landlords belong to tend for this reasons to be relatively wealthy and politically influential.
Kikuyus are very influential within the Mathare Valley and Dagoretti as well as in Kibera slums. It follows that the administrations have advantaged specific ethnic groups through land concessions. In Mathare Valley, Kikuyus constitute the majority of tenants and landlords[20].

INFLUENCE OF ETHIC GROUPS

Ethnicity may be an essential criterion to limit the number of beneficiaries; moreover, it may also be considered the advantage of some over others: as Kikuyus benefit of a better asset than other ethnic groups, the result of their predominance among slums might be the result of the general well being and economic status of the ethnic group. In Mathare, Kikuyus have become large-scale landlords as well as political leaders thanks to a resource pooling action.[21]

17 Government of Kenya, 1999. in Dafe F. (2009)
18 Ndugu, 2006
19 Dafe, 2009
20 Chege, 1981, in Dafe, 2009
21 Cege, 1981 in Dafe, 2009

TOWARDS 2030

2030 is the end term for the actuation of agendas and programs decided by every country member of UN, under the leadership and decisions of conferences and discussions led every 10 years.
Many are the protagonists of the political and the economic renovation and growth of the Kenyan Country.

This chapter offers a short abstract of projects, program and institutions currently cooperating to gain this goal, with a specific look on the construction industry, as it is the aim of this work. These institutions are part of the actor's domain treated in the next chapters.

Sustainable Development Goals

After the General Assembly of 25th Sept. 2015, The United Nations adopted the 2030 Agenda for Sustainable Development as a **'plan for action for people, planet and prosperity'** and recognizes that **'eradicating poverty in all its forms and dimensions, including extreme poverty, is the greatest global challenge and an indispensable requirement for sustainable development'**[1]

This document is one of the pillars and lighthouse for the development in the years between 2015 and 2030 for countries members of the United Nations.

It consists of **17 Sustainable Development Goals,** a completion of the Millennium Development Goals (which were to be completed in 2015), integrated and indivisible and based on the three dimensions of sustainable development:
The economic, the social and the environmental.

The most important goals for the scope of this study, will be reported below.
(See Endnotes for the entire text)

Goal 1. End poverty in all its forms everywhere
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3. Ensure healthy lives and promote well-being for all at all ages
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5. Achieve gender equality and empower all women and girls
Goal 6. Ensure availability and sustainable management of water and sanitation for all
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable[2]

World Bank

The World Bank is a unique global partnership with the merit of counting within its members most of the world's countries
It aims to fight and reduce poverty and *'build prosperity in developing countries'*[3].
It provides loans and grants to the most impoverished governments of the world, to facilitate the achievement of capital projects.
It comprises some of the greatest sources of funding and knowledge:

- IBRD, The International Bank for Reconstruction and Development
- IDA, The International Development Association

These two associations provide advising and financing services to developing countries

- IFC, The International Finance Corporation
- MIGA, The Multilateral Investment Guarantee Agency
- ICSID, The International Centre for Settlement of Investment Disputes

The private sector is as important as the public one in the matter of development of entire nations and in the empowerment and general well being of the population. IFC, MIGA, ICSID's role s the mitigation, finance and advise private institutions.
The complementary roles of the institutions of the World Bank makes it a reliable source or many countries, as it is also part of the United Nations Organizations.

Habitat III

CONFERENCES

Habitat III, the United Nations Conference on Housing and Sustainable Urban Development, is the third UN Conference on Housing occurring every 20 years since 1976.

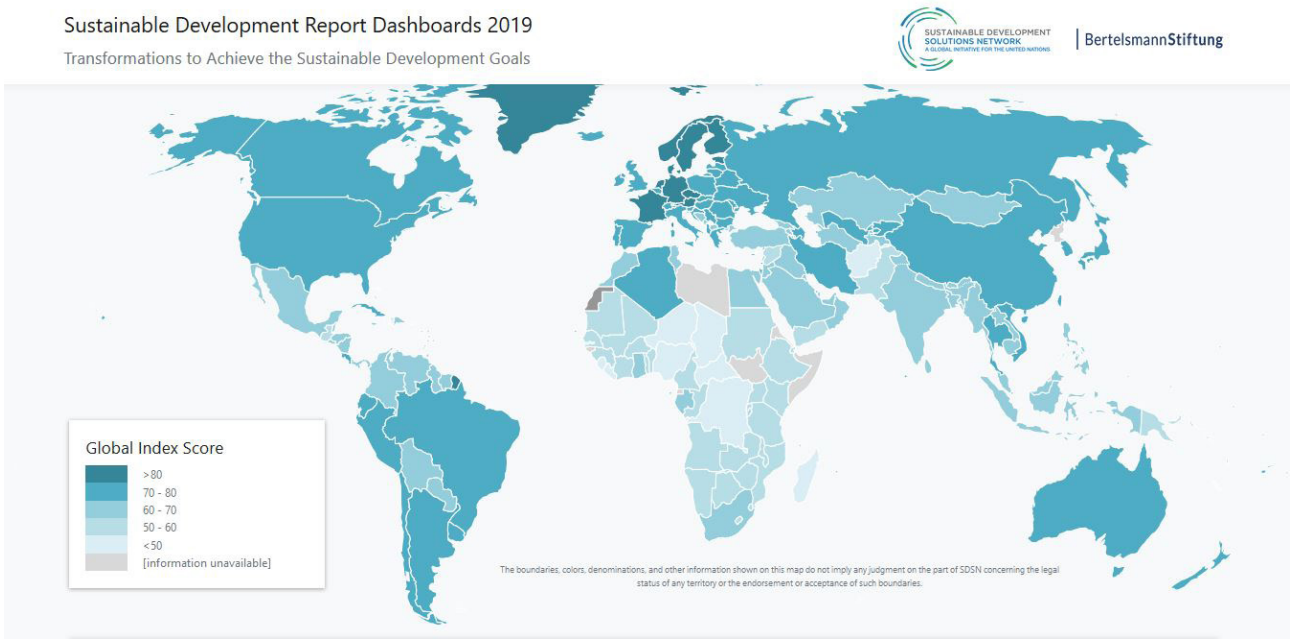
- HABITAT I, Vancouver, 1976,

The focus is on the extreme urbanization: its impact and expansion rate worldwide. In particular, Vancouver conference recognises the demand for low-cost housing.
The United Nations Commission on Human Settlements (UNCHS, now UN-Habitat) was then created.

'UN-Habitat supports countries to implement the urban dimensions of the sustainable development agenda to

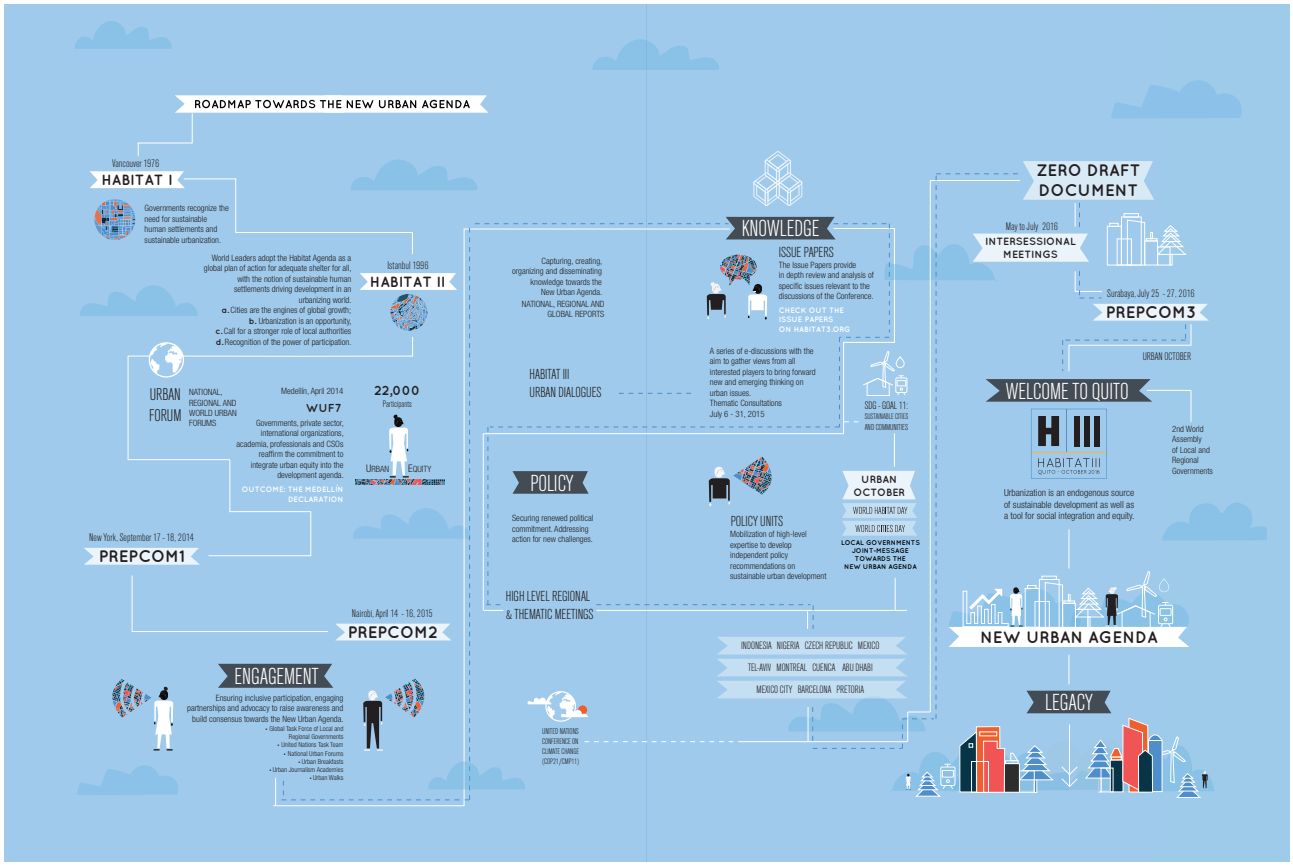
1 UN General Assembly, 2015, Resolution adopted by the General Assembly on 25 September 2015
2 Sustainable Development Goals
3 The World Bank homepage, https://www.worldbank.org/en/who-we-are

World map showing countries that are closest to meeting the SDGs (Sustainable Development Goals, in dark blue) and those with the greatest remaining challenges (in the lightest shade of blue) in 2018



Source: Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G. (2019): Sustainable Development Report 2019. New York: Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN)

Concept Map of the Habitat III conference



make cities and human settlements inclusive, safe, resilient and sustainable'[4]

ˆ HABITAT II, Istanbul, 1996,

It recognises the guarantee of possession of goods as an integral part of life quality and protection which is since then included in the Universal Declaration of Human Rights in the form of Art. 17, 1

ˆ HABITAT III, Quito, Ecuador, 2016

Sustainable urban development is the central point giving birth to the New Urban Agenda, an action plan for future settlements.

NEW URBAN AGENDA

The New Urban Agenda (NUA) is a guideline for urban development in the period between 2016, and 2036. It refers to many other UN agreements and consistsof three parts:

Transformative commitments for sustainable urban development
Effective implementation
Follow-up and review

Urban planning is considered the mechanism of accomplishment of the NUA, in particular, as he document quotes:

'*Urban planning and design instruments that support sustainable management and use of natural resources and land, appropriate compactness and density, polycentrism, and mixed uses, through infill or planned urban extension strategies as applicable, to trigger economies of scale and agglomeration, strengthen food system planning, enhance resource efficiency, urban resilience, and environmental sustainability*'[5]

Following the Smart City model.

The declaration of the principles outlined in the NUA, follows in the **Shared Visions** section the expression of **Right to the city.**

'*The question of what kind of city we want cannot be divorced from that of what kind of social ties, relationship to nature, lifestyles, technologies and aesthetic values we desire. The right to the city is far more than the individual liberty to access urban resources: it is a right to change ourselves by changing the city. It is, moreover, a common rather than an individual right since this transformation inevitably depends upon the exercise of a collective power to reshape the processes of urbanization. The freedom to make and remake our cities and ourselves is, In want to argue, one of the most precious yet most neglected of our human rights*'[6]

A very discussed topic that, however, doesn't provide any explanation on how to act or who'd prevail when different parties' interests conflict. The conference also considered the social and ecological function of soils as a premise for the enjoyment of the principle of the right to the house; the civic commitment and participation as foundations of the sense of belonging, and the importance of public space[7]

4 UN-Habitat
Https://open.unhabitat.org/

Ruwaza ya Kenya 2030

The Kenya Vision 2030, (in Swahili Ruwaza ya Kenya 2030) aims to transform Kenya into a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment.[8]

Its objective is to transform Kenya in a 'newly industrializing, middle-income (income exceeding World's average currently at US$10000) country providing a high quality of life to all its citizens by 2030 in a clean and secure environment'.[9]

Three mid-term programs are scheduled: MTP1, MTP2, MTP3 under which Kenya will conquer its **Sustainable Development Goals**

The Big Four Agenda

National Kenyan program formed of four of the most urgent necessities in the Country and it is a parallel program of the Kenya Vision 2030 and its Third Medium Plan. The Third Medium Plan of the Kenya Vision 2030 will be based on the Big Four Agenda (which name resembles the 4 biggest animals representing the country).

This program has been established by President Uhuru Kenyatta, involving:

1. Food Security
2. Affordable Housing
3. Manufacturing
4. Affordable Healthcare

Nairobi Metro 2030 Strategy

Long term project developed in 2008 following the precepts of the Millennium Development Goals within 2030. It is part of the program Kenya Vision 2030, a seemingly planned program on a national scale.

Here below, part of the presentation on the project's website is presented:

> *'The city also plans on investing heavily in building modern municipal infrastructure to improve access to electric, water delivery and sanitation utilities across the entire metropolitan region. In addition to providing basic access to these utilities, the plan also stresses the importance of improving access to information and communication technology networks that support business, government, education and literacy.*[10]"

It is here evident how the Nairobi Government, helped both by humanitarian organizations and by the Government of Kenya, intends to invest in the poorest areas of the city. In particular, the Nairobi Metro 2030 program addresses specifically to the slums eradications[11] from the Metropolitan city and the implementation of the general quality of life and

8 Kenya Vision 2030 http://vision2030.go.ke/

9 ibid.

10 Nairobi Sustainable development goals (for the entire text, see chapter Endnotes)

11 Ministry of Nairobi Metropolitan Development , 2008 *p. 76*

inclusiveness of the region[12].

It is nonetheless notable, how the document refers to these hubs in such an aggressive and detached way

> *Eliminating slums, of which Kibera gives the NMR an infamous image as host to the largest slum in Africa, is critical to these strategies Branding the NMR needs to employ an effective strategy based on fi rm principles in order to ensure a principal focus on the expected merits and requisite interventions, taking into account contextual realities.* [13]

It comes natural to wonder which tools the government is going to actuate in order to 'eliminate' them.

KENSUP and KISIP

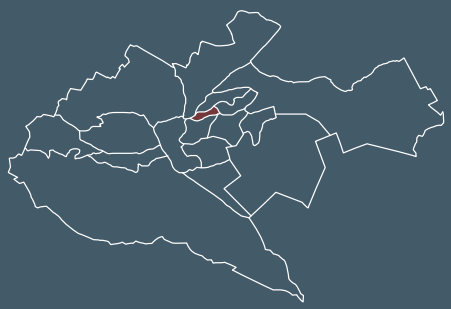
After the adoption of the Millennium development goals, and the drafting of Kenya Vision 2030 and Nairobi Metro City, the Republic of Kenya has adopted a completely innovative way, by standards, to deal with the problem of slums. In 2003, the government approved a Memorandum of Understanding, according to which the government formed the Kenya Slum Upgrading Program (Kensup), initiated in 2000 thanks to an agreement between the former government (lead by President Arap Moi and UN-Habiat and renewed by President Kibaki in 2003 together with NARC.
The Government of Kenya developed specific strategies for both the funding and implementation program, for the period between 2005 and 2020.
The goal of KENSUP is to improve the living conditions of at least 5.3 million people within the year 2020, for an estimated cost of 13 billion US dollars. (UN-HABITAT and The Kenya Slum Upgrading Program Strategy Document, May 2008). These would have included the improvement of services, infrastructures, the right of ownership.
The KISIP (Kenya Informal Settlement Improvement Program) is a short-term program, created for the implementation of the strategies planned between 2011 and 2016 in 15 municipalities. It is an organization belonging to KENSUP, whose long-term range of action extends to 2025.
They are both supported by the Ministry of Housing and the Ministry of Lands and supported by very important local authorities. KENSUP focuses on Kenya's urban centers with the highest population density such as Nairobi, Mombasa, Mavoko, Kisumu and plans to extend to 15 other municipalities. The integration of communities is welcome even if not perfectly integrated.
The Mavoko and Kibera projects are an example of the shortcomings that this lack brings: these projects have in fact been accused of having been designed and priced for middle-class classes, thus preventing slum residents from being able to financially access residences. In fact, there have been problems of poor transparency regarding these programs, both for the selection of municipalities and for the awarding of contracts and contracts. In addition, the Government of Kenya does not invest what is due in these programs, which therefore mainly entrust private donations, making cost sustainability difficult.

KENSUP	KISIP
• Formation of Settlement Executive Committees in Soweto East and Laini Saba villages in Kibera • Socio-economic mapping of the Kibera settlement • Master plan draft for Kibera under formulation as of 2008 by UN-HABITAT • Physical mapping of Kibera under way • Housing at Kibera Decanting Site Housing Scheme: 17 blocks of 5-story flats totaling 600 three-room self-contained units	• According to a presentation by the KISIP coordinator, the various components have been implemented to some level • Institutional strengthening in all 15 municipalities • Land tenure in Nairobi, Mombasa, Eldoret, Malindi, Kakamega, Thika, Kericho, Garissa, Embu

Achievements of KENSUP and KISIP
Source: Anderson M., Mwelu K., (?), Kenyan Slum Upgrading Programs KISIP & KENSUP

12 Ministry of Nairobi Metropolitan Development, 2008, 4.4
13 Ministry of Nairobi Metropolitan Development, 2008, p.76

Part Two



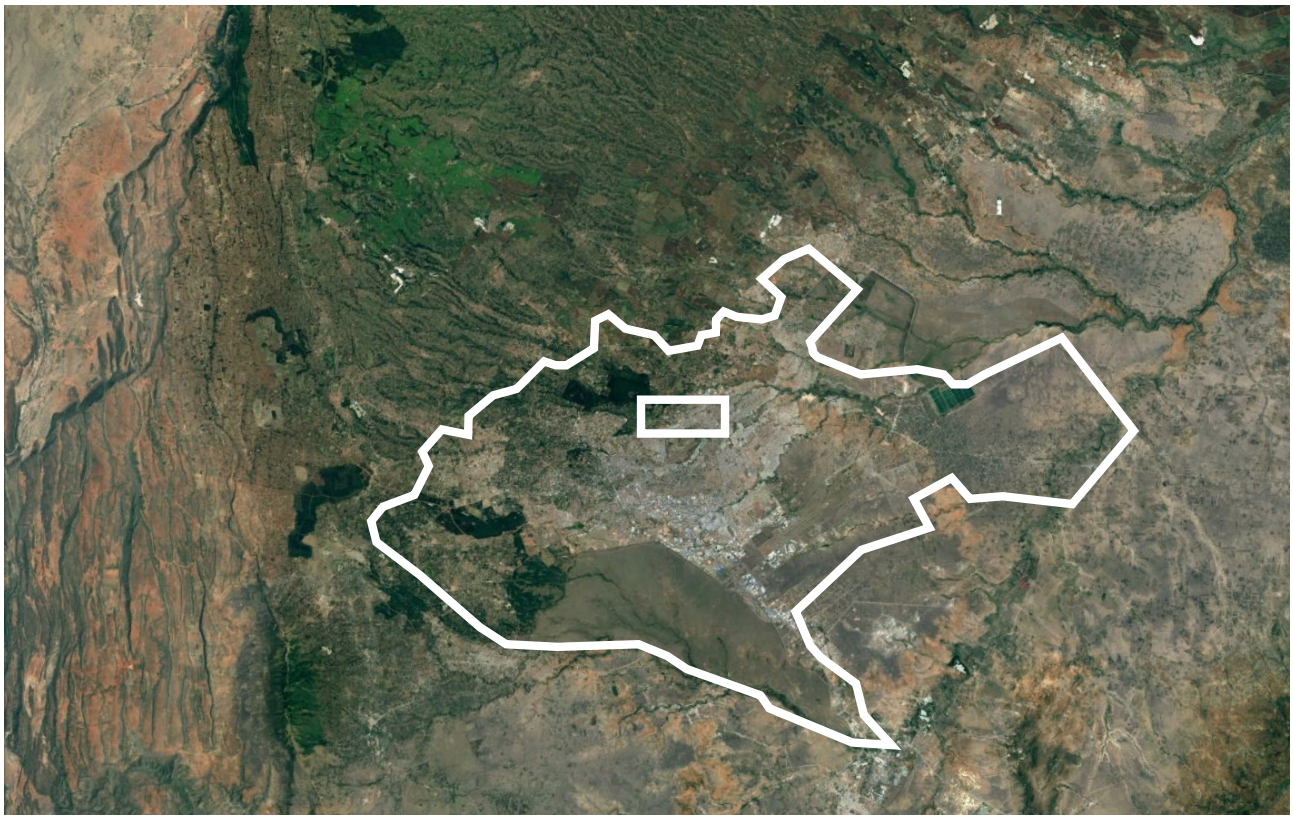
Focus

MATHARE

Population esteemed:
188,183 (2011 Collaborative Upgrading Plan)
Nairobi

Mathare Valley is an agglomeration of informal and regular settlements; the informal ones outcome the formal ones, giving the area the definition of informal settlement. It is located in Nairobi and sadly famous as the second largest informal settlement of the city of Nairobi after Kibera.
Mathare Valley is a definite political, economic and social space, with recognizable borders. The area bounded by Thika Rd., Juja Rd. and limited by Muratina St. and the Outer Ring Rd. is usually addressed as Mathare or Mathare Valley. The so defined Valley has therefore a space outside and a space 'within', a peculiarity that has strong consequences.
With 'Informal Settlement of Nairobi, usually is defined the eastern area of the Mathare Valley, composed by nine districts. These areas are among the most ancient slum bases in the city; squatters have lived in the area since 1920 during the colonial period.

Nairobi



Mathare

Source: Gogle Earth

0 500 m 1 km

Brief History

1920-30

During its formation, Mathare Valley was subdivided into nine rural villages rented from Indian landlords. It was divided between 1920 and 1930 and distributed to private individuals and public institutions.

1950

In 1954 part of the settlements were demolished behind the fear of the Mau Mau movement, a dissident movement which fought against the colonial power of England, and most of the residents of Mathare was sent to jail.
After independence a huge immigration flux from the land to city made the villages explode into what nowadays is known as the Mathare slums and Valley. Although the government kept trying to evict them, with few results, and the settlements developed around the 10 villages between Mathare and Giathuru Rivers.

1970

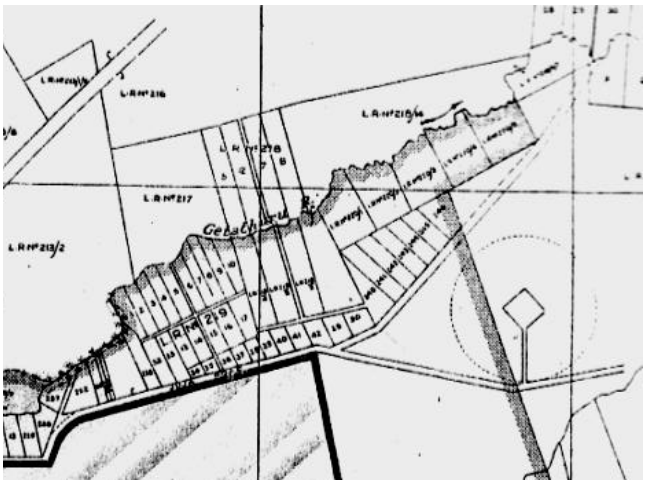
In 1969 lands in Mathare Valley were owned by 34% by the state, 8% by the Nairobi City Council and by 58% by individuals[1]. Following the abandonment of plots by the landlords, squatters occupied lots, and still lay claim on them, in a rural and informal way.
As land ownership was distributed between the state and housing companies during the 70s (see figure aside), the following distribution of housing plots was heavily influenced in the valley.
Of course, forced evictions have been part of the projects, even if the original goal of housing companies was the allocation of the squatters into the newly built environment. After some time, as sometimes happens, the original social and humanitarian objective transformed into a speculative tenement blocks projects, made of buildings of up to 8 storeys, making them illegal structures.
So far, the initial original rural villages and their open spaces are now acquired and developed by individual and housing companies, it is a mostly self-sufficient community.

2000

After the heavy post-independence influx, poor shelters in Mathare offered a cheaper option for people coming from rural areas. The extreme population density today tangible is because locals consider the slum a temporary settlement, As it is mislead and poorly ruled by the governance, its development becomes nearly impossible.

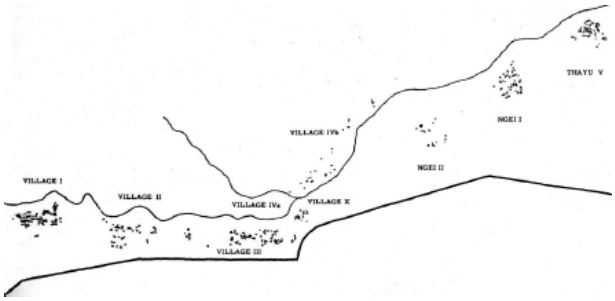
DEVELOPMENT OF THE SETTLEMENT

Once, villages in Mathare raised as separate settlements with rural environment and economy. When open spaces were acquired by housing companies, the rural areas that originally divided the village units were transformed in built lands aiming to host the squatter members. Squatters originally associated in cooperatives that, due to very restrictive rules for cooperatives, were then transformed in companies. The results, in a building point of view, is a mix of makeshift structures and a permanent multi-story tenement blocks.

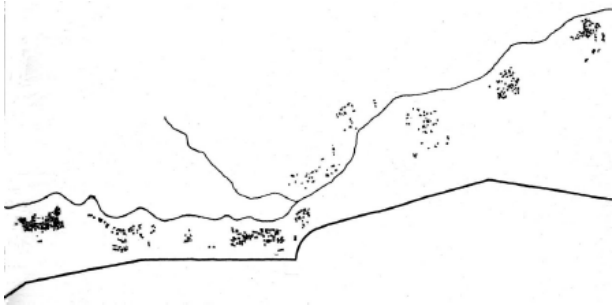


Distribution of plots in Mathare Valley and the surrounding areas
Etherton, D. (1971). Mathare Valley: A Case Study of Uncontrolled Settlement in Nairobi. Nairobi, Housing Research and Development Unit, University of Nairobi.

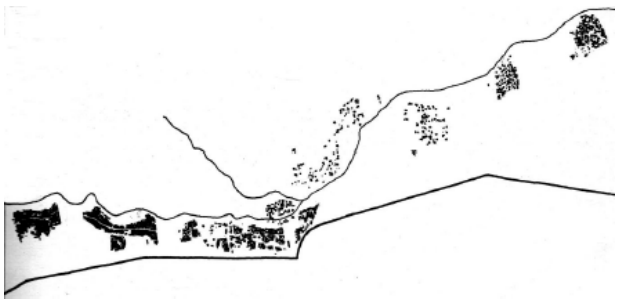
1. Mathare Valley settlements, 1964



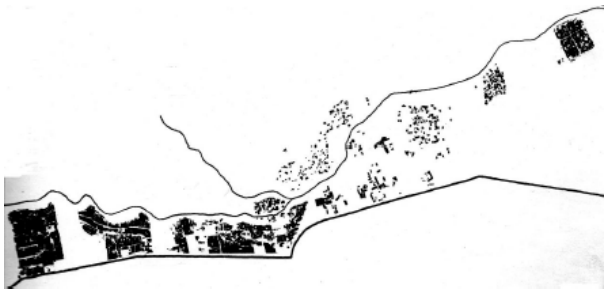
2. Mathare Valley settlements, 1966



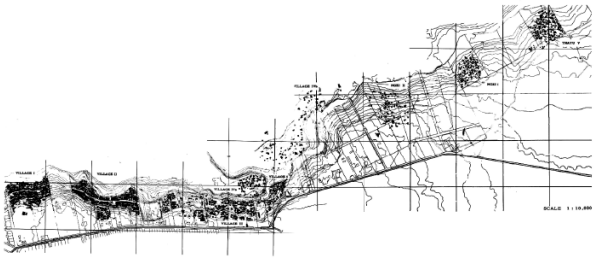
3. Mathare Valley settlements, 1969



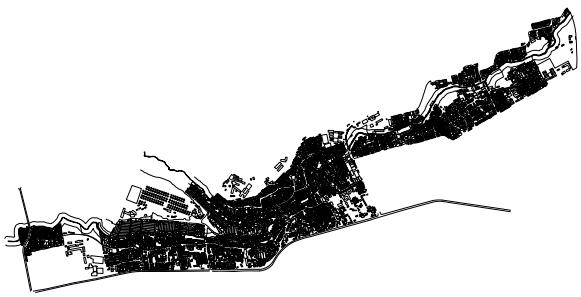
4. Mathare Valley settlements, 1971



5. Mathare Valley settlements, 2001



6. Mathare Valley settlements, 2020



Source im. frm 1 to 5: Etherton, D. (1971). Mathare Valley: A Case Study of Uncontrolled Settlement in Nairobi. Nairobi, Housing Research and Development Unit, University of Nairobi.
Source im. 6: Author

Administrative Units

Mathare Valley is under the jurisdiction of the Nairobi Province and its Commissioner. It also falls under two constituencies, Starehe and Kasarani. There are other two administrative Divisions, lead by a District officer, and three locations, lead by Chief (location) and sub-Chief (sub-Location).
The Valley is then divided in villages which boundaries are not visible to outsiders but remain very clear to residents[2] due to political, ethnic and economical reasons. The Village has then Village elders, who do not officially own any legal power but are still able to mobilize masses and communities around certain issues. They are the heritage of the colonial period, and the Council of elders is still a principal character in the political scene of the slum.

Geomorphology

Mathare's geography is shaped by both natural and man-made morphology. Man-built barriers frame the area such as the new connection between Juja rd. and the highway. The Meru-Nairobi highway sets a very strong boundary with Ruaraka and Roysambu constituencies and the Mathare one. The Kenya Power and Lighting Training School are among the biggest elements facing north the slum of Mathare which, together with the police station, are among the northern limits and the Moi Airbase, whose wall stands on the opposite side of Juja Road, limits the growth of the slum on the south.
The area is characterized by a hilling territory, with an average height of 1650m above sea level[3]; as the average of Nairobi is 1,7954, it is evident how, Mathare lays in low land, although the altitude gaps and disparities between the eastern and western areas: that is why floods frequently occur in these areas.
The river flowing in the valley names the entire area: Mathare River, and as all rivers flowing in Nairobi, it flows east-side.

RIVERS

As mentioned before, Mathare Valley is crossed by the rivers Mathare and Gitathuru. As most of the riparian areas of Nairobi, whose environmental role should be fundamental, Mathare Valley riparian zone have come under heavy intense pressure, resulting in habitat loss, waste and raw sewerage, in addition to untreated industrial effluent.
Moreover, many are the activities taking place along the Mathare riparian zone, carried by slum dwellers in their daily routines like commercial activities, waste disposal, recreational activities and urban agriculture. This lead to various forms of water pollution: the contamination proportions of the rivers, showed high concentrations of heavy metals and agro-based chemicals. Magnesium levels were around 0.44 and 10 mg/l, affecting the quality of soils over which urban agriculture takes place, ending up in food consumed by residents[5]. Other forms of pollution affecting the rivers are solid wastes (glass, metal ad plastic waste) and poor sanitation facilities, leading to infections and illnesses.

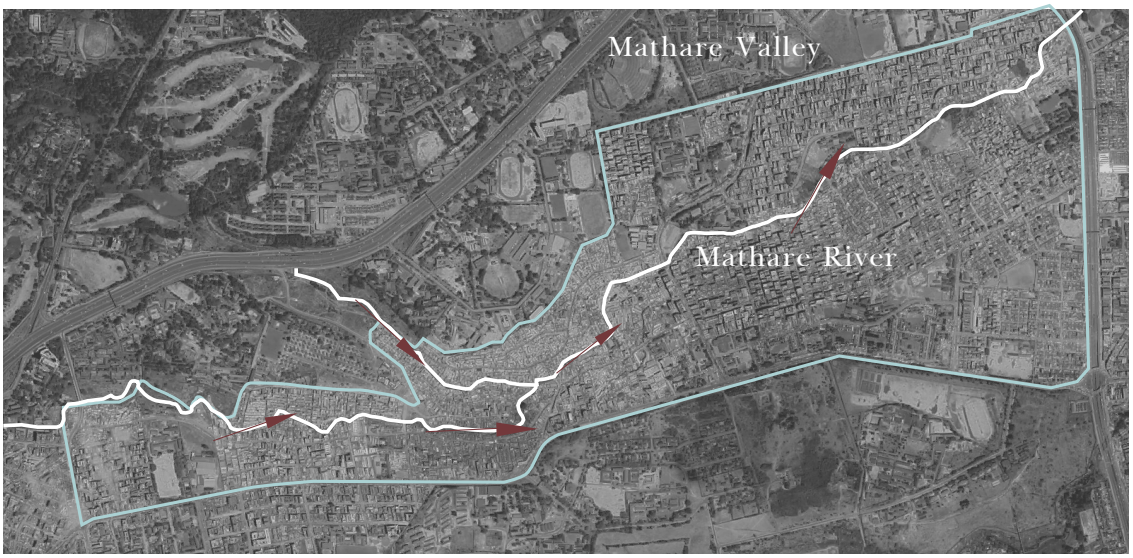
GEOLOGY AND SOILS

The river bed of Mathare River flows over a tuff kind of stone with flows of basaltic lava.
The process of drainage slowly frees brown clayely loam, a kind of sols that becomes very sticky when wet but also very dry when sunny, shrinking and cracking.

