



Mercato
Densification without segregation

P5 RESEARCH REPORT

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INTRODUCTION

The city of Addis Ababa is rapidly growing and evolving. Ethiopia's urbanization of the past decades has proposed many opportunities for economic growth, but has also resulted in an enormous shortage in decent affordable housing in cities. The graduation studio Dwelling Global Housing – Cross-cultural Methods and Positions / Addis Ababa studies this pressing issue. By researching Addis Ababa's history, development and identity, in combination with literature studies on various themes related to the process of urbanization in the developing world, a collective knowledge base has been established within the studio.

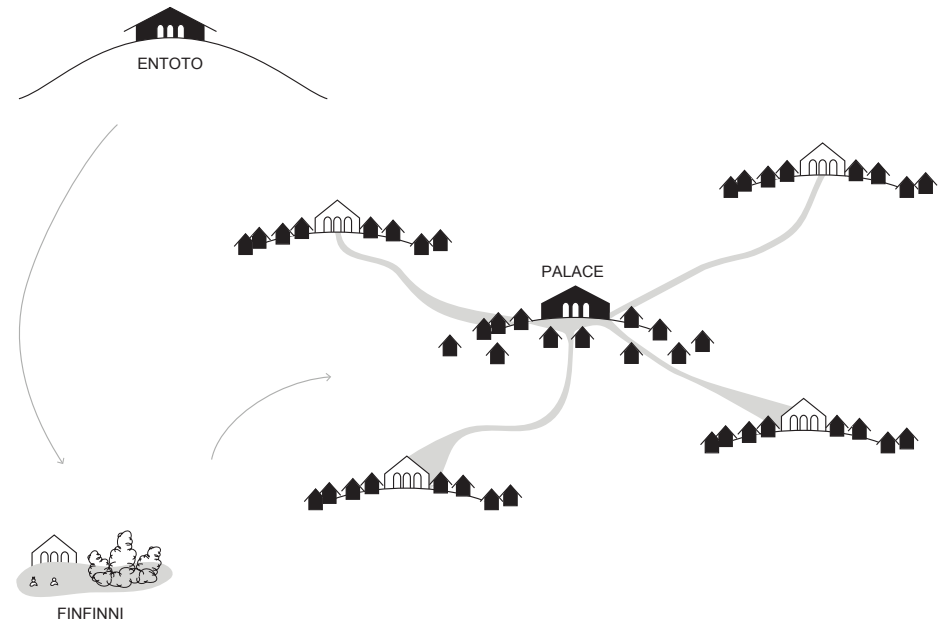
This research report forms my interpretation of this collective knowledge base. The research will be presented around three themes. Recurring throughout the entire research period, they have formed the input for my design proposal. These themes are 'the community lifestyle', 'mixity' and 'the appropriation of space'.



HISTORICAL RESEARCH

INITIAL SETTLEMENT

Before Addis Ababa there had never been a real city-building tradition in the Ethiopian Empire. In his book published in 1897, the British Count Gleichen argued that the Addis could not be called a town. He described the capital as a camp that covered a large area at the foot of the Entoto hills. Most probably, the very first settlement largely consisted of tents and huts. Among the first architectures were the residences of the Emperor and the Empress which formed the original nucleus of the Gebbi, the royal compound. This one was a settlement in its own, with several huts encircling it. In the end of the nineteenth century, Menelik's personnel numbered no fewer than 15,000 persons considering servants, chamberlains and artisans. A periodical swelling of the population often occurred because of the arrival of provincial governors and their retinues. The population was also slowed by the influx of armies perhaps of 30,000 and 50,000. Moreover, many people like the Gallas used to stay in the capital for short periods in order to sell the products. From the moment of its foundation, the capital layout expressed the traditional system of hierarchy of the ruling class and its society. As in the previous capitals, the principal men of state and of the nobility began to settle around the Gebbi. Their palaces, usually built on top of the hills, were surrounded by several huts thus forming an enclosure, or compound, whose size varied according to the importance and the power of the dignitary living in. These buildings were far from only being dwellings, as they all had a significant political importance. In the capital, administrative and judicial functions were carried out from private residences. In these regards, the open veranda that characterized many of these architectures not only served as circulation space, but also allowed a constant control over the surrounding territory. In gener-



al, the Royal Palace was an architectural model to imitate. At the moment of its foundation, and in the

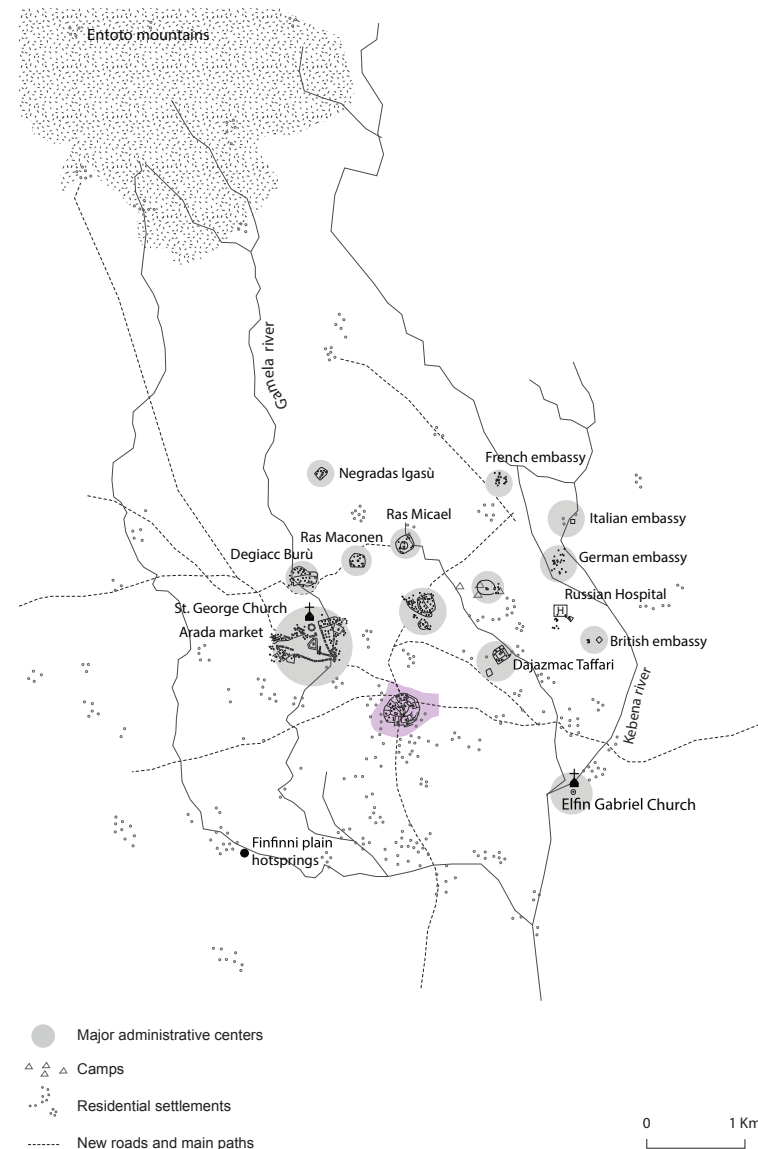
1)1881 First military settlement of the king Menelik II in the region of the Ontoto mountains.

2)In November 1886, while the Emperor was off in a distant corner of the Empire, his wife Taitu Bitul moved the encampment from the hills down to the current site of Addis Ababa.

3)1886 Beginning of the construction of the 'Gebbi ' an Amharic word literally meaning 'compound fence'.

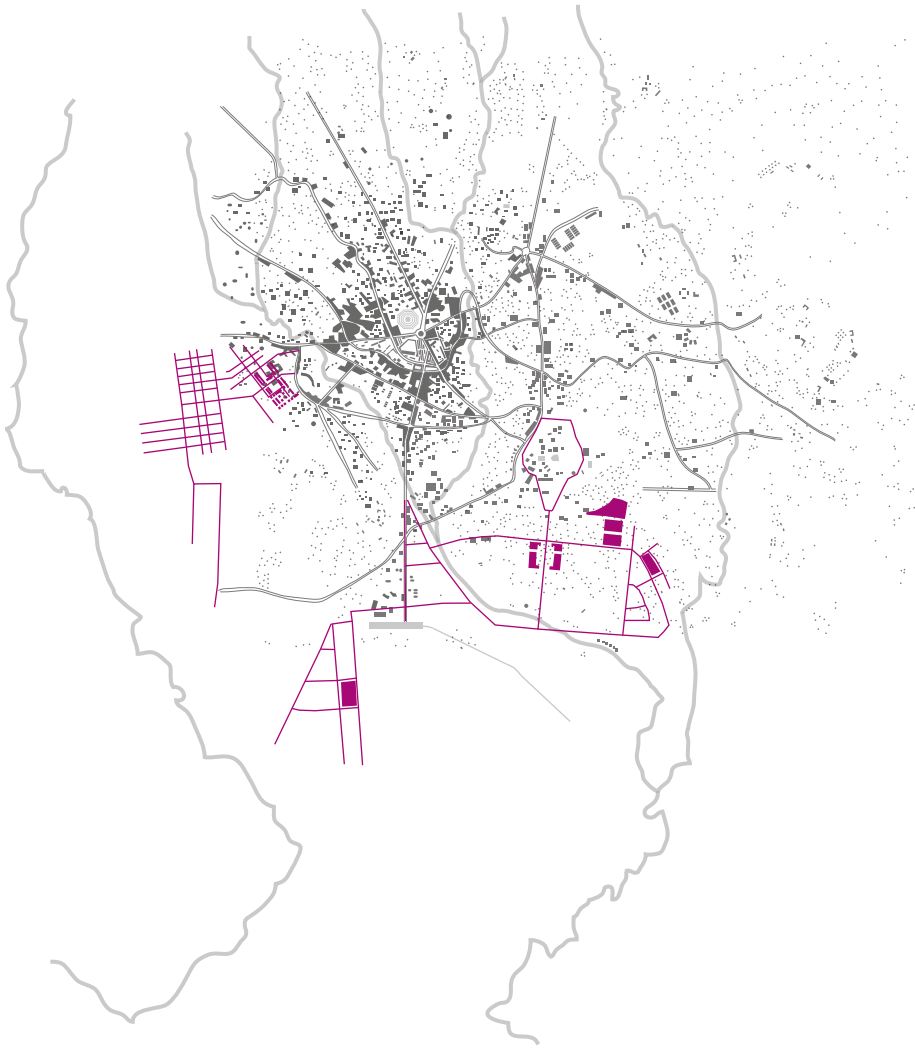
4) Construction of embassies and buildings with administrative functions.

5)Grow of the residential settlements around Gebbi and around the administrative and trading enters.

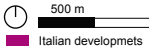




Merkato late 1938
"The first stalls"



1940_Italian developments



HISTORICAL RESEARCH

ITALIAN OCCUPATION

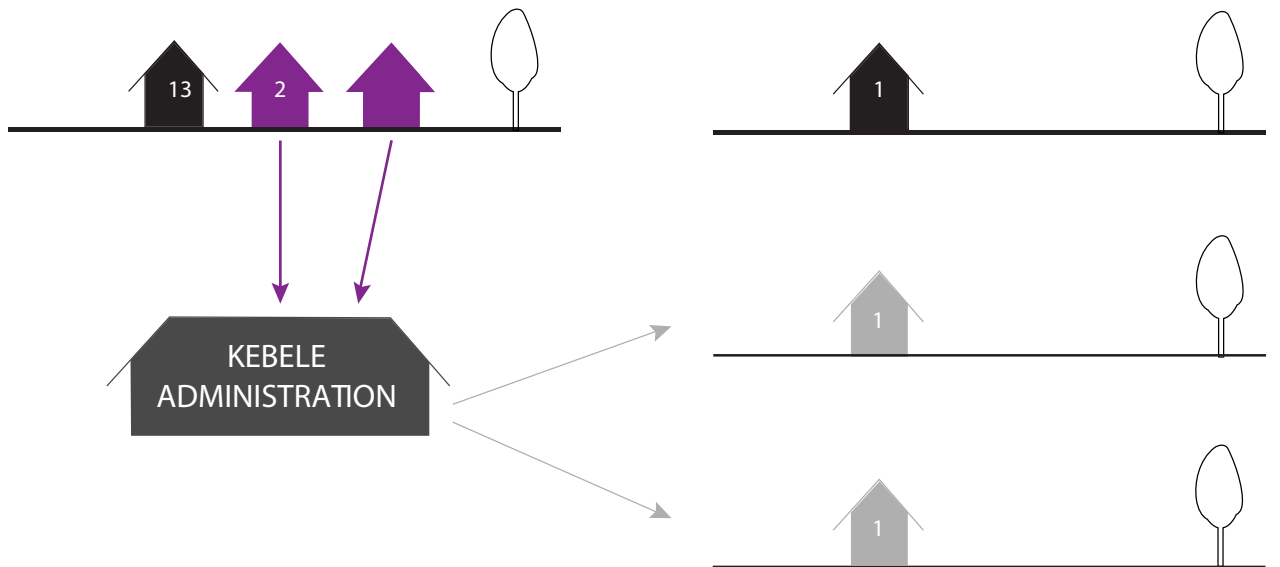
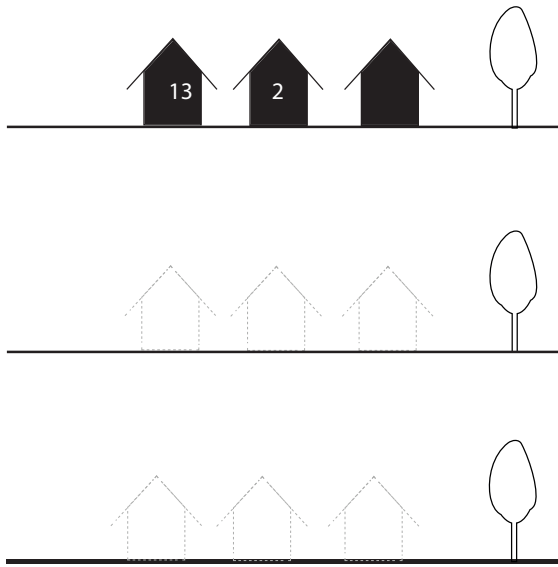
The time-frame of 1936 until 1974 can be subdivided in two distinct sub-periods, following the political events that took place. In 1936, Ethiopia was successfully invaded by Italian troops. After the defeat in Adwa in 1896, that dramatically put an end to the 19th century dream to set an empire, the conquest of Ethiopia had become a personal business for Italy and was considered to mandatory be a point of priority for all the following governments. With the eventual conquest of Ethiopia during the reign of Mussolini, the vision of establishing Italy's grand empire of Africa Orientale Italiana (Italian East Africa) seemed to become reality. Addis Ababa was planned to be the colonial capital of the empire. The Ethiopian Emperor Haile Selassie fled the country and resided in Bath, England.

THE THIRD AND FOURTH ITALIAN MASTER PLAN

The third plan, approved in March 1938, shifted the intended centre altogether, southwards (and downhill), leaving the densest native area around the church of St George, uphill, more or less in place. Moreover, the plan moved important areas southward and downhill such that the centre was now actually the periphery. Italian residential quarters were placed to the southeast; the railway station to the south; and industrial areas to the southwest. At this point, the work began on the native quarter - now settled to the northwest, beyond the market - and commercial and industrial areas. The natives were not only set apart from the centre of the city, but they were sorted out into regular subquarters according to their ethnicities and religions.

The final revisions, making up the fourth plan which was finalised in October 1938, focused on the Italian "centre" itself, making it more grand and imperial. The newly proposed plan comprised two parallel axes: the first axis was to connect the Arada commercial centre) with the railway station, while the second axis was a political axis to the east of the commercial axis.

In addition to the zoning of the city, the Italian superiority was clearly displayed throughout the new infrastructure system, as this was the first target of the fascist regime in the work of valorisation of East Italian Africa. The road issue was placed before any other one, both for ideological reasons, such as to join the imperial model of ancient Rome, and for practical reasons as Ethiopia, before the Italian conquest, did not have many roads (impassable during the rainy season). Beyond any political and economic motives, the roads built by the Italians were above all a sign of the superiority of the white coloniser against the Ethiopians. In the journalism of the time they became "signs of our civilization". The fascist propaganda used the lack of existing infrastructure in the country to support its idea of backwardness and barbarism of Ethiopians. Most of the initial energy and funds were therefore dedicated to this objective.



HISTORICAL RESEARCH

DERG REGIME

During Derg Regime several changes occurred, especially in the organization of the territory. In 1975, the urban and rural land was nationalized, as a result of the new socialist approach of the Derg. They declared several Proclamation Acts in order to resettle the existing land policies in a clear and equal division between the dwellers. The previous period was indeed characterized by a lack of organization and no housing policy. In the first 10 to 15 Years after the Italian liberation it would appear that there was no stringent planned public guidance or control over housing development. Houses and land distribution was done without control and permits. At the early 1970s only one quarter of the housing units had municipal permits, and unauthorized proliferation of low standard houses accelerated during Haile Selassie government as never before. In the prerevolutionary Land tenure system, about 95% of privately-owned land was in hands of only 5% of the population, and so the power was owned only by a very small group of the population. The power of the property owners was so strong as to discourage illegal occupation of land by anyone, but it encouraged the production of unauthorized housing by the owners themselves. The notorious discrepancy between the number of annual municipal building permits and the actual housing was indeed reflecting the fact that most property owners boosted rental incomes through increased supply of unauthorized dwellings. Nearly two-thirds of households rented in that period, and the cause of this may have been the combined impact of the dominance of land ownership by so few, and the abject poverty of so many, leaving the majority of families without sufficient capital to build even simple homes. Moreover, it was common practice among tenants to share their rented spaces with needy individuals or



households based on various informal living arrangements. The issue of the disorganized land was one of the motive forces behind the revolution in 1974 together with the increasing problems of the accommodation for a large part of the urban population

Moreover, the urban growth is dominated by the increase of the population of around two thirds between 1970 (800,000) and 1980 (1.3 million). This fact is followed by the apparent overcrowding problem in the urban center, where in this case, Addis Ababa was the central node of developing industries and services for citizens. The city of Addis Ababa wasn't ready for accommodating such amount of people due to the lack of control and housing programs from the previous period.

HISTORICAL RESEARCH

DERG REGIME

For the reasons said before, the situation when the Derg regime took the power was that of a country mainly characterized by unauthorized and not controlled informal houses, overcrowded urban land, and a big gap between the few riches and the majority of poor.'

The Revolutionary regime decided to introduce one of the most radical land reforms ever attempted in Africa in order to re-ordered social and economic relationships in Ethiopia. With the Proclamation Act of 1975 Derg nationalized all land of the country with different consequences both in rural and urban territory. The goal was an equal redistribution of the land, in order to rebalance the differences between riches and poor, following a socialist model, and so to arrange an house for everyone. On the rural level, when the reform nationalized all rural land, the government also redistributed the usufructuary rights of land to the landless and to tenants. It dictated that the legal maximum area of land permitted per farming households was only one quarter of a "gasha" (about 10 hectares). The result of this land reform was to replace the great myriad of land tenure system which prevailed throughout the country, and also to de-marginalised the peasants with better living standards and social conditions.

On the other hand, the consequences that affected the urban situation were related to the organization and the ownership of the urban land and housing. The most important part of this reform was related to the housing sector, especially to the fact that the Derg restricted to a single one the number of residential units that an household could own, without any distinction

between poor and rich. The ownership of extra houses was declared illegal and confiscation occurred. All the extra houses owned by individuals were consequently nationalized and transferred to governmental authorities who had the responsibility for renting them to those in need. All rents were reduced, reflecting the official ideology of social justice and socialism.

Several governmental authorities were created for these purposes. The proclamation placed all the dwelling that rented for more than 100 ETB (3.75 euros) per month under the management of one of the revolution's newly created institution, the AARH (Agency for the Administration of Rental Houses). All the remaining rental accommodations (less than 100 ETB) were placed under the administration of the new neighborhood associations, called the Urban Dwellers' Association (UDA) or Kebeles.