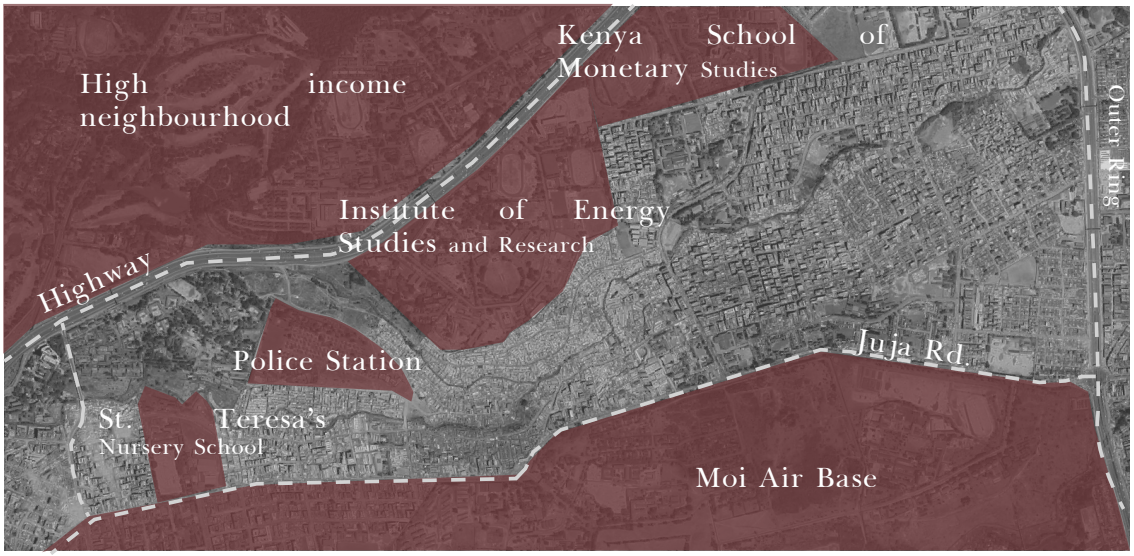
VEGETATION

Mathare soils used to be covered by natural and agro-forest trees like:
-Eucalyptus plantations -Croton -Cyprus -Grevillea -Bamboo -Lantana camara -Typha -Cyperus -Napier grass -others
Few natural wetlands persist along the Mathare River Basin

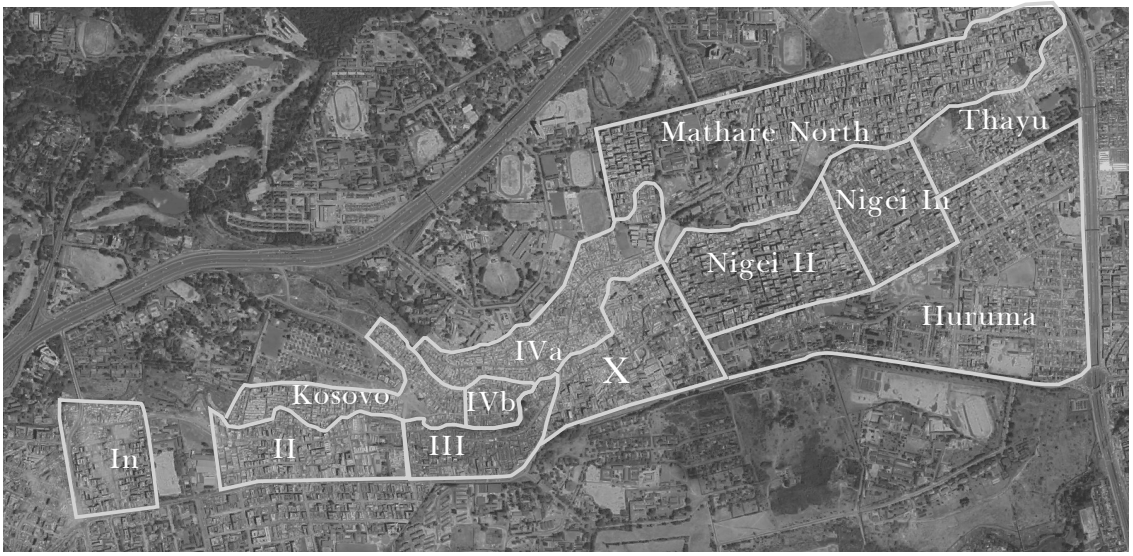
Mathare Valley



Man-made boundaries



Subdivisions of Mathare



©Google Maps, graphics by the author

0 500 m 1 km

ECONOMIC ACTIVITIES

Upper zones of Mathare are strongly cultivated and farmed for autonomous consume and commercial activities are vibrant within Mathare thanks to micro stores and entrepreneurial activities, symbol of a self-sufficient and contained community. Most families rely on occasional work .

Services

SCHOOLS

Mathare is provided by three primary schools and a number of primary schools run by individual and church organizations. These structures are to be considered informal as they are not registered with the Kenyan Ministry of Education.
Private schools are registered as non-conforming to the law within the ministry of education, as they do not provide a sufficient level of preparation, and they lack decent spaces and playgrounds for children. According to O Diang'a, 2011, one of the interviewed village elders indicated these structures as commercially oriented activities which don't care about children's performance.[6]
There are although some public schools in Huruma, but they are mostly overcrowded. Children of parents who cannot afford fees are forced to spend the day on the street, increasing the possibility for them to become victims of crime or taking part in illegal activities. According to the village elder of Mathare 4B, these children are up to 30%.
NGOs provide other facilities and balance the lack of space and personal official structure experience. Residents still consider some of these schools as purely commercially oriented entities. Government schools in Huruma have the necessary requirements but are overcrowded like all services in the area.

SOCIAL

Mathare is characterized by a multi-ethnic society. Tribes populating the slum are mostly Kikuyu, Luo and Kamba and, as further described in '*At the same time, youth groups of various natures collaborate with associations and NGOs to fight against forced evictions and to upgrading projects.*', *page 36,* the the tensions between them are evident, as every tribe feels that one ethnic group is more favoured than the other in slum upgrading processes and in politics.
Moreover, the insecurity of the tenants favours the arousal of vigilante groups made by young men[7]. Groups like the Taliban and the Mungiki originated with charging the residents with protection taxes, forcing them to pay 20 Ksh or otherwise beating them and destroying their homes.
At the same time, youth groups of various natures collaborate with associations and NGOs to fight against forced evictions and to upgrading projects.

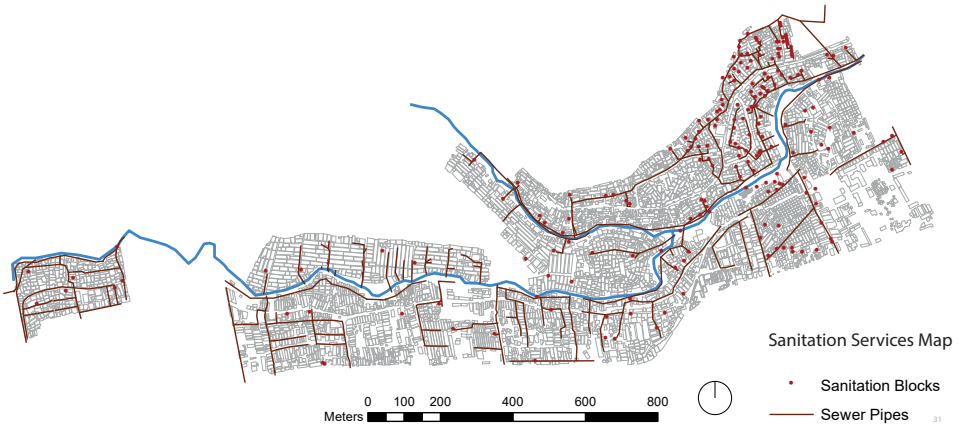
SANITATION

Sanitary foundations in Mathare are very bad.
Very few infrastructures exist and those actually working are even less; rarely they are connected to the sewerage system.
They vary deeply in distribution and typology and youth groups are in charge oftheir maitainance, requiring users 5 Ksh every use.

7 Diang'a O. (2011)

Public Services in Mathare

© Google Maps



© 2011 Collaborative Upgrading Plan

Order and control of the slum

Slums can be a site of potential disorder and instability; residents have many reasons to hold against political and economic elites. The Mathare Valley is a economic, political and social space defined by clear boundaries, which define an outside and an inside space. Important instruments of order are evictions and arsons, which have been and still are largely used. It is relatively easy to control a slum from the outside, but it is not that easy to control its inside for many reasons, starting from the labirinthyne pattern of its street system. Moreover, as already descried in '*Influence of Ethic groups*', *page 22*, the influence of the Kikuyu ethnic group in Mathare Valley is heavy and strong both among tenants and landlords[8] . This influences the political and ethnic discordances within the Valley dwellers and contribute to internal disorders. Other factors are the conditions the dwellers live in, the extreme density of people, the lack of services and others.

Long lasting poverty

We can look at the poverty in these environments as a result of the system of the Mathare Valley. We can consider it in two different ways: [9]

1. as a semi-closed system, where social and economic interactions taking place in these spaces are responsable for the reproduction of poverty and dilapidation and are likely to continue in the absence of major external intervention or

8 Chege, 1981 in Dafe, 2009

9 Andvig Jens C. and Barasa Tiberius, 2014, pp. 10-11

2. as an open system where people from poor rural areas or people coming from even poorer slums enter the valley, which acts as a urban basin from which some are able to come out and some others are forced to remain.

Poverty in these environment is also worsened by lack of residential structures, political and economical external conditions that contribute to the semi closure of the Valley. The absence of external work sources forces 60% of the population to turn their job research inside the slum. This, together with the already cited factors, contribute to the semi-closure and to the poverty trap the slum is.
To date, the slum keeps getting shaped by four principal factors:

1) the rise of absentee ownership of the shacks,
2) the size of the slum,
3) the origin of its high population density and poverty level, and
4) it's perceived origin as a center of political opposition as well as a site of irregular economic transactions and regular crime[10]

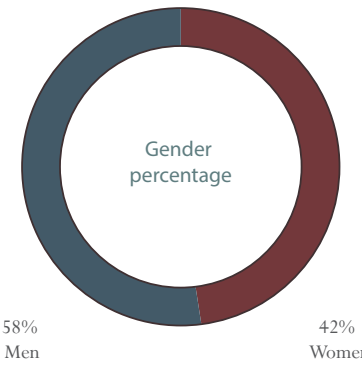
People of Mathare

Here below will be presented an abstract of the work done by Spatial Collective in 2014 'Mathare Demographics' [11]. The study was made after a survey has been taken in Nov 2013 on a sample of 980 people.
The absence of official data makes it necessary to count on unofficial surveys and data collections like this one, as it is difficult to gather reliable surveys due to the problems these areas present, described in '*Slums of Nairobi*', *page 13*.

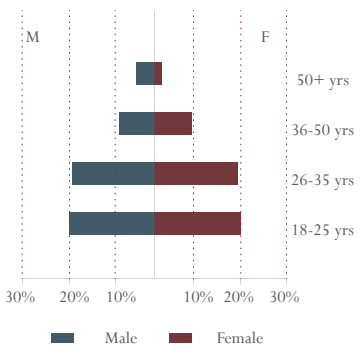
POPULATION

Mathare valley provides shelter to an estimated number of 800 000 people[12].
The survey outlines a balance between gender percentage, which corresponds to the national ratio[13].
The result of the age survey corresponds to the patterns of Kenya and Nairobi, with nearly half of people below 25 y.o. This results also brings attention to the african Youth Bulge, a phenomenon caused by the knock down of infant mortality, combined with a high fertility of the population, a phenomenon happening in most developing countries.

1. Gender percentage of survey[14]



2. Age rates[15]

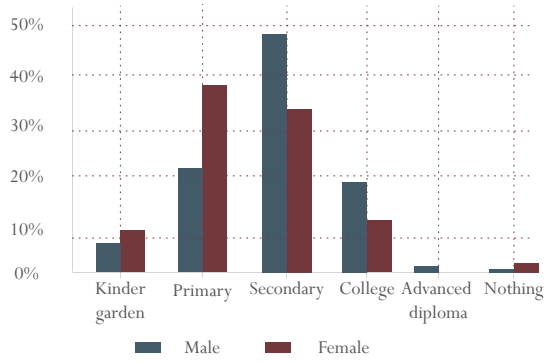


10 Andvig Jens C. and Barasa Tiberius, 2014, p. 14
11 Mathare Demographics
12 ArchGIS
13 Kenya's Population Hits 47.6 Million, The Kenyan Wall Street, November 4, 2019, Jackson Okoth:
'Nairobi City leads as County with the highest population of 4,397,073 made up of 2,192,452 males and 2,204,376 females, and 245 intersex'
14 Mathare Demographics
15 Mathare Demographics

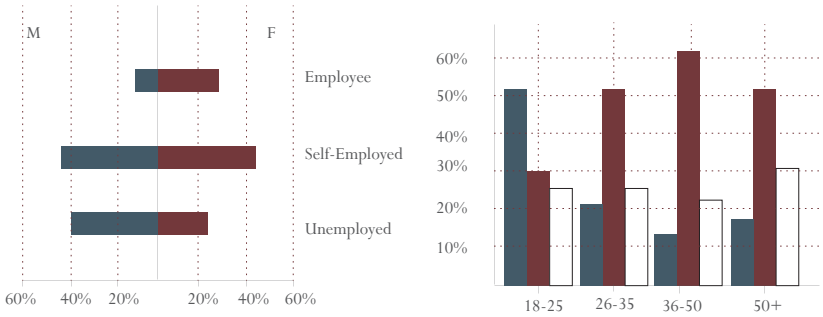
EDUCATION AND EMPLOYMENT

Education is one of the first resources in order to develop an underdeveloped area. Primary school enrolment grew significantly after the introduction of free primary education in Kenya in 2003, but of course, due to high poverty, few people do keep on with studies due to their costs. In environments like slums, many children do not benefit even of primary education.
Unemployment is in general in Africa very high, particularly towards young people and especially to women. The report shows that, although up to two-thirds[16] of the work force of Nairobi comes from informal settlements. Unemployment seems to decrease with age, due to self employment in informal sector[17]

3. Education



4. Employment



TRANSITION RATE

Informal settlements are considered by newly arrived as a temporary shelter while in search for a better location. Given the transient nature of the area,the care levels given by the community to the environment doesn't help its development.

16 Spatial Collective, 2014 , Mathare Demographic
17 Spatial Collective, 2014 , Mathare Demographic

HOUSEHOLD ECONOMY

Household Monthly Income & Select Expenses by Village

Village	Estimated or reported monthly income, Ksh	Mean HH monthlly school fees	Mean Monthly health care expenses, Ksh	Mean monthly transport expense, Ksh	Mean monthly food expense, Ksh	Mean monthly electricity expense, Ksh	Mean montly security expenses, Ksh	Mean monthly water expenses, Ksh	Mean monthly toilet expenses, Ksh	Estimated mean household expenses (exclusing rent), Ksh
3A	7,500	1,618	758	1,507	6,642	333	1,338	425	483	13,104
3B	5,000	1,913	1,208	2,175	6,430	562	3,300	424	100	16,112
3C	10,000	2,057	371	877	7,286	448	2,033	362	130	13,564
4A	10,000	1,255	452	1,105	6,218	361	1,759	494	151	11,795
4B	9,282	968	561	1,793	5,775	385	2,650	461	72	12,665
Gitathuru	5,000	1,298	1,083	1,900	8,146	460	1,514	313	48	14,762
Kiamutisya	5,000	1,313	1,504	2,813	5,500	476	67	527	50	12,250
Kosovo	15,000	2,111	722	1,261	5,434	308	1,352	421	324	11,933
Kwa Kariuki	10,000	1,193	691	1,955	8,302	363	600	387	342	13,833
Mashimoni	5,372	2,270	673	1,288	6,158	333	1,950	469	306	13,447
Mabatini	6,767	1,860	1,486	3,000	9,600	580	100	588	150	17,364
No.10	12,500	1,621	370	775	10,555	358	154	306	67	14,206
Village 2	10,000	1,797	978	1,482	5,650	432	1,233	475	173	12,220
Mathare Valley	8,500	1,636	835	1,687	7,054	415	1,450	435	184	13,635

Soource: University of Nairobi , University of California, Berkeley , 2011 Mathare Valley | Nairobi, Kenya Collaborative Upgrading Plan

Key Findings:
ˆ Average monthly household income in Mathare is less than KSH 8,500
ˆ Average household monthly expenditures are over KSH 9,100
ˆ 87% of residents are casual laborers or have informal businesses
ˆ 61% work within Mathare
ˆ 66% of residents moved to Mathare for economic reasons, noting both affordable rent and employment opportunities (only 7% were displaced from another area)

The poor constitute 51.5% of Kenya's urban population, which is one of the highest concentrations of urban poverty within East Africa. Casual labour and informal work accounts for the vast majority of the employment within Mathare, and only 10% of Mathare residents are engaged in the formal labour market [18]

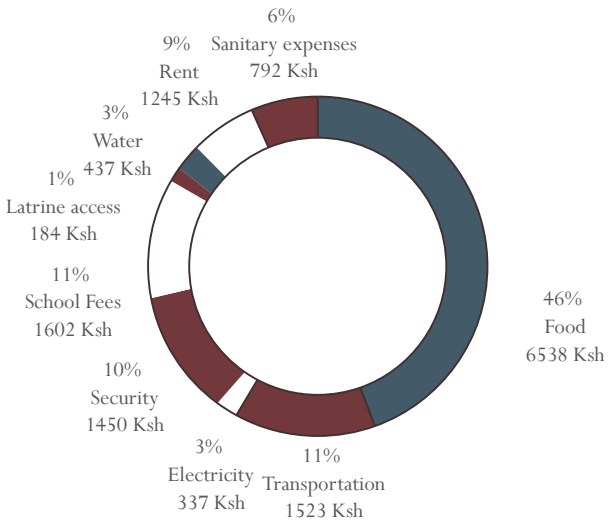
Most families in Mathare are forced to rely on casual labour as, even within informal settlements, the only income source. The salary they're able to earn is at time lower than the expenses needed to meet basic expenditures.
The unreliability of casual labour, family income fluctuates with direct impact on health and food security. Other needs are forced to be ignored.

Income distribution varies widely between villages, with some residents earning less than Ksh 2,500 per month, and others earning upwards of Ksh15,000 St. Theresa Girls Kiamutisya per month. In the valley as a whole, 30% of the residents earn
Ksh 5,000 or less per month, with low wages having the highest prevalence in Kiamutisya[19]

Monthly Household Expenditure

18 University of Nairobi , University of California, Berkeley , 2011 Mathare Valley | Nairobi, Kenya Collaborative Upgrading Plan

19 University of Nairobi , University of California, Berkeley , 2011 Mathare Valley | Nairobi, Kenya Collaborative Upgrading Plan



Soource: University of Nairobi , University of California, Berkeley , 2011 Mathare Valley | Nairobi, Kenya Collaborative Upgrading Plan

A land of activism

The Slum of mathare is populated by a high rate of young and willing population, as the high number of associations suggest. Here is were the association Muungano wa Wanavijiji (see chapter '*Muungano wa Wanavijiji*', *page 89*) was born in a periods of oppression towards poor and slum dwellers. It is just one of the stories behind the birth of many collectives and activities in the area.
Moreover, the saturation of the working market has lead slum dwellers towards unconventional economic activities in order to be able to earn something.
Of course the youth rate and the absence of working slots has forced many people towards illegality.
Slums are fertile grounds for criminal aggregation such as the one described in the previous chapter.

Mathare is known in Kenya and around the world as one of the most fervent areas of the city of Nairobi. Here is where the Mau Mau movement was born and where most of the acts of violence have been carried during the independence movements.
In 2009 the Mathare slum was the stage to the post electoral movements and disorders as it gives easily shelter and hiding spots to fugitives, who were often inhabitants of the slum.

A SHACK ARCHITECTURE CATALOGUE

Most of Mathare Valley is dominated by shack architecture, and this has a number of consequences. Although its ease to demolishment, shack architecture has created a non-symmetric path system which are not accessible by automobiles and create a sort of labirinthyne pattern.
The analysis of the urban types in Mathare gives us precious informations about how the stratification, clustering and new edification works in the suburb.
It gives us, in this case, an important knowledge of how these populations are used to expand their spaces and possessions in an environment with no services.

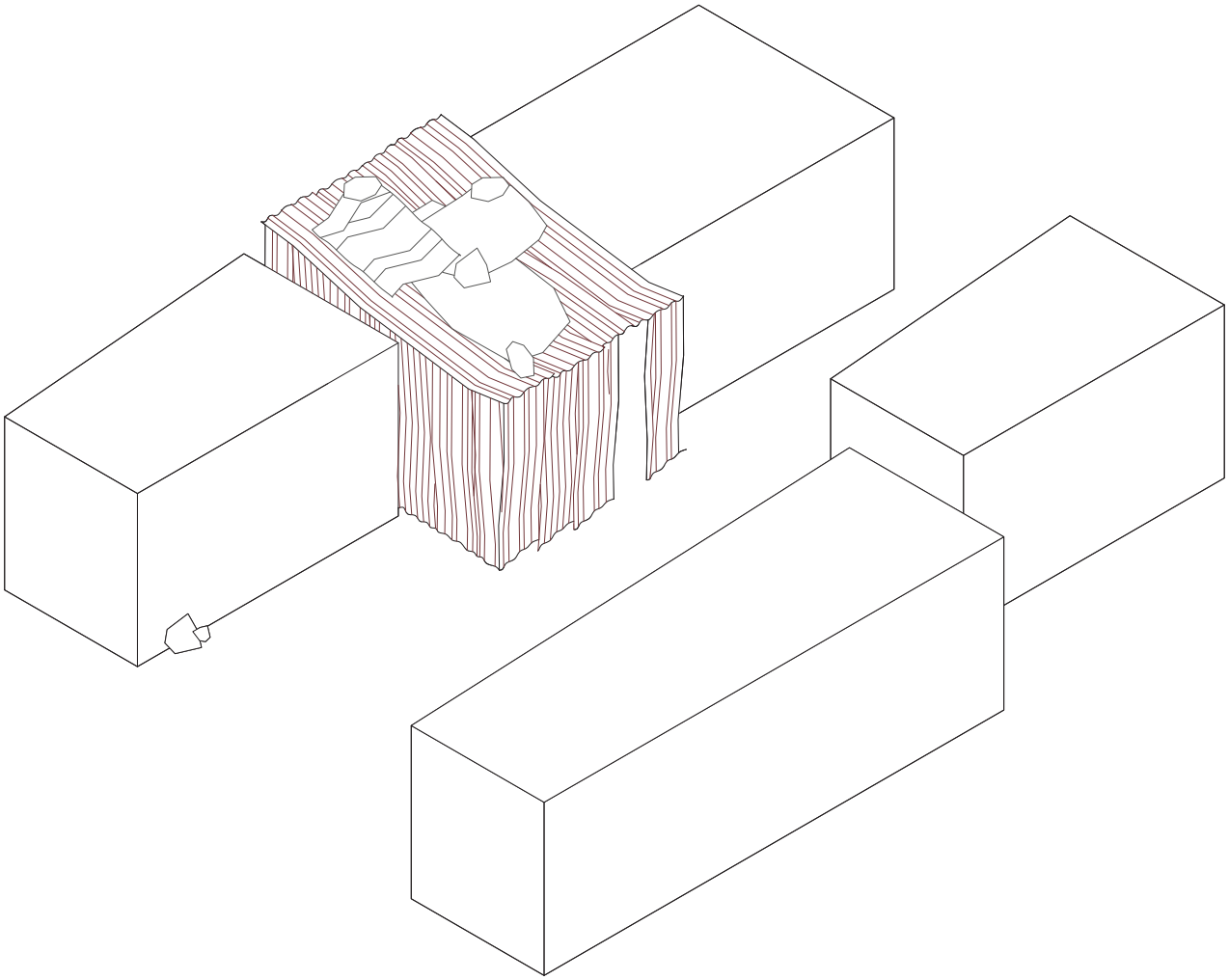
It has been found particularly interesting how the merging of functions works sometimes even on different levels and how the so called 'parasitism' enables dwellers to merge different activities into one single building. Also, the absence of services and regulations forces these populations to work with different resources, giving birth to sad phenomena like water tanks.

Informal settlements

Most of Mathare Valley is dominated by shack architecture. Mutual monitoring between dwellers eases control of behaviours. The Valley is covered by an irregular pattern of narrow and non symmetric paths inaccessible by cars and preventing part of the area development. The high mutual control levels and the complex patterns of social relations lead to a constant spill-over between the activities perpetuated in the area.

SHELTER

It is the fundamental element and it can be used in clusters or as single ambient. Its shape can vary from a minimum of one room to a multiple room house. It serves both as house and warehouse for shops and activities.
Most of the informal settlements are formed by an agglomeration of these shelters. Materials are usually limited to metal pre-formed slabs or wood, which is though way more expensive.
The conglomeration of the shelter element may vary from a minimum of 4 to an infinite number of houses. The labirinthyne urban patter created may follow the lead of lots permissions, given by the county to to-date mostly unknown owners, or be limited by other major elements like natural ones (rivers, steep slopes etc) or man-made ones (streets, other properties), see '*Urban patterns and factors of influence*', *page 47*. These compositions reach a level of high population density, creating a semi-closed neighbourhood that characterize informal settlements of Mathare Valley [1] and a infinite number of relations ad a high mutual visibility between the neighbours.



Abstract from iang'a, Stephen O. (2011), **Regularizing Informal Settlements for Sustainable Housing for the Poor: The Case of Nairobi, Kenya,** *pp. 251*

Shelter

Shelter cluster

Insideof a house

The principal activity performed in the typical shelter is the sleeping one, taking place from 4 to 10 hours per day[2]. The most important role of this elements is to provide secure shelter during the night. The space reserved to the bed shapes the rest of the area, but there are some solutions to let the bed-space to be used as space for other activities during the day.

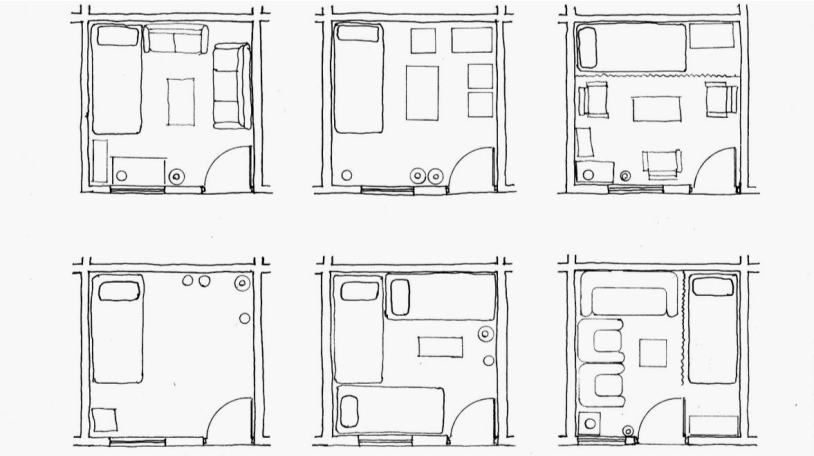
> *On the average, each household comprises of four members. This gives a unit area of 2.25 square meters per person. According to the Kenyan Building Code (2001), the minimum floor area recommended for a habitable room is 3.72 square meters per person.*
> *64 per cent of the dwellings have one single bed in the dwelling. 22 per cent have two single beds and only 4 per cent have three beds.* [3]

Sleeping arrangements in some cases can end up in children or teenager sleeping on the floor, or sometimes they can be hosted by childless families; this solution by the way, may be dangerous due to the risk of sexual abuse over these children.
The house-sharing may also be a practice in which residents take turns to sleep.

Lounging activity has also a very important role in the arrangement of the hut, taking place mostly in the evening and weekend in open spaces, ostly right outside of homes.

Cooking takes usually few space compared to other activities and the setting of the utensils is normally flexible and minimal, most of it is done using the floor as a working place or any kind of top surface. Utensils are then clustered on the floor. Meals are generally consumed sitting around a table or on the floor.

Shelter floorplans



URBAN PATTERNS AND FACTORS OF INFLUENCE

Pattern 1: unregulated

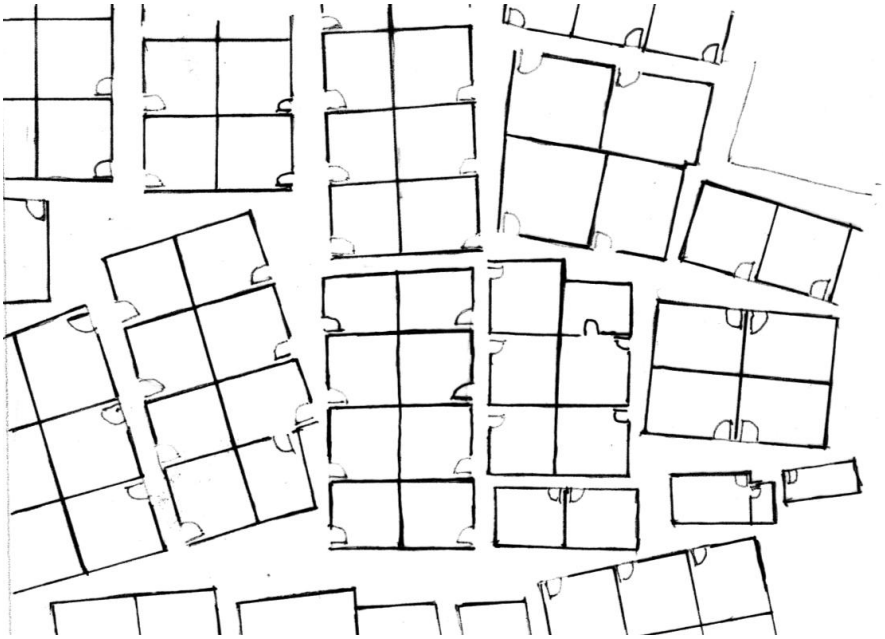
Pattern 2: given lots

Pattern 3: natural elements

Pattern 3: street and artificial elements

©Google Earth

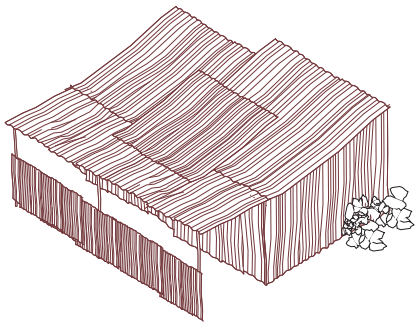
Shelter cluster



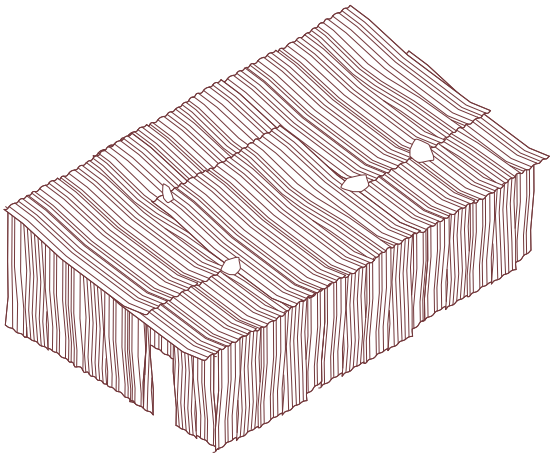
SHELTER COMPOSITION

It is the composition of the fundamental shelter, as a form of multi familiar house. It is composed by a central corridor, giving access to the single-spaces fulfilling all the functions of a family. These residential areas occupy[4] about 85% of the territory and majour part of them is formed by terrace housing, built end-to-end by the combination of rooms for rent. Materials used in the constructions vary from iron sheets, mud, structures and few masonry structures. The average size of an apartment is approximaely 9 m^2, for an average family of 3.5 people.[5]

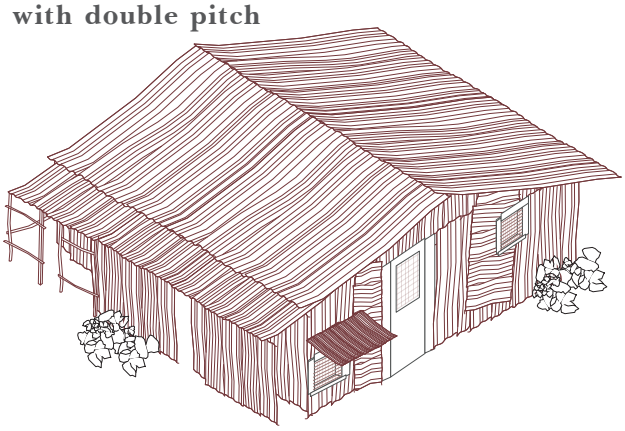
Type with commercial front



Multi familiar shelter



Multi familiar shelter with double pitch

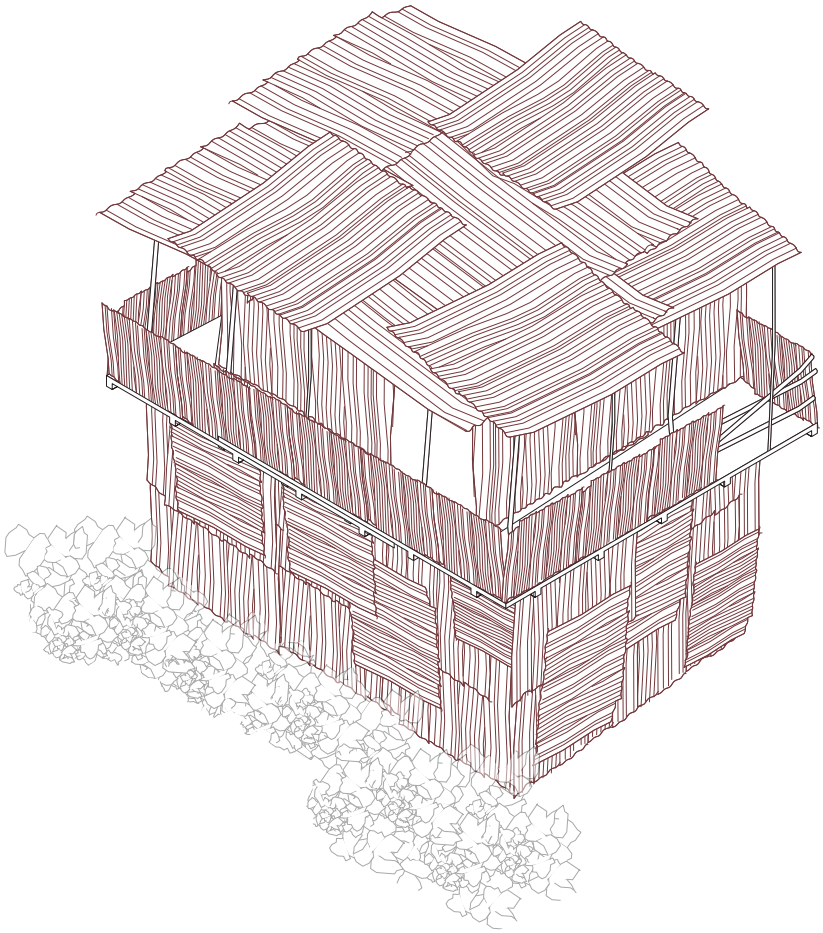


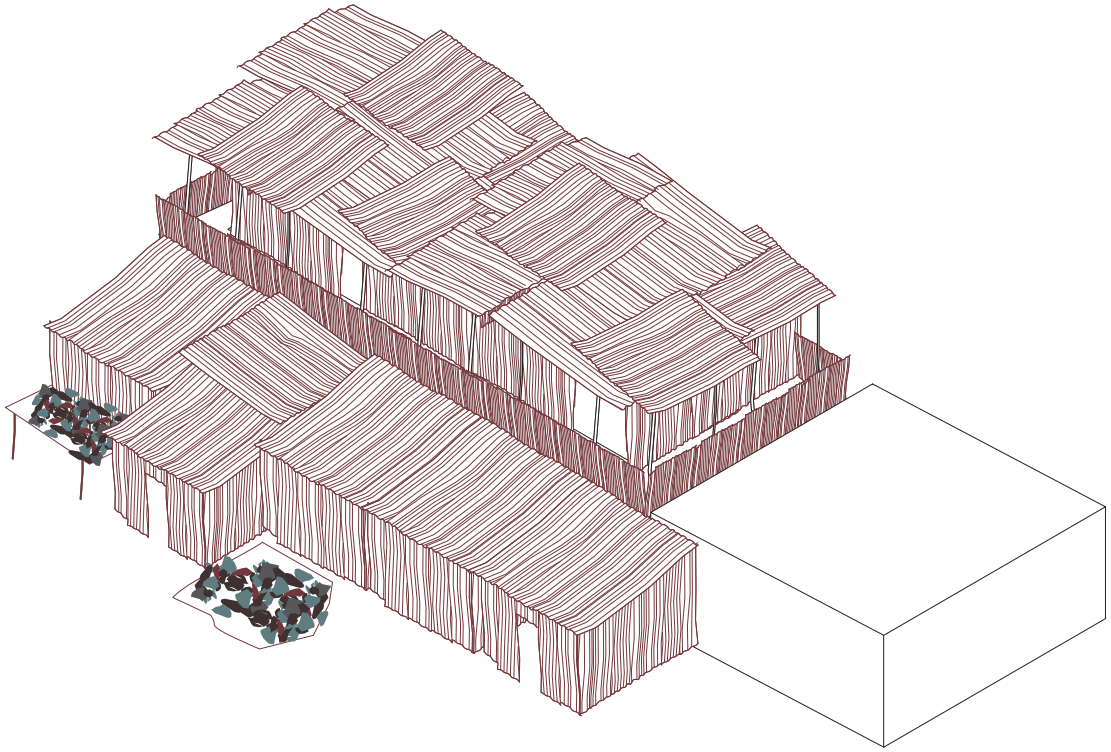
4 Kinyua, 2018, *p. 5*

5 Primus, 2014, Mathare Demographic, Mapping: (No) Big Deal

MULTI STOREY

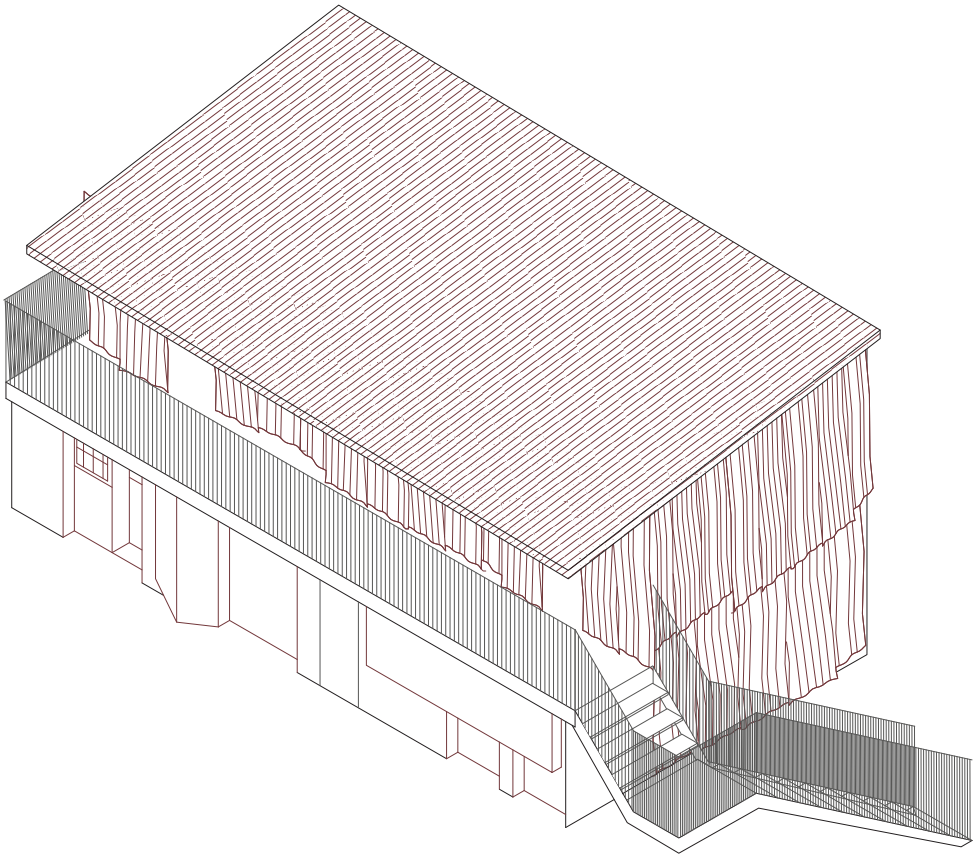
It is the most elaborated version of the shelter and it works as a residence or commercial area depending on the plot they're built in.

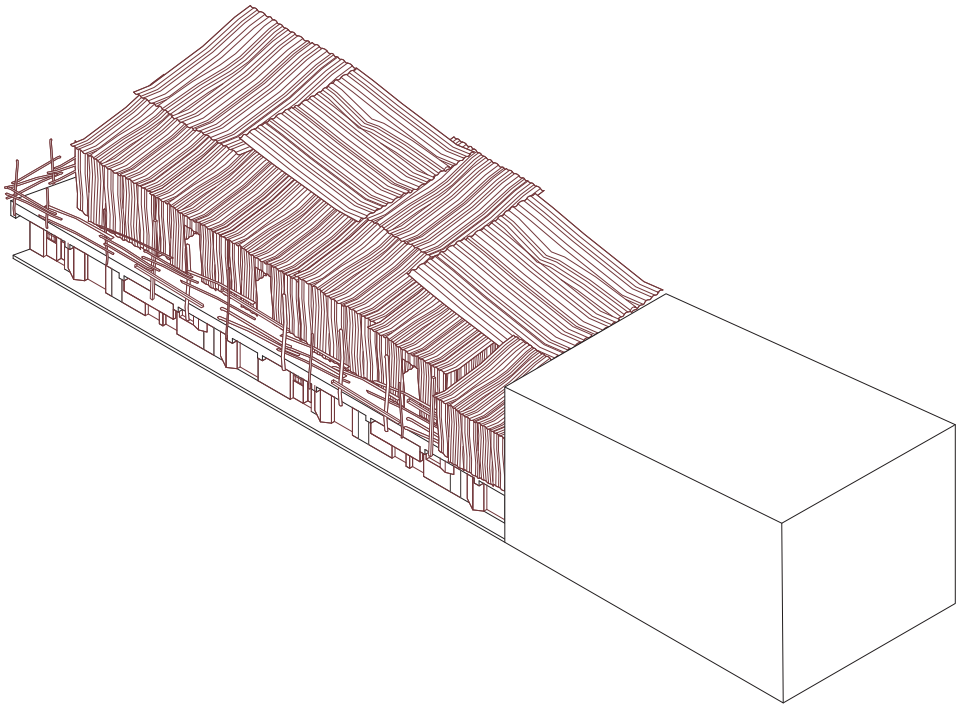


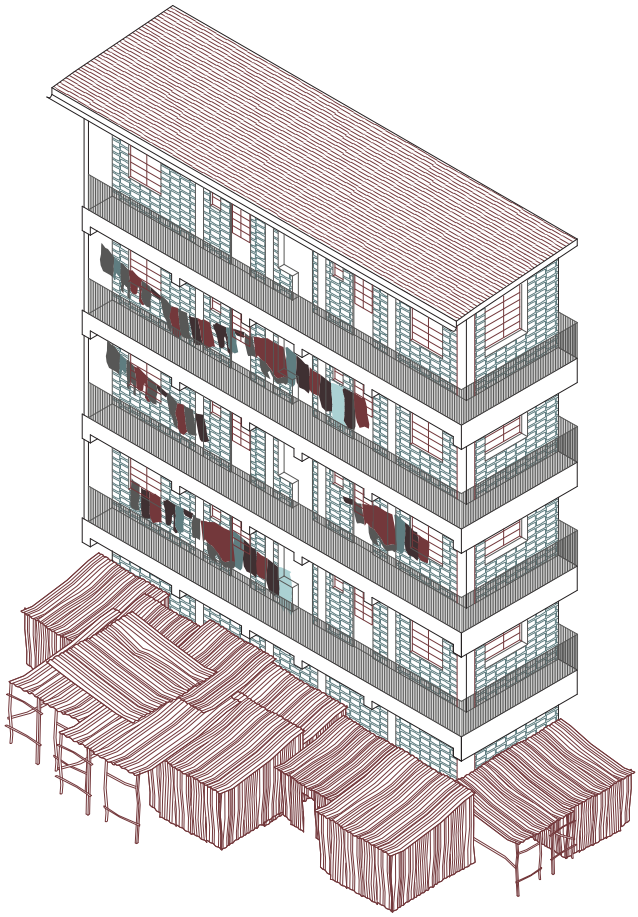


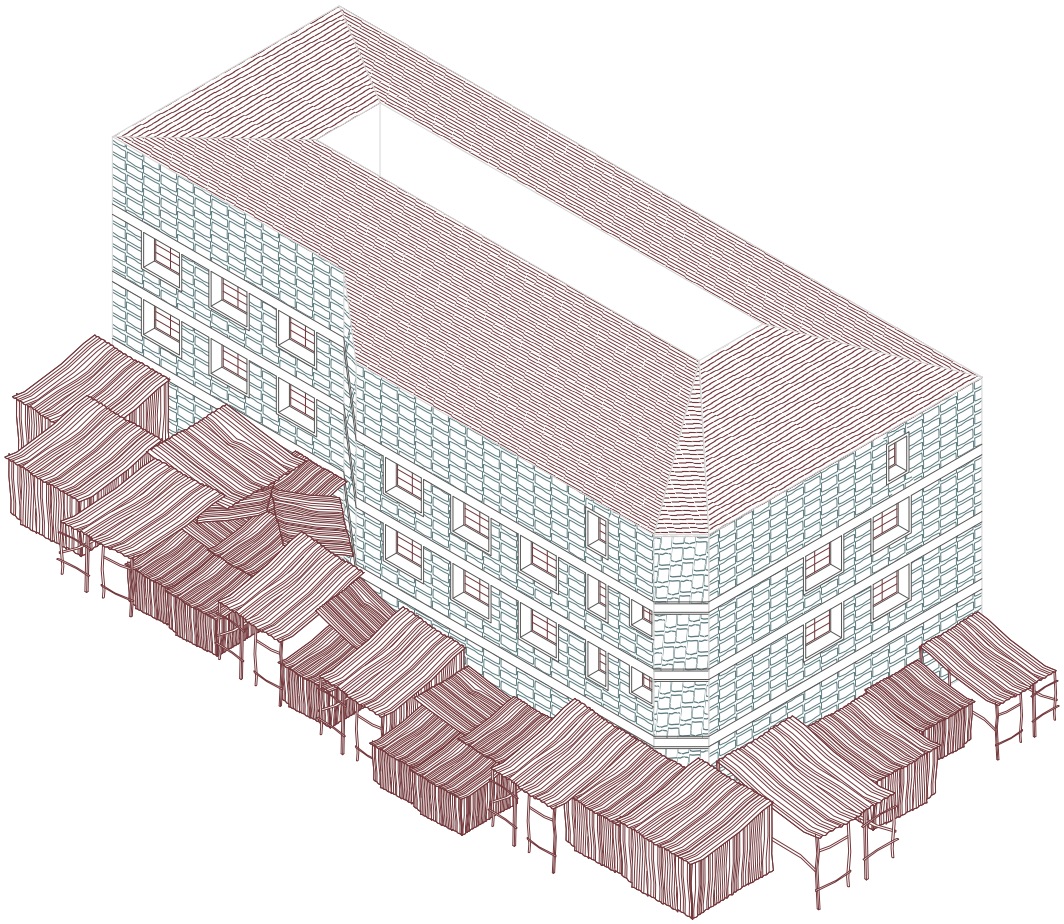
PARASITISM

Both the forms of residence and shop are used here respectively on the ground level and the first floor. The informal elements are built over the formal building, using it as a base to grip on.





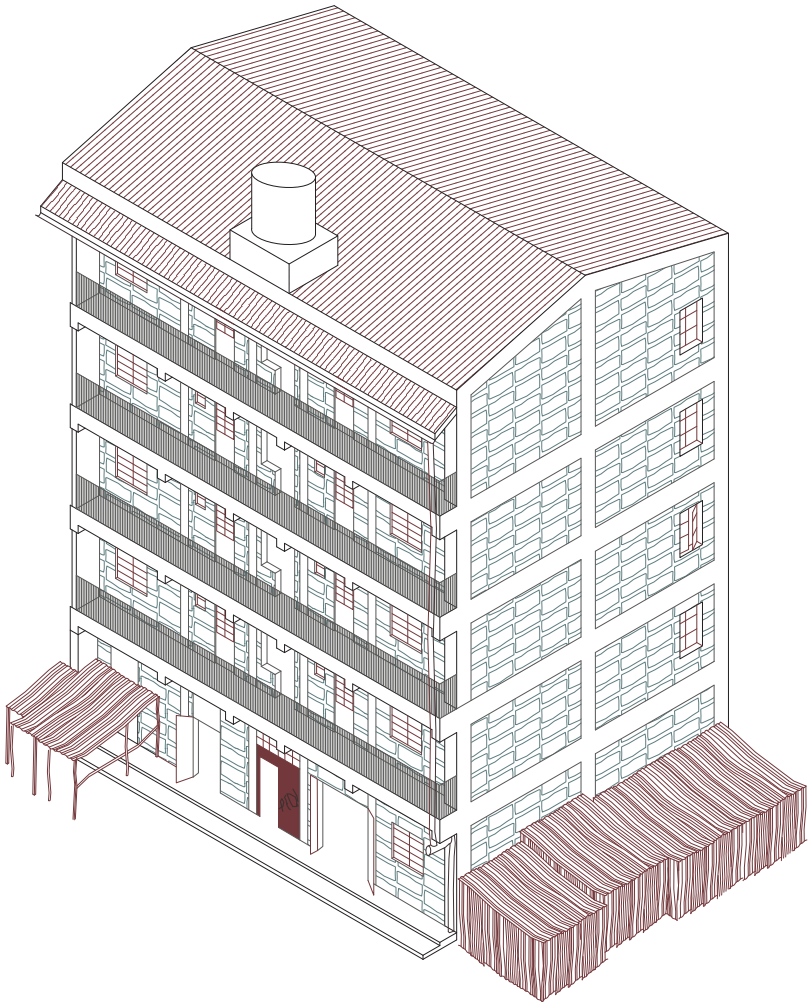


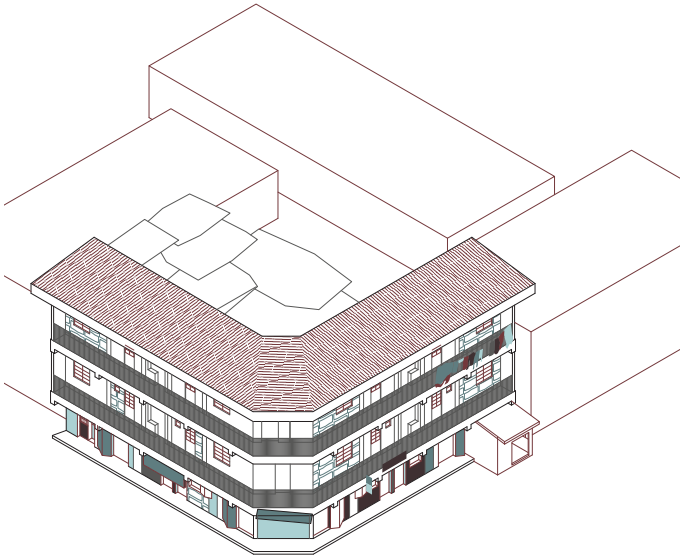


Formal settlements

FORMAL URBANITY

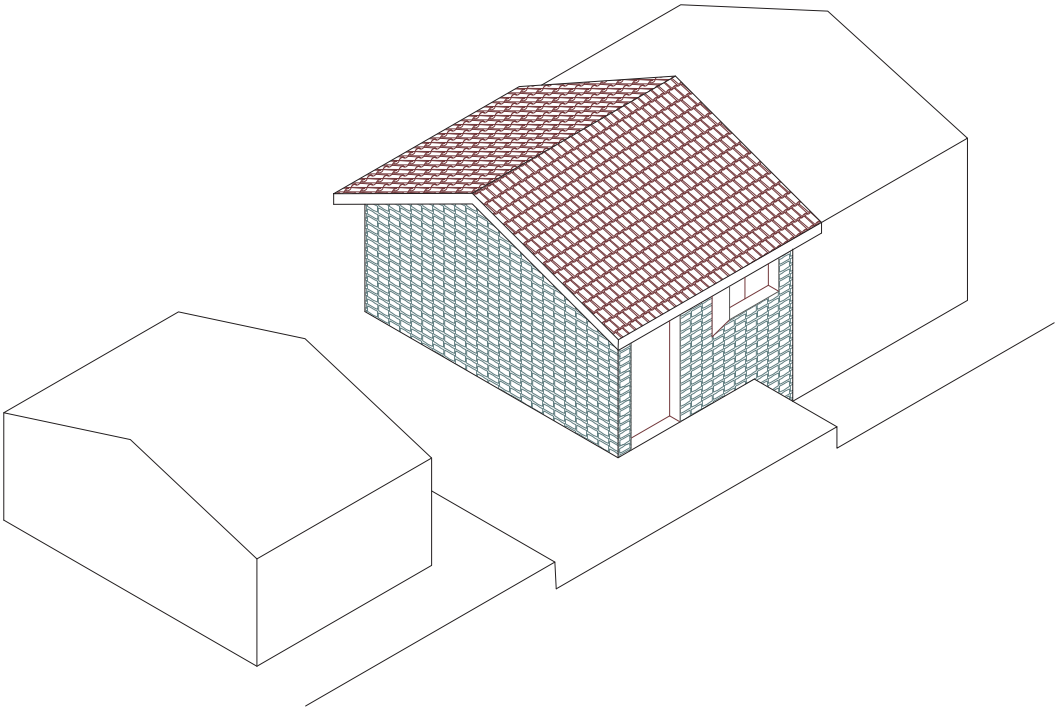
It is part of the ‘70 s speculative building plans. These buildings were raised up to 8 storeys, making them illegal due to country laws, although the standard of living in these buildings is not anyway as low as in informal settlements. Forms of parasitism are visible around their basement, generally used as commercial spaces.





HOUSE ONE

It is part of one of the first slum upgrading projects built in the early 2000 lead by Amani. They are located in the village IVA.



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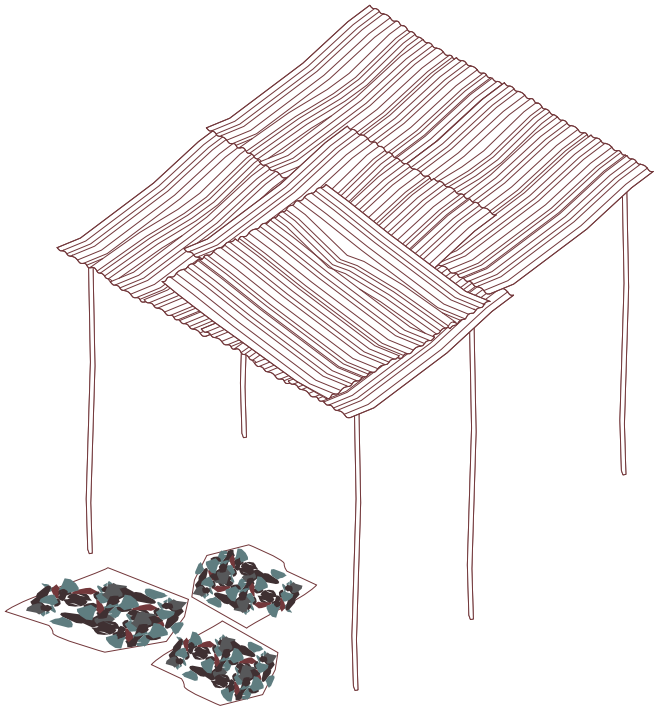
Commercial and activities

COMMERCIAL STRUCTURE

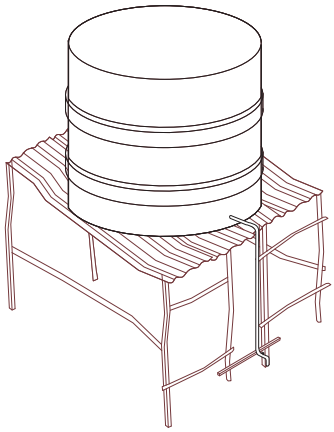
Very simple shelter; it can be made of metal panels and bamboo. Dimensions and height vary with necessities from a minimum of 2 to a maximum of 4 meters.



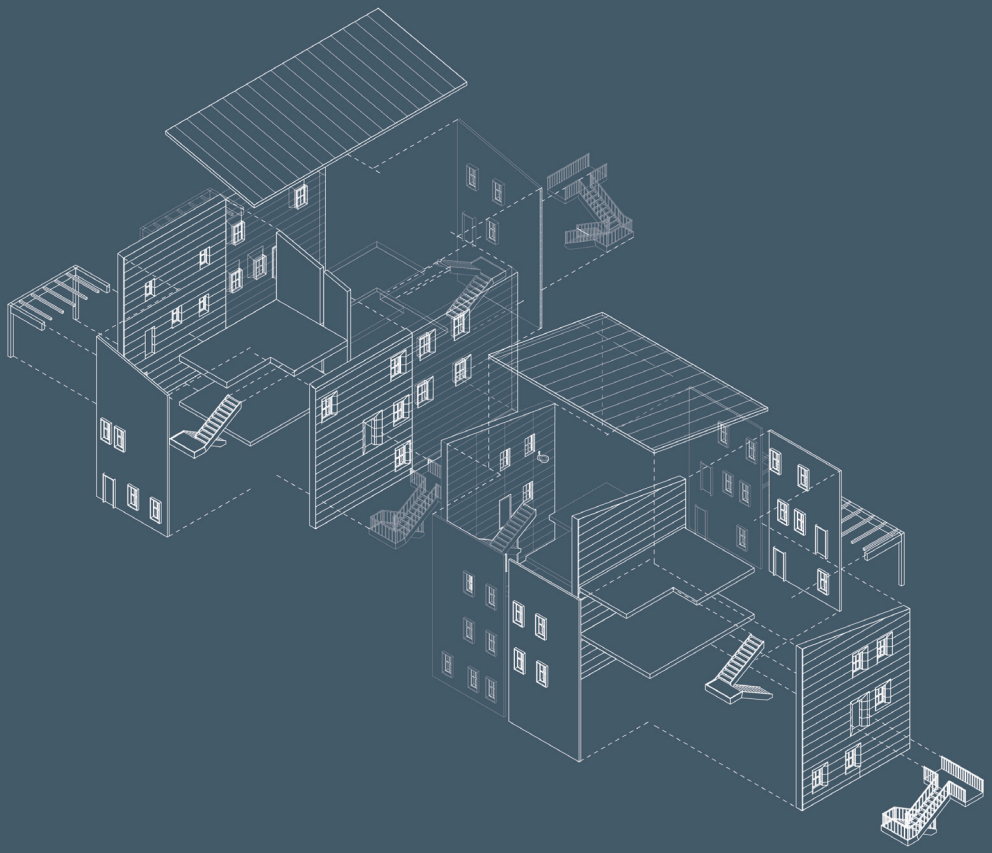
©Google Earth

WATER TANK

It is one of the most important structures in the slum, as it provides water where the pipeline doesn't reach the population. Water is sold here at a high price compared to areas were water lines arrive



Part three



Project

MATHARE 4B, KOSOVO AND GITATHURU

Mathare IVB is located on the junction between the rivers Mathare and Gitathuru. The land the village lays on belongs to the Government and it consists of around 5 hectares. The number of households here hosted is very high, and they belong to some of the lowest income earning groups, mostly composed but Luo tribe's members for more than 50% of the population.[1]
It is an area that is mostly not accessible by vehicle and the rivers surrounding it limit even more it's accessibility.
The structures of this neighbourhood are very closely built, mostly formed by single roomed dwellings.

1 Djang'a, 2011, p.257

Mathare

0 1 km

Villages 4B, Kosovo and Gitathuru

Source: Gogle Earth

0 200 m

Sezione A-A',

Sezione B-B',

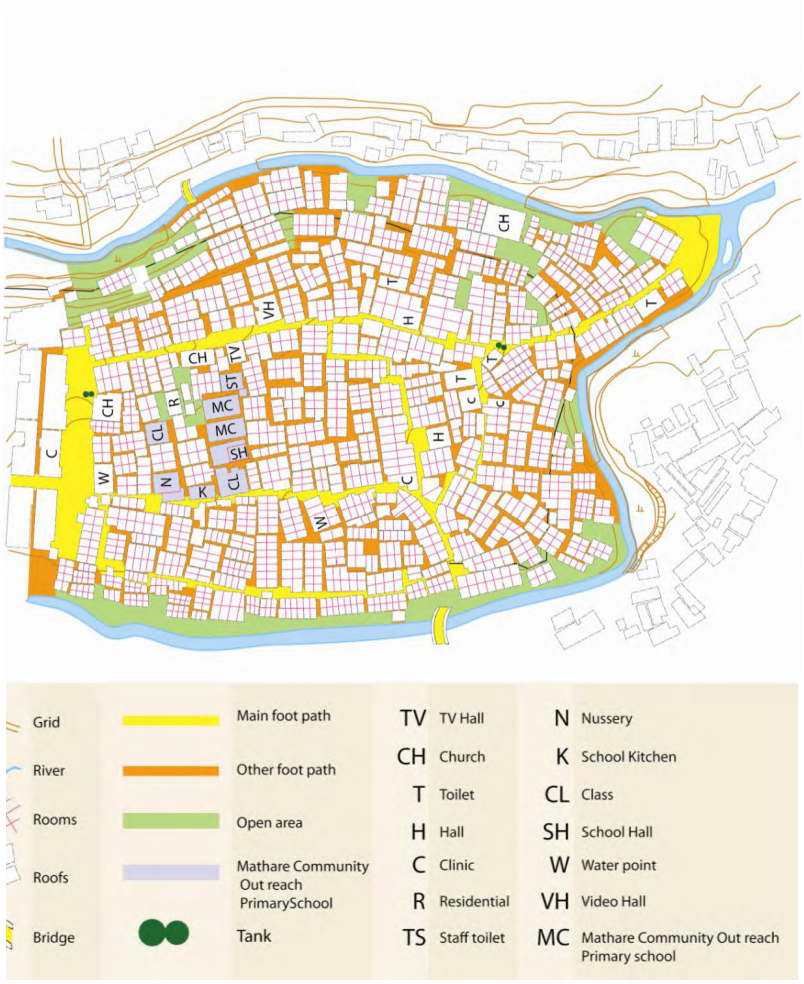
0 100 m

Dwellings

Village VIB is one of the villages of Mathare that has been through minimal intervention. Stephen Diang'a (2011) makes a deep analysis of Mathare 4B in his work.

Abstract from: Diang'a, Stephen O. (2011), Regularizing Informal Settlements for Sustainable Housing for the Poor: The Case of Nairobi, Kenya, *pp. 203-262*

The area of Mathare 4B gets easily isolated during the rainy season when the rivers overflow. The bridges that were introduced in the 80s made the pedestrian accessibility easier but the motor vehicle access is still not totally possible and it has been only in recent years the areas of Kosovo and Gitathuru have been developed and upgraded, which let the access to the western area.
Dwellings are made of metal sheet walls and roofs. They differ from the original huts, made of wattle and earth probably due to lack of land from which to obtain the primary materials, even though few wattle huts still stand.
The rust layer of metal sheets is caused by frequent fires occurring in the land and the recycling of materials of which the galvanizing layer has been consumed.

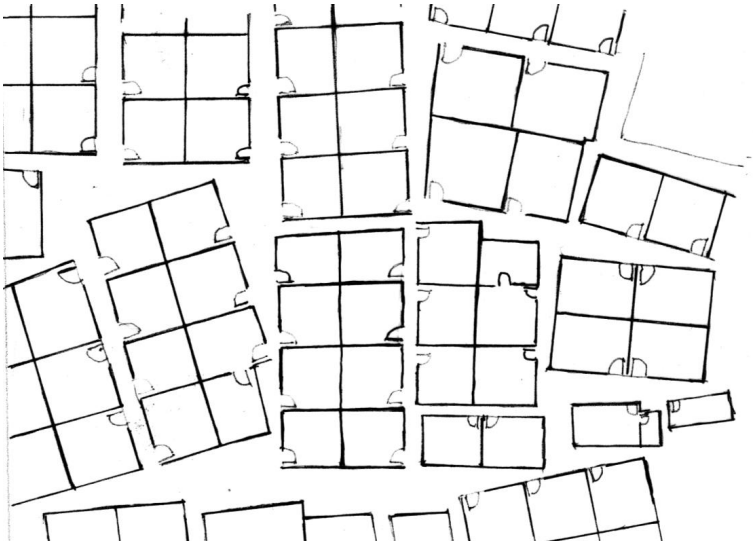


©Diang's, 2001, Map of village IVB showing configuration of household units

CLUSTERING

The way these settlements have developed their pattern is to be datable back to its formation, as the area used to be used as a quarry and it was first built over when activities stopped in the 60s. First inhabitants have been former workers of the quarry and job seekers. They have been demolished by colonial durong the late 50s in the effort to contain the disorders and resumed in 19646 after independence. It remains to-date a government land, as it has never been purchased by any private company, and the allocation of buildings artifact became responsibility of the local Chief or the district officers. This, led to an illegal distributions of land behind bribes and fees.
Belonging the land to the government, structure owners couldn't build permanent buildings due to lack of security; they so kept building rows of housings.
Only incidental spaces were left over by the ultra-densification happened in the years, forming nods and irregular footpaths and used a form of relaxation or playing spaces, or as an activity strategic point for vendors, or as a rubbish dump by residents.
Narrow footpaths are used in the same way open spaces are used, but the amount of activities taking place in these spaces is far too much and end up interfering with the wellbeing of residents and with the privacy levels. Some residents who don't care about privacy levels, use spaces between houses for commercial purposes.

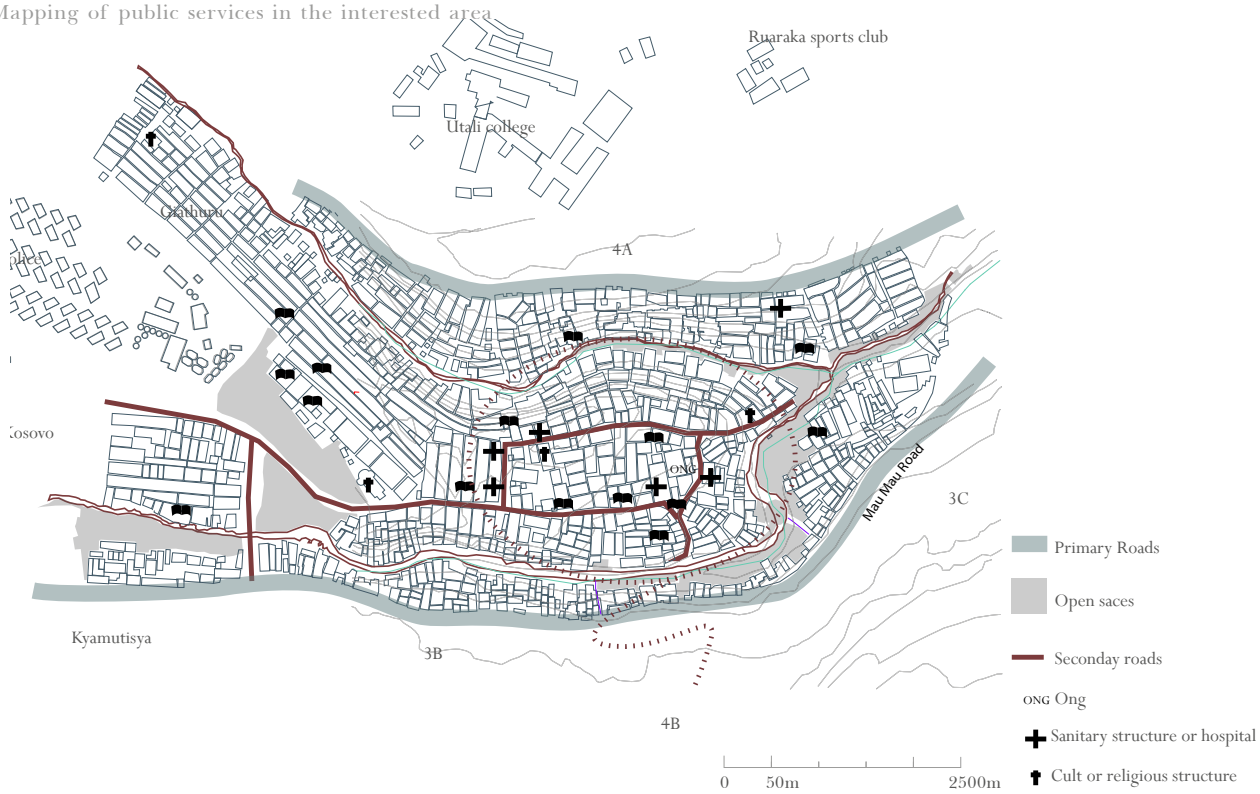
Shelter Clustering in Mathare 4B



INFRASTRUCTURES AND SHELTERS

Mostly, open drains run between houoseholds making walking difficult or barely possible. They serve various purposes in the every day life routine of residents, from sanitary actions (like clothes washing and drying or personal hygiene in general) and run through the same narrow paths described, where people rest and play. Garbage and residues run along these so-to-say canals, flowing in the rivers that surround the Village, increasing their pollution, which is already high, and their level of residues, which inhibits wter flowin and becomes riky during rainy seasons (see chapter '*Flooding*', *page 19*).
As there are no garbage collection services working in the slum, the river and open areas remain the main garbage storage locations.
Emergency vehicle's access is impossible within the narrow and difficult passages, so when fires occur the time and work ability required to emergency services are prevented by the environment.

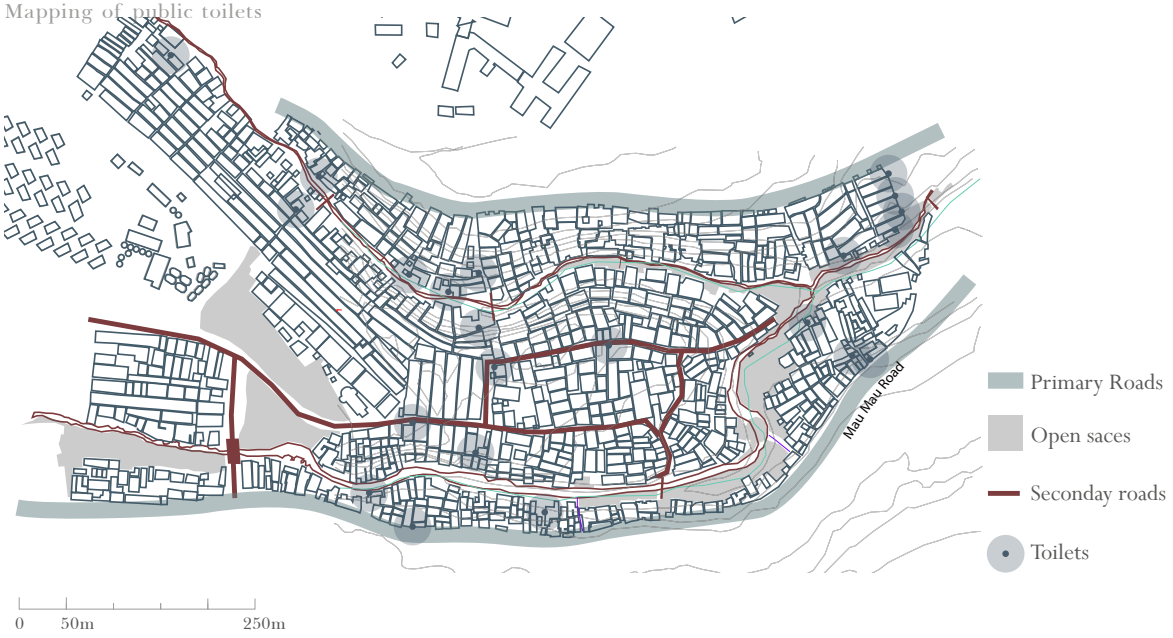
Mapping of public services in the interested area



©Author, from: 2011 Collaborative Upgrading Plan

The sanitation situation isn't less critical, as latrines lack in the area is evident so residents are forced to use pit latrines along the riverbanks. Long distances to cover to get to a bathroom, vandalism, lack of maitainance and misuse are among what concerns residents, along with the usage fees applied to the toilet users by some youth groups.
Children do not often use toilet pans and the attendants are forced to wash floors often but the scarcity of water doesn't always let this process take place and the flush of toilets is not commonly remembered by users.