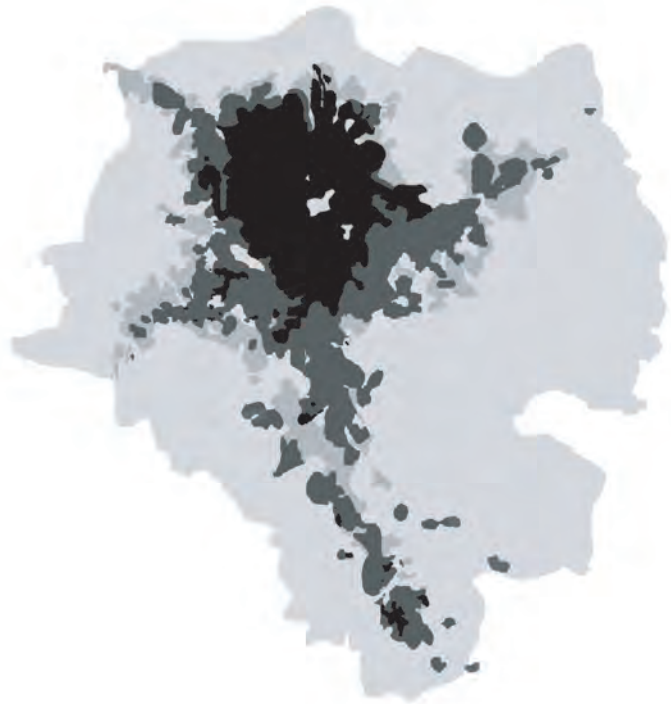
Kebele



Kefitegna



City



- Before 1975
- 1975 -1985
- 1985 -1995

Urban expansion between 1975 and 1995

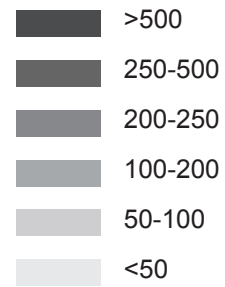
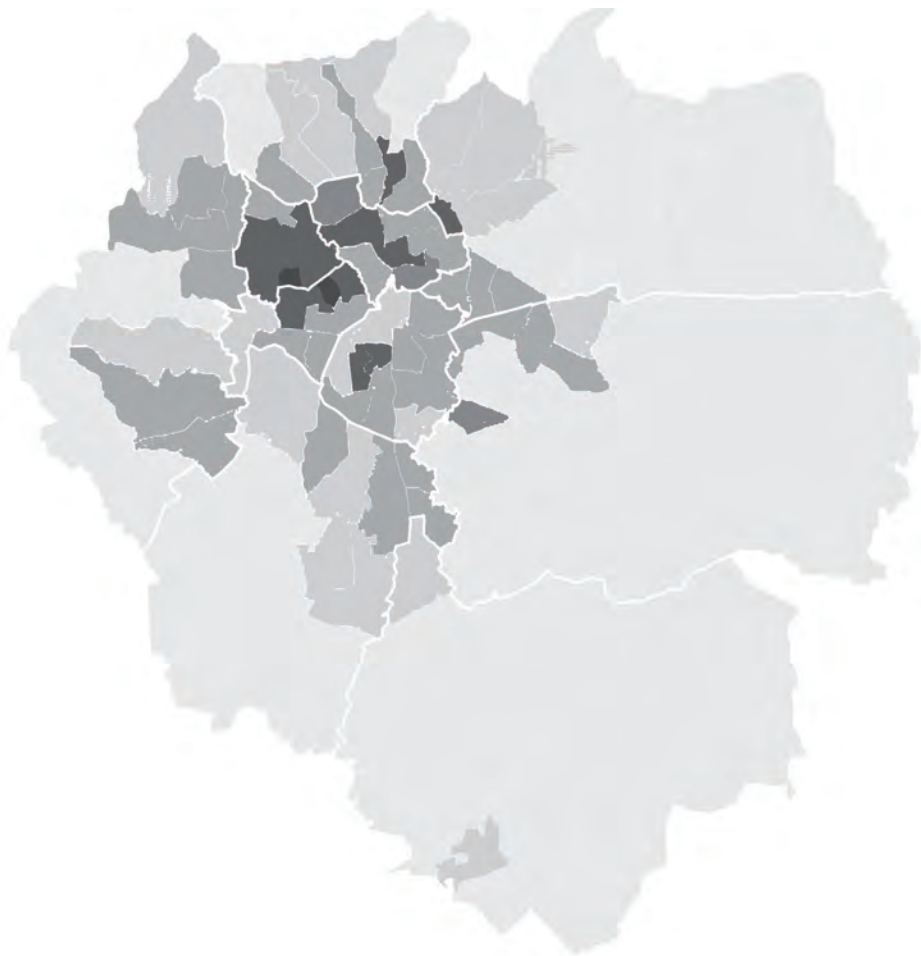


- Type 1,2,3
- Type 4 (relocati
- Upgrading Hou:
- Facilities
- Income Genera

Kirkos - Upgrading Plan (facilities and housing ty

Kirkos

During the upgrading of the Kirkos, the inhabitants were temporarily relocated in the nearby kebele 14 in a single story row house. When the project was delivered to the Kebele administration, the Kebele administration poorly used law enforcement and the living conditions weredeteriorated. Uncontrolled housing transformation took places and inhabitants started constructing additions into three homes. The RBE introduce 4 different housing units.



ADDIS TODAY

The period of 1991 until now has caused major changes for the city and still the city is developing and changing fast. After a period of 17 years, the Derg Regime was eventually overthrown by the Ethiopian People's Revolutionary Democratic Front in 1991. The overthrow saw political and economic conditions stabilise, but not enough to restore investors' confidence immediately.

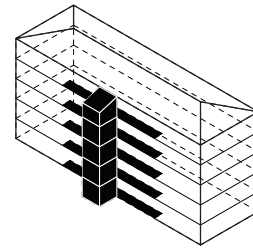
In 1994 the Land Reform Programme was introduced to decentralize the urban planning responsibilities and to encourage secondary cities to attract rural migrants to ease pressure on the limited housing available in Addis Ababa and other major urban areas. Housing shortage was worse than it had been 10 years earlier. There was only 0.93 housing unit per household available. This meant 5.5 individuals per housing unit. Addis Ababa's first housing policy, which incorporated the Governments' practice of maintaining public ownership, was implemented during this time. Despite large subsidies and land provided at highly subsidised rates, the private sector failed to deliver affordable housing. Housing prices rose and even for people with higher incomes it was extremely difficult to access affordable housing. In 1998 a five year plan was developed by the city administration of Addis Ababa, through a specialized office for the revision of the Addis Ababa Master plan. This plan analysed several critical aspects of the city, like the centre, market system, road network and many more. Unfortunately there were gaps between the capacity of the city administration and what the city needs.

Since 2006 the city administration of Addis Ababa is undertaking a massive Integrated Housing Development Program. This is not

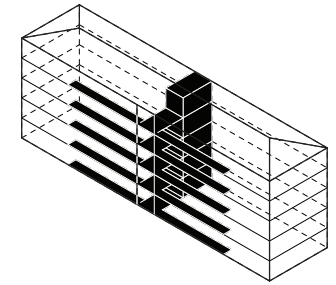
only to address the housing problem, but more than that it wants to be a tool to reduce urban poverty. IHDP primarily focusses on mass housing, but also creates huge employment opportunities, provides basic infrastructure facilities, promotes urban renewal to reduce slum areas, introduces cheap construction technology and more.

The program already booked lots of successes like the construction of 100,000 apartments for 0.5 million people, job opportunity for more than 200,00 residents in 3000 small and medium-sized enterprises, and many slum areas were converted to attractive living and working areas. Several aspects that make the program work are strong political commitment, allocation of own resources (which is important for sustainability), public participation and consultation and many more.

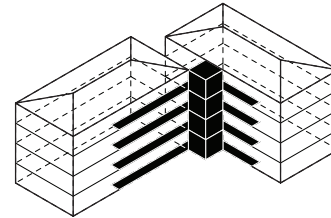
Right now the entire city seems like a big construction site. All across the city new houses, condominiums, offices, roads and other pieces of urban infrastructure are built more or less simultaneously.



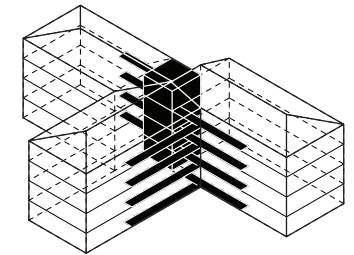
Standard block
25-30 apartments



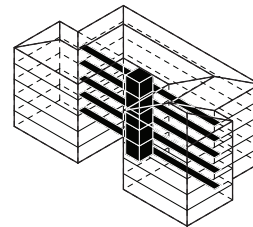
Stretched block
20-40 Apartments



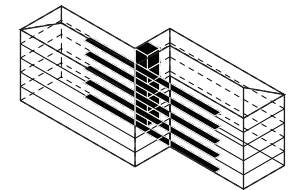
Standard cornered block
25-30 apartments



Triple cornered block
30-50 Apartments



Courtyard block
30-50 Apartments



Switched block
40-60 Apartments

ADDIS TODAY

CONDOMINIUM

A condominium community normally contains four house types, namely studio, 1 bedroom unit, 2 bedroom unit and 3 bedroom unit in order to meet the spatial requirement of different buyers. No matter the size of the rooms, a bathroom, which includes a shower, flush-toilet, and basin, and a separate kitchen are built in each unit. Among all the typologies, the units with 1 bedroom occupies the largest proportion (40 per cent) since it keeps a good balance between the floor-area and price.

A new block of condominiums is erected somewhere in the city. New inhabitants arrive, they have finally found a house with drinking water, solid walls, electricity and enough space for the family to live. The large courtyard is perceived as the blocks own communal space. When a family buys the house they also buy a part of the block where their house sits on, therefore making them all responsible for this space. Each stairwell starts from this communal space, and the apartment blocks are placed in such a way that they give multiple entrances to the surrounding infrastructure. The municipality has planted some young trees for the inhabitants and has provided for a small kindergarten. A communal laundry room and a large kitchen provides the utilities that do not fit in the apartments.

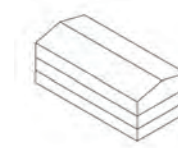
The down-payment system is used to denominate the scheme, namely 10/90, 20/80 and 40/60. In comparison to the first generation of condominium, this new scheme separate the different target groups. Each scheme is arranged in its own buildings other than mixed in the same one. Generally, 20/80 and 40/60 are placed more closely, while the 10/90 scheme is relatively separated. For different schemes, they aim their buyers at different



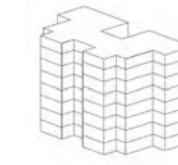
ADDIS TODAY

CONDOMINIUM

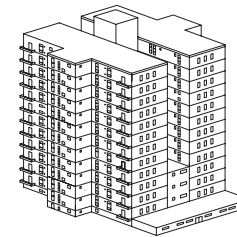
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Target group: low-income group
Height: G+1 / G+2
House type: only studio (31 sqm)



Target group: low- and middle-income group
Height: G+4 / G+7 / G+12
House type: 1-bedroom (50 sqm) / 2-bedroom (70 sqm) / 3-bedroom (85 sqm)
Other program: 10% commercial space



Target group: high-income group
Height: high-rise with lift
House type: 1-bedroom (55 sqm) / 2-bedroom (75 sqm) / 3-bedroom (100 sqm)
Other program: 20% commercial space





LOCATION

MERCATO

Mercato is the largest market in Addis Ababa and is said to be the largest in Africa

The Italians created Mercato during their occupation of Ethiopia from 1936 to 1941. They introduced a policy of segregation that spatially separated the indigenous local market from the national market of Arada. This policy was behind the relocation of the local market – including 90 percent of its population – to an area organized by two newly developed street grids, where Mercato is still located today. The street grid to the west distinguished the 'indigenous' residential area, with a small stream separating it from the newer grid to the east. Additionally, the Grand Mosque was built to attract Muslim traders to the Mercato area.

The variety of goods available in Mercato is astonishing. The common saying goes:

“If it's in Ethiopia, you can find it in Mercato; if it's not sold in Mercato, then it's not in Ethiopia.”

Approximately two hundred thousand people both live and work in Mercato and another three hundred thousand commute there each day to either work or shop. On Saturdays and before holidays, is estimates that up to 1.5 million people use the area daily. Under pressure.



LOCATION

MERCATO

1) Grid

The grid defines much of the built structure of Mercato and the surroundings.

2) Between

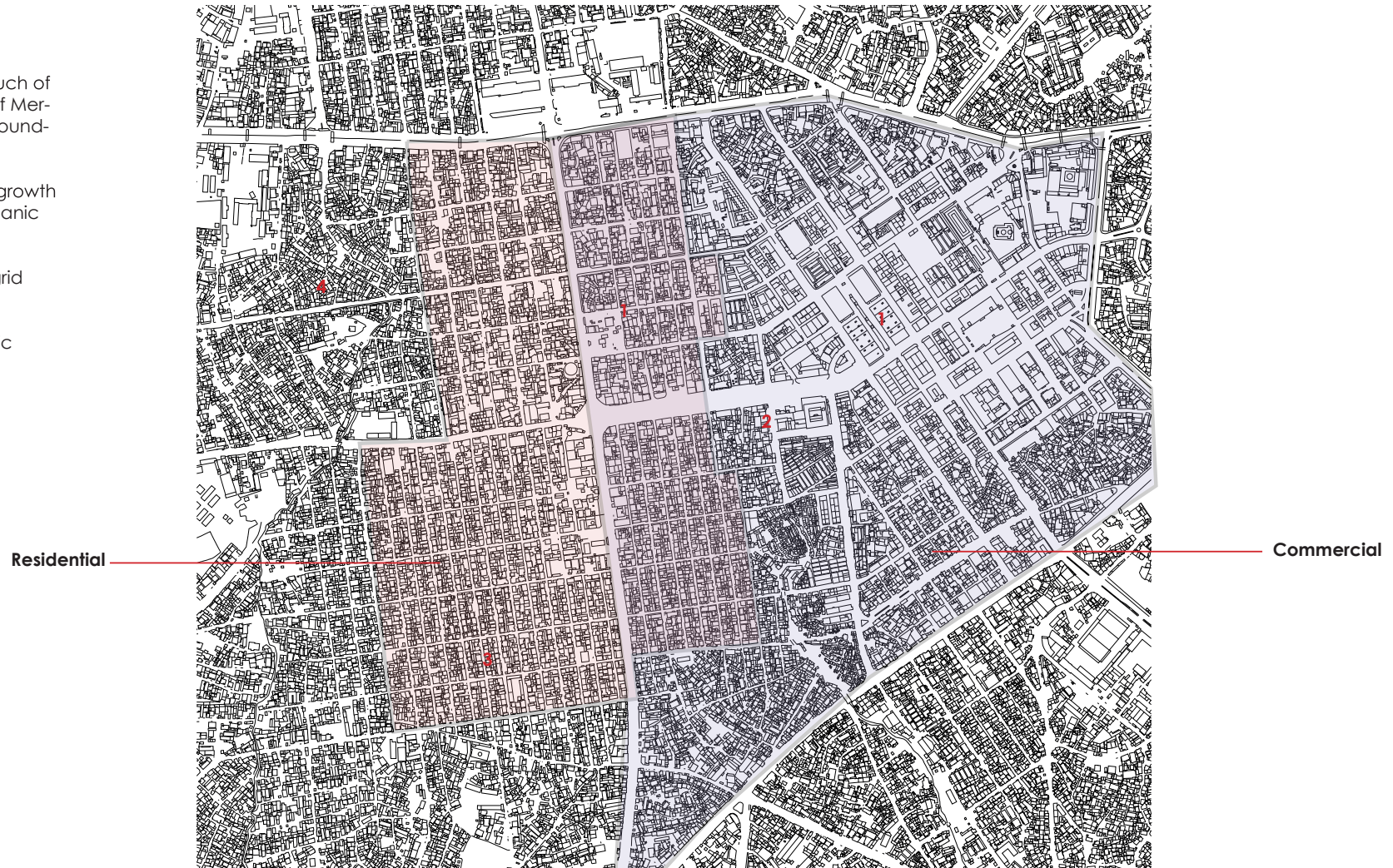
Influenced by the growth of the grid and organic structures

3) Edges

New forms of the grid and organic fabric

4) Organic

Surrounding organic growth





"Past"



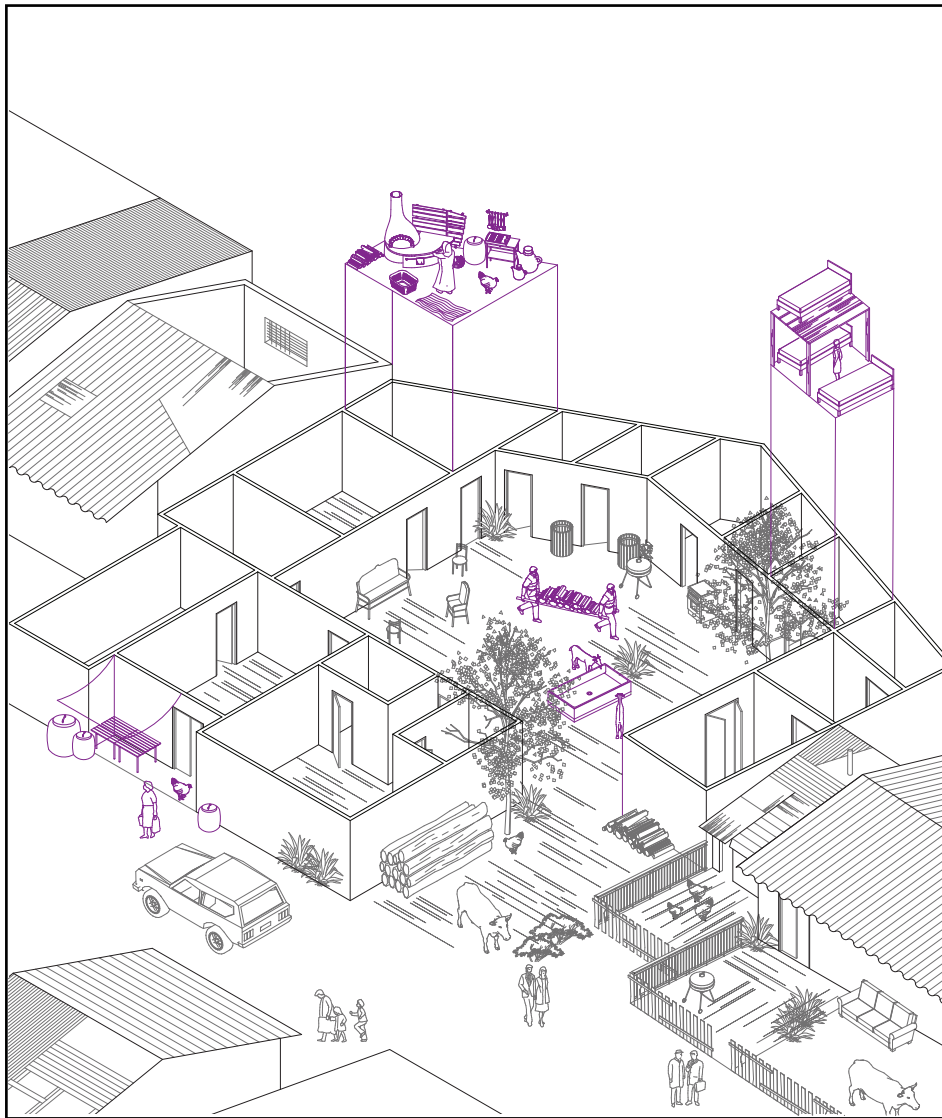
"2015"



The housing quality has deteriorated mainly because, since the housing nationalization, no maintenance has taken place because the rent is not enough to pay for this. When we zoom in on part of the Urban fabric (the case study location) we can see that indeed the urban fabric has completely covered the area. There is almost no open spaces, or courtyards anymore. The open spaces that remain are used for many different functions. Furthermore the lack of open space makes it difficult to ventilate these houses and allow for enough natural light. The densification has led to overcrowding on the area but the amount of sanitation facilities has not grown as much. Many of the blocks have only one shared latrine and kitchen.

ANALYSIS

SLUM DEVELOPMENT



Courtyards are a typical feature of Ethiopian informal settlements. Their shape is the unplanned result of the casual arrangement of several houses around an open space that may be partly enclosed by perimeter walls. Access is typically provided by a door or a gate. The appearance is often the one of a green open space where people strive to preserve trees that are disappearing from the city. Courtyards play a crucial role in encouraging social life and in enhancing the sense of community and belonging. A courtyard is often combined with other patterns, such as the waterstand and the coffee table.



Organic vs. the grid

Due to its organic structure, a compound within the organic tissue can be large or either small. Within the Mercato area, the compound is limited by the grid.