Mapping of public toilets



©Author, from: 2011 Collaborative Upgrading Plan

Electricity is available in some areas and some high lamp posts have been provided by the City Council and improve security in some points of the slum. These structures are deeply important

©Diang'a S. 2011, Multiple use of space as open drainage, footpath and clothes drying area

© Diang'a S. O., 2011
The interior of toilet block showing misuse despite management by youth

for the security during night hours of the surrounding areas.

Network of Power poles, Wires and Lighting Masts

SOCIAL SETTING

Mathare 4B has a social representative system lead by a chairman, elected by representatives of 10 communities. They work under the guide of the Sub-chief but are not part of the official gevernment administration and aim at the general welfare of the community; on of their obligation is the limitation of forced evictions, helped by the NGOs operating in the area.

SLUM UPGRADING

Impact of upgrade

Since most slums residents are also tenants, the effects of an upgrade in a slum environment are unpredictable: in the case of a public service's upgrade, many would be the activities who'd suffer an economic loss, due to their reliance on the slum's conditions. Some examples would be water vendors, and entrepreneurial garbage collection activities, economical small activities like detail vendors.
As Huchzermeyer[1] says, it is impossible to predict how an intervention will impact the slum, given the highly complex relations between residents and due to the fact that targeting these implementations to slum dwellers unleashes a high competition. This eventually translates in a displacement of the original beneficiaries through bribes or other illegal activities and creating customers for tenants and water sellers in farer locations, expanding the slum's area eventually. So indeed slum intervention are responsible of taking in consideration realistic means an prevent these situations from happening or provide slum dwellers with a better condition that won't force them to move to another slum.

THE RIGHT TO HOUSING

Following the Committee on Economic, Social and Cultural Rights standards[2], the right to housing is identified into seven aspect, (for full text see paragraph '*Endnotes*', *page 130*):

1. *Legal security of tenure*
2. *Availability of services, materials, facilities and infrastructure*
3. *Affordability*
4. *Habitability*
5. *Accessibility*
6. *Location*
7. *Cultural adequacy*

Although the development of *Habitability* and *Accessibility* of housing and *Availability of services, materials, facilities and infrastructure* may seem to act as a development agent, *Tenure security* and *Affordability* may not be guaranteed anymore and force slums residents to relocate in locations with less services provided, de facto undermining the first two too.

REDUCED MINIMUM HOUSING STANDARDS

Here is were *Cultural adequacy* plays an important role in the planning of such services: particularly in Nairobi, official standards of habitability are determined by comparison with western-based ones.
An affordable housing alternative can not therefore be provided following the minimum standard of ambients imposed by the Nairobi County, as market pressure is too high to permit a family to inhabit two rooms.

1 Huchzermeyer M., 2008, p. 23
2 CESCR, 1991

Slum Upgrading in Nairobi

The project realized in the Kibera-Soweto Village, in the south-eastern side of the Kibera Slum, has been launched in 2004 with a graphic presentation for a project mostly planned of 50 m^2 two-bedroom apartments, which dramatically resembles two other project built in Nairobi, which are the Kibera High Rise project, 1990, and the Pumwani-Majego slum redevelopment, both by the National Housing Corporation.
The first one faces the slum's problems with a middle-class planning standard, compared to Kenya's population, and all the units ended up being traded to richer dwellers instead of poor people they were destined to.

The Pumwani Majengo slum redevelopment located slum dwellers into two-bedroomed apartment with an unsubsidized mortgage of 11 000 Ksh. In order to pay back the debt, residents rented their apartments and bedrooms[3].
The fear for slum redevelopments is felt by the dwellers of the slum, who are afraid that such projects will eventually lead to raise of rents in the interested area, forcing them to leave in search for a cheaper option.

Slum Upgrading in Kibera

©Jacob Otieno, 2016

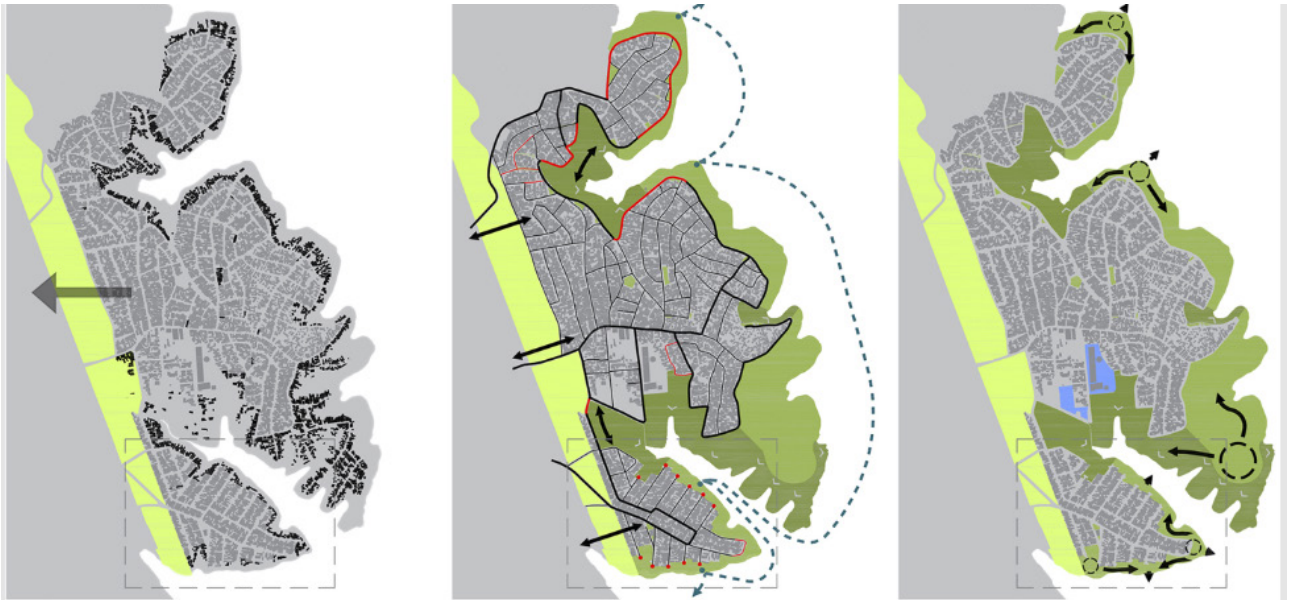
3 Huchzermeyer M., 2008, p. 36

Good Practices

COMPLEX OF CATINHO DO CÉU

Sao Paulo, 2008-11
Boldarini Arquitetura e Urbanismo

To make an action in an informal settlement means recognize and respect its pre existence. The revitalization of one of the banks of one of Sao Paulo's favelas, the so called '*Represa Billings*' has been possible by the layout and design of public spaces along the banks of an artificial lake. Before this intervention, houses and huts gave their back to the water reservoir, but thanks to the new park and public areas a waterfront has been created, giving the inhabitants a new community pole and sense of belonging to their homeland.
The landscape is designed in total respect the specific characteristics of environment and landscape through urban episodes like panoramic terraces and walkways with entertaining facilities.
The project forecasts a series of demolitions, which made possible the realization of a linear park and where anyway necessary due to geological risk; this intervention was actuated within a width of 15m and 100m and made also possible the improvement of existing structures like sewage , water and drainage systems, and the street one.



©Bondarini Arquitetura e Urbanismo

©Fabio Knoll

Masterplan

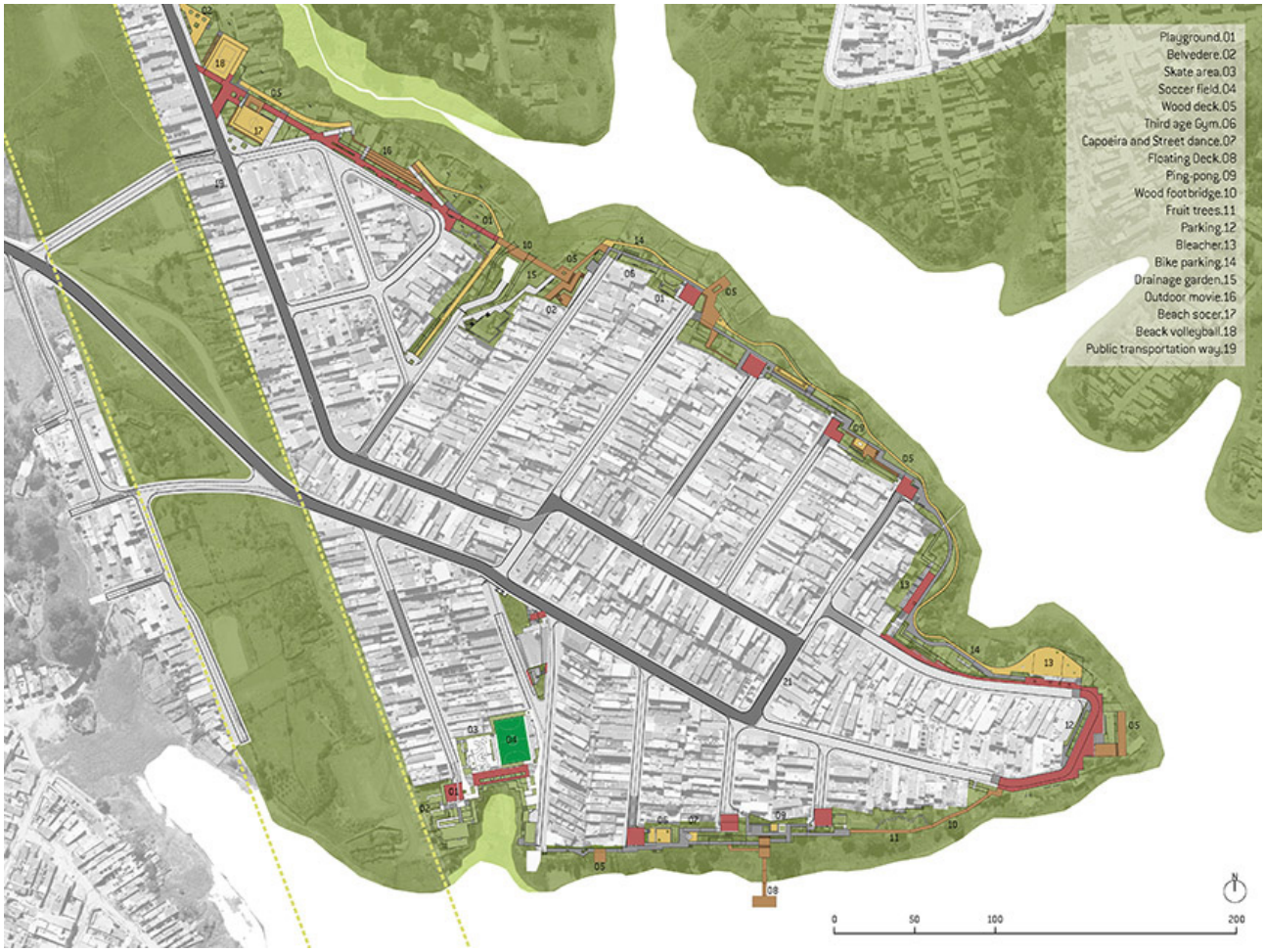
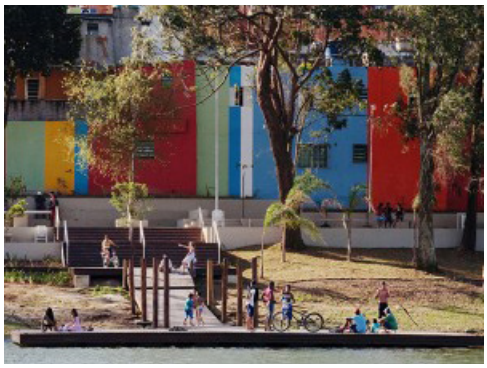


Image credits: Bondarini Arquitetura e Urbanismo



© Daniel Ducci

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SHANGHAI HOUTAN PARK

Shanghai's Huangpu riverfront, 2010
Tourescape

Houtan park is a regenerative landscape on a linear 14 hectare land running along the Huangpu River waterfront. It was previously owned by a steel factory and shipyard, and many parts of the area were used as dumpsite by the industril activities. The project's aim was he creation of spaces for the Expo 2010, a green belt along the ocean capable to host a large number of visitors, which would then have been transformed in a public permanent waterfront.
The intervention was able to convert highly polluted brownfields and waters. The waters of the Huangpu River had a scale of pollution of V (ranking of Lower Grade) and it was consideed unsafe even to swim into.
Moreover, the flood control elements present on the project site were not designed to welcome visitors and public and created a muddy shoreline.
Thanks to regenerative design strategies like food production, flood, water treatment and habitat creation the project have achieved its aims.
Cascades and terraces have been used to oxygenate the water and a selection of species of wetland plants absorb different pollutants from the water. Field testing indicates that 2,400 cubic meters per day of water can be treated from Lower Grade V to Grade III[4] . The wetland also works as a flood management system thanks to a terraced design and at the same time protects the land from erosion. The creation of a urban farm and agricultural park provides a great educational opportunit for the population.

Masterplan

Source: Archdaily

4 Archdaily, Shanghai Houtan Park /

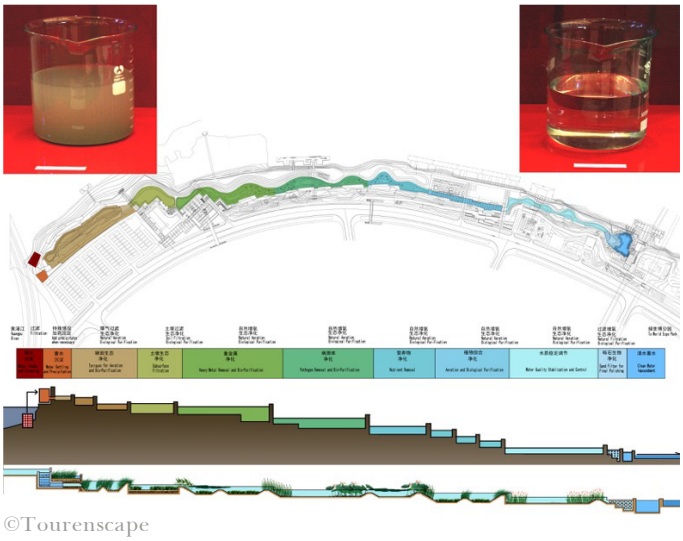
Site before intervention

©Tourenscape

.Site before intervention

©Tourenscape

The water cleaning mechanism of the man-made wetland.



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QUINTA MONROY

Iquique, Chile, 2003
ELEMENTAL, Aljandro Aravena

Quinta Monroy was one of the irregular settlements located in the centre of Iquique, a free port in northern Chile. The project aimed to resettle 100 families in the same lands they had been occupying illegally for 30 yrs.
Every family has been given a total area of 30 m^2, made of basic modules designed to host future forms of construction built by inhabitants of another 30 m^2. It has been reached a form of density which allowed the expensive lands to b bought. In doing so, families hadn't had to be relocated and could still make usage of the advantages of living in the city center.
The provovision of space for forms of '*extensive families*' is a key issue. The provision of collective spaces created an intermediate level of socialization.

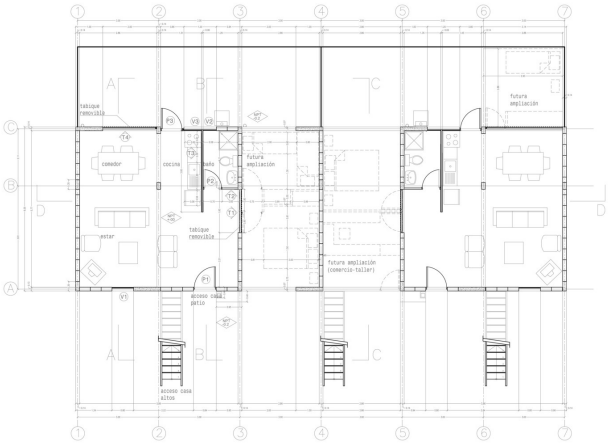
Masterplan

©Elemental

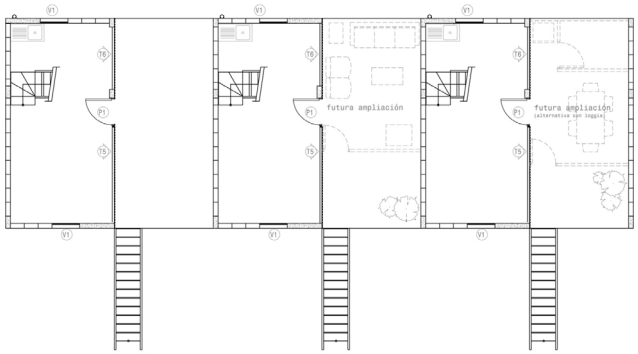
© ©Cristobal Palma, Estudio Palma

©Eleemntal

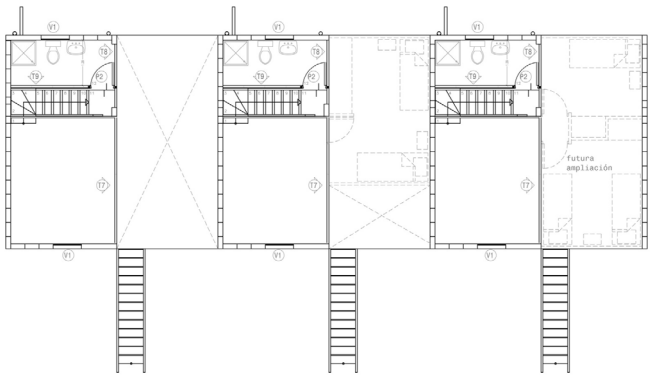
Floorplan: simplex



Floorplan: Duplex lower level



Floorplan: Duplex higher level



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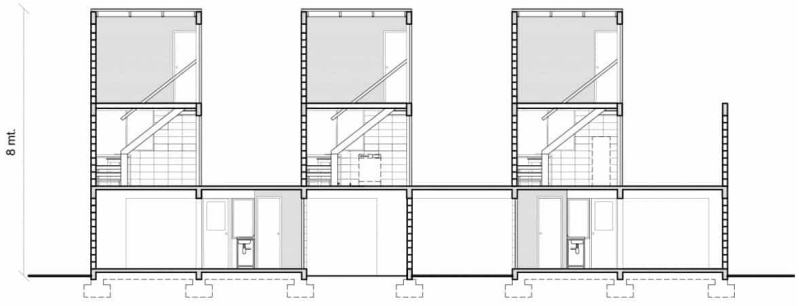


Image source: Archdaily

RHIZOME

Addis Ababa, Ethiopia, 2017
Paolo Turconi, Arianna Fornasiero

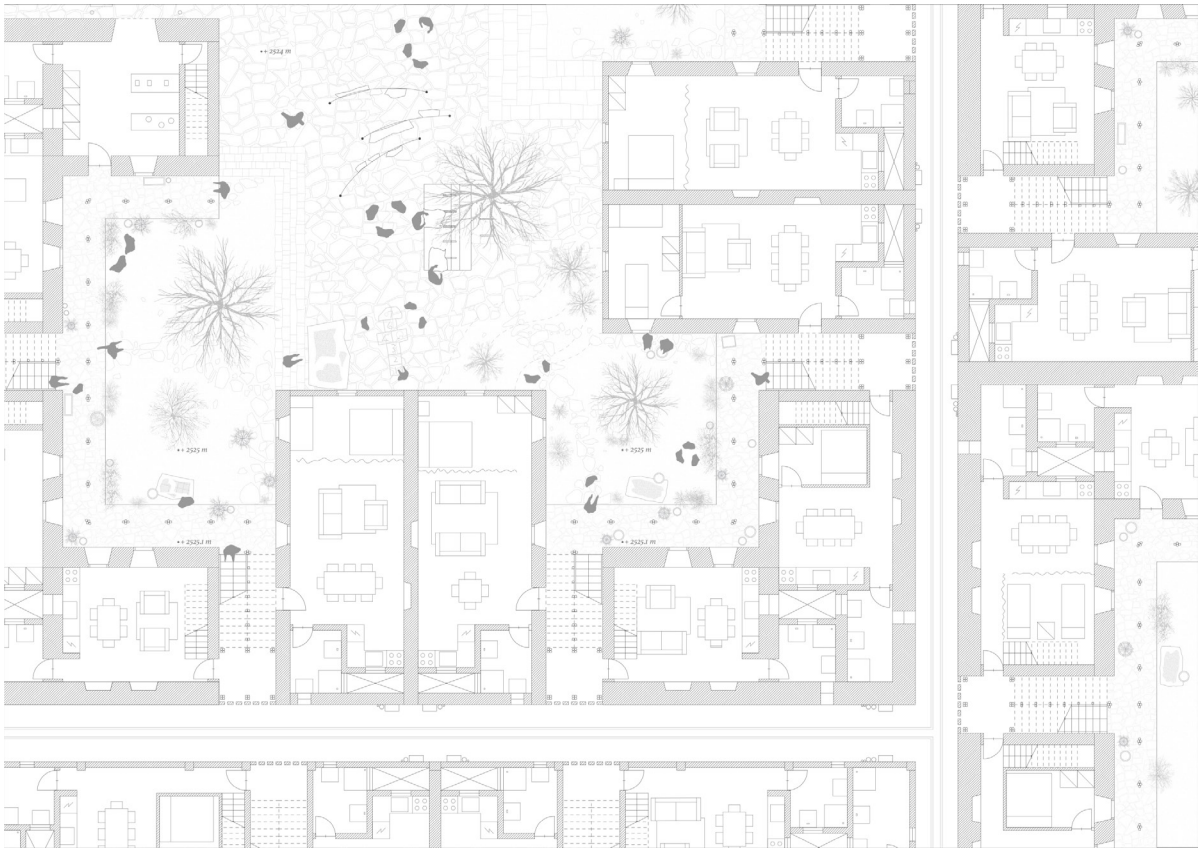
The project aims to give an answer to the intensive urbanization the city of Addis Ababa is living through an alternative to condominium blocks, with a similar density but at the same time flexible and modular. The residential compound generated allows freedom of movement for the residential compounds, privacy for the dwellers and a form of social environment. Every cluster is in this way independent, allowing a development of the project through time. Every block is to be built independently from the others and different materials can be used (rammed earth or concrete structure). Forms of auto construction are expected in the wide terraces.

Masterplan

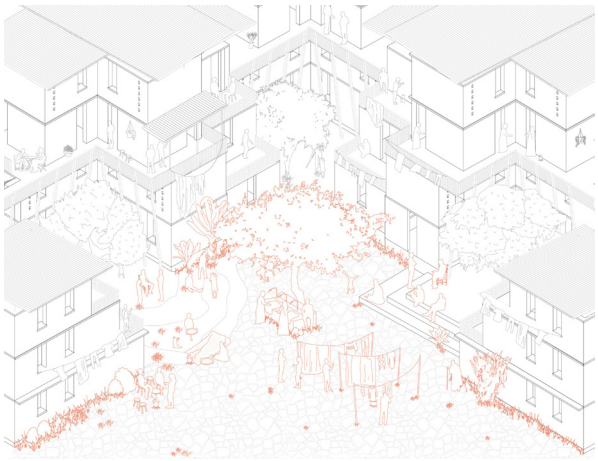
Self-construction render

Image source: Divisare

Floorplan:Duple lower level



Axonometry of the court



Section: comparison between materials used

Image source: Divsare

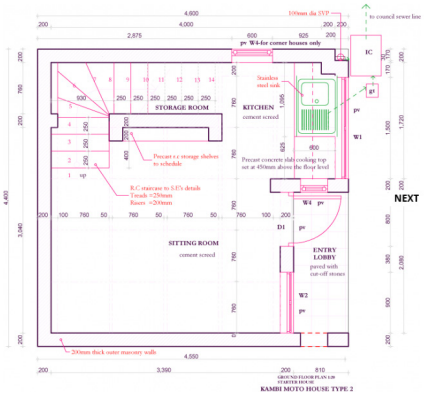
KAMBI MOTO

Kambi Moto is one of the villages of the informal settlement of Huruma and a unique case of success in Kenya, as an in-situ, community-led slum upgrading project. The community was in fact prepared and skill-developed to be able to develop saving schemes and achieve poper housing for all elements of the group. The area is characterized by a working sewerage system, a good quality water distribution one and electricity distribution systems, all set on a public-owned land completed by the presence of clean and free open spaces.
Houses reach a three levels height and are part of an on-going process to-date still working.

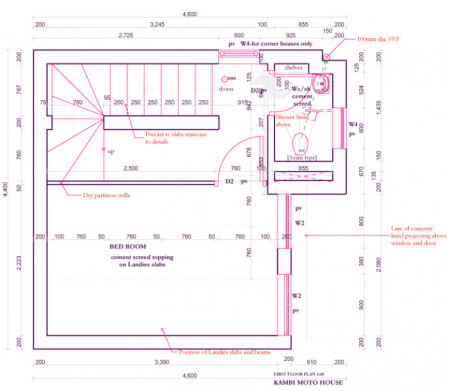
Slum Upgrading in Kambi Moto

Source: ADD, NAIROBI, KENYA, KAMBIMOTO HOUSING
https://www.architectureindevelopment.org/project.php?id=225#!prettyPhoto

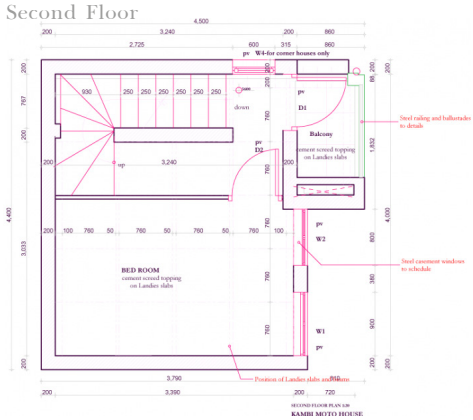
Gound floor



First floor



Second Floor



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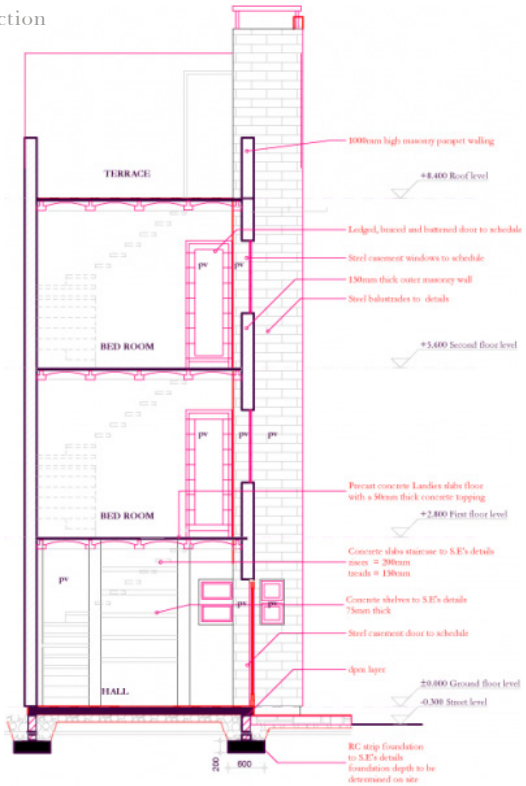
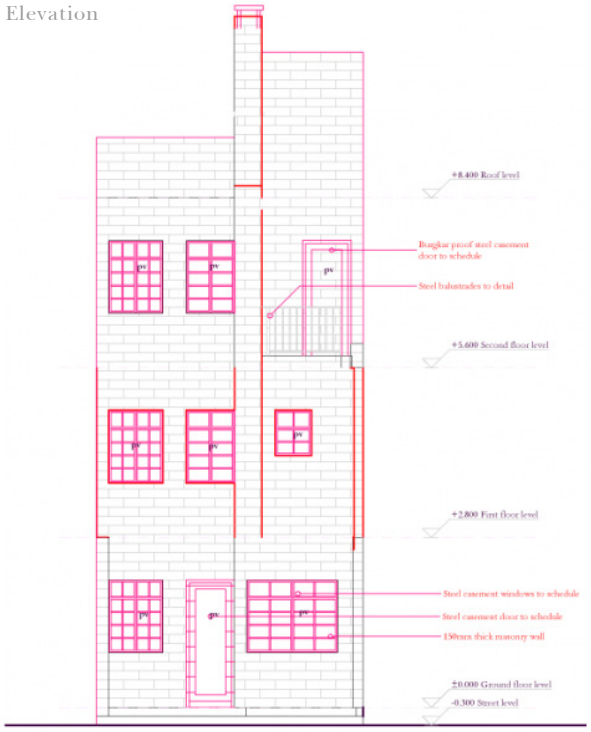


Elevation



Source: ADD, NAIROBI, KENYA, KAMBIMOTO HOUSING
https://www.architectureindevelopment.org/project.php?id=225#!prettyPhoto

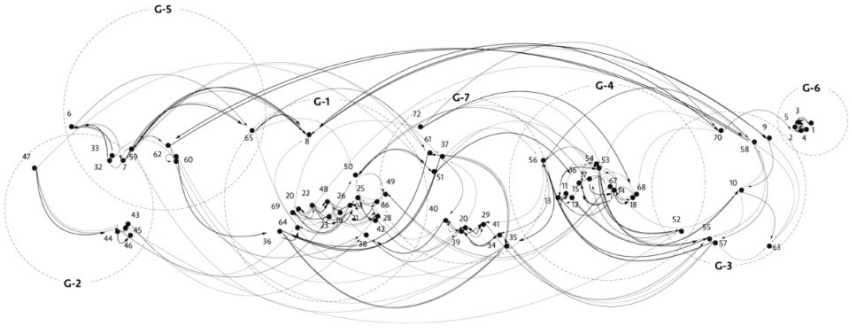
EMPOWER SHACK

Khayelitsha, Cape Town, South Africa, 2013
Urban Think Tank

South Africa post-Apartheid keeps experiencing a housing crisis in the form of informal settlements. The rise of rents, inaccessibility to financing, land regulations are among the reasons poors are trapped in such environments, without services and adequate housing quality, sense of security and environmental regulations. Te aim of the project was to develop a '*scalable, transparent and replicable model that addresses both real demand, market dynamics and municipal planning objectives*'[5] The offer of a fair distribution of space, services and urbanization schemes, approaching these problems with the assistance of livelihoods programs of various fields, like micro-financing and education. Thee expected densification of the area leads to a general upgrading of the livelihoods and most of all is able to guarantee the permanence of inhabitants in the same site. Thanks to a computational tool, the studio has been capable of distribute the neighbours depending on the preferences and the needs of each of them.
The building's pricing meets the needs of the micro financial contribution from recipients.

©Urban Think Tank

Computational model of neighbourhood preferences



©Urban Think Tank

5 Urban Think Tank, Empowerment Shack, http://u-tt.com/project/empower-shack/

Floorplans

©Urban Think Tank

Internal images of the residences, before and after

©Urban Think Tank

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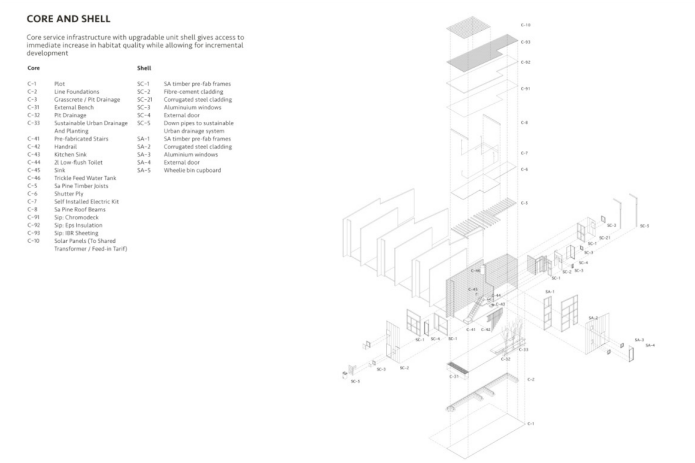

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INCREMENTAL HOUSING STRATEGY

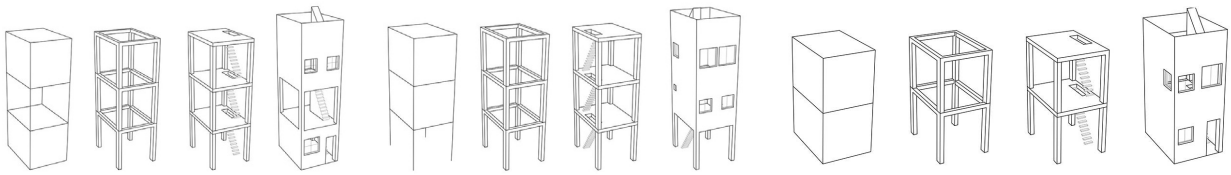
Netaji Nagar, Yeramada, Pune, 2008-09
Urban Nouveau with SPARC and Mahila Milan

SPARC is one of India's biggest NGOs working in infrastructure and housing. The development of an improving strategy for living condiions in informal settlements lead to the design of the Yeramanda pilot project as a result of workshops and activities with locals and the participation of the Mahila Milan, a woman's collective.

The projects is actually a legalization of a process developed by people living in informal settlements, transforming the old shacks into new homes by bringing services to them.
The mapping and clustering of the envirnoments of the Kacchas has been a fundamental part of the process as well as the experiences of the architects, who have been living for months with the dwellers in order to learn te most from their habits.

Render

Housing types



Four colmn structure

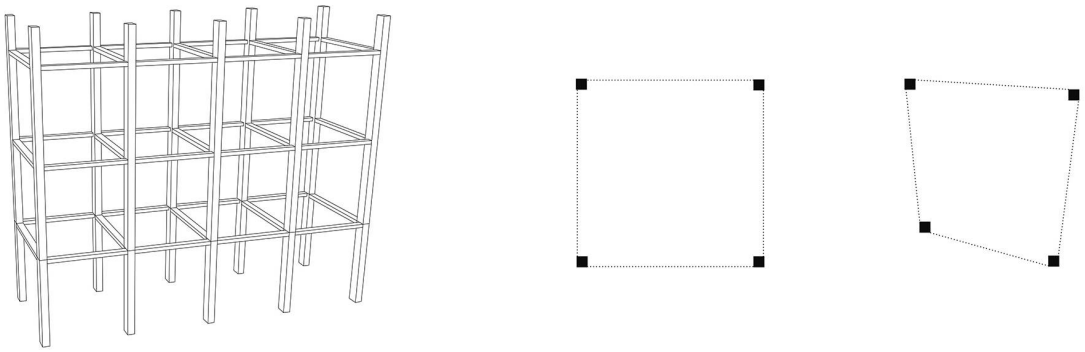
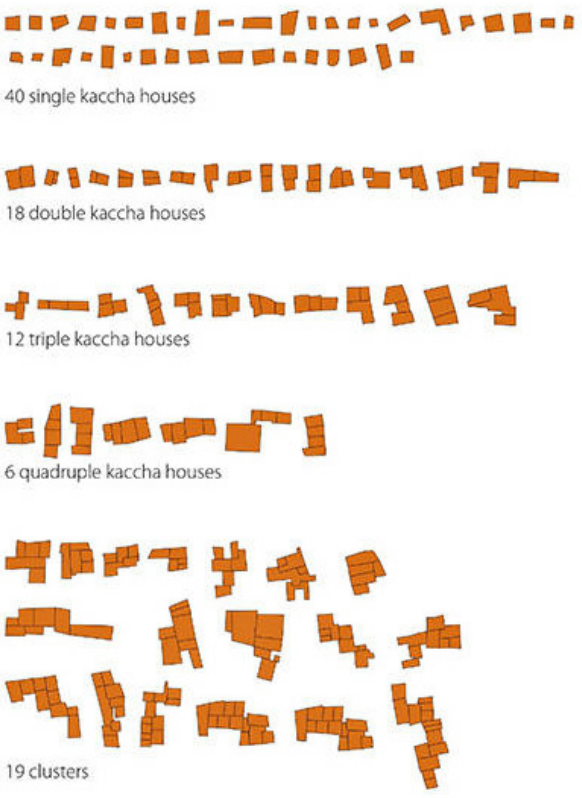
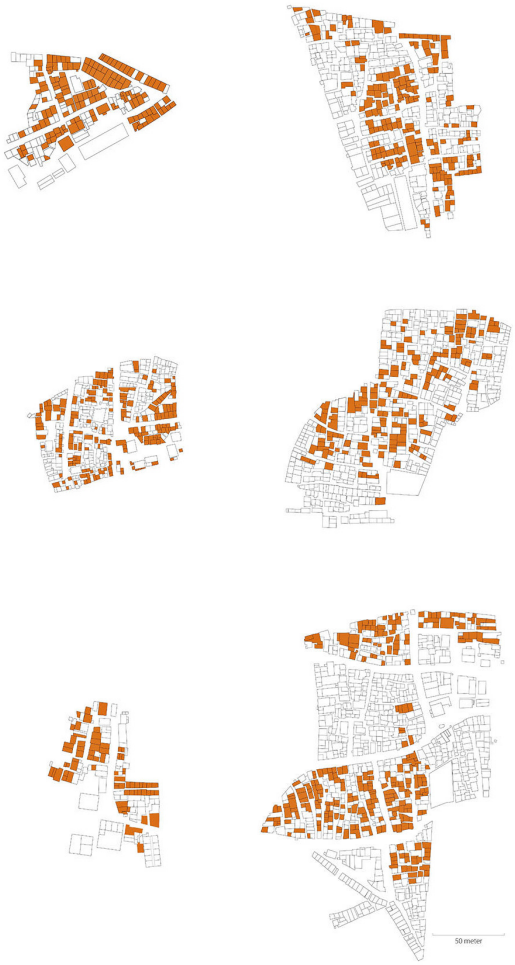


Image source: Area-arch.it

Mapping and catalogation of the Kacchas in the seven selected slums.
The existing Kacchas were grouped into single, double, triple, quadruple & clusters

Catalogue example





Workshops

Expantion hypothesis

Image source: Area-arch.it

Actors

UN AGENCIES

UN agencies play a central role in the administration of such a project. The representatives of the UN Habitat in its Nairobi sections are among the most important figures in the development of the projects for the future metropolis described in the program 'Nairobi Metro City' (see ch.1 section 'Towards 2030).
Of course, the world Bank plays a central role in the grant of loans to the area.

As the UN Habitat itself quotes:

> *Slum upgrading remains the most financially and socially appropriate approach to addressing the challenge of existing slums*[1]

NAIROBI COUNTY

The projects for Nairobi 2030, in the guise of KISIP and KENSUP, and the reference to the Big Four Agenda are expected be the core of the leadership for the operations of development of the Mathare Vallley.
The interest in the development of these areas is to be founded on the economical impact that a balanced and full of life area can develop.

Previous experiences in the field of slum upgrading have been made by KENSUP and KISIP like the Kibera Soweto East project which, although it is considered as a failure, it is still one of the biggest efforts of slum upgrading made in these areas.

GOVERNANCE ADMINISTRATION

It is important to know, for the purpose of this study, that the area defined 'Mathare Valley' falls under the constituencies of **Starehe** and **Kasarani**, each one with its parliamentary representative, and three wards. There are also two administrative divisions and three locations. The Valley is moreover divided into nine villages, which are considered an unofficial division but still are recognized by the Provincial Administration.

Each village has a **village elder**, who doesn't officially own any legal power though governments often collaborate with this category to help mobilize the community. Elders are a political figure inherited from colonial period, as they were in charge of ruling informal settlements back then. Today, their role is to help dissolve incomprehensions and discussions against Chief and Assistant chiefs and influence public opinion in every village.
For the purpose here aimed, the involvement of these figures is as central as the involvement of the community of the slum.
Of course, the involvement of elders is possible prior contacts and agreements with constituency's governance figures of **Chief and Assistant Chief**

NGOS AND ASSOCIATIONS

Many are the NGOs operating on the field of Mathare and a cooperation of humanitarian activities is needed in order to perpetuate a urban effort as the one needed in such difficult environment as the one of a slum.

As NGOs represent some of the most influential elements on the territory, involving these organization will be necessary to reach strict collaboration with the population. Since the masterplan here proposed aims to the creation, the reinforcement and the development of the community, the role of NGO like are extremely important.

1 United Nations Human Settlements Programme 2014, A Practical Guide to Designing, Planning, and Executing Citywide Slum Upgrading Programmes

PAMOJA TRUST

Pamoja trust '*promotes access to land, shelter and basic services for the urban poor*'[2]. It was born to provide institutional support for the anti-eviction movement developed between the 90s and the early 2000s. The collaboration with Muungano wa Wanavijiji has been very close and among the developed projects the 2009 Collaborative Slum Planning & Upgrading brought to attention the problems of the Kosovo village, village 4a, providing a strong response to the informal settlement's problems which will be discussed in the section '*Collaborative Upgrading Plan (2011)', page 92.*
Together with many other NGOs, Pamoja Trust '*seeks to influence the development and implementation of national policies by creating replicable, pro-poor models and advocating for the participation of the urban poor.*'[3]

MATHARE SLUM COMMUNITY ASSOCIATION

The Mathare Slums Community Association (MaSCA) is a member organization which connects volunteers, NGOs, and the Mathare community. We look for projects and connect volunteers with short-term and long-term assignments on projects that aim to strengthen sustainable, community-based partnerships.[4]

The importance of mediators in the political and social field of such a big project is crucial. As the NGOs and associations working in the field are so many, the role of a super-coordinator like the MaSCA to be considered as very important as they represent the link between some of the main figures needed.

MUUNGANO WA WANAVIJIJI

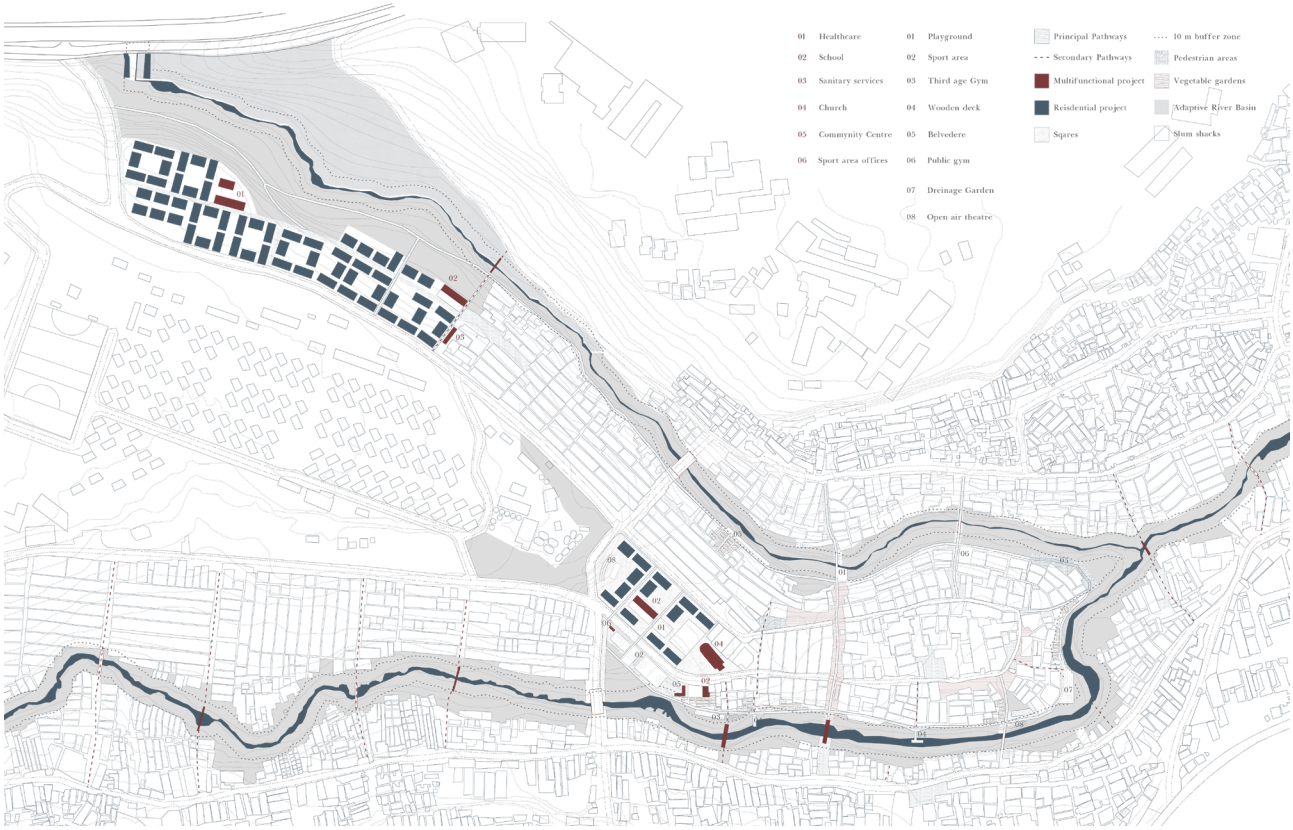
Muungano wa Wanavijiji is collective of slum residents and urban poor people in Kenya. At he core of their interventions, the community living in the territory they're acting on is the principal actor. Among its most recent Work, the Mukuru SPA is to be taken in into consideration, as a act of development taking place in one of the poorest slums in Nairobi.

SLUM DWELLERS INTERNATIONAL

It is a network of community-based organizations in many continents born in '96. The idea at the base if the SDI is to have a stronger global platform to help local initiatives and develop alternatives to forced evictions.
They are promoters of slum upgrading projects all over the world in a urban point of view. Their idea of slum upgrading is the creation of '*Inclusive, "pro-poor" cities where residents of informal settlements are thought of not as hotbeds of crime and disease, but as engines for development strategies.*' [5]
Among their projects in Mathare is the 209 and 2011 collaborative upgrading plan, made in collaboration with Muungano wa Wanavijiji and Muungano Support Trust.

2 Pamoja Trust homepage https://www.pamojatrust.org/index.php/about-us
3 Pamoja Trust https://www.pamojatrust.org/index.php/what-we-do/housing-and-slum-upgrading
4 MaSCA homepage http://mathare.org/about-us/
5 SDI homepage http://skoll.org/organization/slum-dwellers-international/

MASTERPLAN



These areas have been subject to many injustices, but also many acts and planning strategies to upgrade it.
Mathare 4B, as one of the poorest and most difficult zones of Mathare to intervene on, has been deeply studied, maybe even more than other areas of the Valley, due to its particular geomorphology (irregular and sometimes steep), its poverty and its conditions.
The developed masterplan has taken into consideration previous upgrade projects, i.e. the Nairobi River Basin Restoration for the environmental aspect and the 2011 Collaborative Upgrading Plan for the slum Upgrade project.
After taking into consideration these two approaches, the project focuses its study on the area between Mathare 4B, Kosovo and Gitathuru and northers lands as a key point to start the rebirth of the nearby slums.
Also, these areas will be able to host some of the community that needs to be evicted from flood-risk areas. Majour effort has been put in the demolishment of as less livelihoods as possible, in order to encourage an upgrade both from the community and from the government

Previous projects and land visions

MATHARE RIVER RIPARIAN ZONE RESTORATION

Riparian zones provide different services to the community and the environment: the ecological, the theatrical and aesthetic, commercial and other uses. The causes of degradation of water basins in Nairobi are provoked by many factors like human settlements, industry and urban agriculture, translated in waste dispersion and accumulation, both liquid and solid, habitat loss, raw sewerage. Nairobi's riparian river zones have been covered by numerous informal settlements to-date occupying areas destined to environmental functions. Moreover, the discharge of polluted waters directly in the rivers without any appropriate treatment is a contribution to the pollution of waters.
Causes of land occupation are many, but little has the intervention's success been:

Land occupation: the government has taken into consideration both eviction and negotiation, but with little success. The cases of Kambi Moto (see *'The case of Kambi Moto', page 81),* the result of negotiation with squatters on public lands, and of land sharing of private lands has not been successfull in order to move landless from the river basin.

Land planning and development control: since the year 2000, the Nairobi Mettopolitan Growth Strategy, the ambitious masterplan that'd see the capital as an avanguardistic and smart city (see *'Nairobi Metro 2030 Strategy', page 27)* hasn't seen much of a development and most of the interventions made are focused and disjointed which, together with low organization and leading skills of the government's figures, hasn't been of help in a matter of control of riparian zones.

Housing and shelters: Little have been the government's efforts to provide the low standard-living population with decent housing and shelter. KENSUP's projects have revealed themself as poorly studied and unprepared to service such environment (see *'Slum Upgrading in Nairobi', page 73.*

Environment: Inadequate capacity of environmental development and management has provoked very few results in the development of the indications of the Environmental Management and Co-ordination Act (EMCA) (1999) (see below)

Legislations:
-Environmental Management and Co-ordination Act (EMCA) (1999) regulates the protection of riparian areas and ecological systems thanks to a 30 meters buffer zone between human activities and the river banks

'41. Contents of Provincial and District Environment Action Plans
(1) No person shall, without the prior written approval of the Director-General given after an environmental impact assessment, in relation to a river, lake or wetland in Kenya, carry out any of the following activities–
(a) erect, reconstruct, place, alter, extend, remove or demolish any structure or part of any structure in, or under the river, lake or wetland;
(b) excavate, drill, tunnel or disturb the river, lake or wetland;
(c) introduce any animal, whether alien or indigenous, dead or alive, in any river, lake or wetland;
(d) introduce or plant any part of a plant specimen, whether alien or indigenous, dead or alive, in any river, lake or wetland;
(e) deposit any substance in a lake, river or wetland or in, on or under its bed, if that substance would or is likely to have adverse environmental effects on the river, lake or wetland;
(f) direct or block any river, lake or wetland from its natural and normal course; or
(g) drain any lake, river or wetland.'[1]

'75. Licence to discharge effluents
(1) No Local Authority operating a sewerage system or owner or operator of any trade or industrial undertaking shall discharge any effluents or other pollutants into the environment without an effluent discharge licence issued by the Authority
(...)
(4) Before the issuance of a licence under subsections (1) (...), the Authority shall:
(...)
(d) take into consideration the water requirements of riparian residents and ecosystems, human settlements, and agricultural schemes which depend on the affected water course.'[2]

-Agricultural Act:

'6. Protection of watercourse
Any person who, except with the written permission of an authorized officer, cultivates or destroys the soil, or cuts

down any vegetation or depastures any livestock, on any land lying within 2 metres of a watercourse, or, in the case of a watercourse more than 2 metres wide, within a distance equal to the width of that watercourse to a maximum of 30 metres, shall be guilty of an offence'[3]

-Planning Act

'*15. Requirements when subdivision schemes are submitted In any scheme of subdivision of land within the area of a local authority the following conditions shall be complied with (...)*
(c) wayleaves or reserves along any river, stream or water course shall be provided of not less than 10 metres in width on each bank, except in areas where there is an established flooding;'[4]

Nairobi River Basin project

The main goal of the Nairobi River Basin Project, 1999, is the restoration of a clearance and balanced river basin environment for the city, with clean waters and the creation of a healthy environment for the citizens. The project was led by Ministry of Environment and Mineral Resources, the Ministry of Nairobi Metropolitan Development, the National Environmental Management Agency, the Ministry of Local Government, the Nairobi City Council, UN agencies and private sector led initiatives.

In November 2008, the third and latest phase of the Nairobi cleanup programme forced up to 127 000 people[5], mostly living and working within the river basin area, along with schools, and other services to the community, to move from the project-affected area. People from the slums of Mathare, Huruma, Kiambiu, Korogocho, Mukuru and Kibera hav been victims of forced eviction, although actors affirm that previous conceling activities have been perpetuated in order to collaborate with the community.

However, residents have not been consulted as the interviewed people by Amnesty International confessed, as they have been in fact kept in the dark about the details of the operation.

'*Fredrick from Mathare told Amnesty International:*
I heard [of the river evictions] but I don't know how far it will go from the river in terms of metres. I think it will affect me, and I will wait and see when it happens. I don't know for sure if the government will help us, but I hope they will. I haven't spoken to anyone about the evictions. But who can we talk to really? As it is, it is still unofficial because the area chief has not even called a meeting to talk to us about the river eviction like he did when the road evictions were done.'[6]

The government's program in the river's cleanup program hasn't worked to-date due to lack of participation of affected communities and the voluntary (or not) denial of alternatives to forced evictions

Challenges in the cleanup of the Mathare Slum's river banks

COLLABORATIVE UPGRADING PLAN (2011)

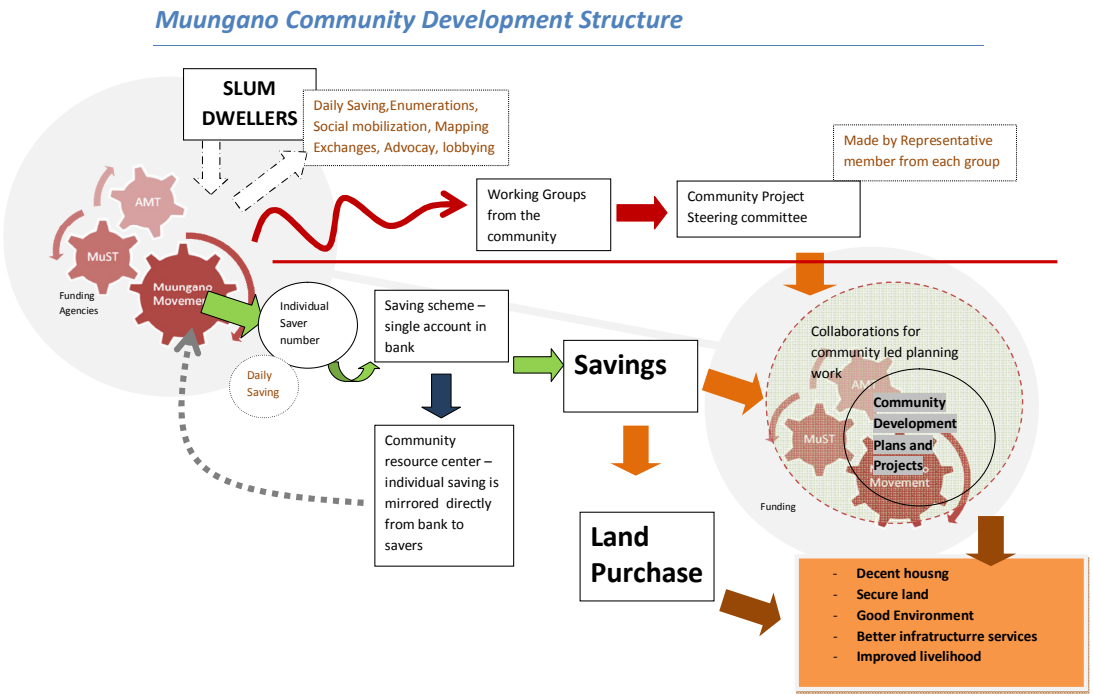
The project aims at improving life and living conditions of slum dwellers in the Nairobi through a partnership between Muungano Support Trust, Slum Dwellers International (SDI), the University of Nairobi, and the University of California, Berkeley[7]

One of the major critical characteristic of Mathare and other Nairobi's slums is the lack of a comprehensive development strategy able to plan in collaboration with so called *Community Planning Teams,* comprising of residents from each village in order to build both a realistic social and service plan and a new awareness of the opportunities, following three principles:

'*1. Build upon existing community assets and strengths. 2. Use infrastructure planning as an entry-point to address other related issues 3. Ensure meaningful participation & community ownership.*'

And following four Goals:

'*1. Generate Valley-scale analyses of existing conditions and concrete ideas for improving lives and living conditions 2. Provide evidence & ideas that can strengthen community organizing, leadership and coalition building. 3. Provide a framework for addressing emerging policies and plans at the county, municipal, and national level aimed at slum dwellers. 4. Inspire service providers to invest in valley-wide infrastructure provision.*'[8]



Source: Mathare Valley, Nairobi, Kenya, 2011 Collaborative Upgrading Plan

Improvement Scenarios

The Analysis made by the team evidenced key subjects able to improve the living conditions of the slum dwellers.

1) Water Infrastructure, as key to living condition decency, demand a water distribution analysis and project able to service the community, not only considering to-date's number of dwellers but projecting the population growth of a conservative annual 6% growth rate, forecasting a population of at least 200 000 people by 2030. The project shows instead an infrastructure designed to encounter the water needs of 500 000 people, a number based on the population esteem made by the 2011 Coll. Upgrading Plan and projected by 2030[9], able to encounter the deed s of a fire estinguishment in the slum in case of emergency.

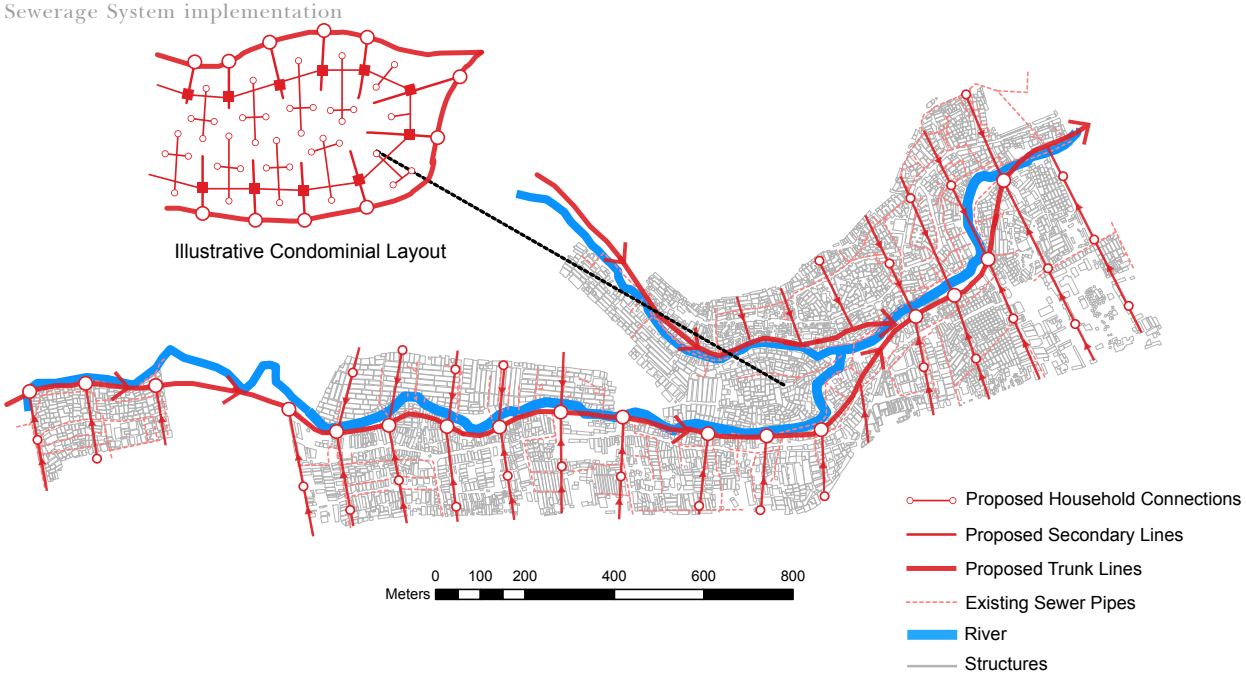
Water distribution System implementation

Source: Mathare Valley, 2011 Collaborative Upgrading Plan

9 Muungano Support Trust, SDI, UNOBI, University of California, Berkeley, Dec. 2011, Mathare Valley, Nairobi, Kenya, 2011 Collaborative Upgrading Plan, Water Infrastructure, *p. 44*

2) *Trunk Sewer Improvements:* The water distribution may create a waste-water overproduction if not accompanied by a correct sewerage system, thought to collect storm waters, household waste waters and toilet black waters and designed to be connected to new community ablution boxes.
Simplified solutions are forecast for steeped-areas, but require a correct maintenance and care by the community, particularly by removing waste blockages.

Sewerage System implementation



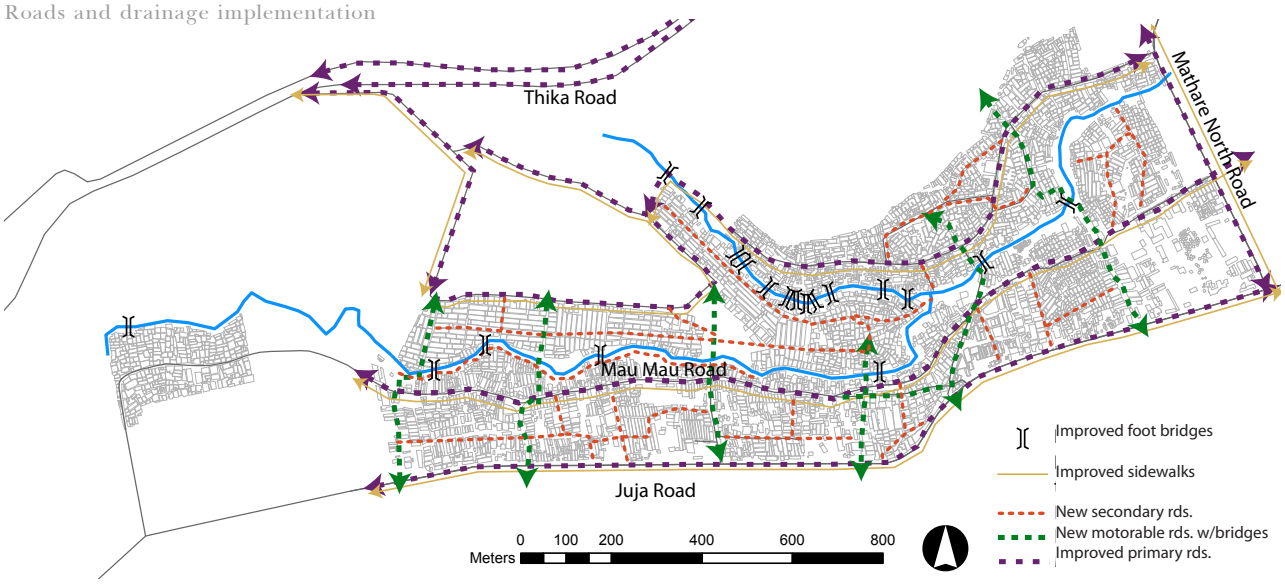
Source: Mathare Valley, 2011 Collaborative Upgrading Plan

Sketches

Source: Mathare Valley, 2011 Collaborative Upgrading Plan

3) *Roads & Drainage:* Providing safer and easier ways to move within and in and out of teh valley is to be rferred to all the population of Mathare. The Lack of motorized transportation system doesn't onl affect the residents but it affects the basic services the area and the people need. The perfect exemple is the lenghth of the emerency service provision, as the roads are way too small for emergency wagons to pass through. Sidewalks are another issue for the safety of the people walking along the streets.

Roads and drainage implementation

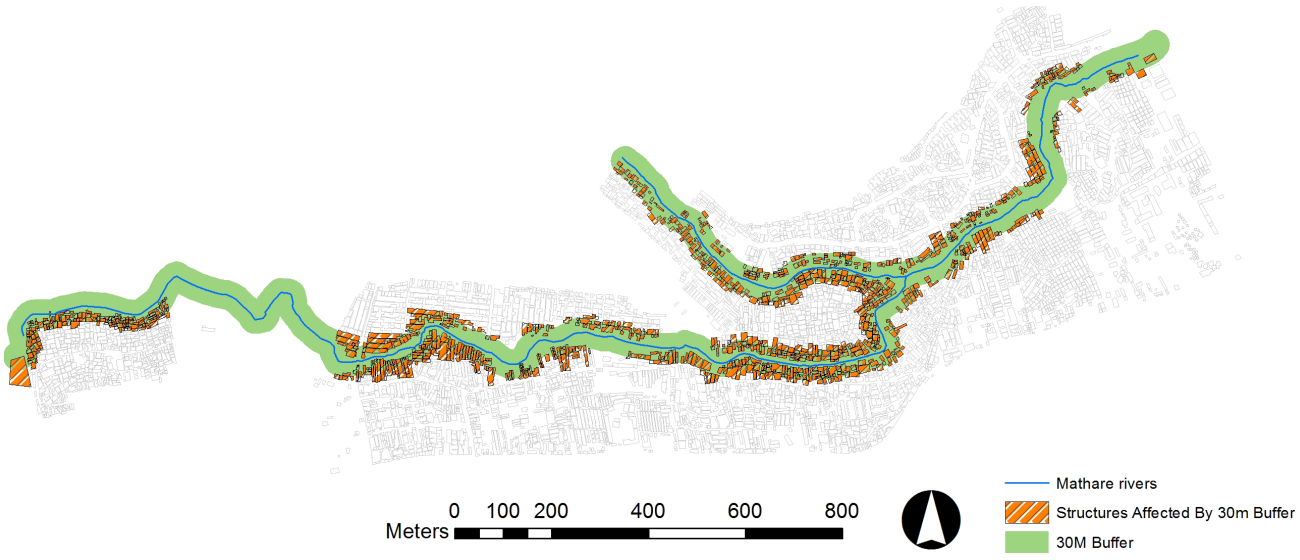


Source: Mathare Valley, 2011 Collaborative Upgrading Plan

4) *Riparian:* The 30 meters riparian buffer placed by the Government and the United nations Environmental Programme (UNEP) (see '*Mathare River riparian zone restoration*', *page 91)* affects a high number of livelihoods , providing few details on how to elocate affected people. The 2011 CUP calculated a better performance buffer '*using the following considerations: watershed water volume, slope, soil type, existing vegetation, flood patterns, erosion control and human uses*'[10]

PLEASE NOTE: The riparian 30 m buffer this study is referred to, is to-date obsolete as it referres to an old regulation. An updated study of the subject has been made in the previous chapter '*Mathare River riparian zone restoration*', *page 91,* which outlines that to-date the riparian zone forecast by the Agricultural and the Environmental acts of the Law of Kenya is 10m, to be adapted to the necessities of the area and evaluated case-to-case.
Also, as the study has been done in 2011, many more schacks have been built on the riparian area compared to the ones presented in the following drawings. The study the project is going to present is an updated version of this study

NEMA & UNEP 30 Meter Riparian Buffer Impacts



©2011 CO. Upgrading Plan

10 Muungano Support Trust, SDI, UNOBI, University of California, Berkeley, Dec. 2011, Mathare Valley, Nairobi, Kenya, 2011 Collaborative Upgrading Plan, Planning Scenarios: Riparian *p.50*

2011 CUP Performance Riparian Buffer Impacts

Project

STRATEGY

In the work here presented, it has been decided to leave, as much as possible, space to the existing structures, behind the idea that forced eviction is never the answer to the problems populating he slum.
The answer here presented will work in those areas which have not been affected by the 2011 Collaborative Upgrading Plan project, but they have been thought as a key action to the start of the development of it. We focus on the area comprised between villages Mathare 4B, Kosovo and Gitathuru, as a strategic point connecting various other villages and linking area between areas of Kosovo and Mathare 4B, studied by both the Collaborative Upgrading Plan's versions of 2009[11] and 2011[12].
Macro interventions have been made possible by the absence of preexistances, or have been made just in parts where it was evident the importance of the presence of a social connector. Transports too, as the veins to a rebirth and the security of an area, have been implemented by the creation of driveways where previously wasn't possible the passage of any kind of transport means, basing the new drawing on the pre-existing pattern of the slum.