ANALYSIS

COMPOUND



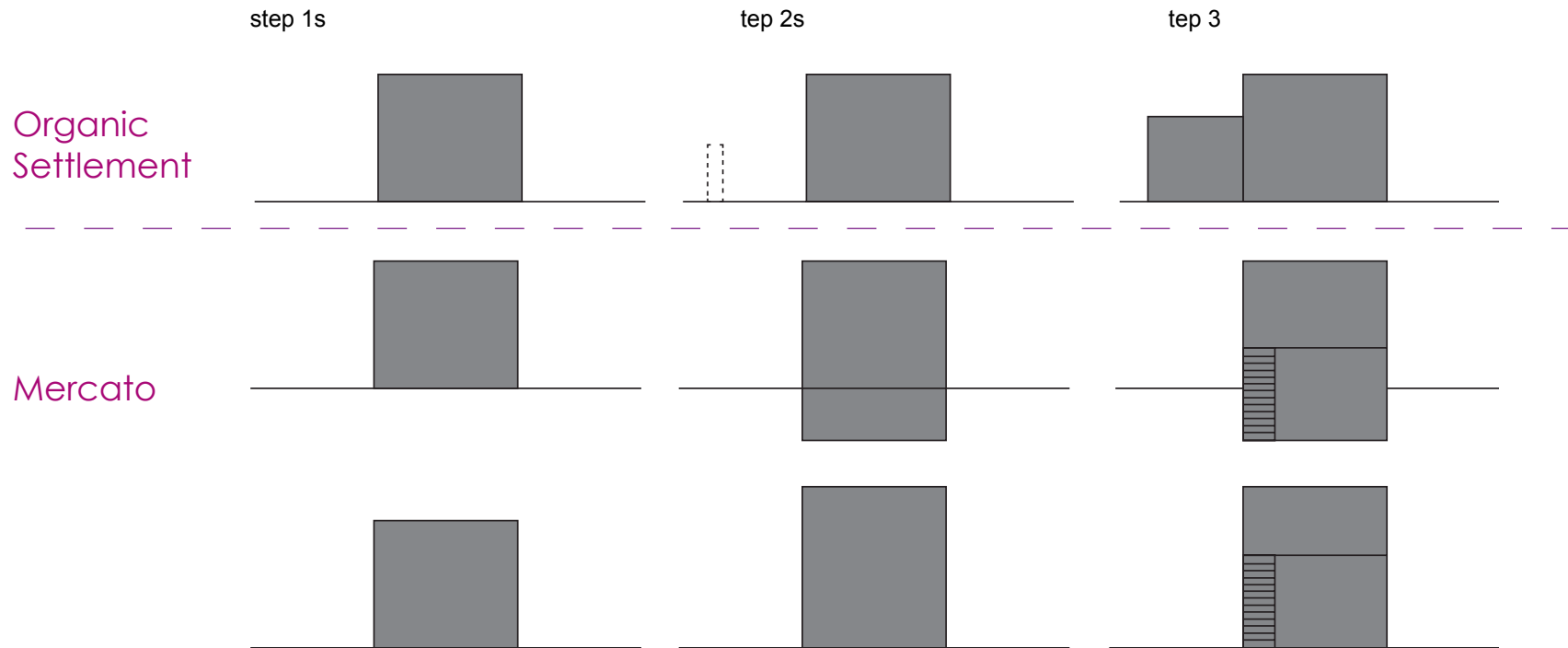
Compound in the organic tissue



Compound in the mercato

ANALYSIS

DEVELOPMENT IN THE MERCATO



“Second floor or
basement”

Due to the limits by the grid the development within the grid
is vertical (by adding a second floor or a basement).

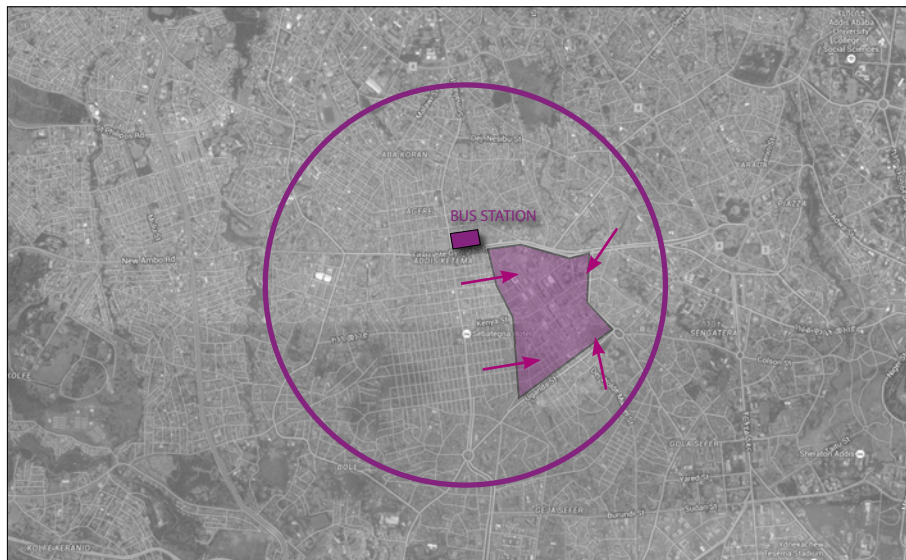
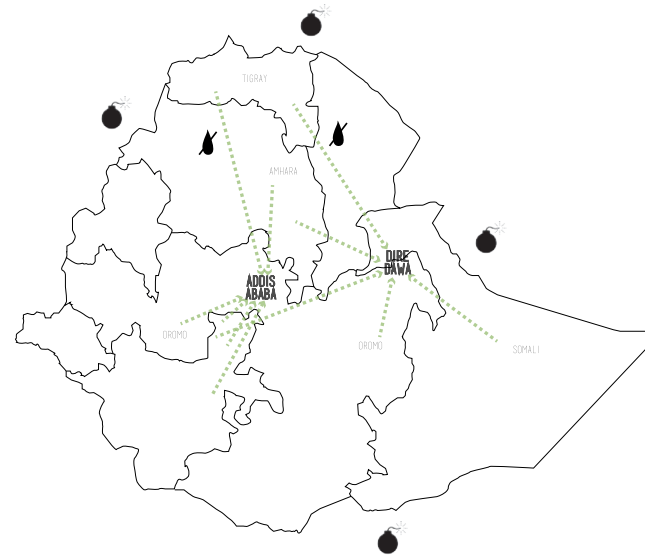
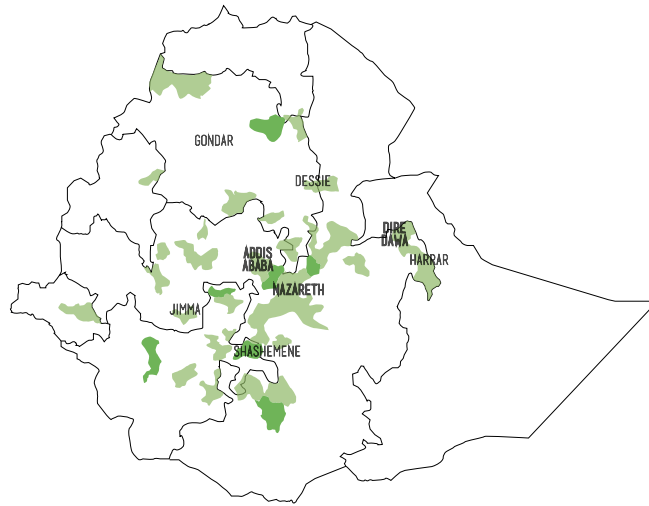
PROBLEM STATEMENT



In some point the “informal” settlements have reached a maximum capacity in densification. The living conditions are deteriorating and spatial qualities air being lost. There is no doubt this situation should change.



MIGRATION



ENVIRONMENTAL DRIVERS

DORUGHTS
CLIMATE CHANGINGS
LAND SHORTAGE
FOOD/WATER SHORTAGE

SOCIO-ECONOMIC DRIVERS

RURAL UNEMPLOYMENT
RURAL POVERTY
LACK OF EDUCATION
POOR COMMUNICATION

PULL



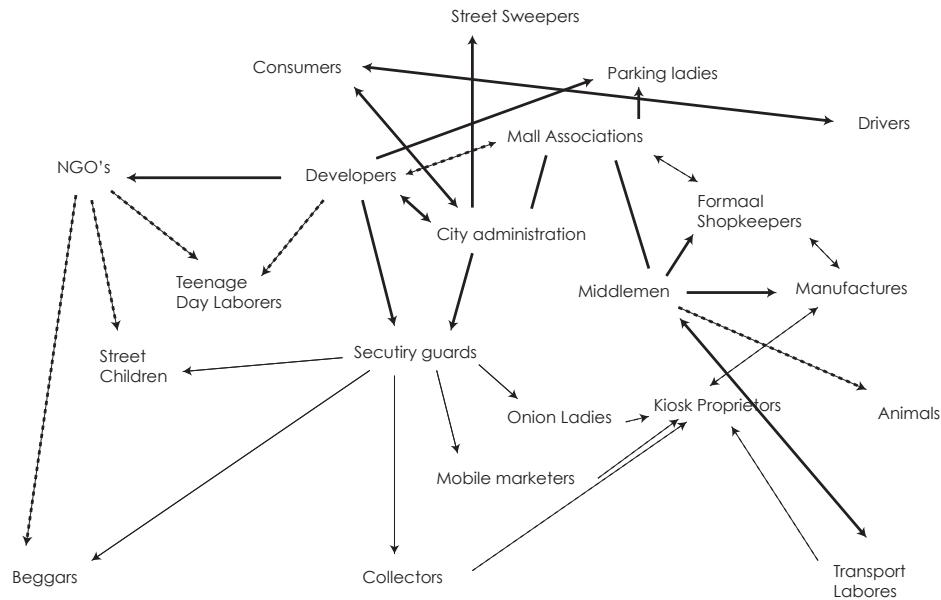
PUSH

JOB OPPORTUNITIES
BETTER REMUNERATION
SOCIAL NETWORKS
EDUCATION OPPORTUNITY
TRANSPORT
HEALTH CARE

Mercato as gate way for addis, people stend to today within the mercato



MERCATO ORGANISM



FORMAL MARKET

Store Keepers
Mall Associations
Street Sweepers
City administration
Security Guards
Developers
Parking Ladies
NGO's
Consumers
Kiosk Proprietors
Manufactureers
Middlemen



INFORMAL MARKET

Onion ladies
Transport Laborers
Teenage Day Laborers
Collectors
Mobile Marketers
Street Children
Animals
Beggards
Drivers

Mercato consist out a balance between the informal and formal market. The informal market is often used as a first place to seek income generating opportunities



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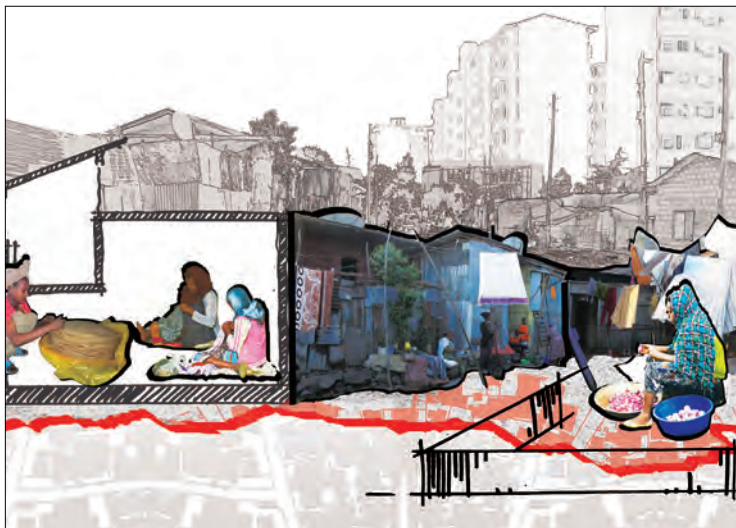
DESTROYED STRUCTURES



COURTYARD BUSINESS



HOME BUSINESS



HOME PRODUCTION



STREET VENDOR

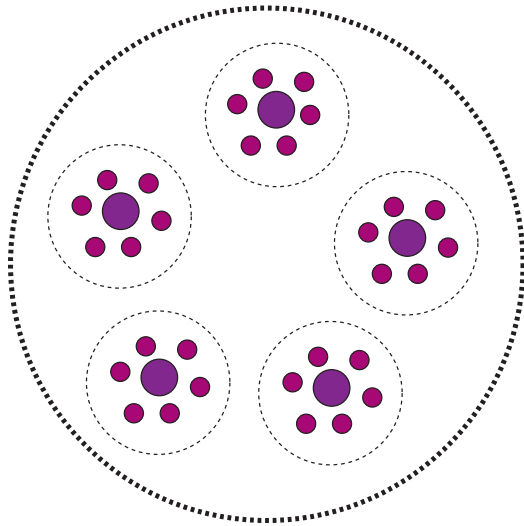
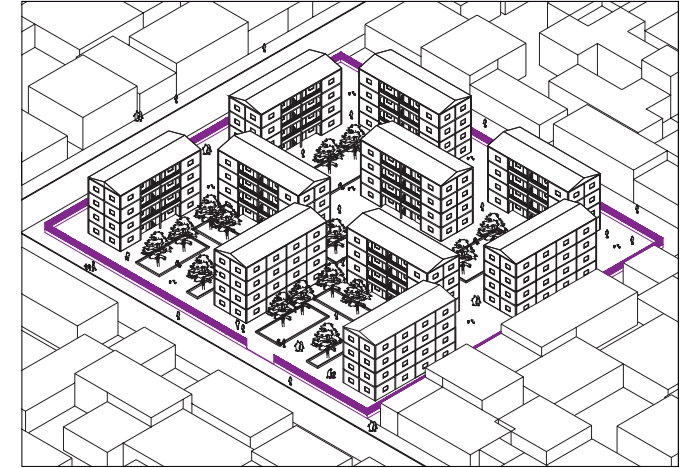
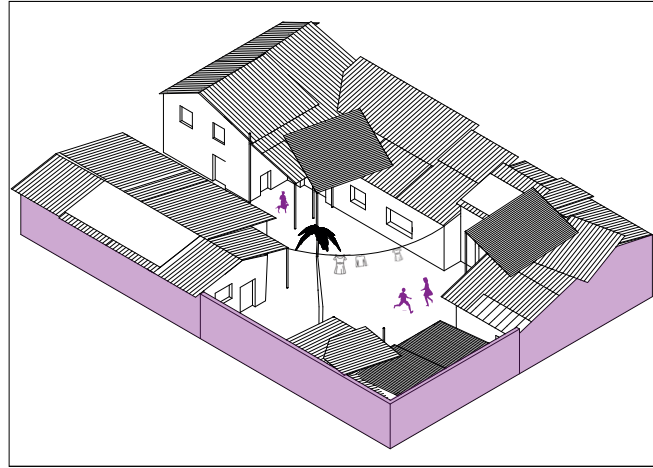
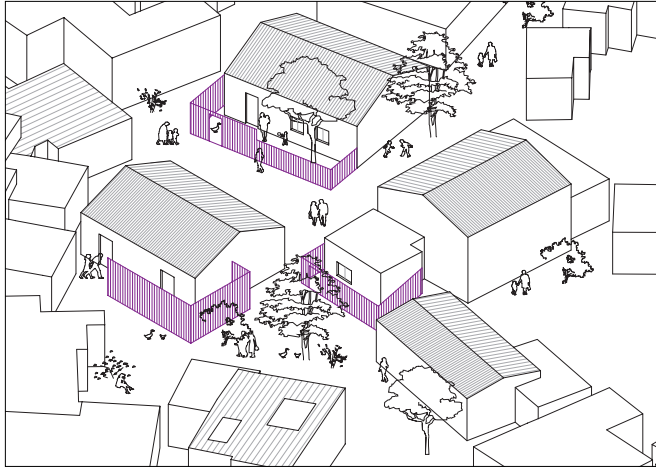


Densification has resulted in a lack of private space. Streets are used as public and private space.



In places where commercial functions are not properly integrated. Streets become abandoned.

EFFECTS OF BORDERS



In Addis people are obsess by territorial claim. In different scales borders are introduced to provide structure to the public and private space. These borders have an impeccable effect on the public real (see left page). On the other hand, Ethiopians forms small communities within their borders.



SANNGHARSH AGGAR

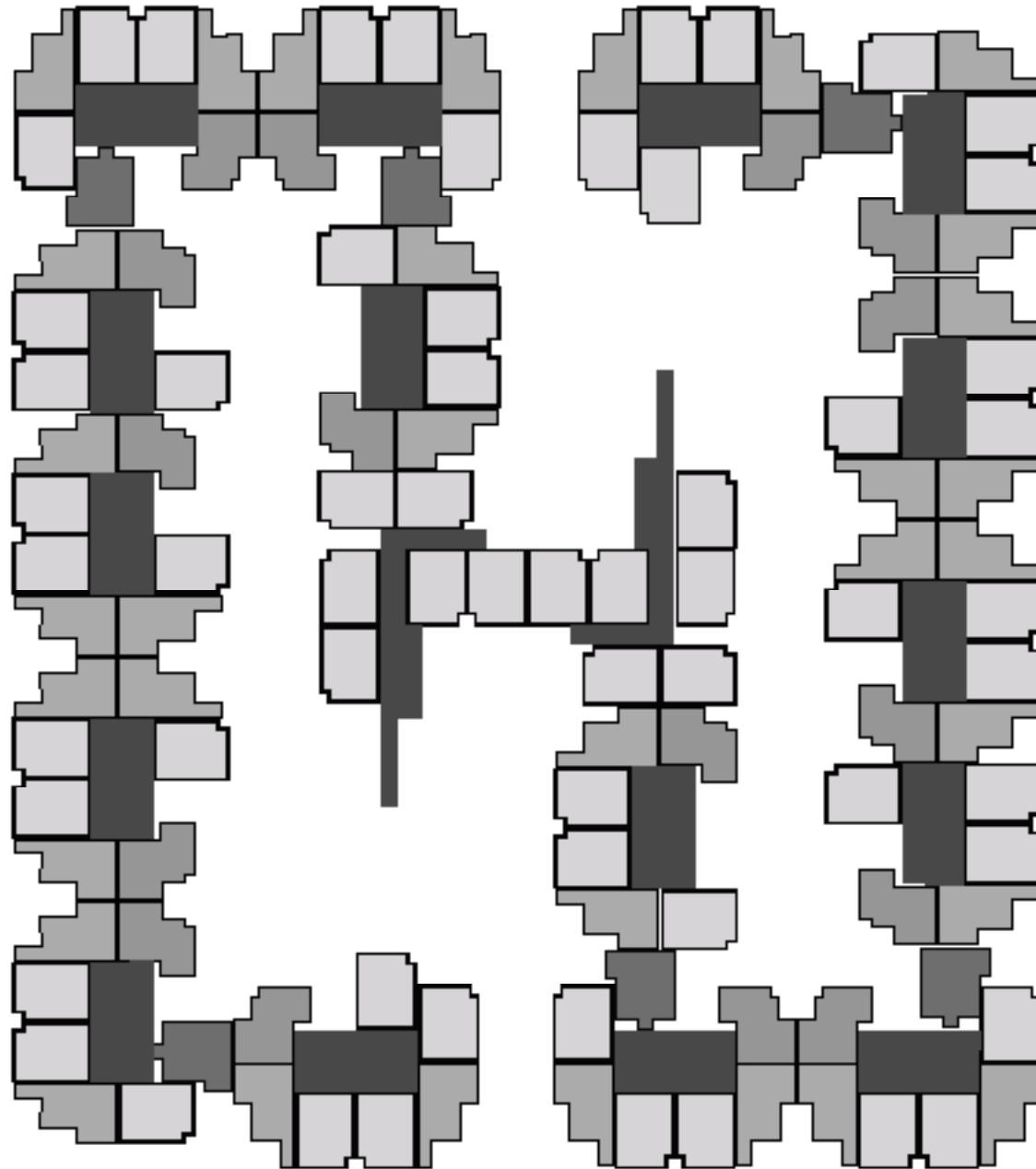
Mumbai, India

Period of construction: 2002-2005

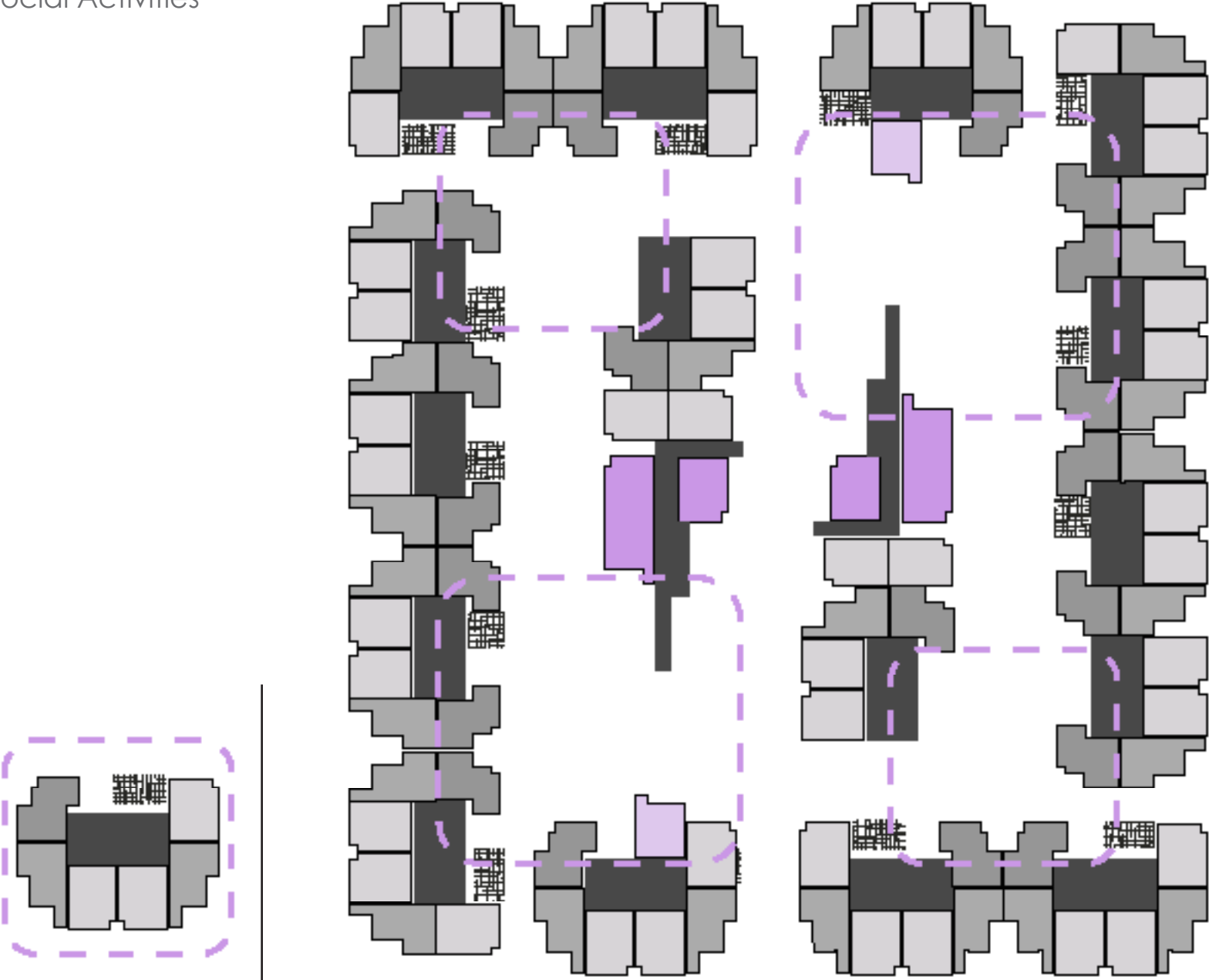
Architect: PK Das Architekten

Supporting architects: Sanjeev Karekar (associate)