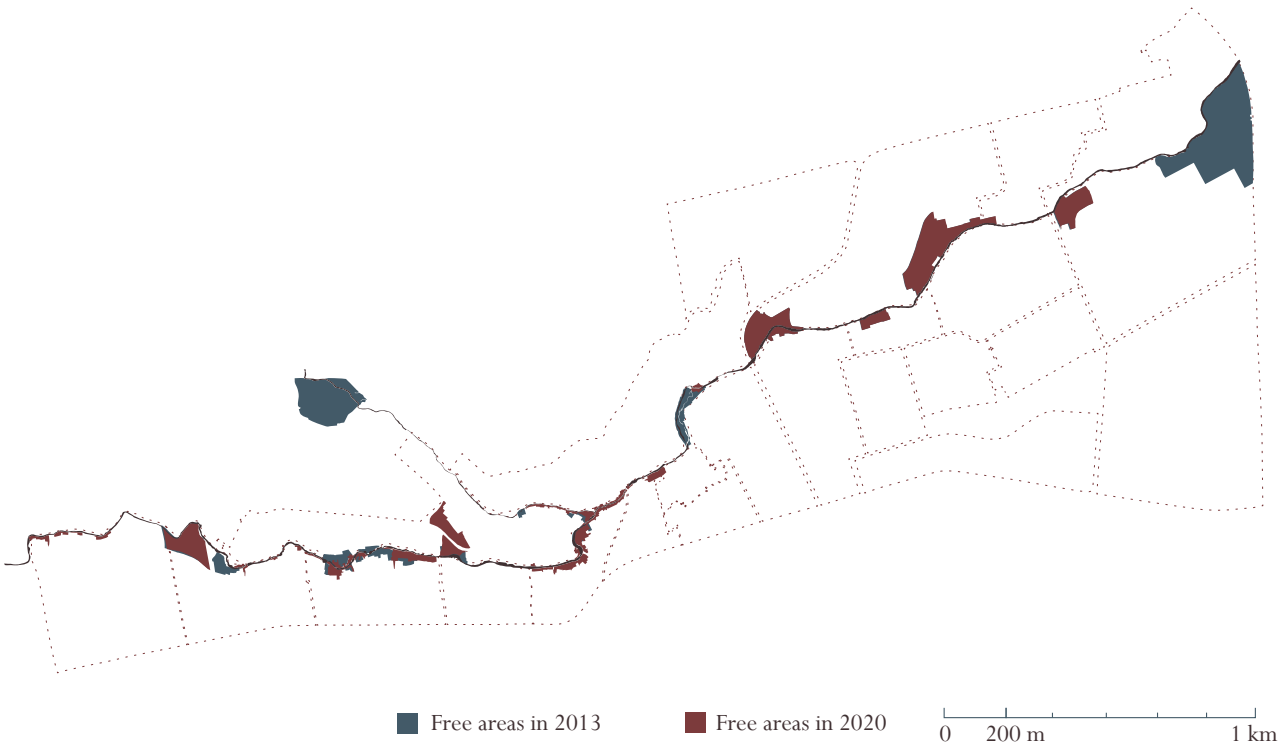
NEEDS AND ANSWERS

River Basin restoration and flood disaster prevention
Many of the constructions populating the river basin are located on lands periodically subject to floods. These artefacts are both the cause of the problem and the first victims of floods.
Their position is considered dangerous both for the dwellers living within these areas and for others, as the debris accumulation that their destruction causes, blocks the water flow.
As explained before, the 30 meters river buffer is considered to be an unrealistic goal to be satisfied, as it doesn't take into consideration the forecast population growth of the city and the slum, nor the allocation of people affected by this decision.
On the other hand, the foresight by the 2011 CUP has to be updated, as the amount of constructions and shacks their project affects has grown, as the population increase to the time this work is written (2020) has reached a number of 129 500 people[13].
Scheme ofthe erosion of the public space

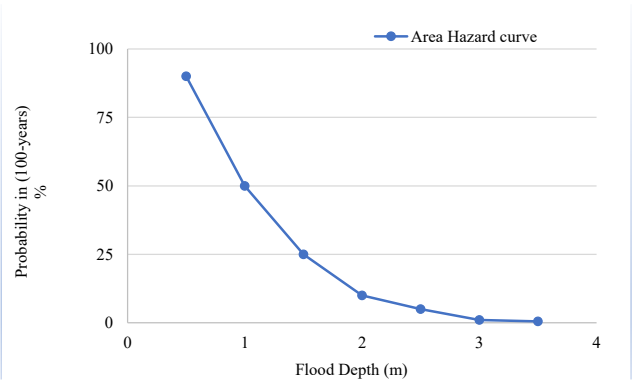
11 University of California, Berkeley, University of Nairobi, Pamoja Trust,2010

12 Muungano Support Trust, Slum Dwellers International, University of Nairobi, University of California, Berkeley, 2011

13 Calculated on the base of the 2011 population number of 118 183 provided by the 2011 Collaborative Upgrading plan and with an yearly 6% population growth rate as indicated in Muungano Support Trust, SDI, UNOBI, University of California, Berkeley, Dec. 2011, Mathare Valley, Nairobi, Kenya, 2011 Collaborative Upgrading Plan, Water Infrastructure, *p. 44*



It is possible to notice that the erosion of the public spaces in the entire valley is not only visible but also really fast, as the available building area is saturated.



Flood hazard curve of Mathare valley, Source: Kinyua, 2018

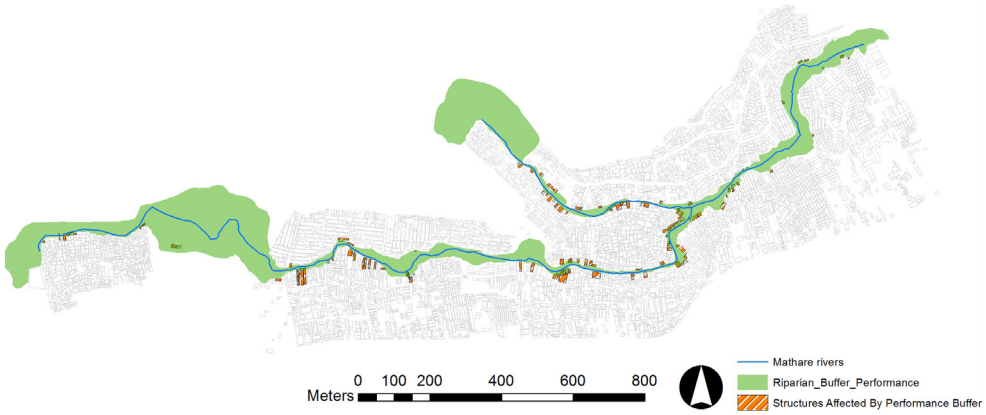
As visible in the diagram, the probability of a 4m flood phenomenon is likely to happend every 100 years which is not that risky, but still has to be taken into consideration.

On the other hand, the probability of a level gap of 2.5 m has a 100% probability of occurrence once an year.

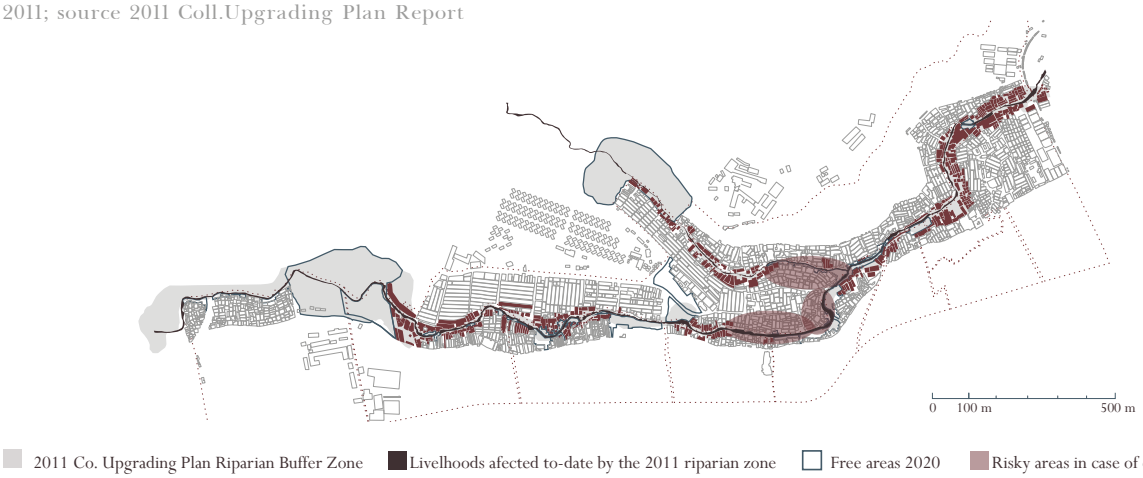
Hence, the project needs to respond to this risk establishing a buffer riparian zone along the river, over which constructions and other permanent artefacts will not be allowed, reestablishing part of the riparian zone of the river.

In the project here presented, it has been taken into consideration the level of floods into the valley and the return period of a hazard phenomenon of the Mathare River, combined with the buffer zone suggested in the acts quoted in '*Previous projects and land visions*', *page 91,* legislation, which impose a buffer zone of 10 meters from the river. It is important to notice that the *2011 Collaborative Upgrading Plan's Adaptive Riparian Buffer Zone* was conceived by a contrast to a 30m rule, set by the Nairobi River basin in contemporary times to that workshop. To-date, this strategy would affect way more livelihoods than it would have affected in 2011, as the urban expansion towards the river has pushed forward its limits untill the very shore sometimes

Comparison: 2011 Collaborative Upgrading Plan's adaptive Performance Riparian Buffer: 2011 vs 2020



2011; source 2011 Coll.Upgrading Plan Report



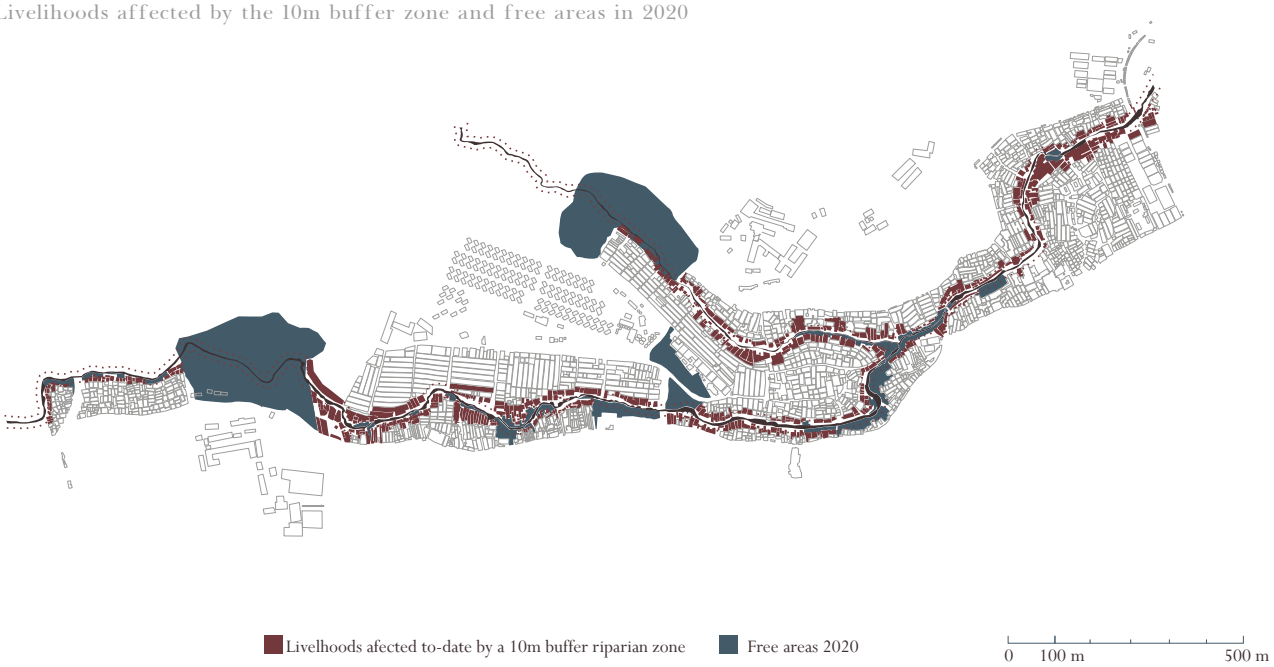
2020; Source: author

The following scheme presents the buffer Riparian Zone proposed by this work, with a minimum Buffer zone of 10 m along the shoreline of the Mathare River
Although thE adaptability has not been taken into consideration, the removal of the shack architecture built in the immediate proximity of the shoreline is considered crucial for the safety of the intervention. The Riparian area may be further adapted by the inclusion of the areas that are to-date still free from architecture, offering the possibility of givin it back to the population as a public space.
Although the total amount of families to be relocated with the 2011 Collaborative Upgrading Plan's adaptive riparian zone (3600 households)[14] would be lower than the one proposed in the project (4 800 households)[15], it is believed that a minimum buffer between the river flow and the livelihood's limit is very necessary in case of exceptional events.

14 Calculated by dividing the area of the affected livelihoods (33 500 m^2) by the average apartment size of families in Mathare of 9 m^2 provided by the article Mathare Demographic (2014) by the website Mapping: (No) Big Deal

15 Calculated by dividing the area of the affected livelihoods (44 800 m^2) by the average apartment size of families in Mathare of 9 m^2 provided by the article Mathare Demographic (2014) by the website Mapping: (No) Big Deal

Livelihoods affected by the 10m buffer zone and free areas in 2020



Urban Agriculture

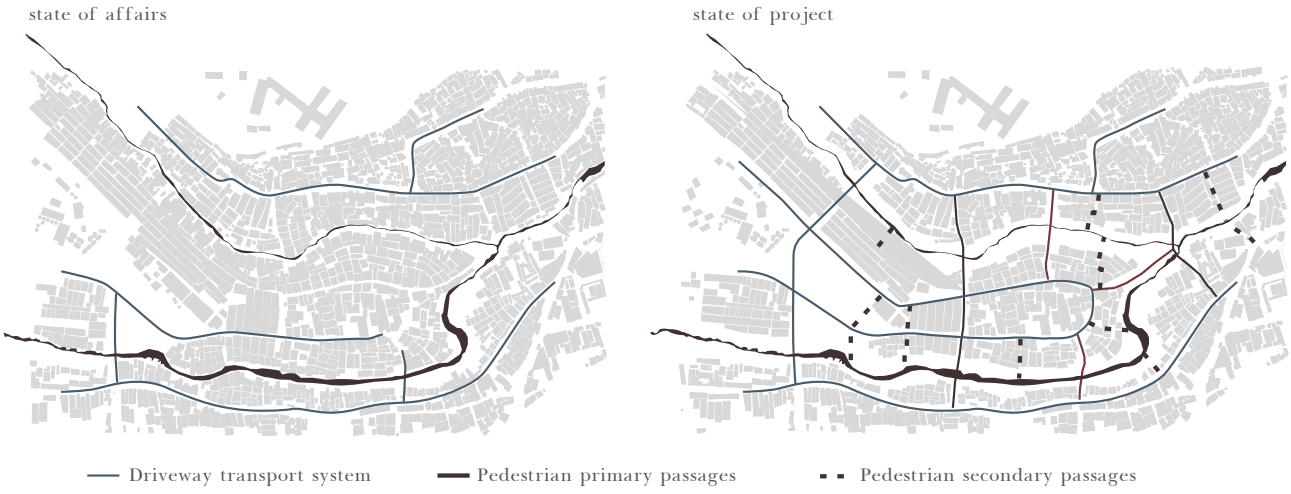
The area of the river basin creates a buffer zone that is usable both as a social and a urban device collector. These uses of the green area will also provide a protection against the advance of the urban limit and informal settlements, as it will be guarded and maintained by the community itself and the government.

Agricultural park: One of the first needs of the population is the necessity for food production, to which the study of the agricultural park and vegetable-gardens reserved areas may give an answer. Many studies have been made on principle of self-sustainment of a poor community, and the idea is to use these devices to control the reconquest of the part area by the urban limit.

Urban intervention

On a smaller scale, it has been considered of primary importance the creation of a correct transport distribution system, which includes a correct driveway transport system and a pedestrian one, both to be correctly separated and implemented in order not only to achieve a major security by the streets, but also within the informal pattern.

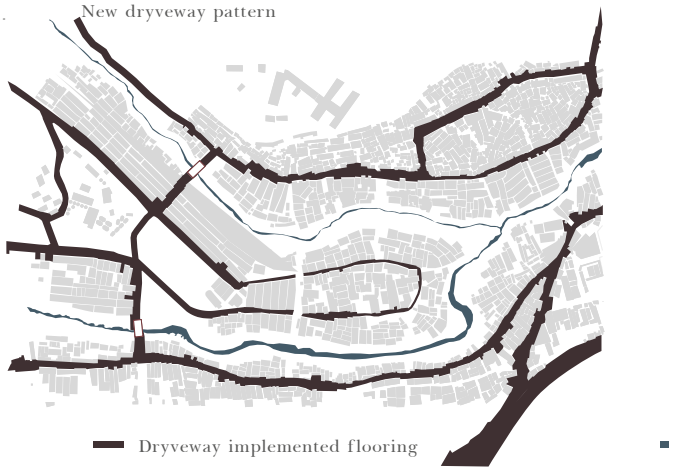
Transportation and pedestrian system study



The correct treatment of the flooring materials and drainage system will be in favour of a better environment, providing architectural quality, better health and environment conditions and, if correctly connected to the sewerage system as proposed in '*Collaborative Upgrading Plan (2011)', page 92, Trunk Sewer Improvements,* a correct protection of the river's natural environment.

Transportation and pedestrian pattern study

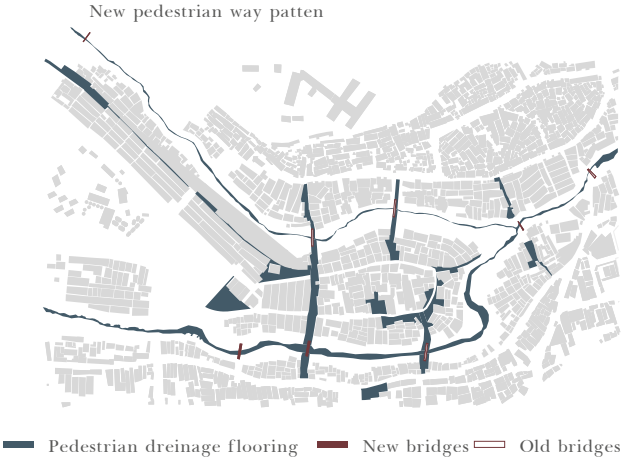
1. New dryveway pattern



2.

Image 1: Source: author
Image 2: Source: 2011 Collaborative Upgrading Plan

1. New pedestrian way patten

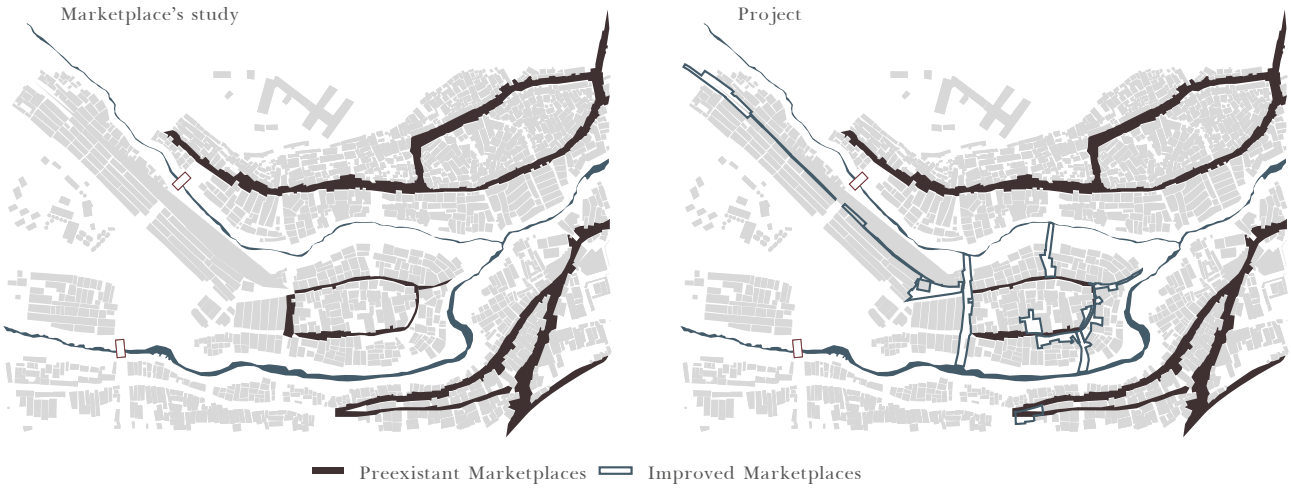


2.

Image 1: Source: author
Image 2: Source: 2011 Collaborative Upgrading Plan

It's necessary to take into consideration that every open area in Mathare is used by the residents as both a social area and a market place; the study made on the masterplan has taken advantage of the pre-eisting market-areas of the villages and developed them by providing more space and basing the development of the urban project and the implementation of the pedestrian area over them.

Marketplaces study

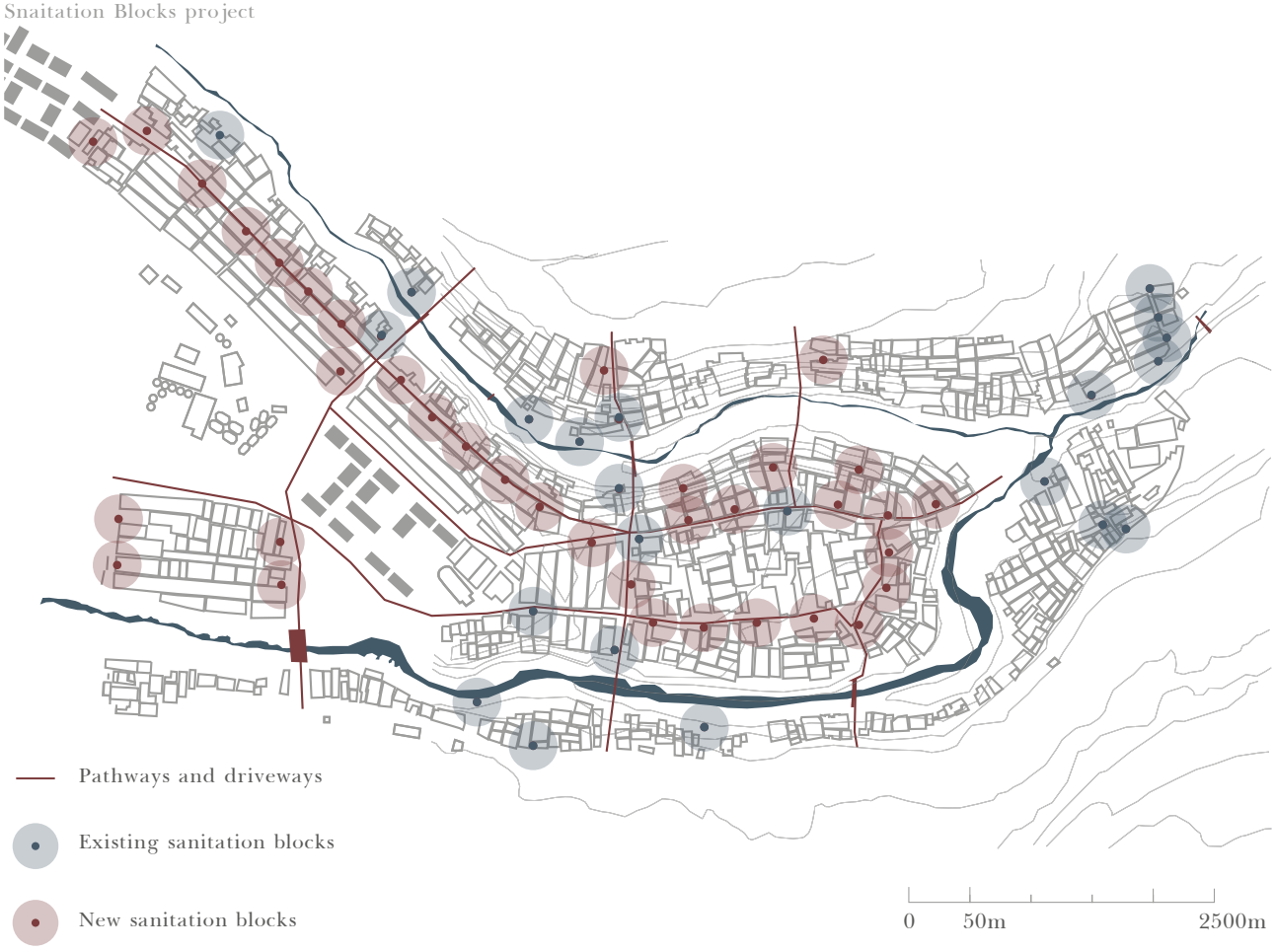


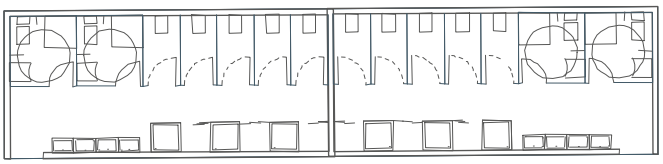
Security
The correct study of marketplace and functional mixture will be a key to a continuous patronage of streets and marketplaces for the day and part of the night, improving the security status both for men and women. The aim of the study is also to provide a safer area for people in need, who may at night be more protected by the people around, improving the neighbourhood control.

Hygiene
Currently, the provision of toilets and sanitation points in the area is drastically low. The provision of sanitation points is indeed urgent in order to provide a better condition to residents. Obviously, the study of this service is not possible if not in consequence to the improvement of the sewerage system. As an alternative, various are the solutions for dry toilets, which may be placed as a way to dab the current hygienic conditions where needed.

In the diagram blow, the upgrade of the streets and their spaces gives an occasion to improve the supply of sanitation blocks, which comprises showers and toilets and may be, as it is to-date, maintained by community groups

Snaitation Blocks project





Sanitation Bloc proposal

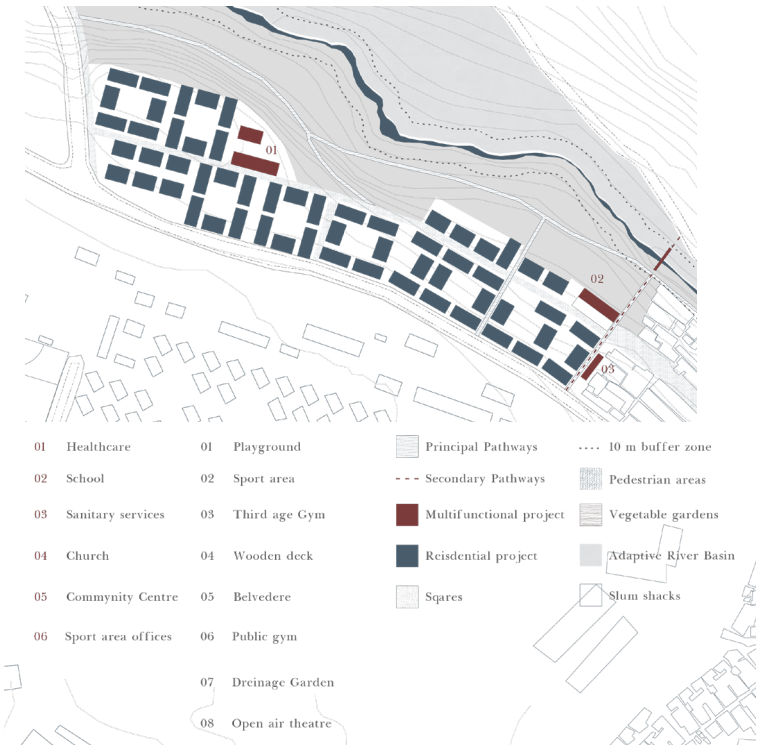
HOUSING PROVISION

Among the needs of the area, the right to the house and to property demand a urgent intervention, as the population increases and the strong urbanization has led to a rise in the amount of shack and informal development in the last 20 yrs. as described in the previous chapters.
Upon this overpopulation problem, the lack of public spaces costs the community cohesion, security, sanity and privacy.
Th correct drawing of new housing developments may start from the idea that a correct redevelopment of the area demands a correct drawing of the ground floor. The creation of public spaces will increase the affluence of social life and the provision of working spaces will be the base of new forms of job activities.
The amount of families in need of an urgent relocation is counted as circa 4800 households, as they are the ones to be more probably affected by a flooding exceptional event, and because their current location occupies a the river basin area.
The intervention studies two locations for the project, one in the very core of the slum, in the linking area between the vollages, and the other one in an area now occupied by urban agriculture activities.

A correct study of the ground floor guarantees a fluid fusion between the old environment and the new one, mostly because it tries to evaluate the present condition and services. The right to the property is an absolute necessity, so that every family provided with a house will not only be provided with the security of tenure, but also with the will to take care of the living space and to community activities.

New residential buildings

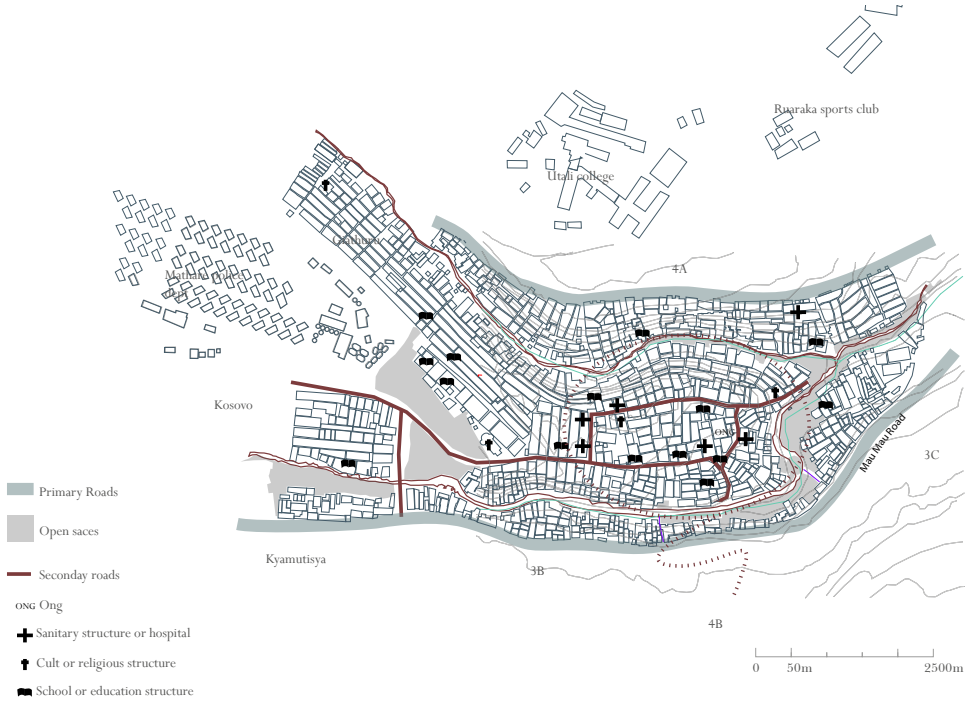
New functional buildings



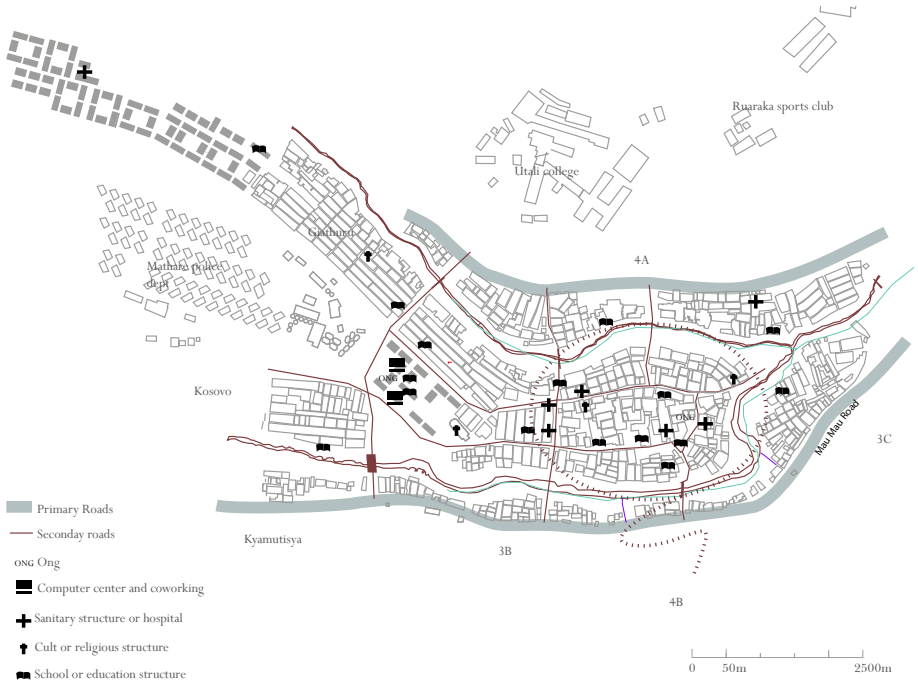
SERVICES AND FUNCTIONAL BUILDINGS

New services have been studied for these areas: among the principal problems affecting the area, the absence of enough schools and sanitary strctures are among the most felt.
The new masterplan forecasts the presence of a new school, a new medical centre and a new library, among sanitary services previously studied

Current situation of services



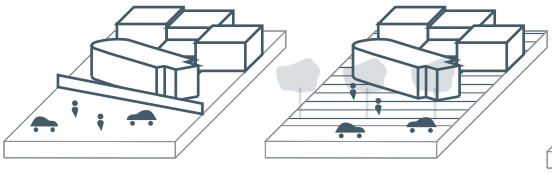
Forecast situation of services



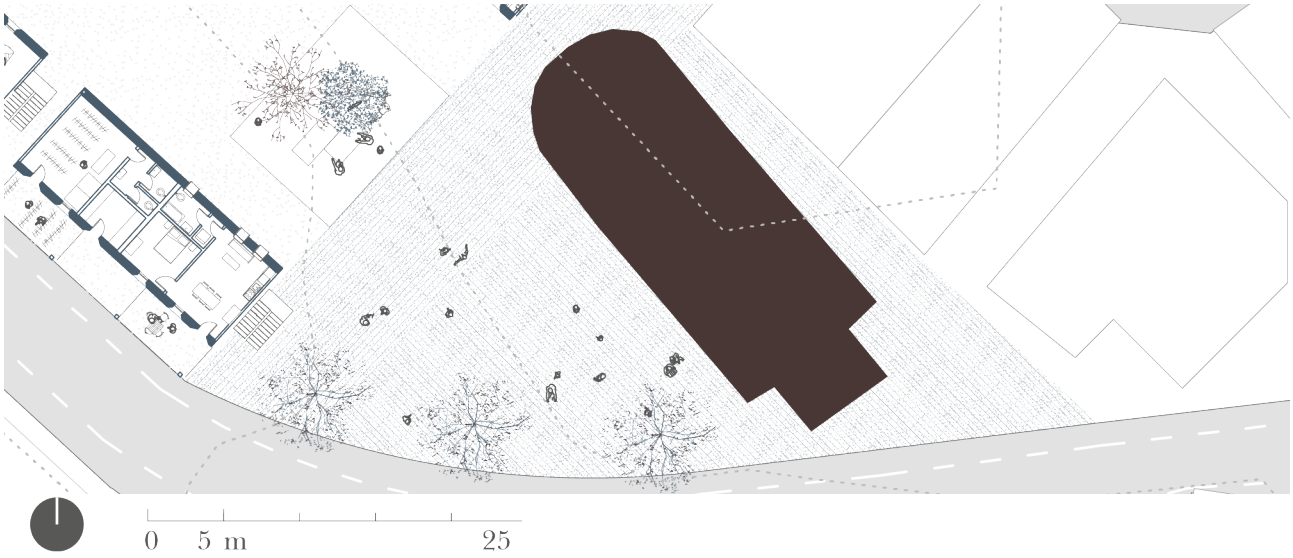
The church

The design of an appropriate space for the moments before and after the religious functions is important, because it builds a space for the community to gather. The division of that space from the traffic improves the security of the zone, protecting one of typical spaces of the villages since ever.

Strategy Scheme: before and after



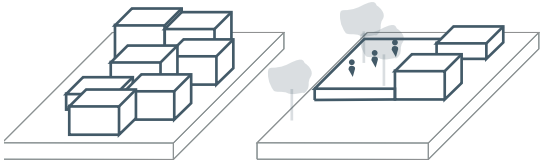
Detail of the general ground floor: the church's square,



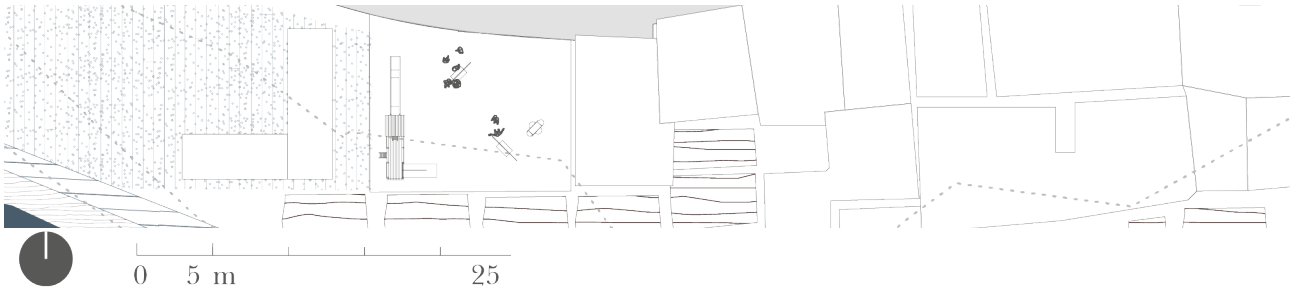
The Mcedo school

The existing school is to-date not provided with an appropriate playground and open space area for the kids attending. With the occasion of the River Basin, neighbouring constructions would be replaced by empty space, giving the opportunity to place a new area next to the school for the kids attending.