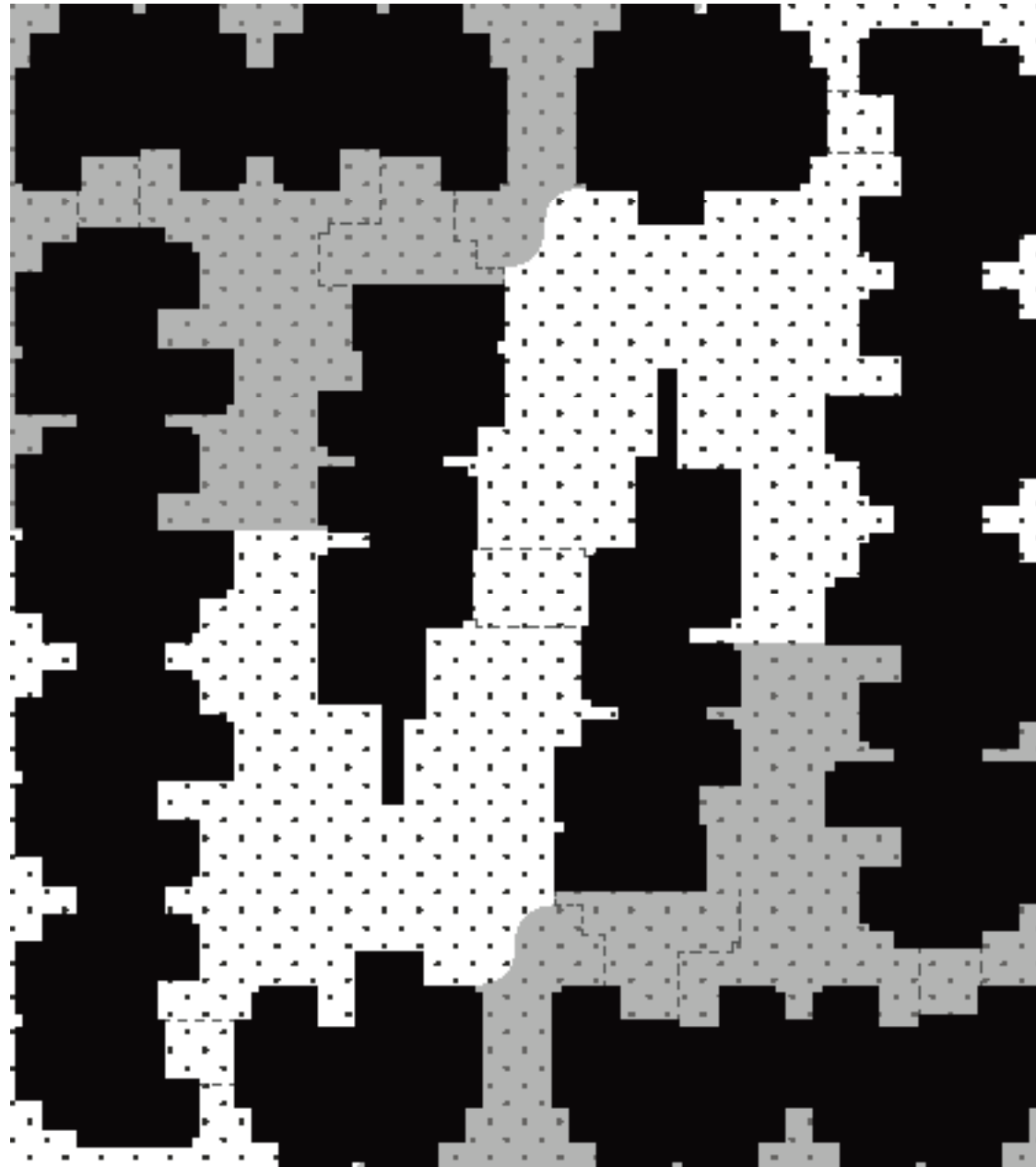
Stamp



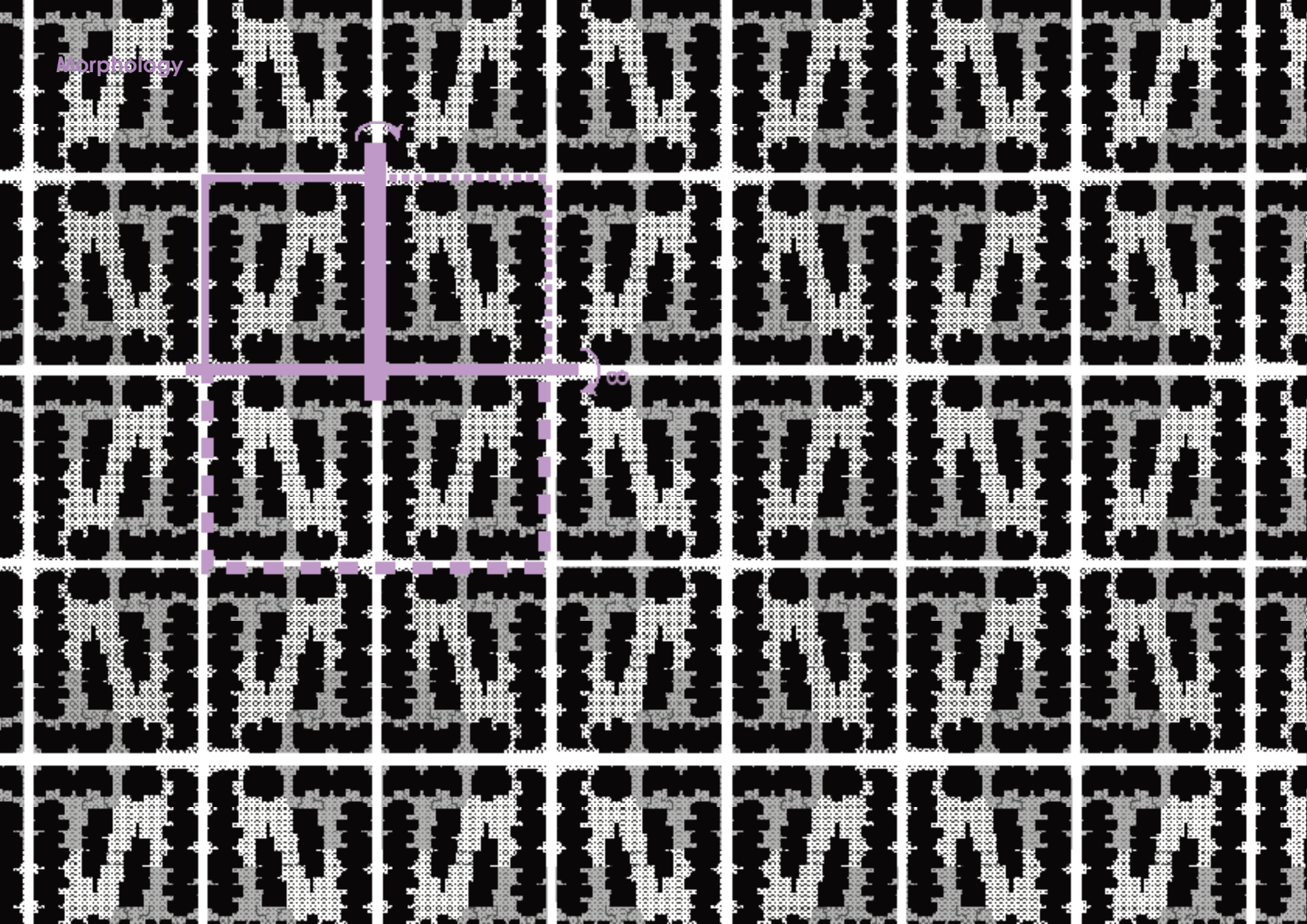
Groundfloor
Social Activities



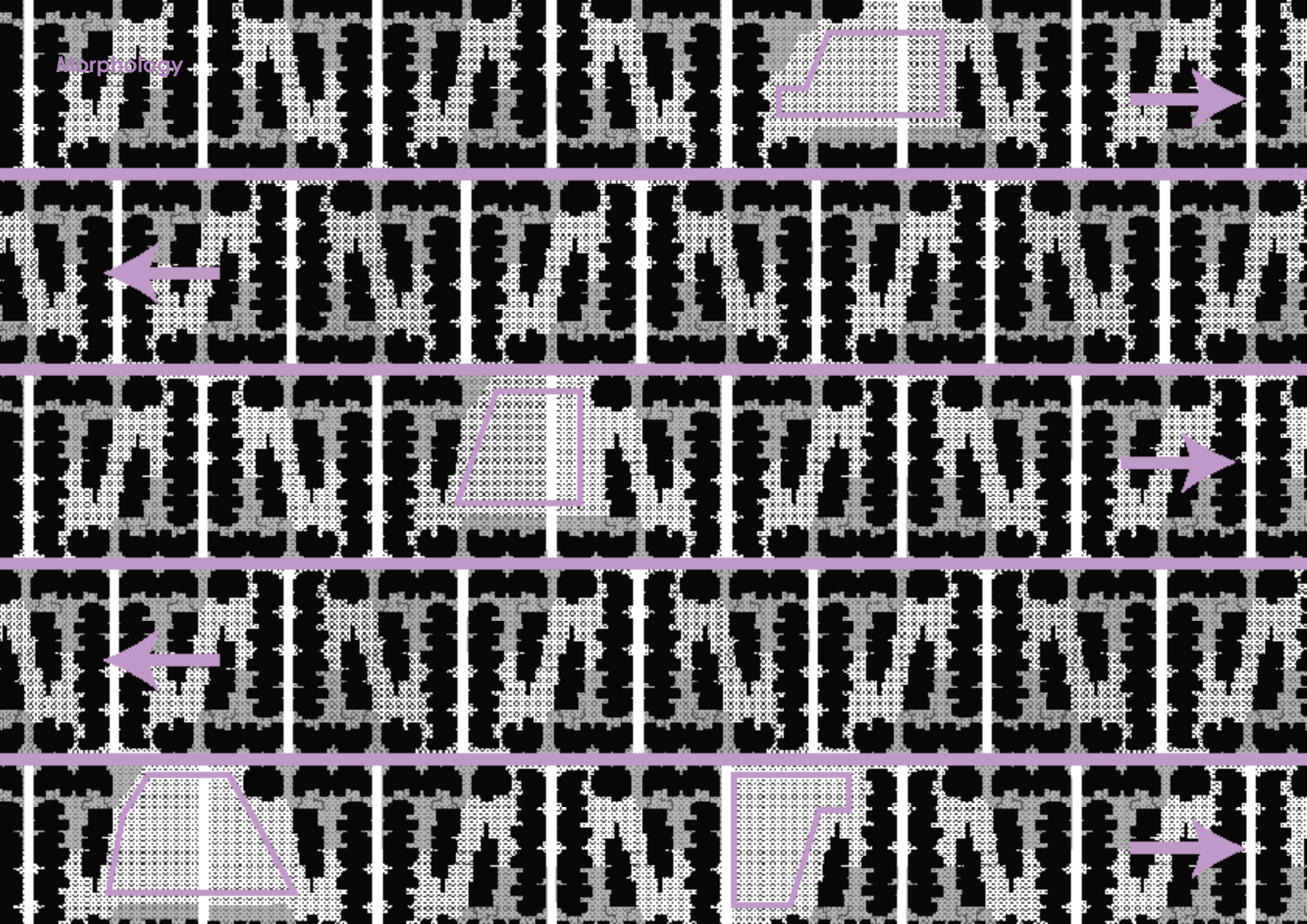
Groundfloor
Morphological
Reduction



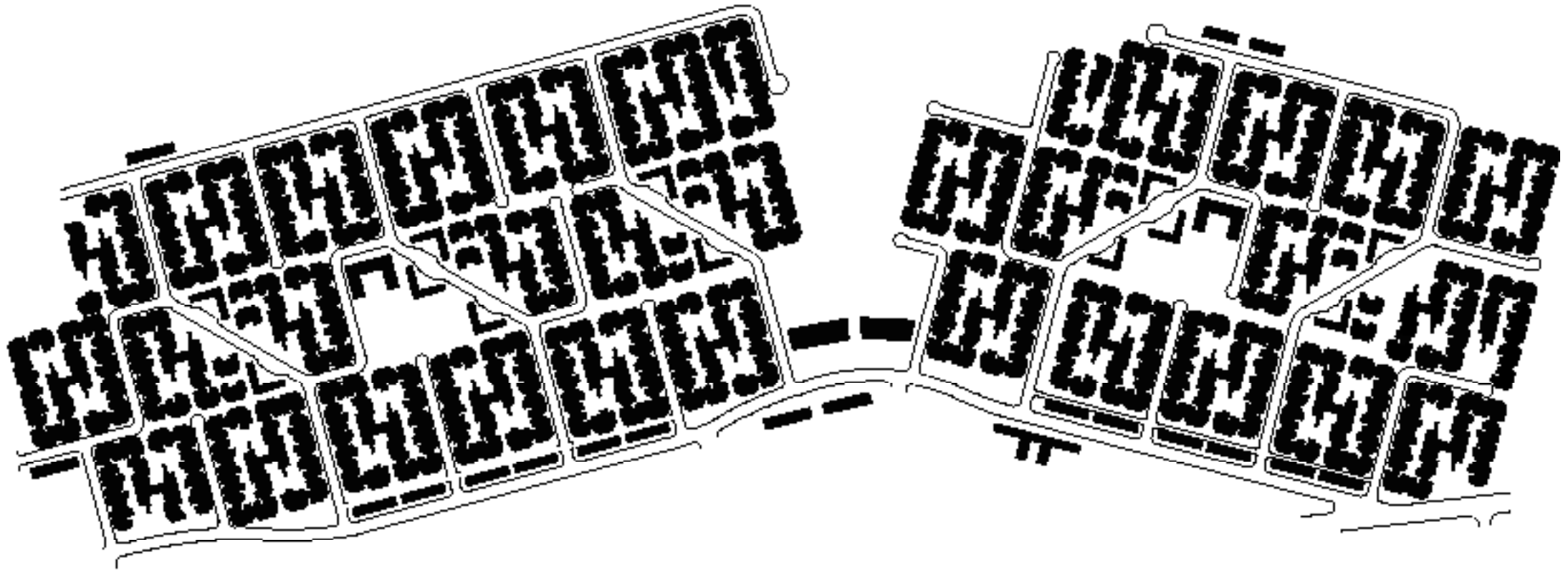
Morphology



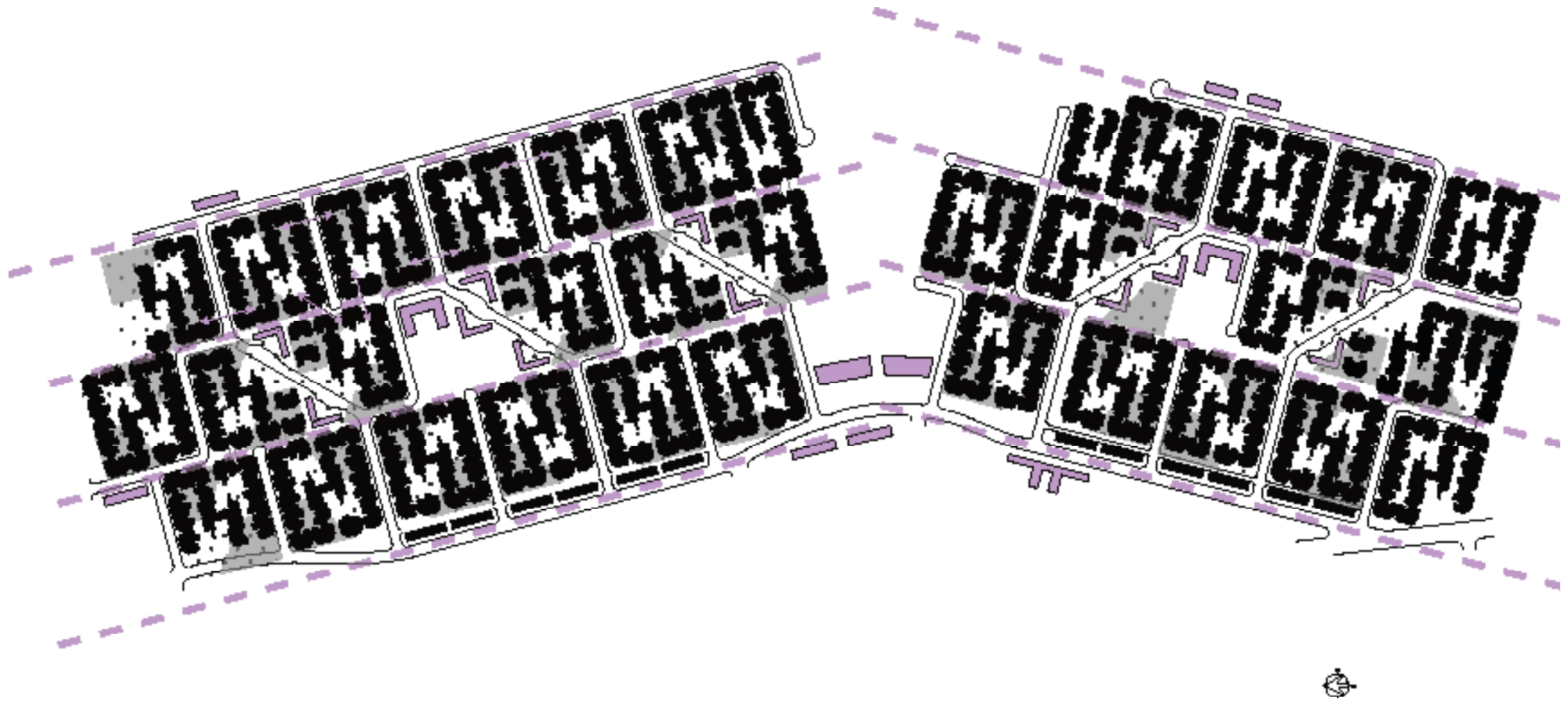
Morphology



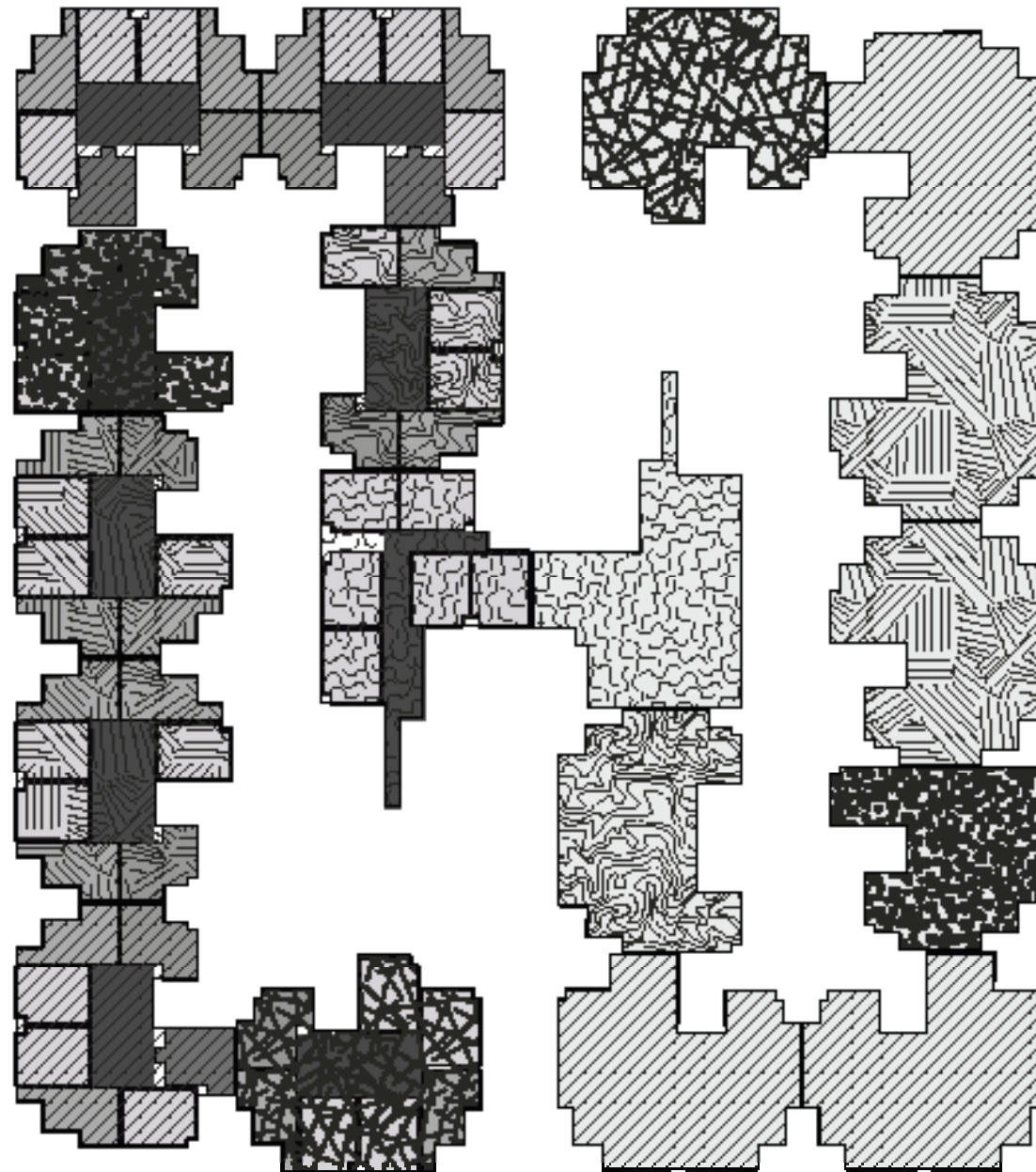
Groundfloor
Morphological
Reduction

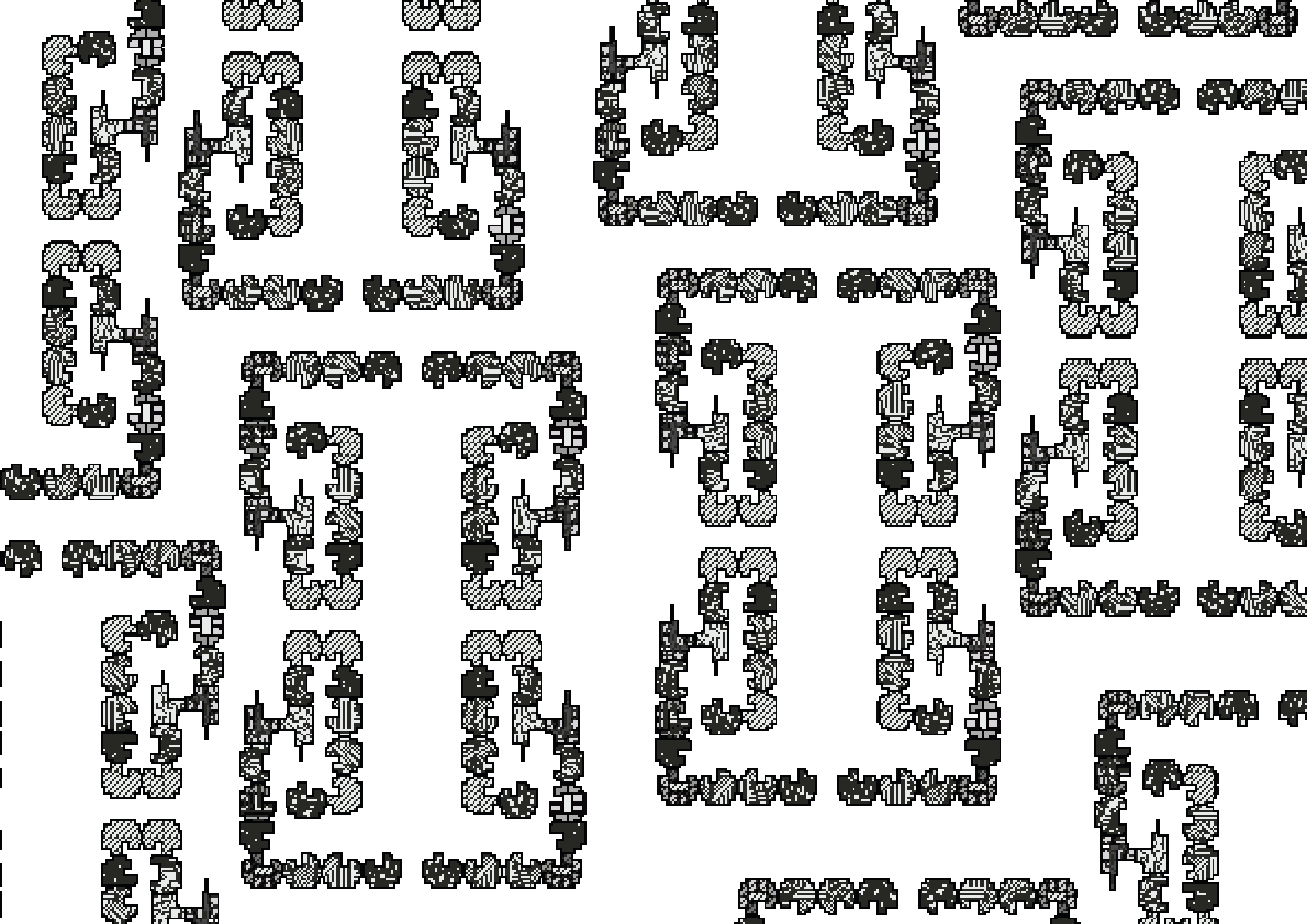


Groundfloor
Morphological
Reduction



Groundfloor
Morphological
Reduction





RESEARCH QUESTION

The new commercial developments are endangering the identity of the Mercato. An imbalance is occurring between the informal and formal market. The current trend of migration from the rural areas and the economic importance of the Mercato set this area under permanent pressure. This pressure has overtaken the Mercato residential area by densifying it and resulting in over crowdedness. The living conditions are deteriorating and spatial qualities are being lost.

HOW:

- * can a housing scheme contribute to densify the Merkato for future needs
- * while maintaining a balance between the informal and the formal market, integrated within the Ethiopian lifestyle

GOAL:

- * Proposing an alternative for the densification of the Merkato
- * Creating a dwelling system that challenges the density and efficiency of the condominium scheme
- * Accomodating the cultural qualities of a community-centered lifestyle



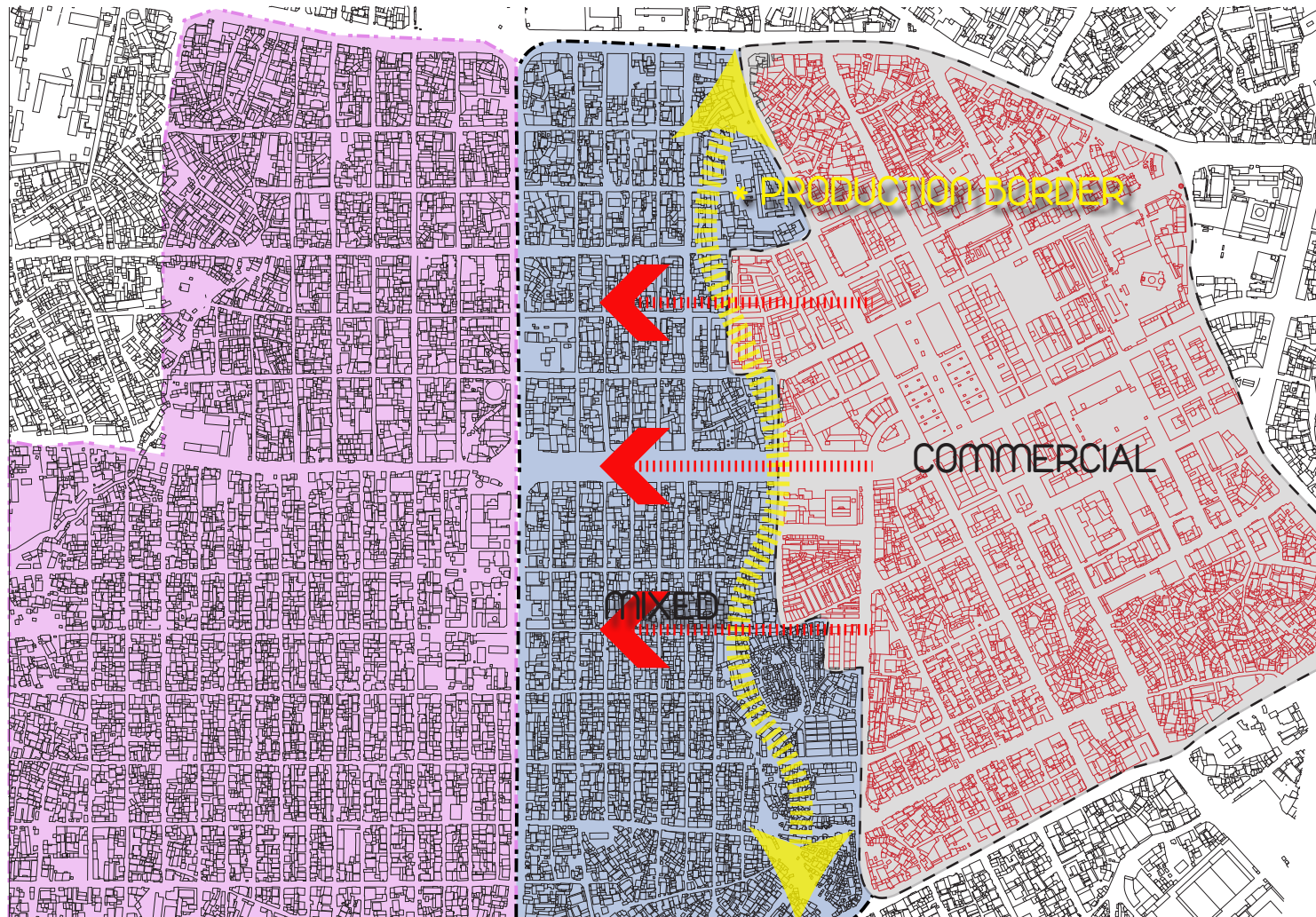
COMMERCIAL



PRODUCTION

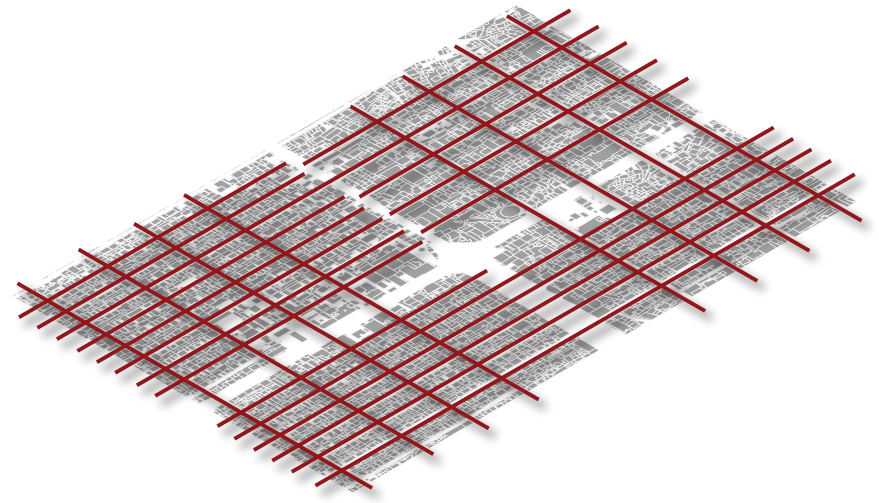
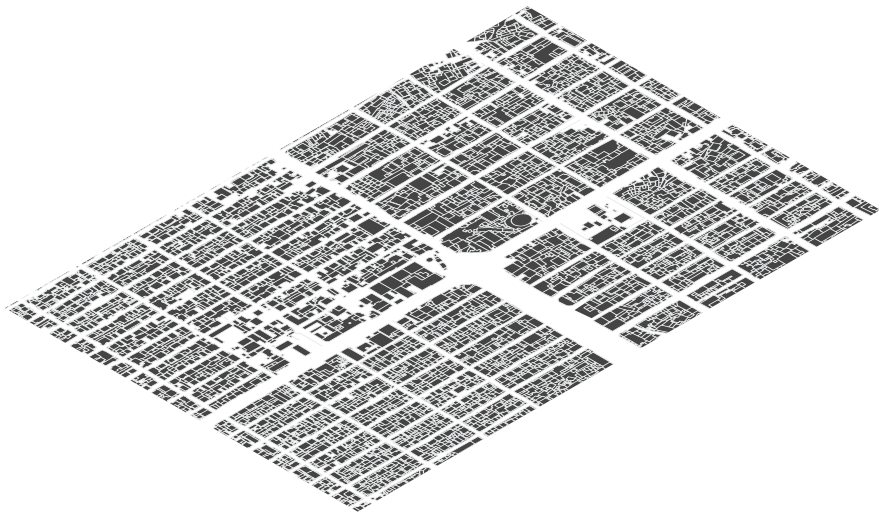




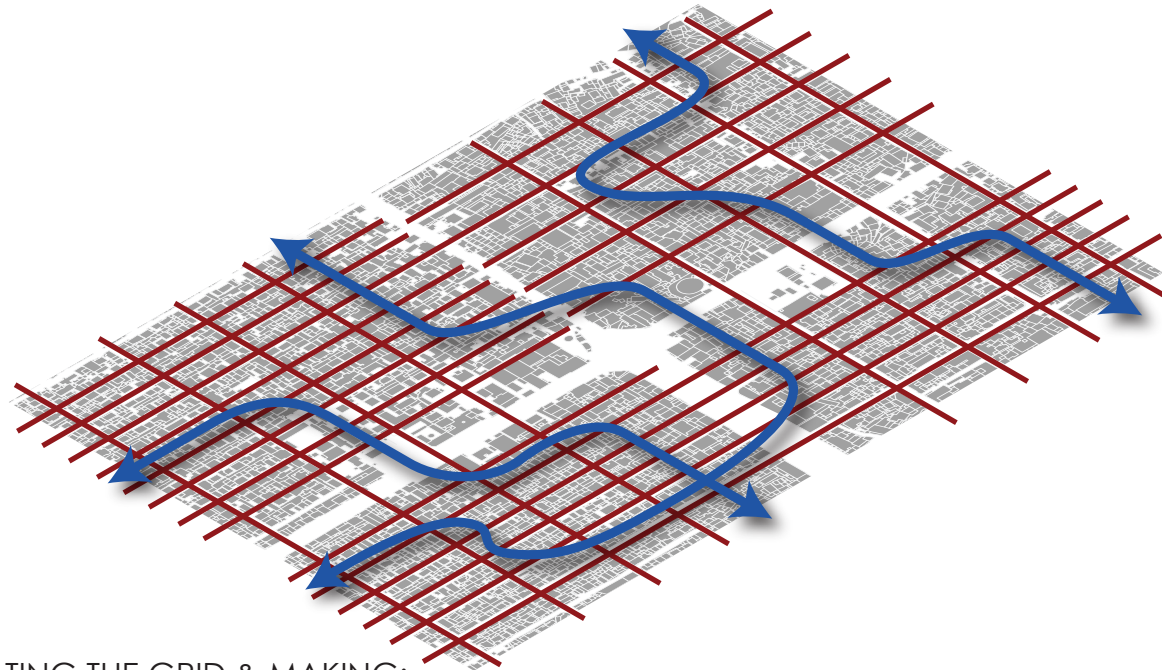




URBAN CONCEPT



- STRONG GRID
MONOTOON URBAN STRUC-
TURE



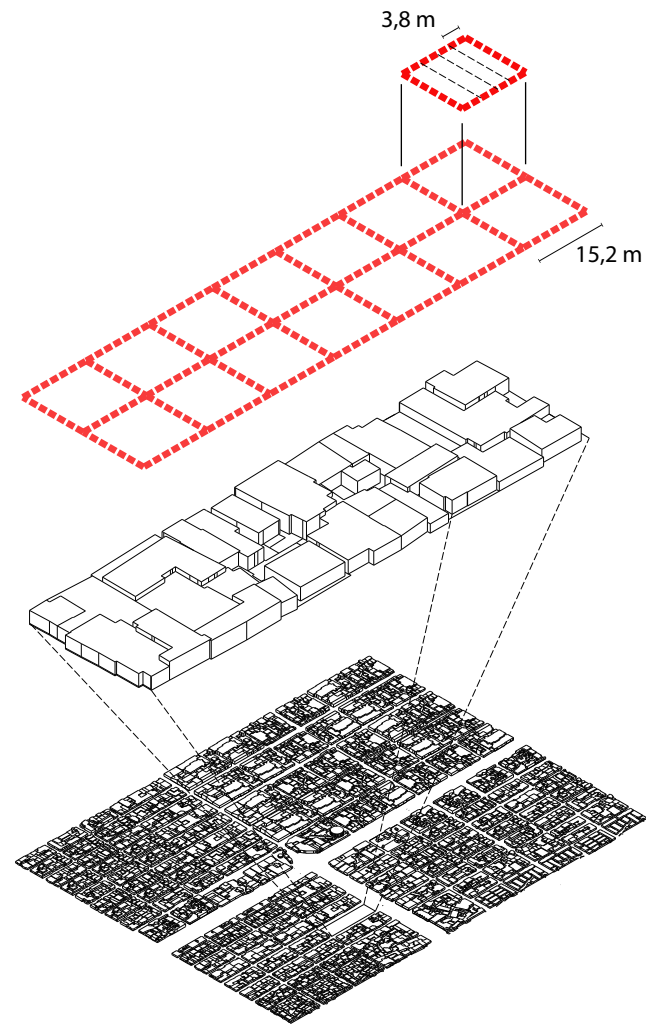
- PERFORATING THE GRID & MAKING:
 - * **NEW ROUTES**
 - * **NEW SPACES**

MERKATO PLOT

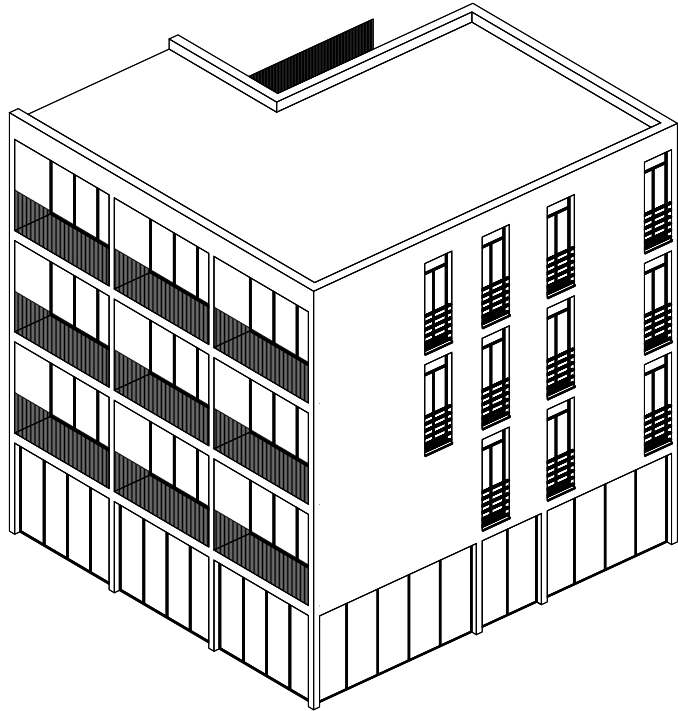
ORIGINAL PLOT DISTRIBUTION

... a grid within a grid

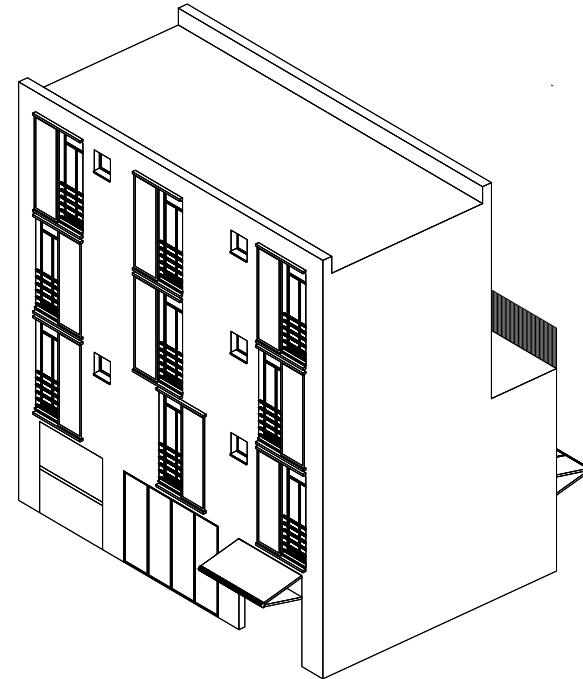
The mercato's grid follows a set of coherent measurements



URBAN CONCEPT TWO PUZZLE PIECES



CORNER UNIT
"SHORT STAY"



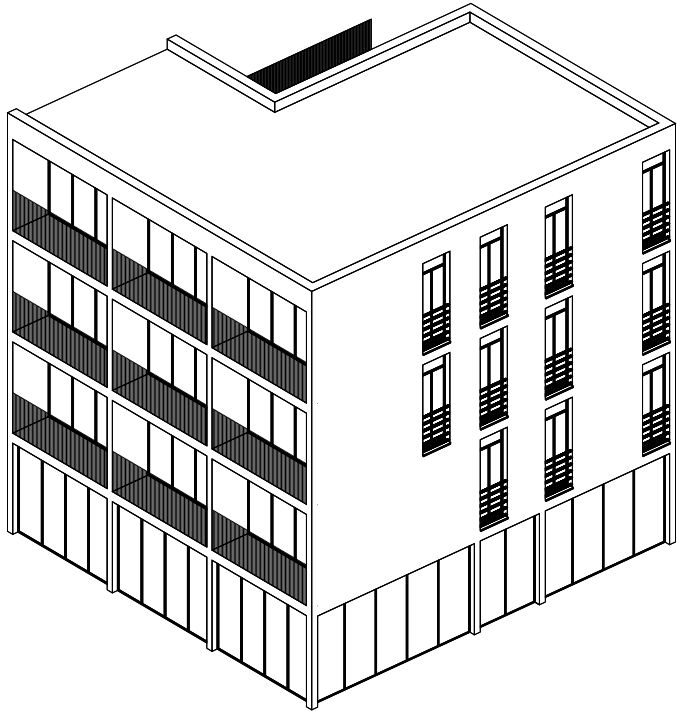
INFILL UNIT
"PERMANENT STAY"

6 VARIATIONS

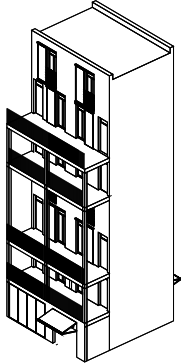
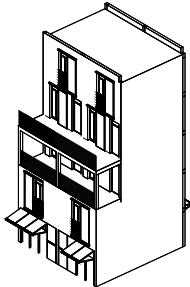
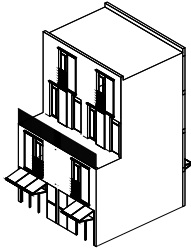
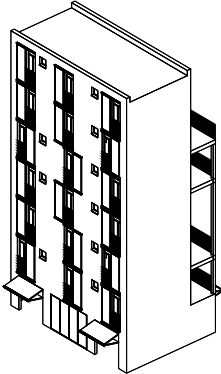
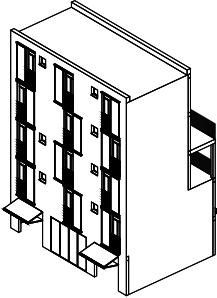
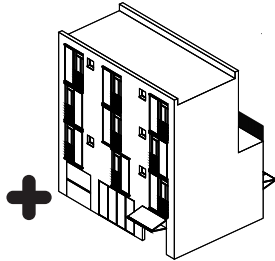
4 STORIES

5 STORIES

7 STORIES

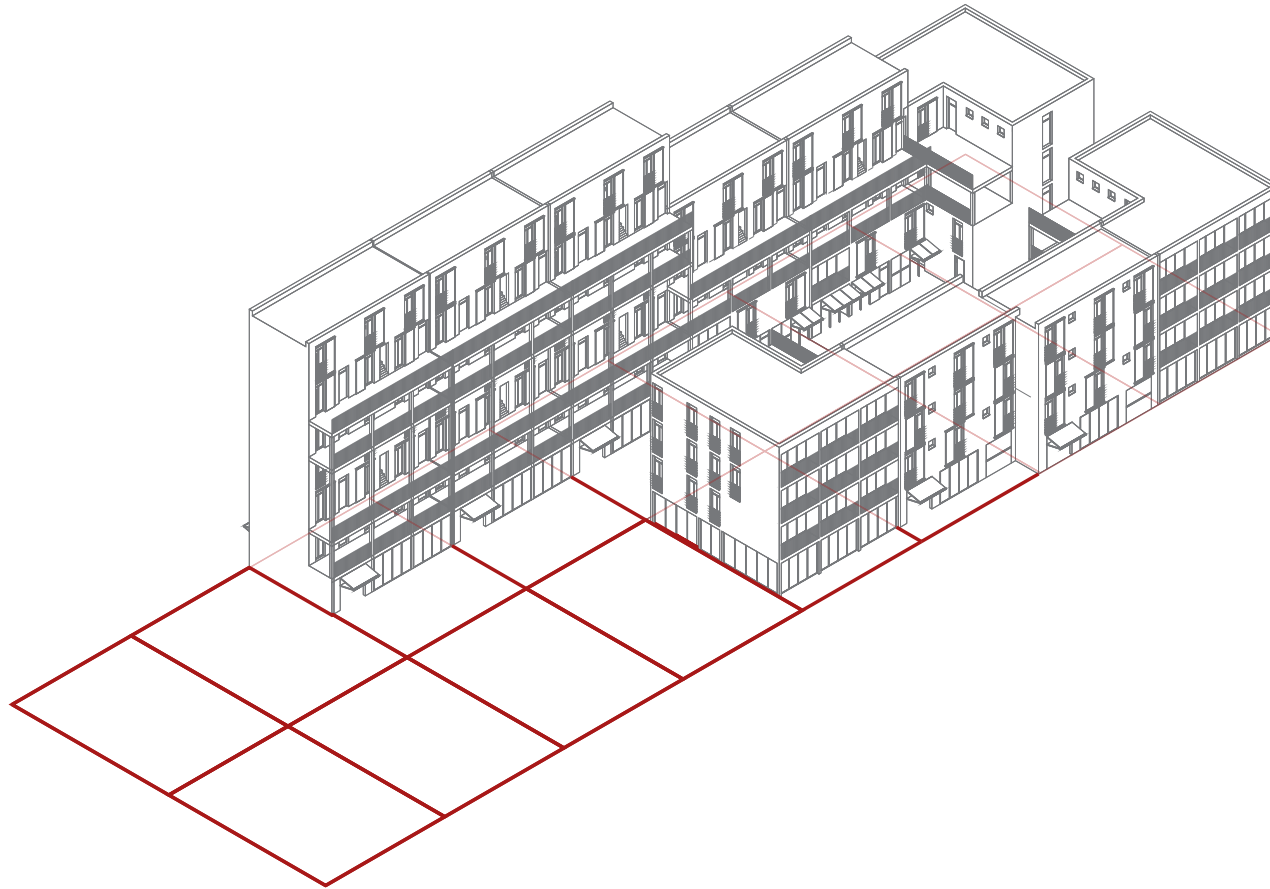


CORNER UNIT
"SHORT STAY"

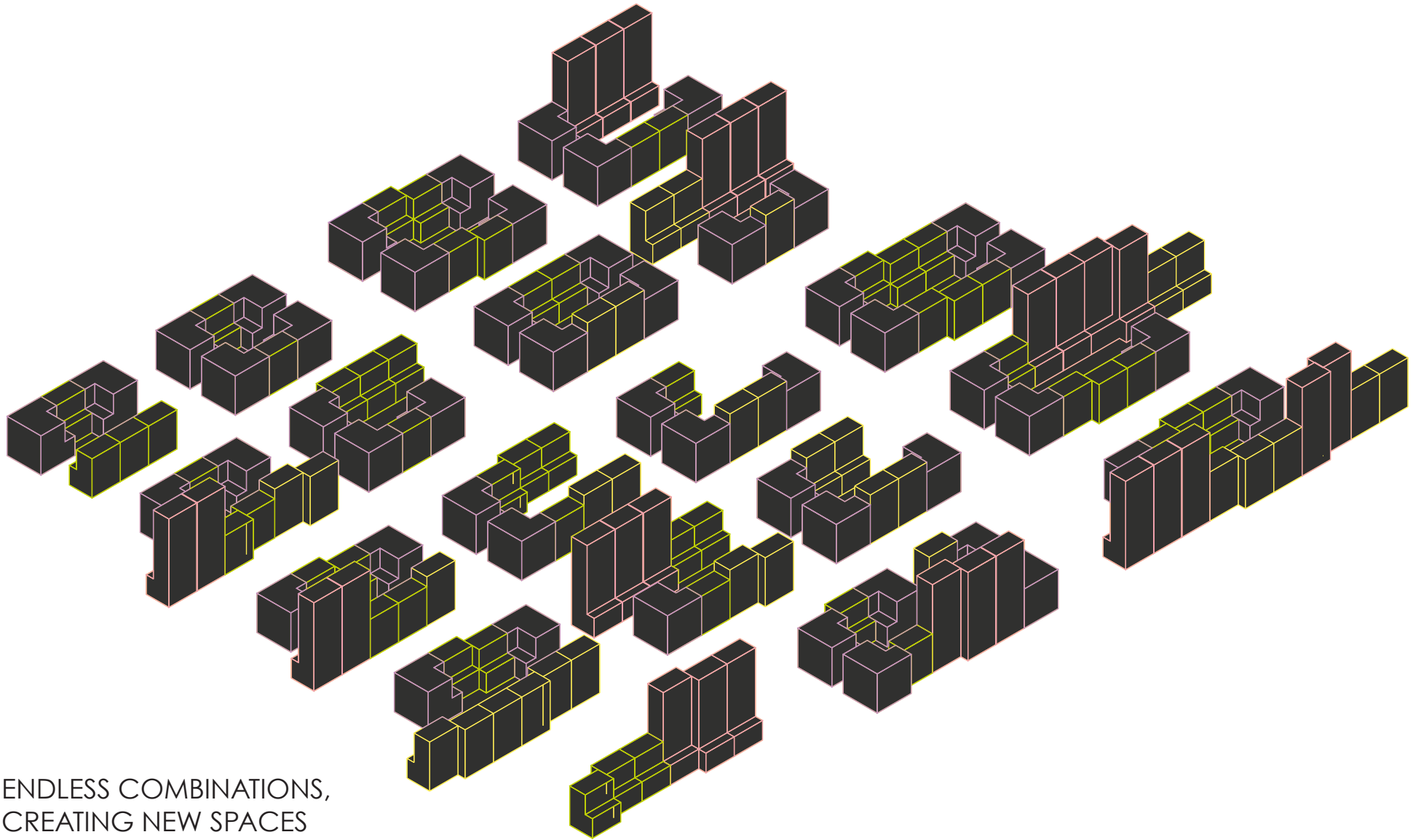


INFILL UNIT
"PERMANENT STAY"

URBAN CONCEPT FILLING IN THE PLOT

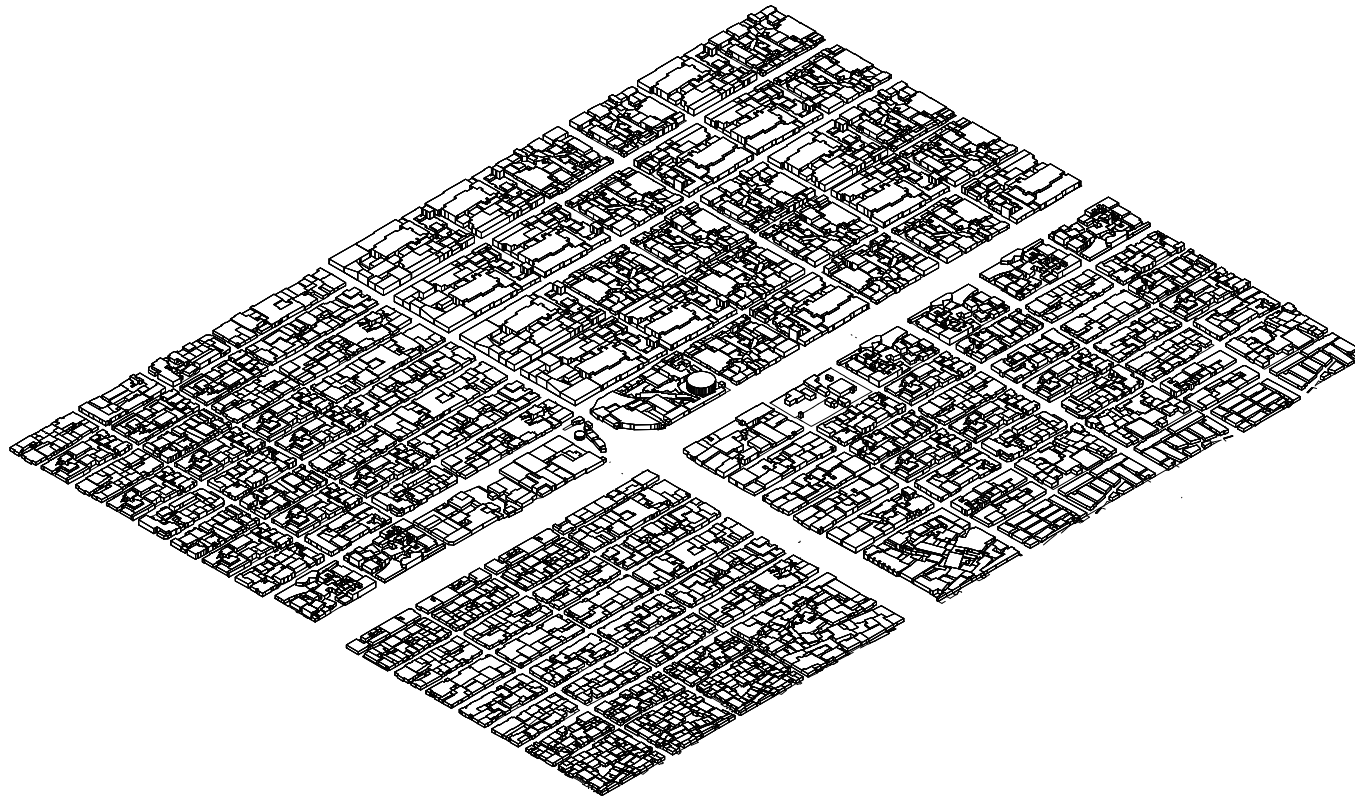


URBAN CONCEPT



ENDLESS COMBINATIONS,
CREATING NEW SPACES
SURROUNDING A COMMUNAL COURTYARD

URBAN CONCEPT



The intervention starts in the mixed zone between the commercial and residential.
On the main road to the merkato's market. Dwellers are temporarily relocated elsewhere in the merkato's grid.



Dwellers from next plot don't need to be relocated and can directly move to there new homes.

URBAN CONCEPT



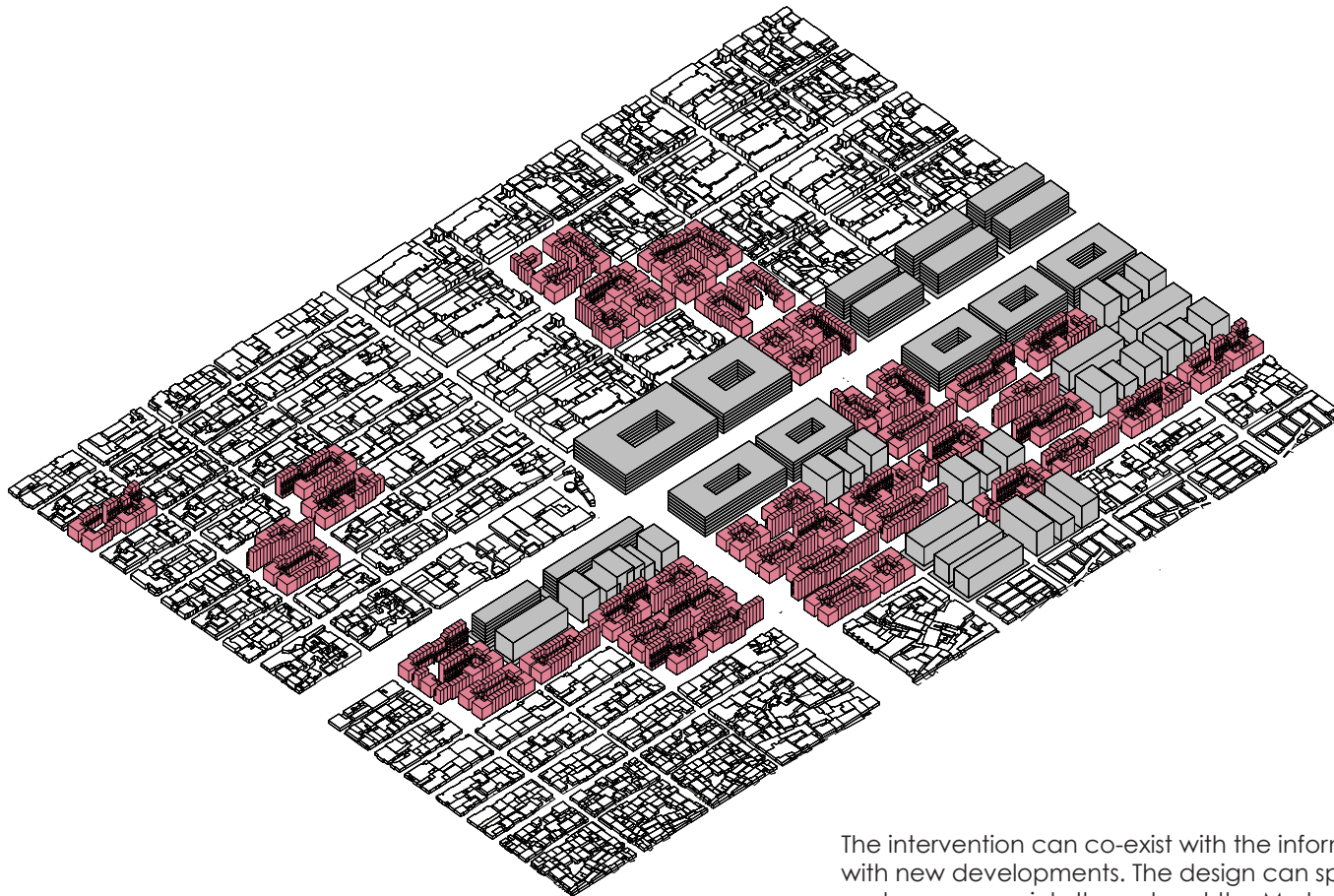


The intervention starts as a chain reaction, Spreading organically through out the grid.

URBAN CONCEPT



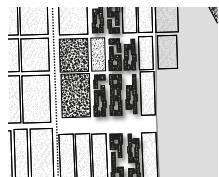
The Merkato is of strong economic importance. Over the course of time other developments will also take place within the merkato. New office and commercial spaces will be developed around the main infrastructure. And other residential developments will be developed to cater for people with a middle or higher income.