Strategy Scheme: before and after



Detail of the general ground floor: the Mcedo School,



New services

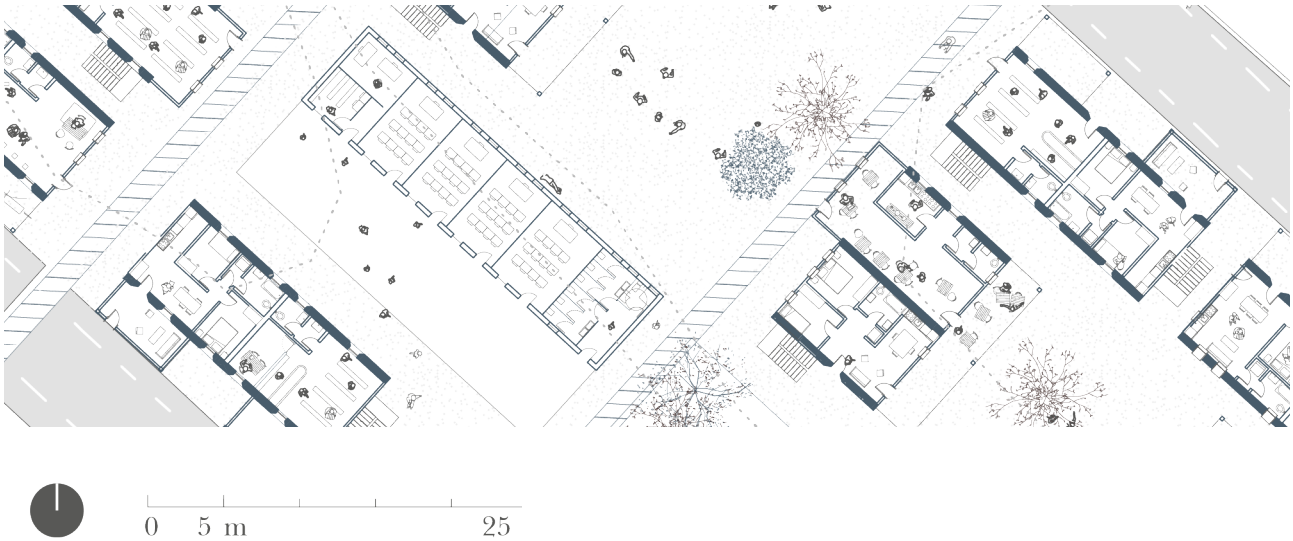
School

Although the presence of the Mcedo school in a nearby position, the general absence of such a service justifies the planning for a new school. Moreover, the protected position between the clusters and on the main way connecting them, makes it a nevralgic centre for the residential area. The reference of this part of the project comes after the Whynot academy, a project already realized in another Village of Mathare by Gaetano Berni.

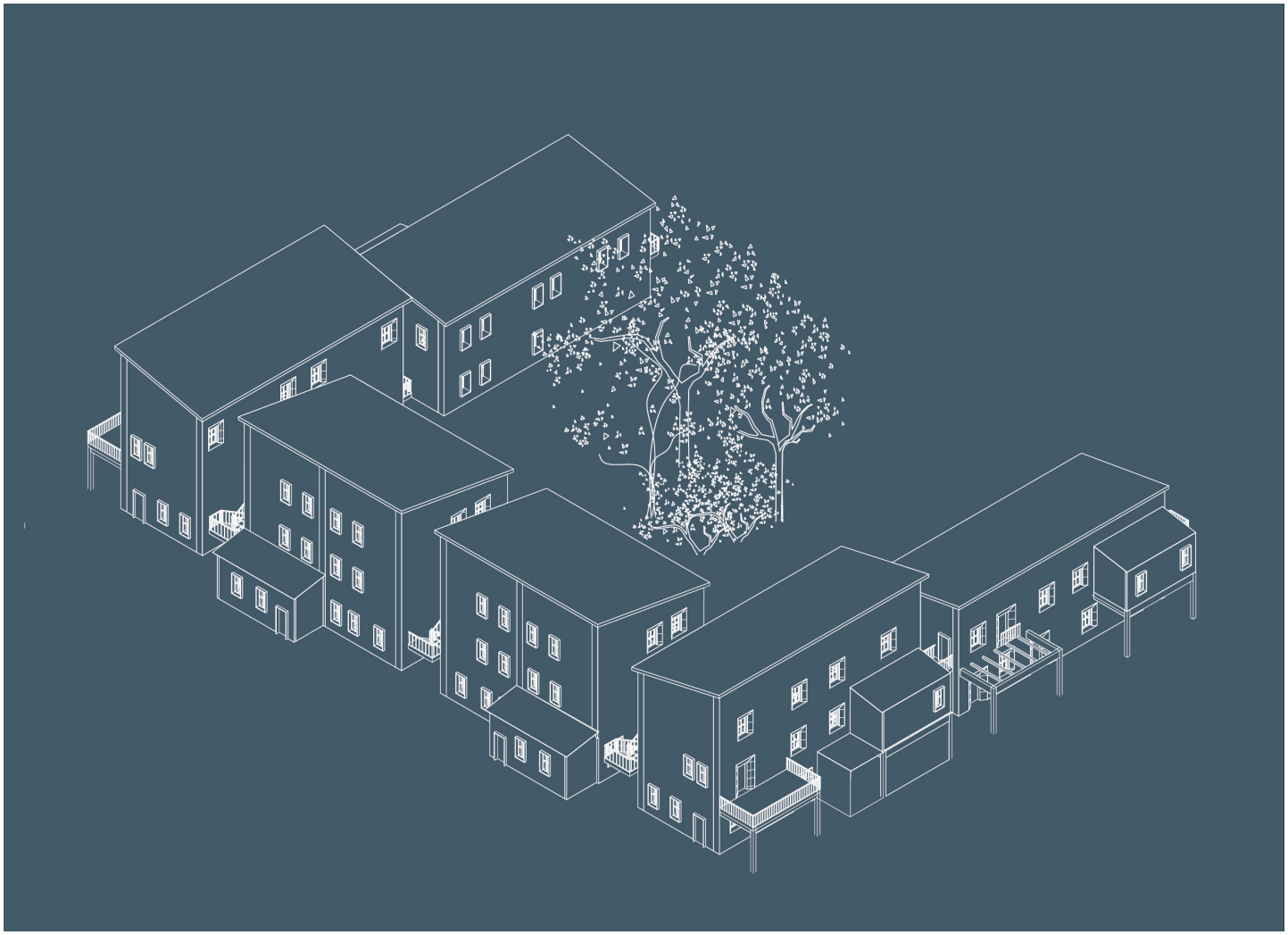
The Whynot Academy

©Francesco Giusti

Detail of the general ground floor: the new school



RESIDENTIAL MODULES



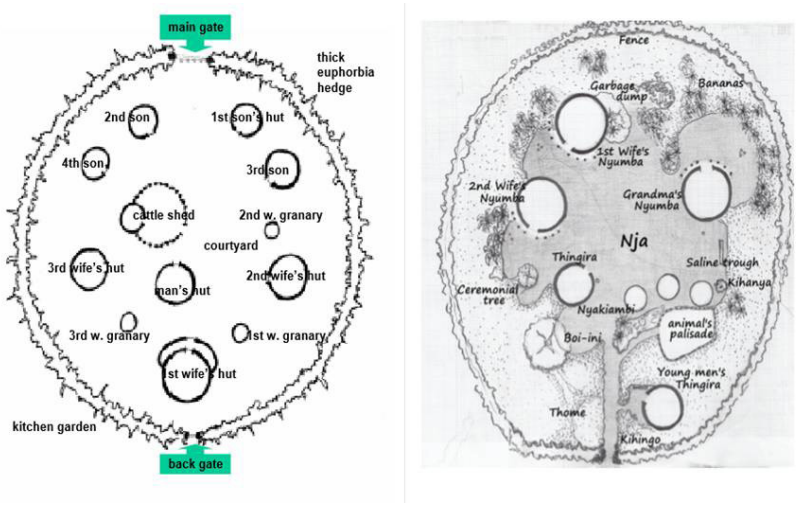
The necessity for housing comes as a consequence of the urban intervention. The module that is about to be described is designed to guarantee an absolute flexibility and an independence between the buildings. This is what permits every module to be independently built from the general intervention in the development process.
The court scheme resembles the recollection of the traditional typology of the huts common to the tribes the residents descend from. Kikuyus, Luos tribes mostly populate the area have a common construction root in the village draw, which will be later described.
Moreover the type chosen will develop micro communities in the area, built over the old living habits.

Cluster

The clustering of the modules needs to respond to the necessity of flexibility and community, as the recollection of a hanfull of families works as a baseline to the creation of a neighbourhood's micro-community. The same principle has been used for centuries in the traditional village structures of the tribes of the individuals who populate the slum, which are principally Luos and Kikuyu in this area of the Valley:

Luos is a tribe original of the Lake Victoria. Their homestead counted from two to twenty buildings, in a familiar cluster, closed by a strong fence. The **Kikuyu** tribal cluster makes use of a similar scheme. Materials used varied between what could be found on site, like mud, grass for the roof and wood for the structure. The use of metal sheets is today common for roofs of huts which are no longer rounded.

Left: Luo traditional familiar cluster
Right: Kikuyu traditional familiar cluster



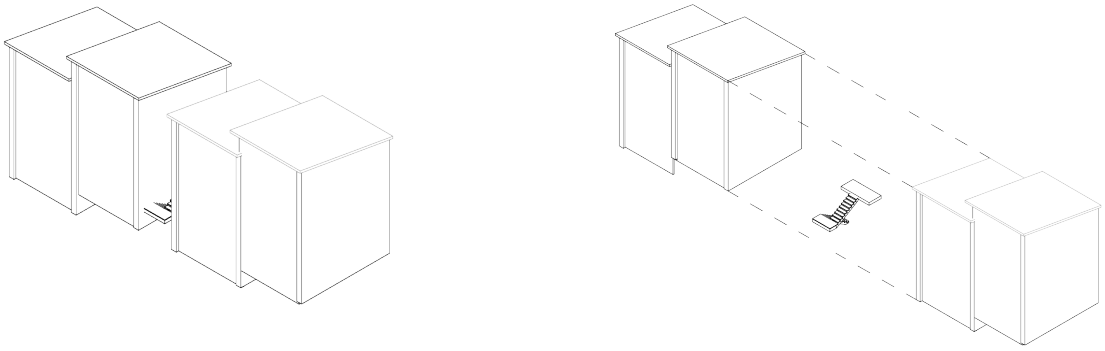
© Achieng, 2005: 9, Kamenju, 2013: 91.

Clustering buildings is part of the traditions of these cultures, and base for the draw of the project. The creation of courts marks a different context, creating, thanks to the fixed division range between the modules, opened passages between the dwellings, preventing the closure of the court and creating a urban yet private and safer space, where children and families may prosper and work in different businesses.

FLEXIBILITY

Horizontal: The independence of the structures frees the project from time and building constrains. The presence of a 3 m gap distance between the dwellings works both as a passage and as a ascent device.

Division between dwellings

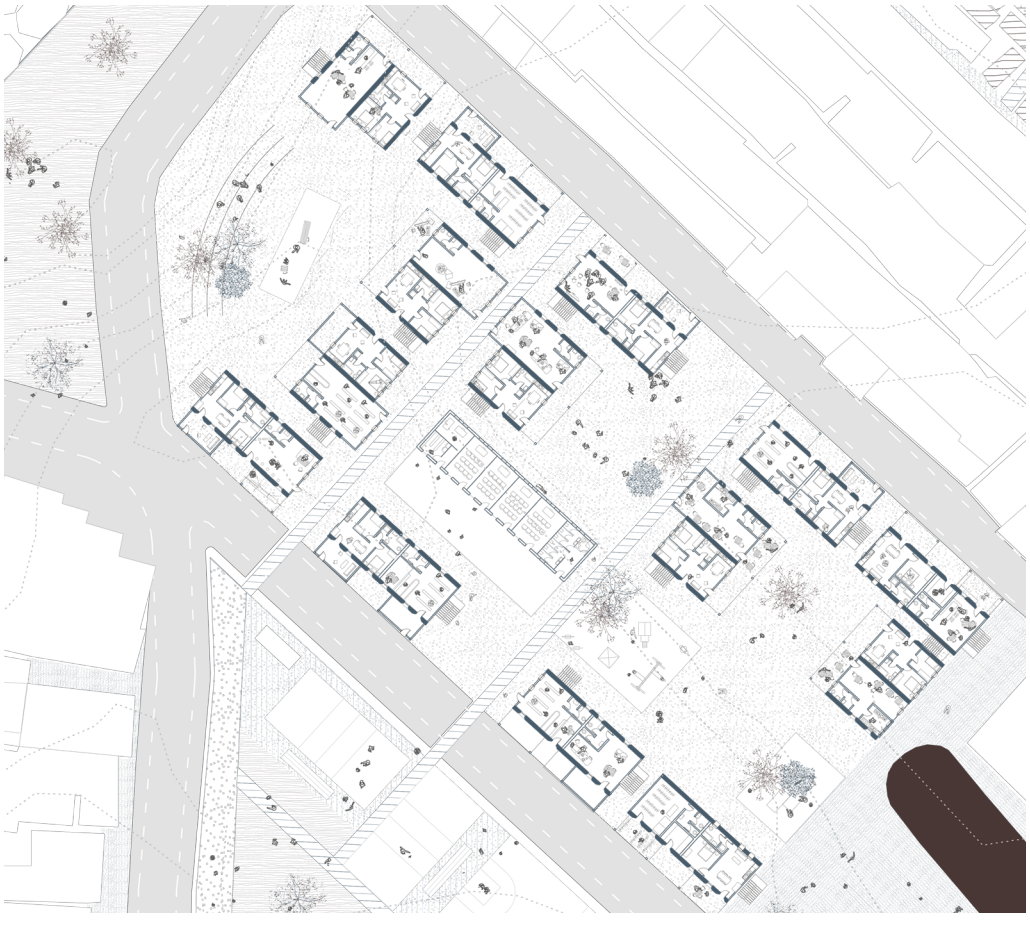


Cluster's alternatives scheme

Combination's scheme

The alternation and variation of the compositions creates private spaces in the areas, at disposal of both the communities living in the residential area and people from other parts of the slum.

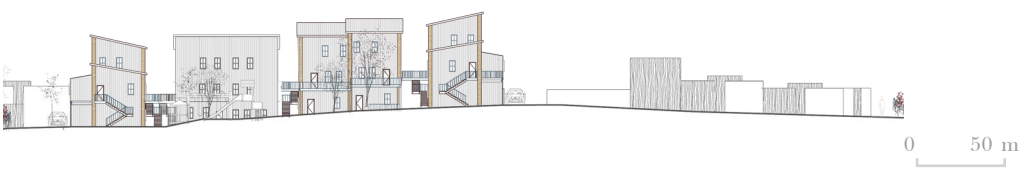
Ground Floor



Vertical: Moreover, a ground level flexibility is needed too, as the project is built over is not flat. As a matter of fact, gentle slopes shape the area, forcing the design of the dwellings to be adaptable to he height gap.

Scheme of the level adaptability

Section of the area

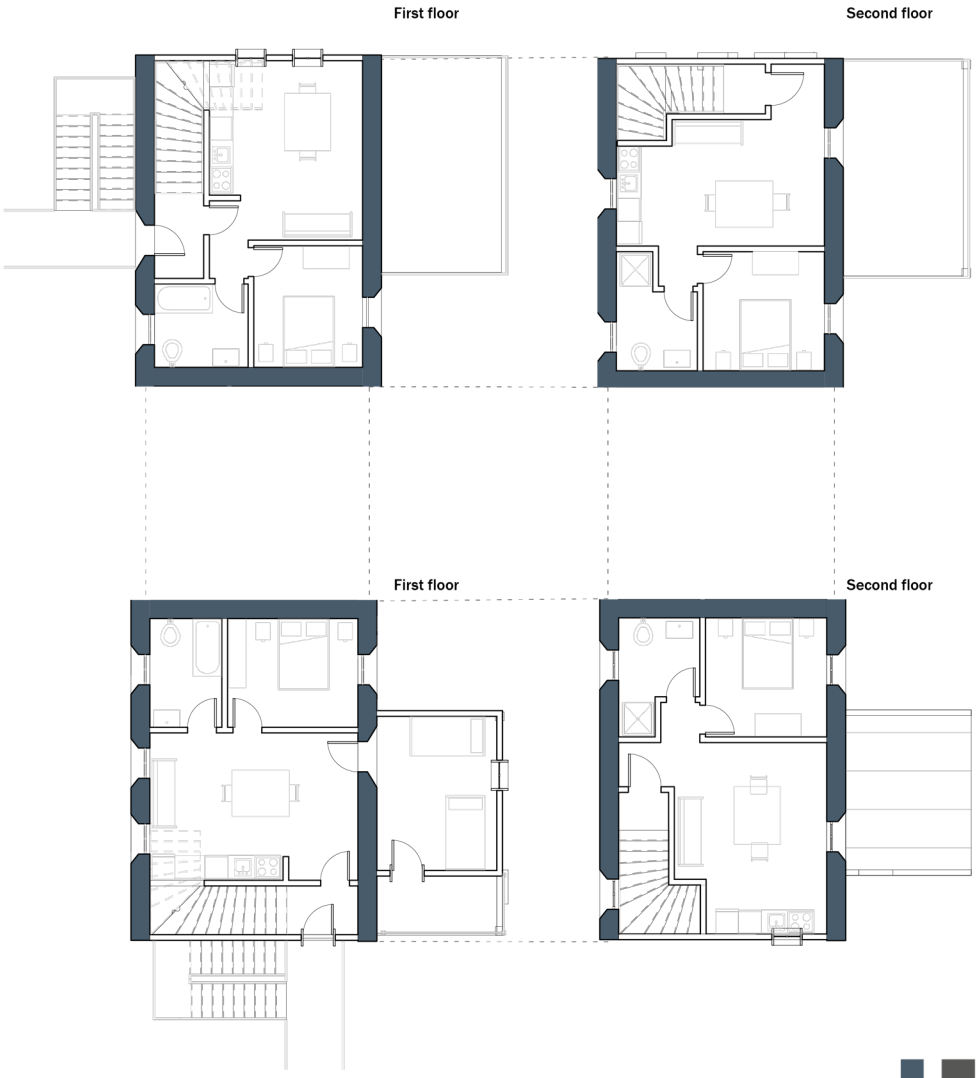


Floorplans

When designing for underdeveloped areas, the necessities of space of individuals is to be seen in different perspective, as these people have been living in a lower-than-minimum standard space for most of the time spent in the city, merging all the functions in one single, minimal space (see chapter *'Shelter', page 45).*

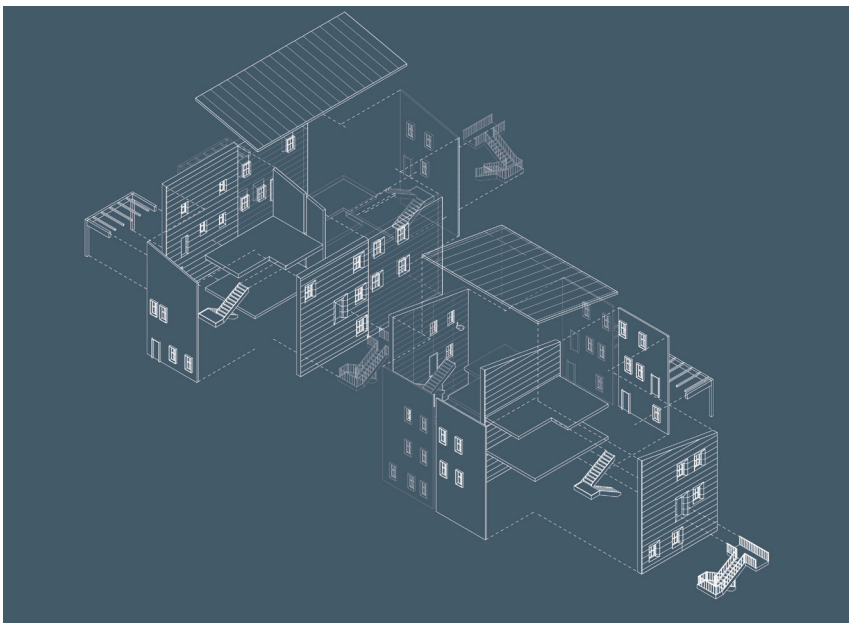
The project identifies in the two-rooms apt. the optimal standard from which the community may start its establishment, in order to contain as much as possible the costs of the new dwelling. The idea behind this choice doesn't only come from the costs but also from the act that the design has to forecast a further construction, both to gain a better integrated appearance and to better respond to the necessities of the single families.
Apartment's square footage will start with an indicative 35-40 m^2 area, which may be extended of a further amount of 16 m^2. (see next chapter)

Module 1 floorplans



0 2 m

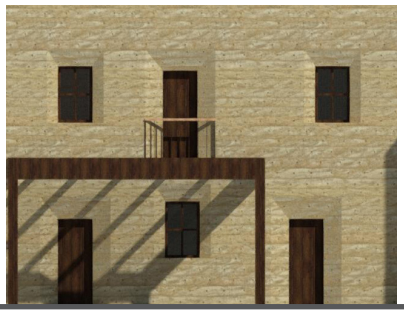
Modules group together a number of apartments ranging from a minimum of four to a maximum of 6, grouped together symmetrically



SELF-BUILDING

Adaptability of the dwellings to needs of residents is with no doubt a very important matter. Most of the commercial activities studied in the previous chapters have a front porch under which the commercial activity may take place, while the rest of the residential functions take place inside (see '*A shack architecture catalogue*', *page 43)*. The adoption of such a pattern has been reproduced in an external porch made of structural wood, which may be used as please by the residents, as it may be used as a platform over which extend the square footage, a veranda, a balcony or as a commercial activity area.

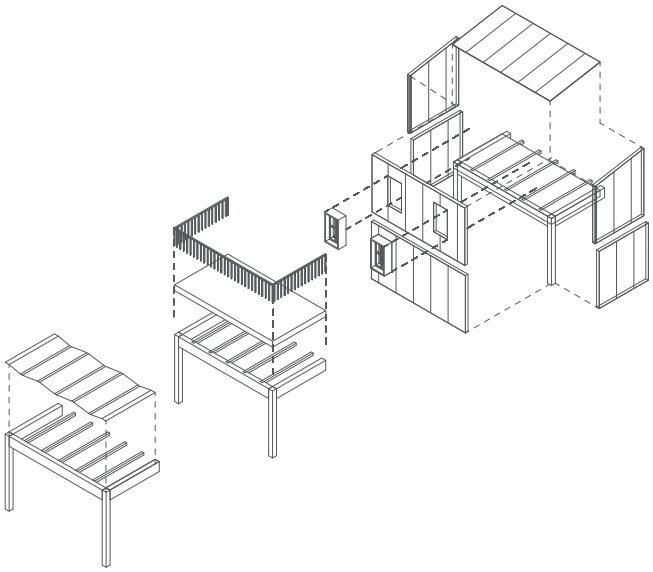
Type 1: veranda



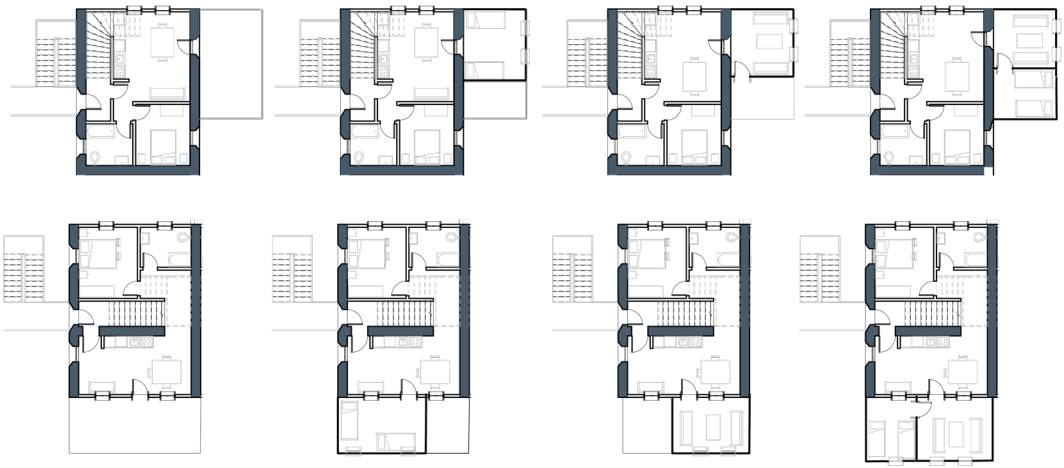
Type 2: balcony

Type 3: additional room

Scheme of the compositions



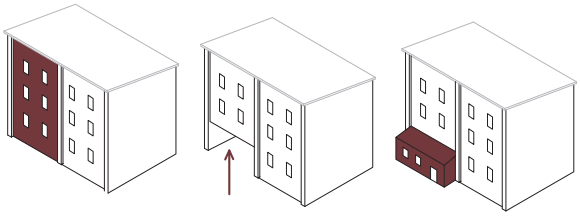
Floorplan expansion alternatives



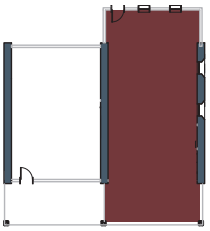
0 1 m

Two types of external walls encase the residential area: a rammed earth one and a metal sheet one. As the metal sheet is a non-load-bearing type of external wall, it gives the possibility to extend even further the ground floors of the modules.
The maximum amount of footage obtainable reaches 80m^2, which may be very useful to commercial and cultural activities populating the ground floor. The space made available by this device merges with the commercial one of the veranda.

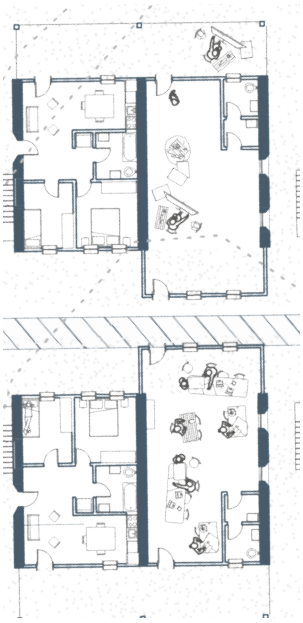
Personalization of the wall: scheme

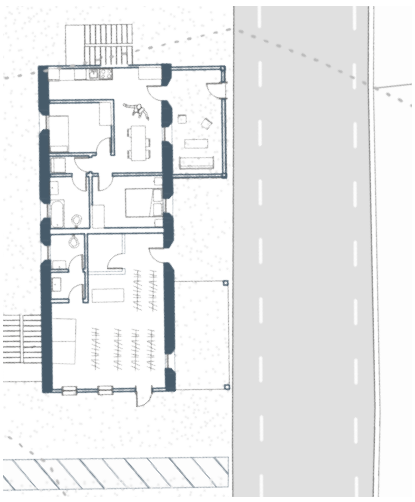


Expanded groundfloor vs original one



Examples of ground floor adaptability of the modules

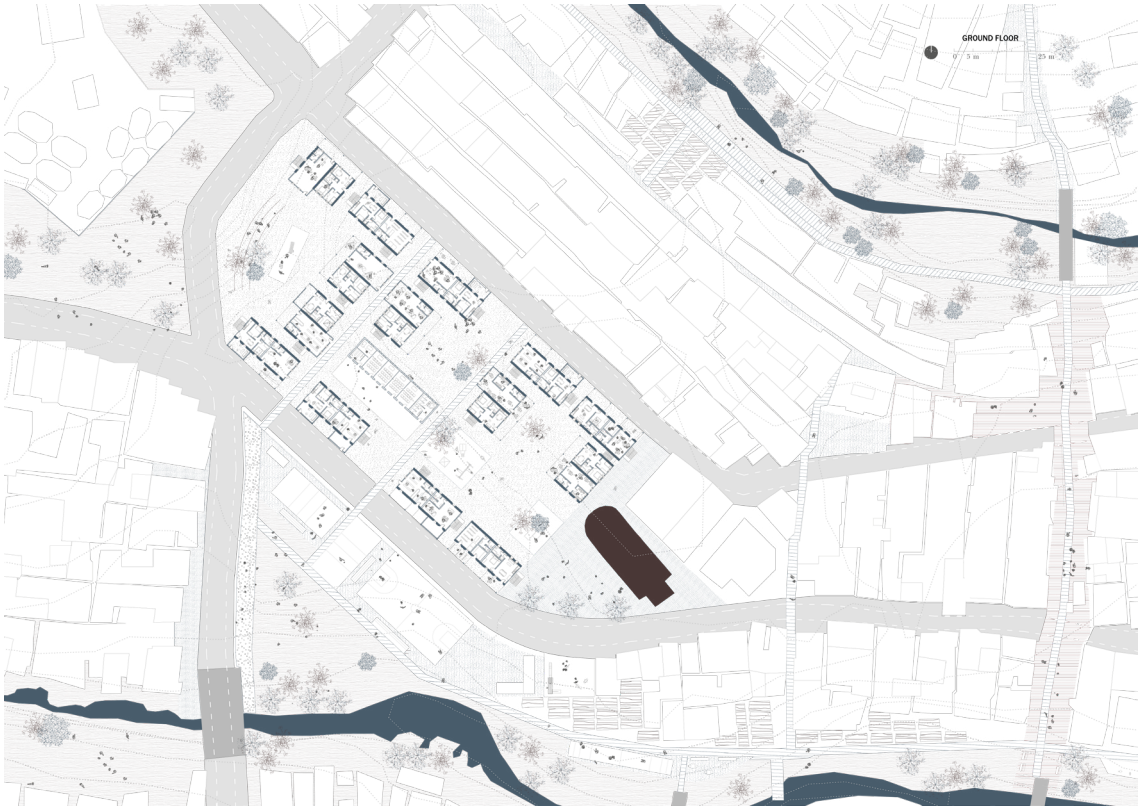




COMMERCIAL FACADES

Every module has been provided with a huge amount of space which can be dedicated to a new commercial activity or to a residential function. This idea finds its origin in the necessity of a trigger for the upgrade of the area, as the necessity for a job resource is very urgent. The idea that the residents may find the possibility to work in the slum, as most of them already do, will help the development of an independent community.

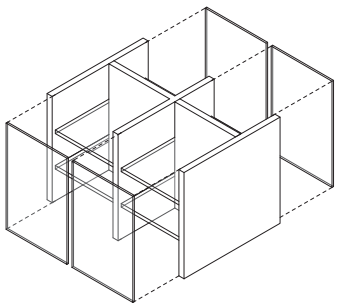
Ground floor



Structure and materials

The choice of flexibility, cost-efectiveness and ease-to-build have shaped the structure of the modules.
Two types of wall have been chosen for the project: a metal shet, non structural one, mainly used for partition and non bearing external walls, and a rammed earth one, which fulfill the structural function.

Structural diagrams



NON STRUCTURAL WALLS

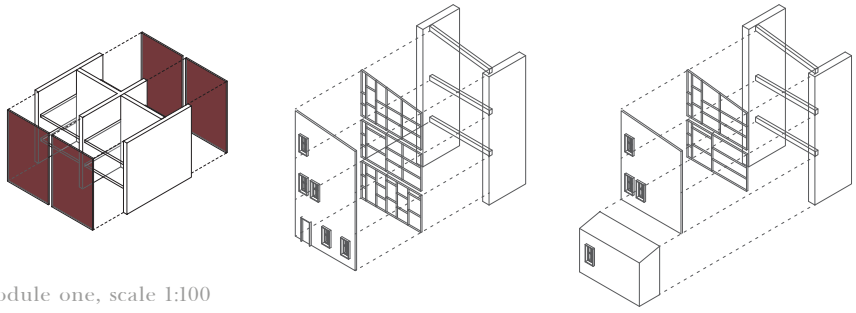
These static elements of the façade stand over a wood structure frame, fixed to the structural elements. This kind of construction has used by Urban Think Tank in the Empower Shack project (see *'Empower Shack', page 84)*

Empowerment Shack

Source: Urban Think Tank
http://u-tt.com/project/empower-shack/

Structural diagrams

Rammed earth structural Walls



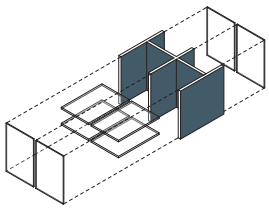
Minor elevation of module one, scale 1:100

STRUCTURAL WALLS

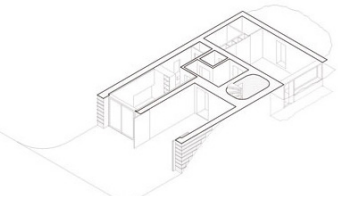
Earth and mud have been building materials of the original tribes of people living in the slum, both inside and outside the urban context. The Valley's huts were originally built in this way , before the overcrowd of the lands took over. The ease of construction of this material makes it a good compromise between a cost-effective material and a performative one.