The intervention can co-exist with the informal settlements but also with new developments. The design can spread out like an oil spill and grow organically through out the Mercato and around other developments. Perforating the grid and creating new spaces.

URBAN PLAN



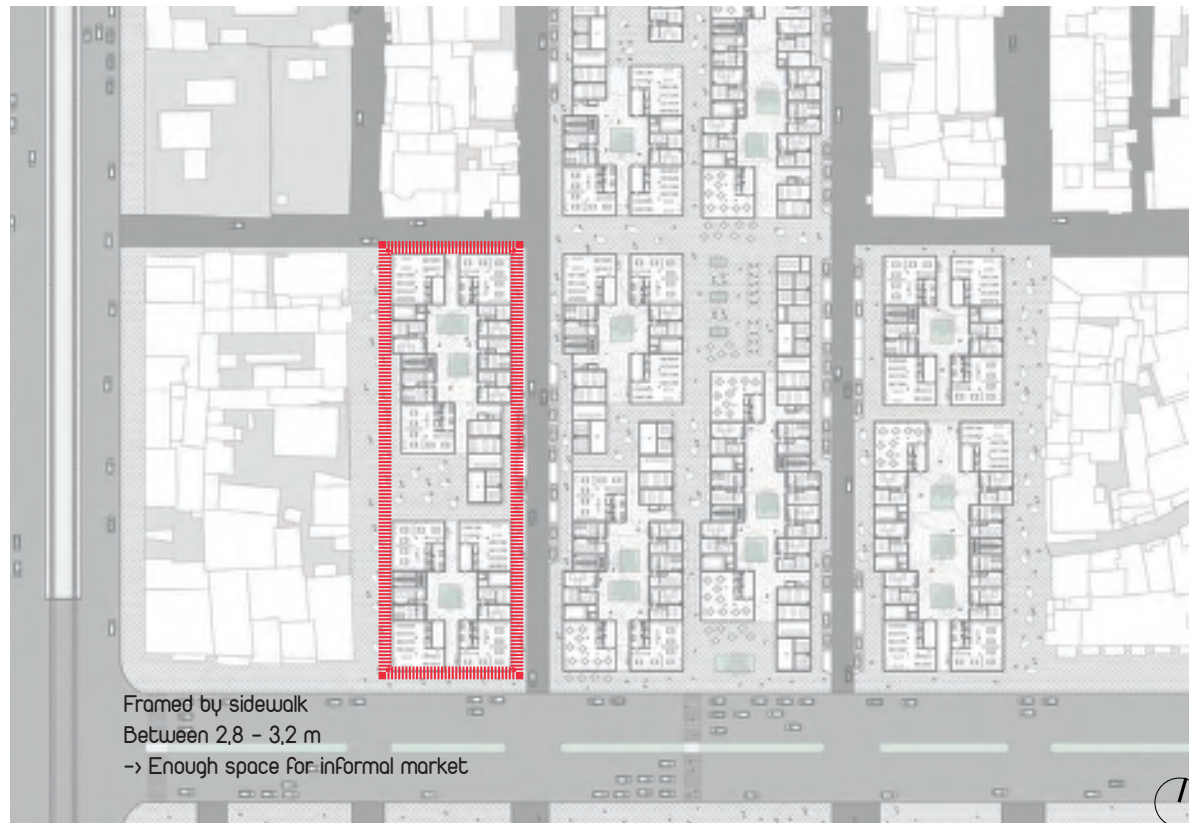


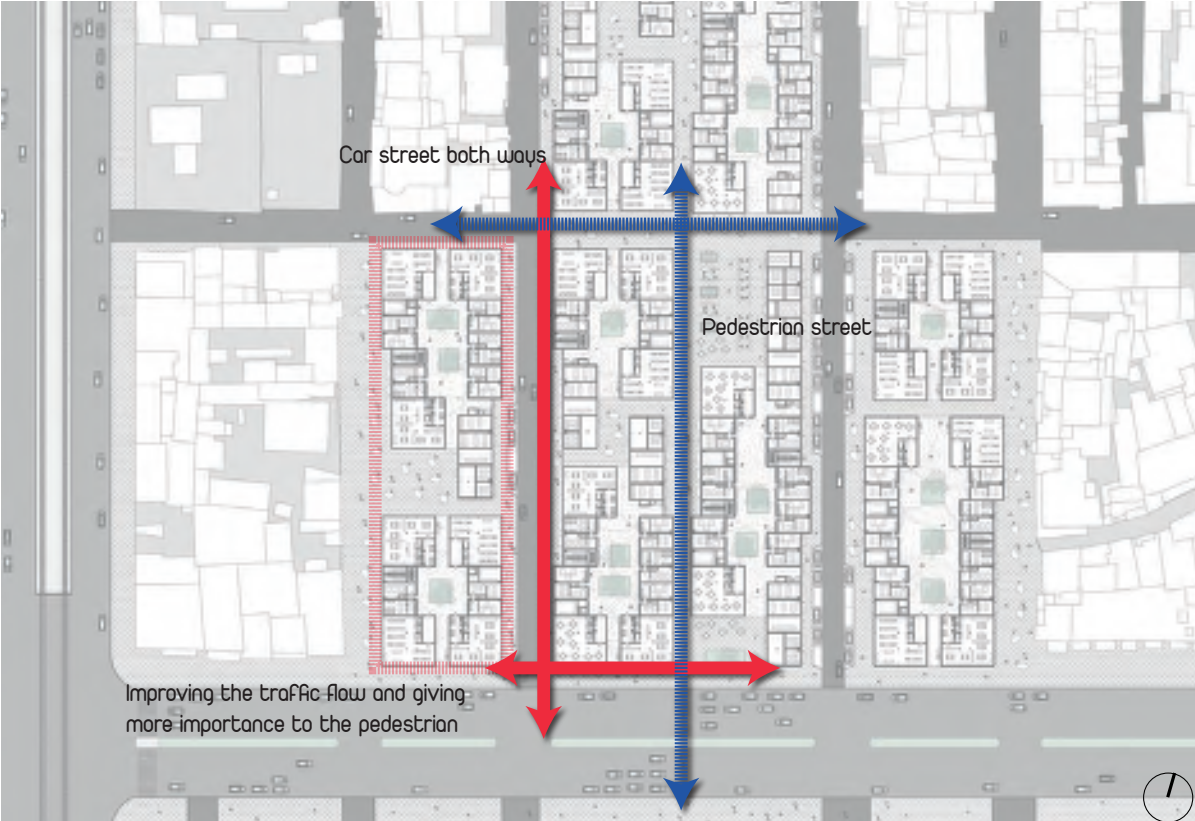


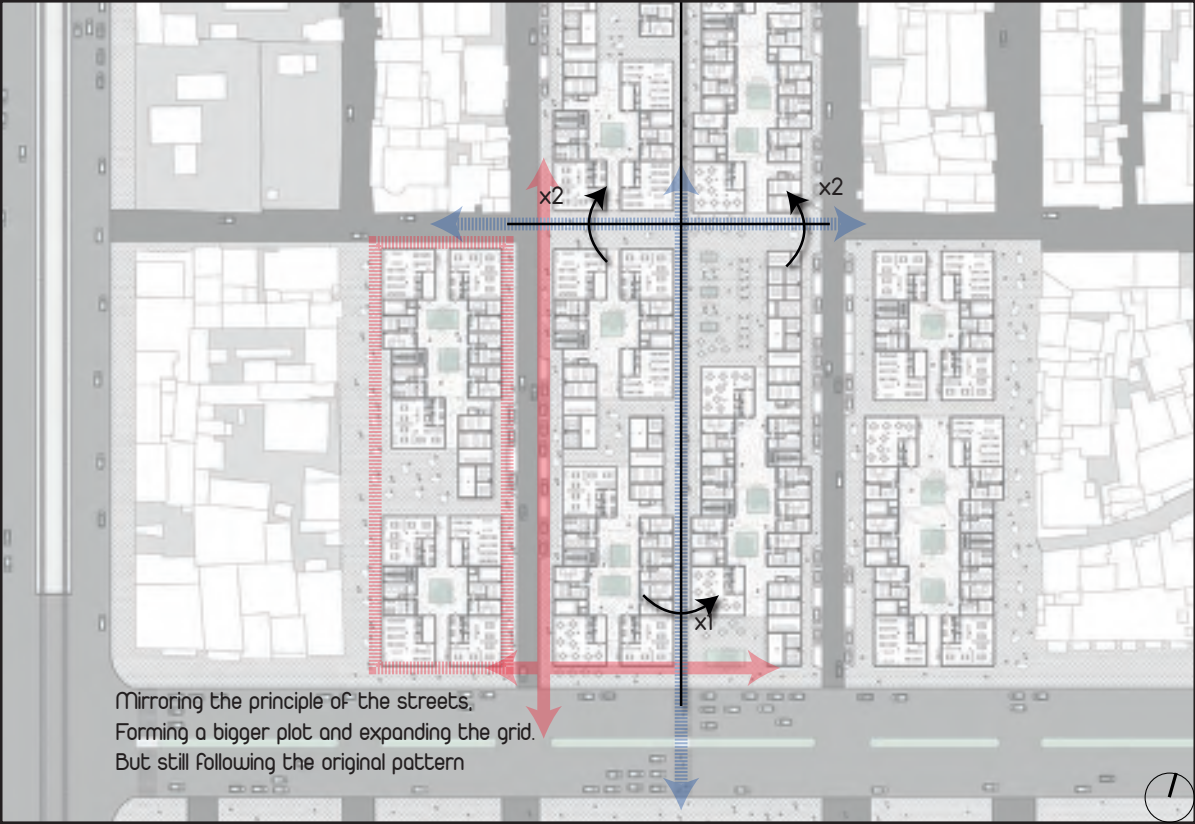
FITS IN THE GRID



URBAN CONCEPT





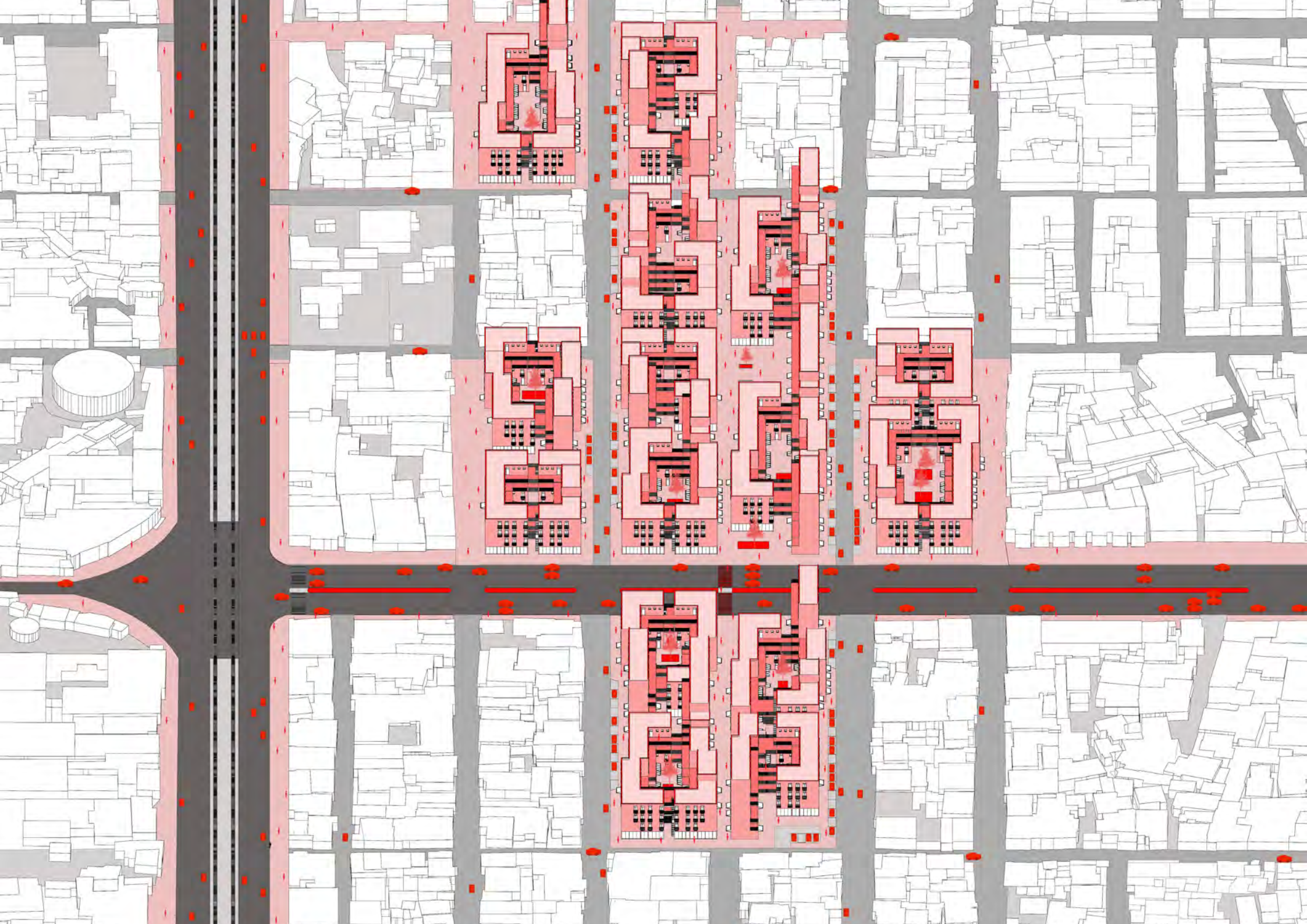


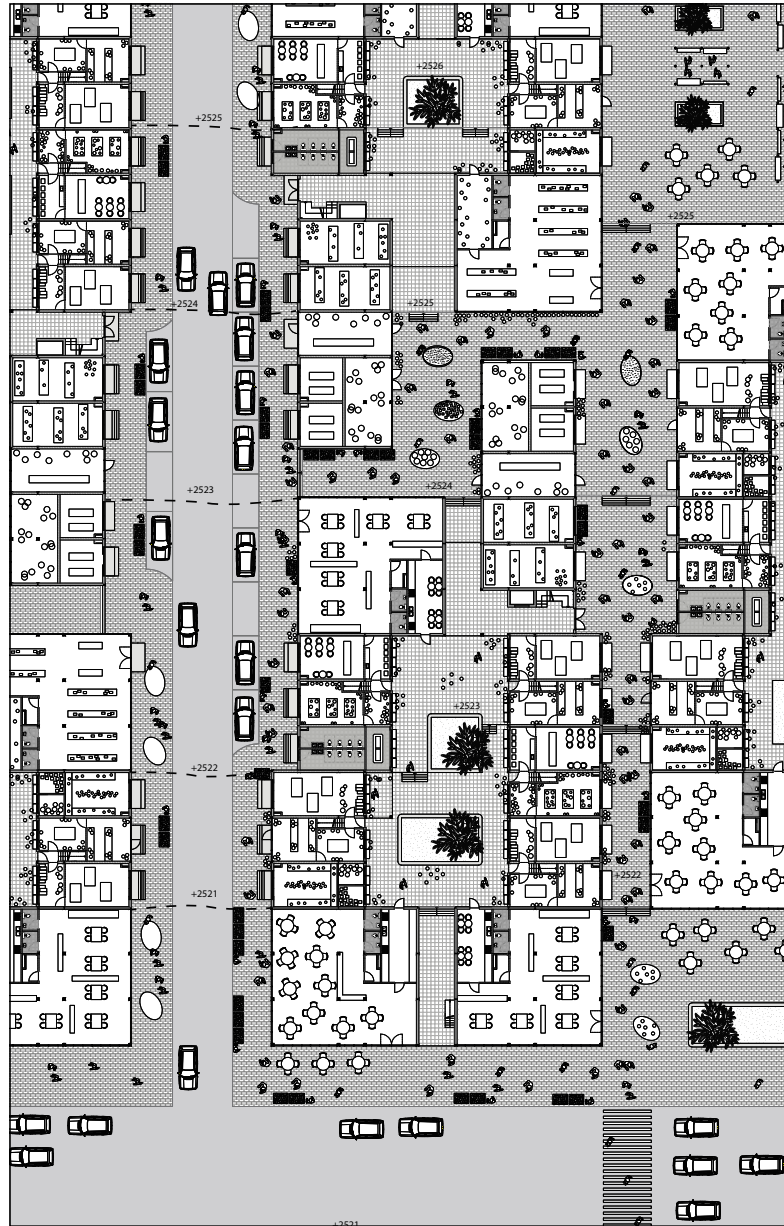


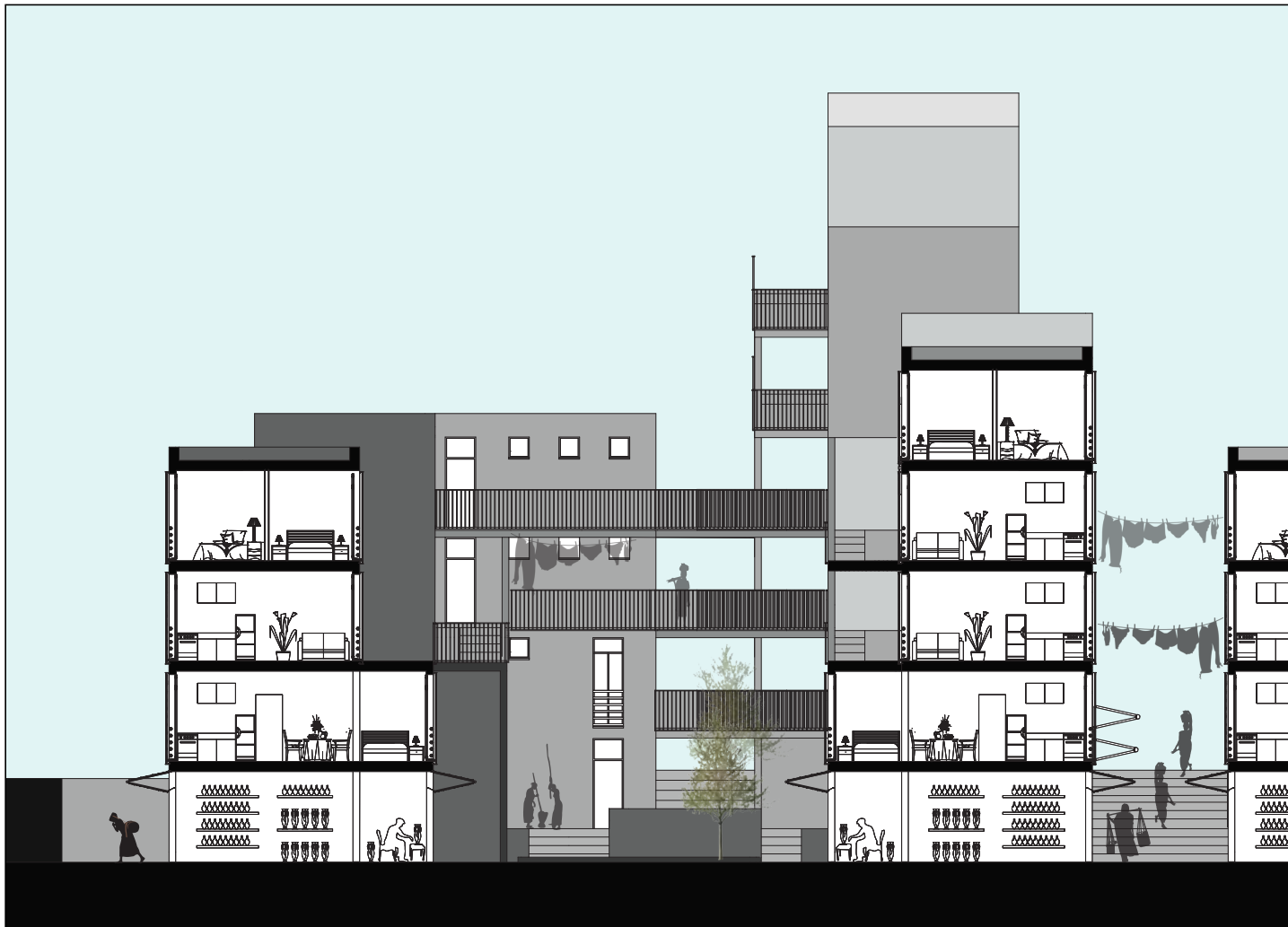
Density

Was 120 u/h & 500/h

New 310 u/h & 1000/h







1ST FLOOR

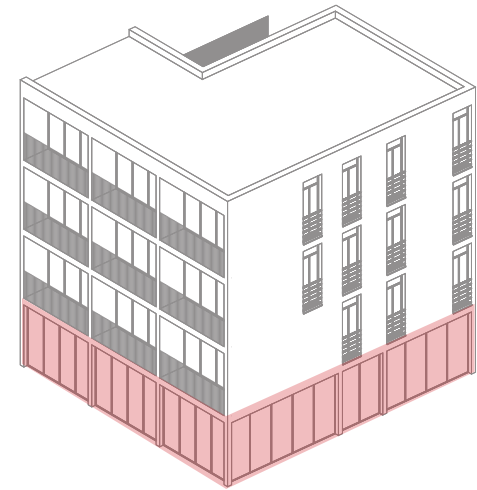
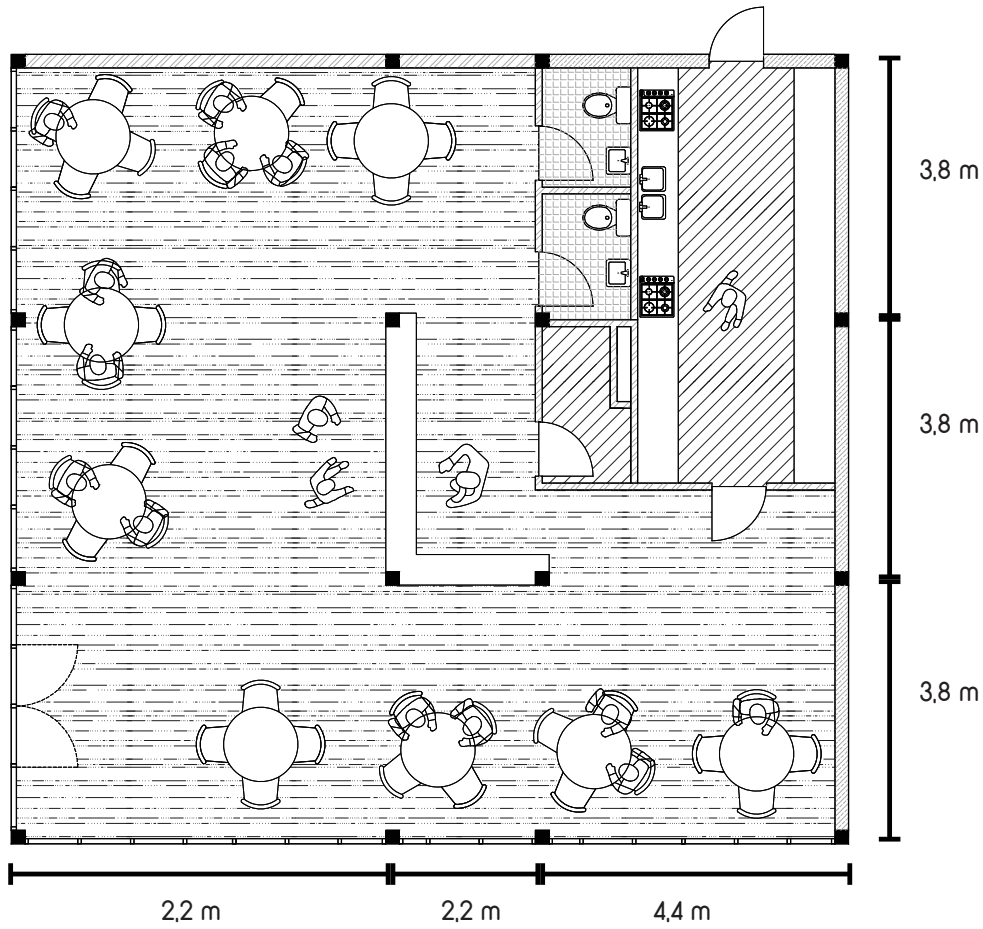


2ND FLOOR

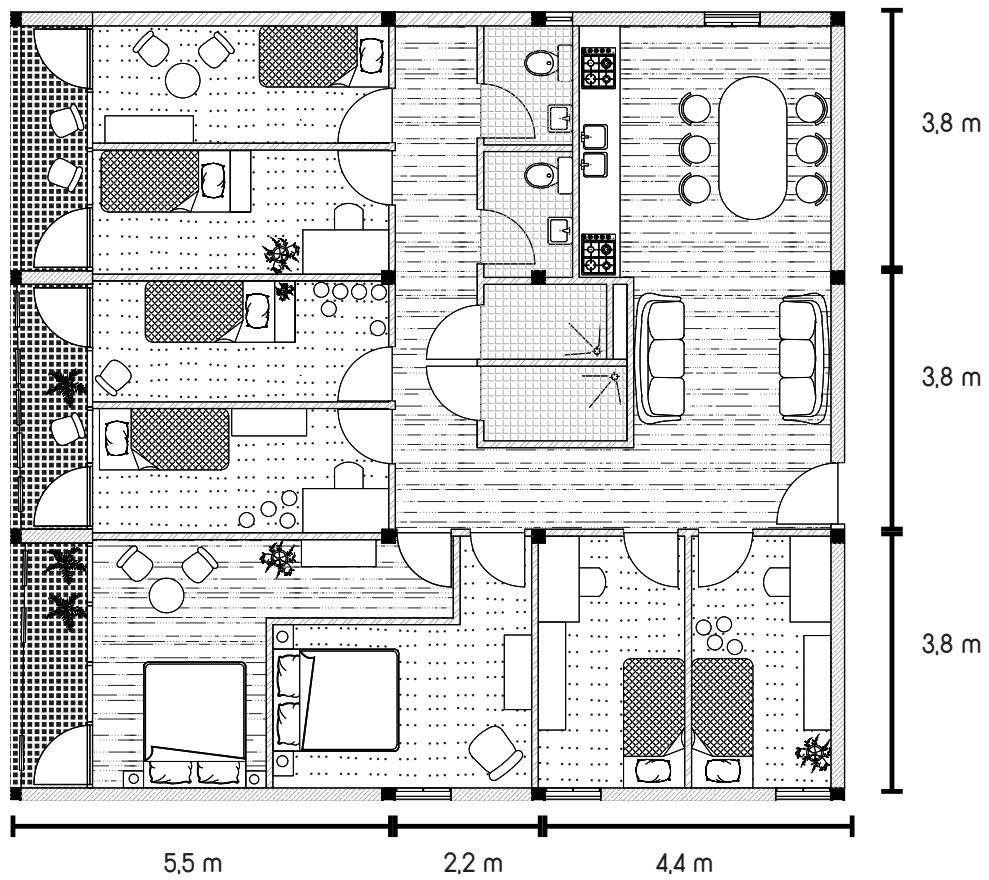


3RD FLOOR

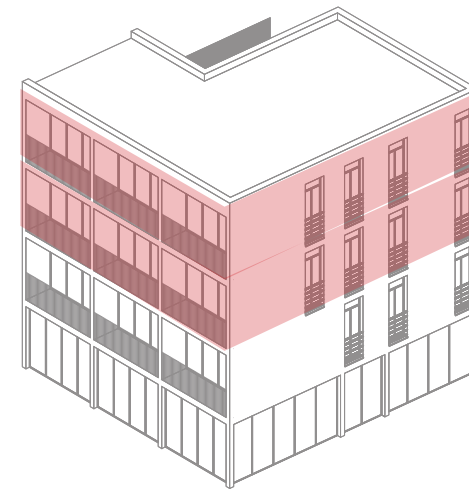
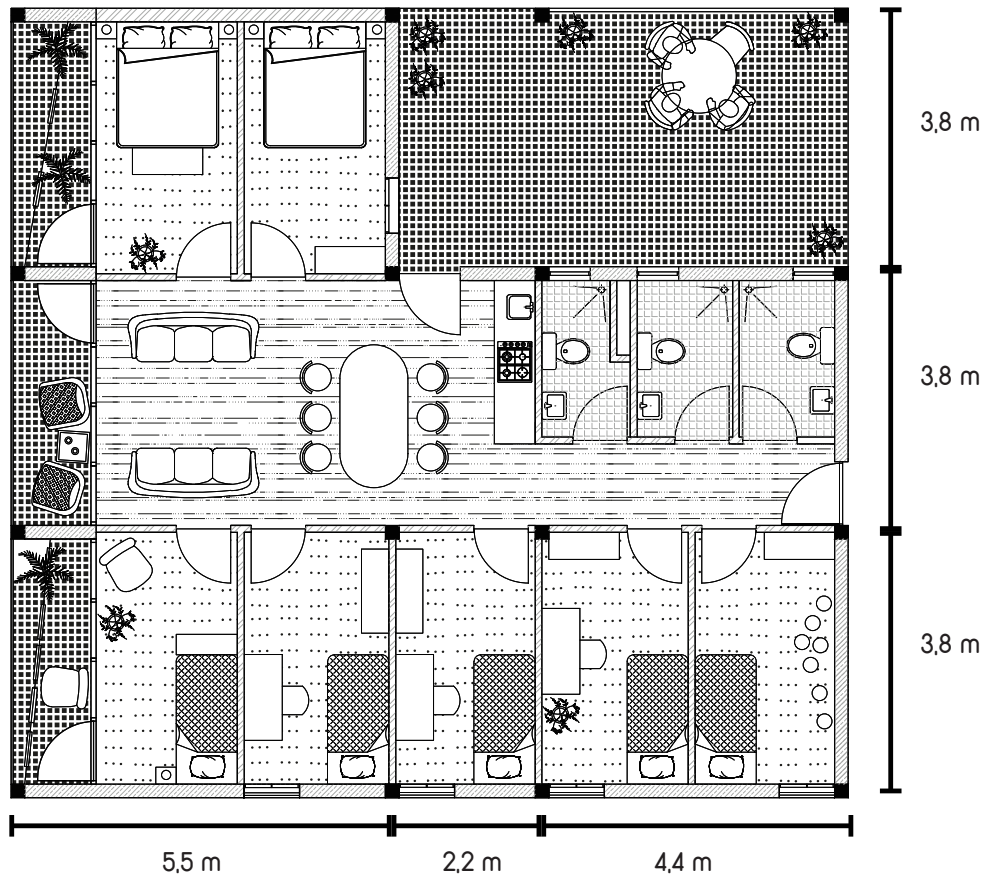




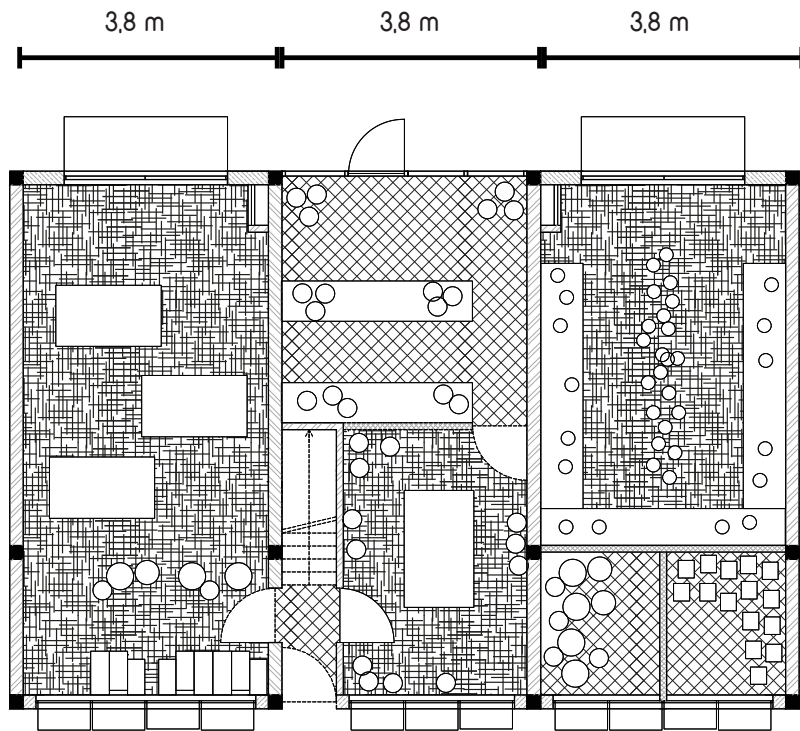
Extended commercial space



Short Stay
8-10 people

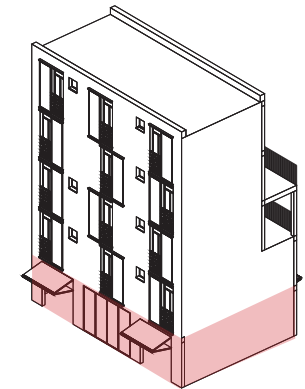