Structural diagrams

Rammed earth structural Walls



The non scatolar scheme, usually required for this kind of construction, is balanced by a connecting wall between the two external ones, which works as a solid spine.
The project by architects Bolthauser Architekten in Zurich might be a good example about the structural qualities of rammed earth



Source: Architonic.com

Majour elevation of module one, scale 1:100

SECTION

Roof

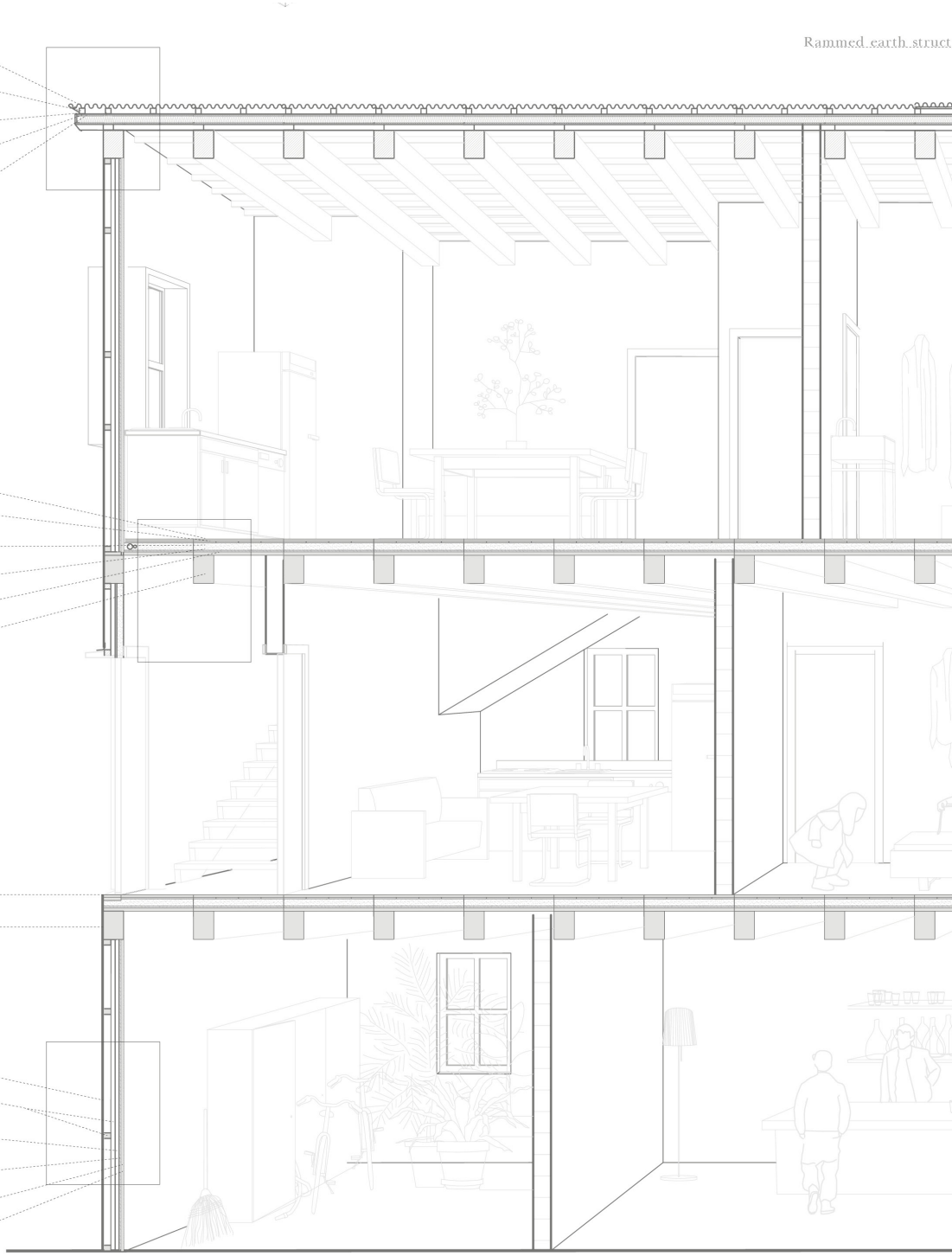
Metal sheet layer
Interscape, 5 cm
Impermeable membran, 0,5 cm
OSB panel, 1.5 cm
Insulation, rock wool, 6 cm

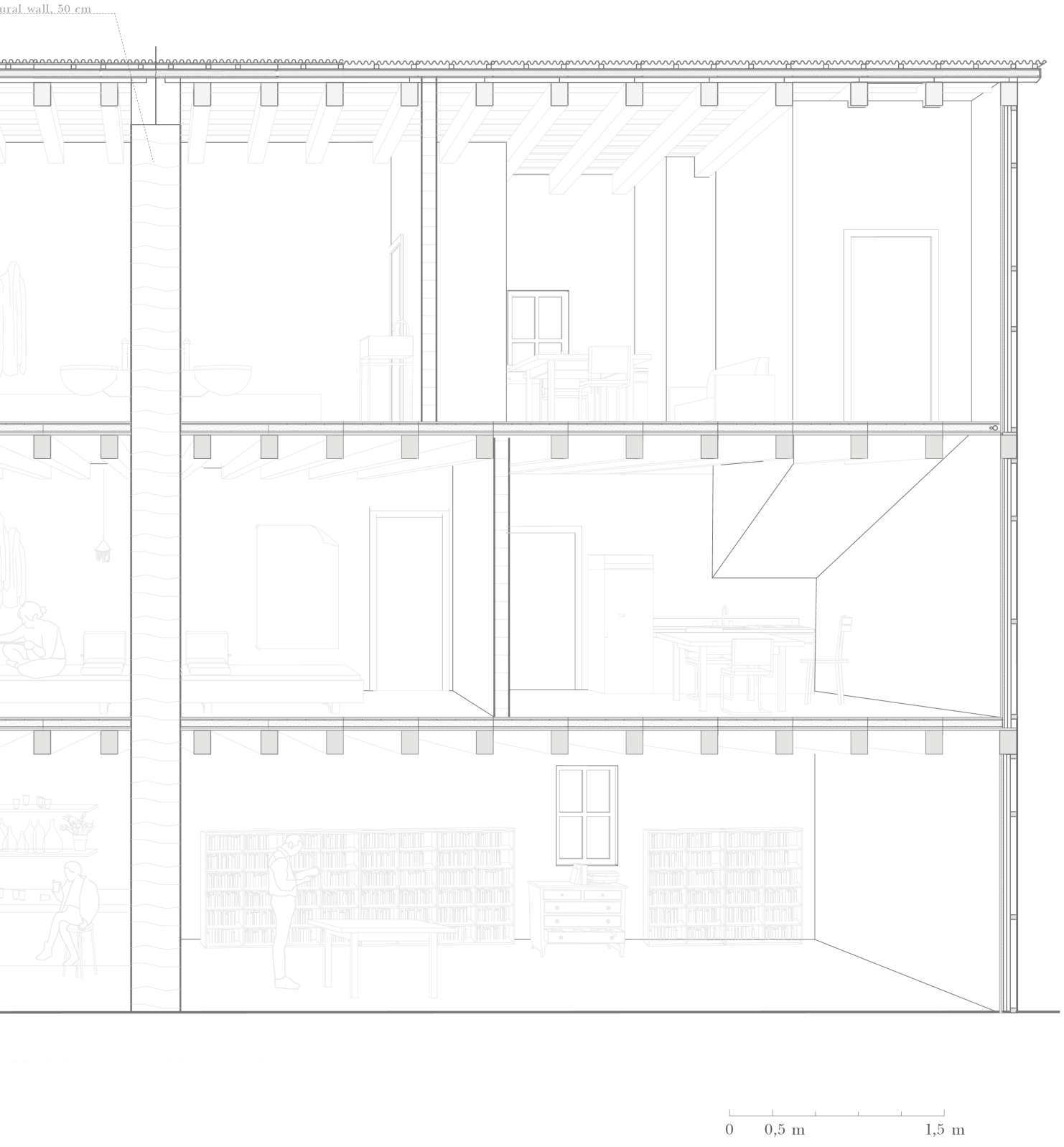
Interfloor

Flooring, 3 cm
OSB Panel, 1.5 cm
Expanded clay system screed, 6 cm
Anti-impact insulator, 1.3 cm
OSB Panel, 1.5 cm
Wooden beam, 18x25 cm, Cypress

Metal sheet facade

Metal sheet layer
Wooden (Cypress) frame: 5 cm
Interscape, 5 cm
Anti-impact insulator, 1.3 cm
OSB Panel, 1.5 cm
Plaster, 0.05 cm




ural wall, 50 cm
0
0,5 m
1,5 m

SCENERIES

Development of the project

Since the development of the entire masterplan requires an enormous amount of economical resources, the residential project has been though independently from the masterplan's one. The idea behind this decision is the fear of a miscarried urban internvention, which would cause much more damage than the current situation

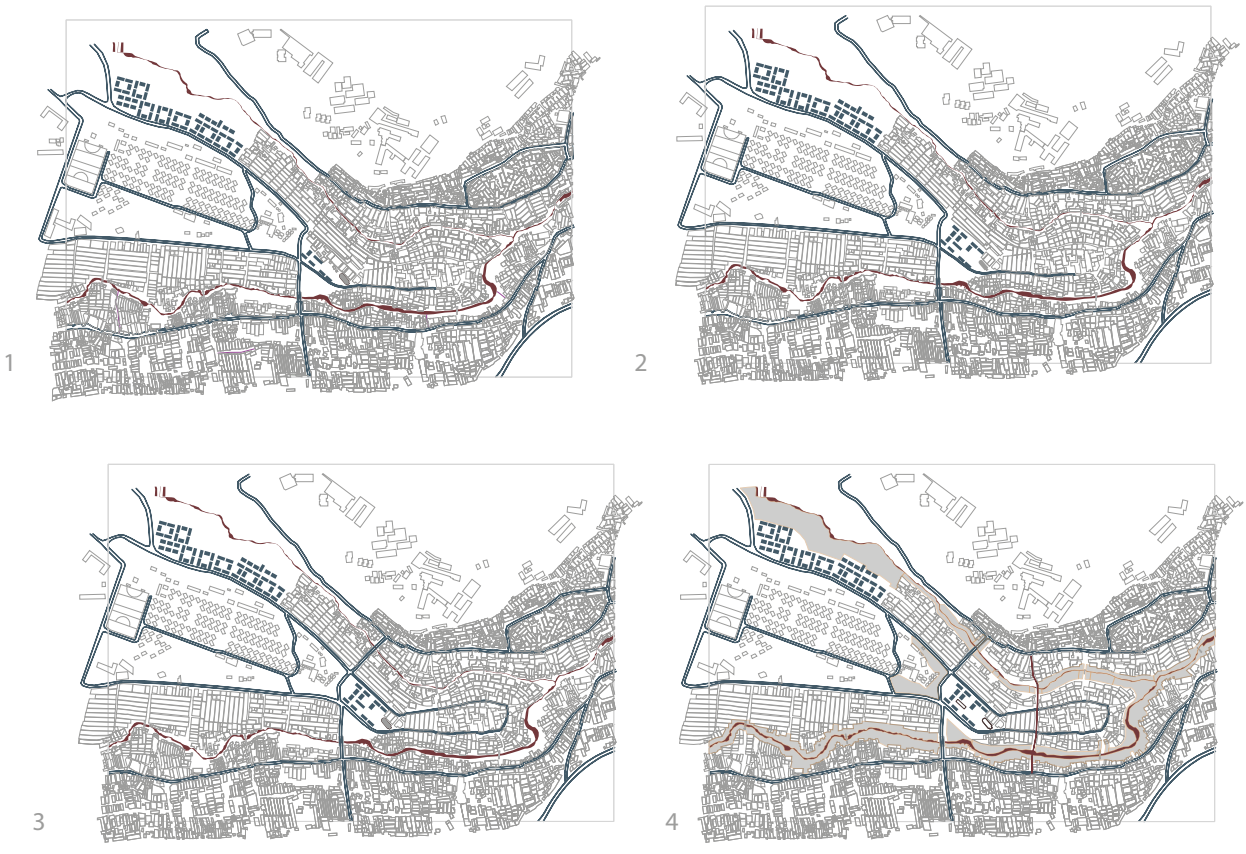
SCENERY 1: CORRECT URBAN INTERVENTION

Of course this is the best possibility the project could be perpetuated, but also the less probable. The intervention would start with a temporary relocation of the dwellers in a different area of Nairobi, in order to upgrade the area starting from the infrastructures and the service distribution, to be carried on as described in the previous chapters.

SCENERY 2: A HALFWAY URBAN INTERVENTION

This is the most dangerous scenery because the temporary relocation of so many people might be bearable for a short period of time. As the demolition of the endangered shacks is the first act to perpetuate the constitution of both the River Basin and the streets, a mislead intervention would bring to an elongation of the period of construction, which risks to end up not only in disorders but also in many people without a home to come back to after the urban intervention.

Prevention
In order to avoid this risk, lots chosen for the residential function would be the first parts of the project to be built, because they stand over lands where minimum or none eviction of residents is required. In the case of success of the comunitarian intent of the design and planning, these parts of the masterplan will work as keys to the community to insist in an intervention on a bigger scale, demanding and participating to the project complete realization.



Timeline intervention

Outreach
The development of the project won't be quick. The outreach on the community over the themes may have already started in 2011 with the Collaborative Upgrading Plan and the many

other associations populating the slum, but since the intent is the participation of such a big audience (only among the to-be-demoulished shacks we are talking about more than 4 000 families) the outreach process must be effective and massive. A good financial plan and loan strategies for the individuals may also be a good motivation.

A UC Berkley student and MuST member co-faciliate a community planning session in Mathare in 2011

2011 Collaborative Upgrading Plan's workshops with residents

Handwork specialization

The amount of specialization required to build the residential parts of the project is not very high. Simple building systems have bee planned in order to deeply involve the community in the project and create job for the families.

Rammed earth is a type of material frequently used in poor interventions, given its availability and its ease of construction. It requires few elements of construction and a solid concrete basement for the plateau. A group of experts and manstrenght will prepare the workers for the job.

Source: The Akaa Project

Metal sheets and wood are already largely used in the Mathare Valley, so that the amomunt of specialization required will be nearly none.

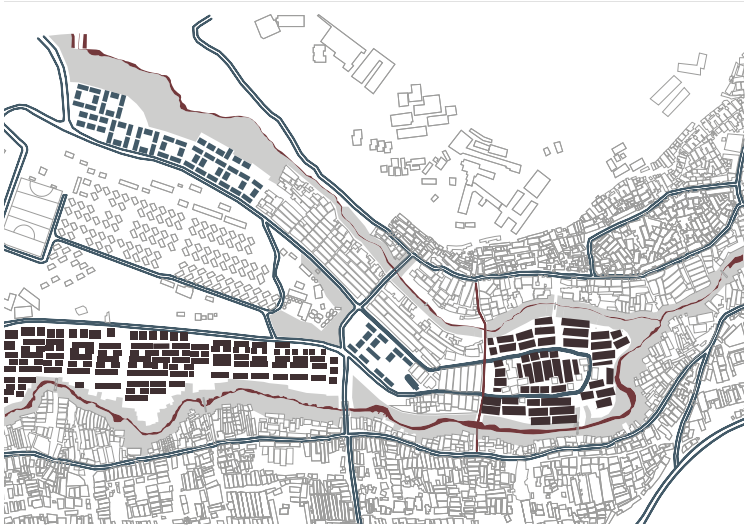
The reference to be kept in mind when instructing potential workers is the work done in the

intervention of Kambi Moto and its collaboration with the community, who has built its own environment and home, even though materials used differ from the ones chosen for the project.

Source: ADD, NAIROBI, KENYA, KAMBIMOTO HOUSING
https://www.architectureindevelopment.org/project.php?id=225#!prettyPhoto

Mathare 2050

The project here presented has been developed as the starting point to the upgrade of the slum. It is going to be joined to the project presented by the 2009 Collaborative Upgrading Plan "Integrated Slum Upgrading"[1] for Mathare 4B and Kosovo. The design will slowly the be integrated between the new masterplan the Adaptive River Basin and the new residential project.



Monitoring and maintenance

The maintenance of the intervention will rely on the community itself, as it acts both as beneficiary and actor. The projects of Kambi Moto and Quinta Monroy are ambassadors of the care and attention the restored community is able to act on the new dwellings, with episodes of , of course, self-construction and adaptability to personal needs and tastes.

Kambi Moto

©NaijaFederation

Quinta Monroy

©Elemental

As mentioned in the first chapters, the community involvement and the tenure security are powerful instrument to push citizens towards a better care of the city and the environment they live in.

The security theme is also a very important factor; residents will become protectors and protected individuals by the 'neighbourhood surveillance' of the community.

Conclusion

As a consequence of the urban population explosion which took place in the last years, the study aimed to analyse the conditions of the urban informal settlements, focusing on the city of Nairobi and in particular on the area of the Mathare Valley, and to propose a possible solution to the residential problem affecting these areas of the city.
Informal settlements result from bad urban interventions or perpetuated political interventions; they are the consequences of problems, not the origin. As the social degradation is easier to see than what causes it, usually informal settlements are considered like some kind of rotten area of the city, leading to a general approval to violent actions against it among the city population. In the case of Nairobi, as described in the first chapter,historical acts, laws and actions have deeply influenced the segregation within the city, first due to colonial racial segregation, which has divided the city into three different categories and zones based on racial origin of the dwellers in 1948, than, after the independence of 1963, the segregation has acted on the base of the different values of economical wealth of the residents and of tribal origin and political favoritism. The lack of coordination and attention to the strong urbanization process which took place after the removal of the colonial and racial restrictions and the laxness of actions against the agglomeration of huge masses of immigrants has lead to the explosion of informal settlements in the city.
The presence of the United Nations Headquarters may influence the urban draw of the city centre, thanks to the creation of the so-called 'Blue Zone', but its influence plays a more important role in the distribution of the resources for the general upgrade of informal settlements, pushing the governments and the political organs through welfare projects following the guide of the 2030 worldwide Vision of the Sustainable Development Goals and the Habitat III conference's results. Nairobi has faced many projects in the last 20 years for the upgrade of the city, although KENSUP and KISIP, the upgrade organs born following the guidance of the Sustainable Development Goals, may not have proposed eligible solution models in this field. On the other hand, private associations and projects, like the cases of Kambi Moto and the Why Not Academy, have been able to develop sustainable proposals for the environments they are built in and provide good examples of the typology of intervention able to play a central role in the rehabilitation of these areas.
In the analysis of the informal settlements of Nairobi, the focus on the impact of the urban environment over people living in informal settlements is outlined. The processes and phenomenons taking place in these areas are mutually linked and influenced, and deeply below international standards of poverty set by UN organs. Lack of basic services like water distribution and sanitation services forces the slum population to pay more than wealthier one to be able to make use of them. In the end, the expenses just for these services for a family living in Mathare weights around 6% of the monthly expenses for sanitary services and 3% for the water one. The struggle for survival in these environments adds difficulty to the development of the population which, together with the high pollution and precarious sanitary conditions of the environment, inhibits the upgrade of the informal settlement. Also, the tribal favoritism practice analyse, which finds the Kikuyu tribe to be the most powerful both inside the slum and in the political context increases the difficulties in the practices of requalification of the lands, as well as it does the political power that this ethnic group covers in the city of Nairobi. The segregation of the lands is the direct result of such behaviour, with private landlords, mostly found to belong to the Kikuyu tribe, living outside of the degraded areas and receiving rents for lands they sometimes have illegally occupied or received as a payment for political favoritisms and corruption. This generally corrupt environment inhibits upgrade processes both from in the forms of top-down and bottom-up, as the political burocracy and corruption these proposal need to pass through slow down and deplete the original plans. The difficulty of action in such environment derives then not only from the slum environment but also from the same people who should care about its upgrade and funds.
In the second chapter, the analyse of the Mathare Valley points out pillar aspects of its development: the historical process of expansion has shown how the valley, from a series of randomly scattered informal settlements, has exploded due to the tragic management of plots and land allocations, and the degradation of first proposals of urban upgrade which took place during the 70s, resulting in speculative building processes and lack of service distribution all over the land. The tragic urban development process is another inhibition to the general upgrade of the slum, as the lack of basic services like water distribution and sanitation services retain formal urbanity development. The study has also outlined the deep activism present in the slum, describing how private or community associations work as the base for mutual help

and assistance within the slum dwellers in the Valley, thanks to economical funds, security and educational oriented associations and community services oriented ones. The catalogue of the building environment has outlined the general aspects of the informal settlement's spontaneous architecture, which helps to define the social and private habits of the residents and the description of the typical living conditions of the dwellers. The study has shown how the extremely difficult environment has forced the residents to the compression of the spaces defining the housing environment into a single-ambient alcove, where the flexibility of every element becomes a necessity in order for the ambient to fulfil every function of the house and of the daily habits of sleep, eat and gather of the residents. The density of the sack architecture also plays an important role in the lack of privacy, enhancing the process of mutual control and communitarian cohesion among the residents, while the lack of services makes commercial activities like Water Tanks a necessity for the slum population where services can't reach.
The third chapter presents the peculiar characteristics of the villages of Gitathuru and 4B; the particular clustering forms of the shacks in the slum have to deal with the irregularity of the morphology of the area, as slopes and steeps characterize this environment. A further service analyse points out the lack of toilets and sanitary points, as well as the total absence of the sewerage system. Acts and interventions of slum upgrading in the city of Nairobi have been more successfull the more the community was included in all the processes of construction and upgrade of the area, from the general project and discussions to the construction itself,: the population have been able in some cases to choose the neighbourhood context (case of Empowermet Schack by Urban Think Tank) or to build the dwelling by itself after a proper preparation and education of the workforce (Case of Kambi Moto). The study of such cases have formed the base for the project design of the residential area.
Previous studies and plans for the Valley have also been taken into consideration for the design of the landscape and urban intervention, like the *2011 Collaborative Upgrading Plan* and the *Mathare River Riparian Zone project*. The Masterplan aims to an environmental action in the maximum respect of the existing urban landscape. After a study of the local laws and the previous projects, the draw of a new adaptive river basin outline has been considered necessary for the security of many families populating the slum, because the lots their dwellings were built upon were located in risky areas in the case of a flooding emergency. It has been decided to reduce the river basin buffer minimum zone from 30m to 10m as imposed in the *Planning Act 15.c* of the Kenyan Law, which has speared from a prevision of demolishment a huge number of households, and to develop the masterplan following the work by the *2011 Collaborative Upgrading Plan*.
Starting from the draw of the New Adaptive River Basin, and a correct landscape project, able to maintain the control ove the slum expansion, the focus moved towards the implementation of main driveways and pathways: motorways in the 4B village and in Gitathuru are to be connected within each other and with the neighbouring driveways and the Thika Road. This will be a starting point to enhance the upgrade of the area, as it will permit to emergency wagons to reach most of the slum, and will permit the birth of commercial activities in the area. A further study of primary and secondary walkways aims to improve the night activities and the attending of most of the residential areas, connecting them to neighbouring villages. A further provision of urban activities and devices will increment the attending of the public areas of the park, also protecting it from a slum spillover.
The modular character studied for the residential proposal is the best choice for an intervention of uncertain development. The fact that every module is independent from the others allows every household to build at a personal path. The independence of the residential module from the masterplan realization has also a fundamental argument, as the difficulty of relocation for the high number of households makes the realization forecast period very long and difficult. Cost effectiveness, ease-to-build, and local materials are what characterizes the modules. Every part of them can be easily built by the house-owner themself, which can be considered as a strategy to keep control of the mainteinance both during the building-site period and the life-period of the building. The flexibility given from the self-building solutions make the project fit to the needs of the households of any kind.
The mutuality of the intervention takes root from the community, from and to which the upgrade takes place. The community needs to be educated and helped to work as actor, activist ad caretaker of the intervention, both of the landscape and of the residential one. The autonomous and natural reconstruction of the communities will be strenghtened and tightened together thanks to a common aim of property-care and project realization, as well as the job possibilities that such big intervention brings to the area. One of the core elements of the

project is the sense of belonging that needs to raise from the urban upgrade, which is itself a guarantee to the care taking of the environment by residents.
The solution here described improves the quality of life of the residents by providing an environmental and a residential solution, given the centrality of the community in the actio.
The maintainance will be taken care of by the residents themself, and even its expansion. The expansion visions and projects, like the ones proposed by the Collaborative Upgrading Plan for Mathare 4b and Kosovo Villages, can then be realized in the same way the intervention has been realized, i.e. using the local workforce, now educated and specialized in the building processes already realized in the experimental project of the lot in 4b Village.
The project here proposed, can be considered as an adaptable prototype, applicable to various degraded contexts or not and to be adapted to the local necessities and peculiarities. It is itself, as a matter of fact, an adaptation of another prototype of residential slum upgrading: the Rhizome project, described in the third chapter. The vertical flexibility that outlines the structure and the materials makes it a good solution for irregular landscapes like the one of Mathare 4b.
More in general, the present study has outlined some fundamental aspects to take into consideration when an intervention in poor contexts is made, given the improved distribution of fundamental services: - first and more important among all, the attention to community centrality, both in the project process and in the layout of public spaces - second, the central role of modularity and adaptability as the initial equal distribution of spaces and services for families is very important to avoid frictions within the community, the self building theme will fill the necessity gaps of every familiar unit left over; - third: the importance and care-take of public spaces as central matter for security improvements thanks to the neighbour-surveillance and an attendance distribution during most of the hours, obtainable thanks to the functional mix of the ground-floor.

Endnotes

REPORTED TEXTS

Nairobi Metro 2030 Strategy

'The Vision of Nairobi is to be a world class African metropolis by 2030. It will strive to create a world class working environment with a wide range of jobs, transport options and communication infrastructure. It is a vision of a world class living environment with modern housing, healthcare, cultural amenities and recreational facilities. Nairobi intends to provide high-quality office, production and storage space supported by a full range of ancillary services and information infrastructure.

The Nairobi 2030 plan intends to achieve its vision through a range of integrated initiatives that address the challenges that currently hinder urban development and social progress. Central to the city's plan on improving its international economic competitiveness is the development of regional and global service hubs for business, trade and finance. In addition to attractive foreign investment through a thriving business economy, the plan also supports the continued development of Nairobi's tourism sector through investments in hotel facilities, transportation access (including a massive upgrade of the Jomo Kenyatta International Airport) and crime prevention. Finally, the plan also intends to spur the development of industrial parks and facilities within the city as well.

The city also plans on investing heavily in building modern municipal infrastructure to improve access to electric, water delivery and sanitation utilities across the entire metropolitan region. In addition to providing basic access to these utilities, the plan also stresses the importance of improving access to information and communication technology networks that support business, government, education and literacy.

The plan also outlines the development of a transport master plan to effectively improve transportation infrastructure and land use planning to improve existing transportation options around the city. Focusing on improvement of the existing road network, the plan also details an urban mass transit strategy that centers around investments in high occupancy buses and modernization of the existing commuter rail network. By improving the city's accessibility to mass transportation, the city can effectively reduce road congestion and increase commuter access to the city center, while improving public health at the same time.

By implementing these strategies, Nairobi hopes to serve as a gateway between Africa and the rest of the world. It also addresses the growing poverty issues with the intention of creating a creating a better quality of life for those living in the metropolitan area.'[1]

Sustainable Development Goals [2]

Goal 1. *End poverty in all its forms everywhere*
Goal 2. *End hunger, achieve food security and improved nutrition and promote sustainable agriculture*
Goal 3. *Ensure healthy lives and promote well-being for all at all ages*
Goal 4. *Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all*
Goal 5. *Achieve gender equality and empower all women and girls*
Goal 6. *Ensure availability and sustainable management of water and sanitation for all*
Goal 7 *Ensure access to affordable, reliable, sustainable and modern energy for all*
Goal 8. *Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all*
Goal 9. *Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation*
Goal 10. *Reduce inequality within and among countries*
Goal 11. *Make cities and human settlements inclusive, safe, resilient and sustainable*
Goal 12. *Ensure sustainable consumption and production patterns*
Goal 13. *Take urgent action to combat climate change and its impacts*[3]
Goal 14. *Conserve and sustainably use the oceans, seas and marine resources for sustainable development*
Goal 15. *Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss*
Goal 16. *Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels*
Goal 17. *Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development*

2 Source : https://documents-dds-ny.un.org/doc/UNDOC/GEN/N15/291/89/PDF/N1529189.pdf?OpenElement

GOAL 11. OVERVEW[4]

Make cities and human settlements inclusive, safe, resilient and sustainable

1. Rapid urbanization and population growth are outpacing the construction of adequate and affordable housing

The proportion of the urban population living in slums worldwide declined by 20 per cent between 2000 and 2014 (from 28 per cent to 23 per cent). That positive trend recently reversed course, and the proportion grew to 23.5 per cent in 2018. The absolute number of people living in slums or informal settlements grew to over 1 billion, with 80 per cent attributed to three regions: Eastern and South- Eastern Asia (370 million), sub-Saharan Africa (238 million) and Central and Southern Asia (227 million). An estimated 3 billion people will require adequate and affordable housing by 2030.

The growing number of slum dwellers is the result of both urbanization and population growth that are outpacing the construction of new affordable homes. Adequate housing is a human right, and the absence of it negatively affects urban equity and inclusion, health and safety, and livelihood opportunities. Renewed policy attention and increased investments are needed to ensure affordable and adequate housing for all by 2030.

2. Access to public transport is increasing, but faster progress is needed in developing regions

Public transport is an essential service for urban residents and a catalyst for economic growth and social inclusion. Moreover, with ever-increasing numbers of people moving to urban areas, the use of public transport is helping to mitigate air pollution and climate change. According to 2018 data from 227 cities, in 78 countries, 53 per cent of urban residents had convenient access to public transport (defined as residing within 500 metres walking distance of a bus stop or a low-capacity transport system or within 1,000 metres of a railway and/ or ferry terminal). In most regions, the number of people using public transport rose by nearly 20 per cent between 2001 and 2014. Sub-Saharan Africa lagged behind, with only 18 per cent of its residents having convenient access to public transport. In some regions with low access, informal transport modes are widely available and, in many cases, provide reliable transport. Stronger efforts are needed to ensure that sustainable transport is available to all, particularly to vulnerable populations such as women, children, seniors and persons with disabilities.

3. Municipal waste is mounting, highlighting the growing need for investment in urban infrastructure

Globally, 2 billion people were without waste collection services, and 3 billion people lacked access to controlled waste disposal facilities, according to data collected between 2010 and 2018. The problem will only worsen as urbanization increases, income levels rise and economies become more consumer-oriented. The total amount of waste generated globally is expected to double from nearly 2 billion metric tons in 2016 to about 4 billion metric tons by 2050.

The proportion of municipal solid waste collected regularly increased from 76 per cent between 2001 and 2010 to 81 per cent between 2010 and 2018. But that does not mean that it was disposed of properly. Many municipal solid waste disposal facilities in low- and middle-income countries are open dumpsites, which contribute to air, water and soil pollution, including by plastic waste, as well as emissions of greenhouse gases such as methane. Investment in waste management infrastructure is urgently needed to improve the handling of solid waste across much of the world.

3. In too many cities, air pollution has become an unavoidable health hazard

Nine out of ten urban residents in 2016 were breathing polluted air—that is, air that did not meet the WHO air quality guidelines for annual mean levels of fine particulate matter (PM2.5) of 10 micrograms or less per cubic metre. More than half of those people were exposed to air pollution levels at least 2.5 times above the guideline value. Air quality worsened between 2010 and 2016 for more than 50 per cent of the world's population. Central and Southern Asia and sub-Saharan Africa are the two regions that saw the largest increases in particulate matter concentrations.

In low- and middle-income countries, the air quality of 97 per cent of cities with more than 100,000 inhabitants did not meet air quality guidelines in 2016, compared to 49 per cent in high-income countries. Ambient air

4 United Nations, Department of Economic and Social Affairs, Statistics Division (2018) https://unstats.un.org/sdgs/report/2019/goal-11/

pollution from traffic, industry, power generation, waste burning and residential fuel combustion, combined with household air pollution, poses a major threat to both human health and efforts to curb climate change. More than 90 per cent of air-pollution-related deaths occur in low- and middle-income countries, mainly in Asia and Africa.

4. Open public spaces make cities more inclusive, but many residents are not within easy walking distance of them

A connective matrix of streets and public spaces forms the skeleton of the city upon which everything else rests. Where public space is inadequate, poorly designed or privatized, the city becomes increasingly segregated. Investment in networks of streets and open public spaces improves urban productivity, livelihoods and access to markets, jobs and public services, especially in countries where over half of the urban workforce is informal.

Based on 2018 data from 220 cities, in 77 countries, few cities have been able to implement a system of open public spaces that covers entire urban areas—that is, within easy reach of all residents. Findings show that the average share of the population within 400 metres walking distance of an open public space is around 31 per cent, with huge variations among cities (from a low of 5 per cent to a high of 90 per cent). A low percentage does not necessarily mean that an inadequate share of land is open public space, but rather that the distribution of such spaces across the city is uneven.

The Right to Adequate Housing

CESCR General Comment No. 4:
(Art. 11 (1) of the Covenant)
Adopted at the Sixth Session of the Committee on Economic,
Social and Cultural Rights, on 13 December 1991
(Contained in Document E/1992/23)

(...)

8. Thus the concept of adequacy is particularly significant in relation to the right to housing since it serves to underline a number of factors which must be taken into account in determining whether particular forms of shelter can be considered to constitute "adequate housing" for the purposes of the Covenant. While adequacy is determined in part by social, economic, cultural, climatic, ecological and other factors, the Committee believes that it is nevertheless possible to identify certain aspects of the right that must be taken into account for this purpose in any particular context. They include the following:

(a) Legal security of tenure. Tenure takes a variety of forms, including rental (public and private) accommodation, cooperative housing, lease, owner-occupation, emergency housing and informal settlements, including occupation of land or property. Notwithstanding the type of tenure, all persons should possess a degree of security of tenure which guarantees legal protection against forced eviction, harassment and other threats. States parties should consequently take immediate measures aimed at conferring legal security of tenure upon those persons and households currently lacking such protection, in genuine consultation with affected persons and groups;

(b) Availability of services, materials, facilities and infrastructure. An adequate house must contain certain facilities essential for health, security, comfort and nutrition. All beneficiaries of the right to adequate housing should have sustainable access to natural and common resources, safe drinking water, energy for cooking, heating and lighting, sanitation and washing facilities, means of food storage, refuse disposal, site drainage and emergency services;

(c) Affordability. Personal or household financial costs associated with housing should be at such a level that the attainment and satisfaction of other basic needs are not threatened or compromised. Steps should be taken by States parties to ensure that the percentage of housing-related costs is, in general, commensurate with income levels. States parties should establish housing subsidies for those unable to obtain affordable housing, as well as forms and levels of housing finance which adequately reflect housing needs. In accordance with the principle of affordability, tenants should be protected by appropriate means against unreasonable rent levels or rent increases. In societies where natural materials constitute the chief sources of building materials for housing, steps should be taken by States parties to ensure the availability of such materials;

(d) Habitability. Adequate housing must be habitable, in terms of providing the inhabitants with adequate space and protecting them from cold, damp, heat, rain, wind or other threats to health, structural hazards, and disease vectors.

The physical safety of occupants must be guaranteed as well. The Committee encourages States parties to comprehensively apply the Health Principles of Housing5 prepared by WHO which view housing as the environmental factor most frequently associated with conditions for disease in epidemiological analyses; i.e. inadequate and deficient housing and living conditions are invariably associated with higher mortality and morbidity rates;

(e) Accessibility. Adequate housing must be accessible to those entitled to it. Disadvantaged groups must be accorded full and sustainable access to adequate housing resources. Thus, such disadvantaged groups as the elderly, children, the physically disabled, the terminally ill, HIV-positive individuals, persons with persistent medical problems, the mentally ill, victims of natural disasters, people living in disaster-prone areas and other groups should be ensured some degree of priority consideration in the housing sphere. Both housing law and policy should take fully into account the special housing needs of these groups. Within many States parties increasing access to land by landless or impoverished segments of the society should constitute a central policy goal. Discernible governmental obligations need to be developed aiming to substantiate the right of all to a secure place to live in peace and dignity, including access to land as an entitlement; (f) Location. Adequate housing must be in a location which allows access to employment options, health-care services, schools, childcare centres and other social facilities. This is true both in large cities and in rural areas where the temporal and financial costs of getting to and from the place of work can place excessive demands upon the budgets of poor households. Similarly, housing should not be built on polluted sites nor in immediate proximity to pollution sources that threaten the right to health of the inhabitants;

(g) Cultural adequacy. The way housing is constructed, the building materials used and the policies supporting these must appropriately enable the expression of cultural identity and diversity of housing. Activities geared towards development or modernization in the housing sphere should ensure that the cultural dimensions of housing are not sacrificed, and that, inter alia, modern technological facilities, as appropriate are also ensured.

(...)

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