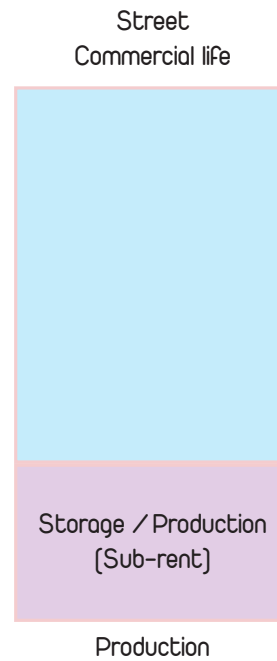


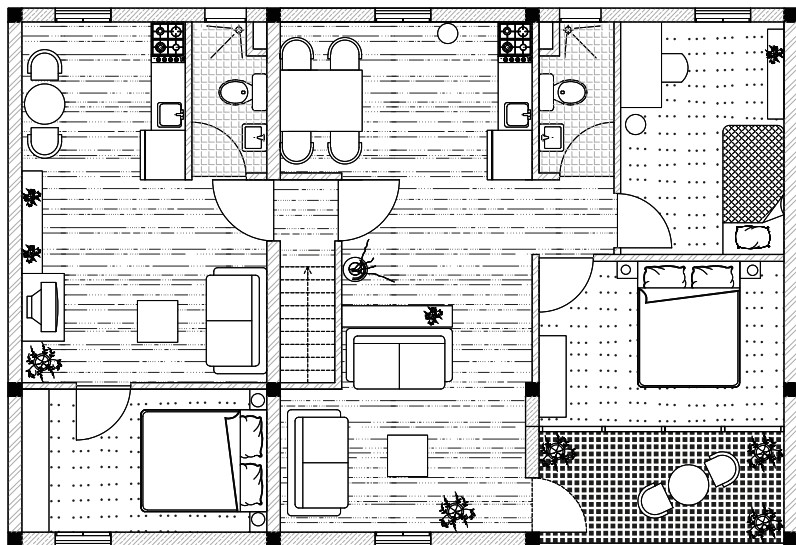
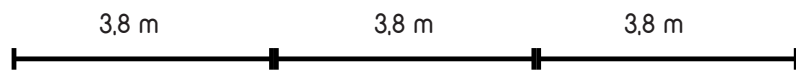
Short Stay
7-9 people



5.5 m

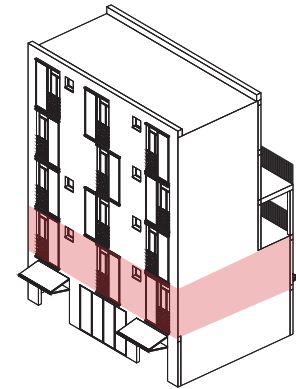
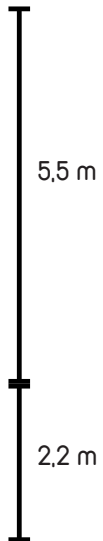
2.2 m





A

B

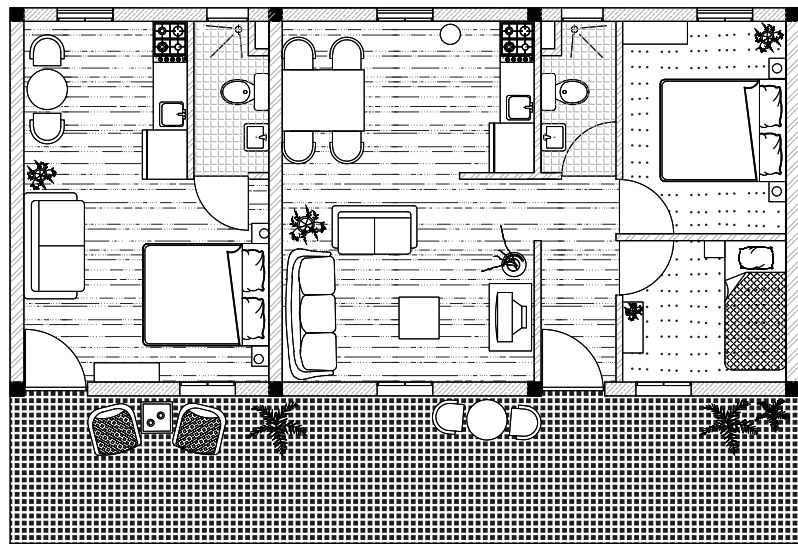
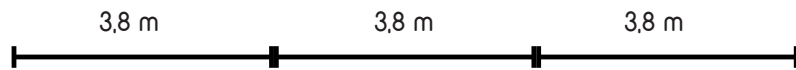


Permanent Housing

Both houses are connected to a commercial space on the ground floor.

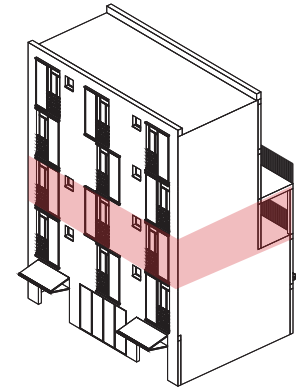
A: 30 m² 1 bed apartment

B: 52 m² 2 bed apartment



A

B

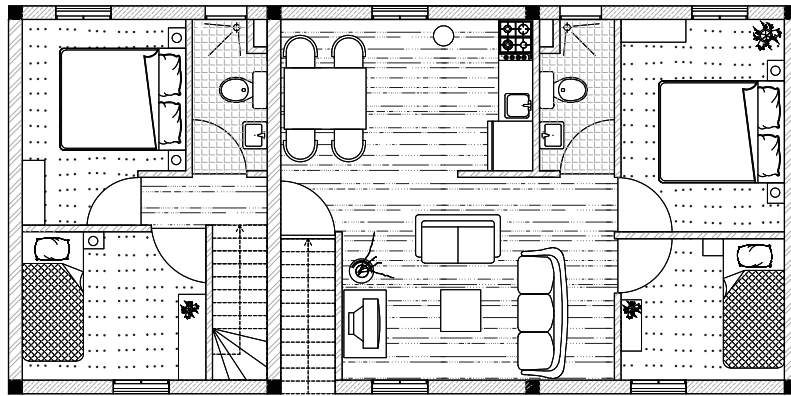


Permanent Housing

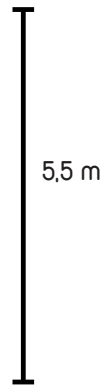
Housing on the main gallery

A: 21 m² Studio

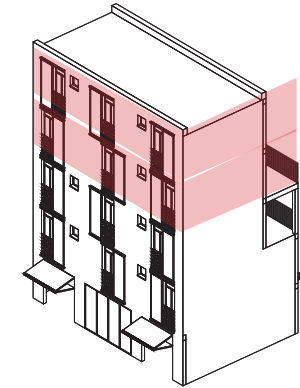
B: 42 m² 2 bed apartment



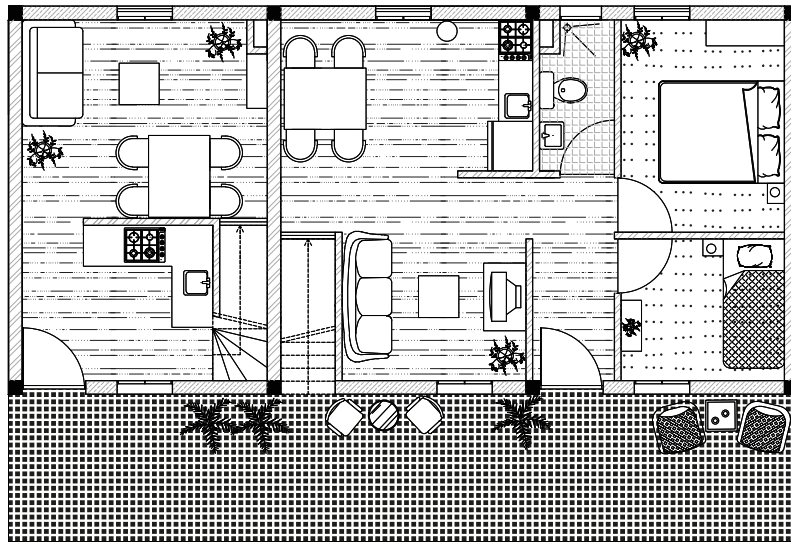
C



5,5 m



Permanent Housing



3,8 m

3,8 m

3,8 m

A

B



5,5 m

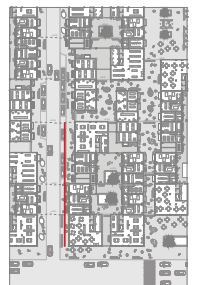
2,2 m

A: 42 m² Maisonnette (2b)

B: 40 m² 2 bed apartment

C: 40 m² 2 bed apartment

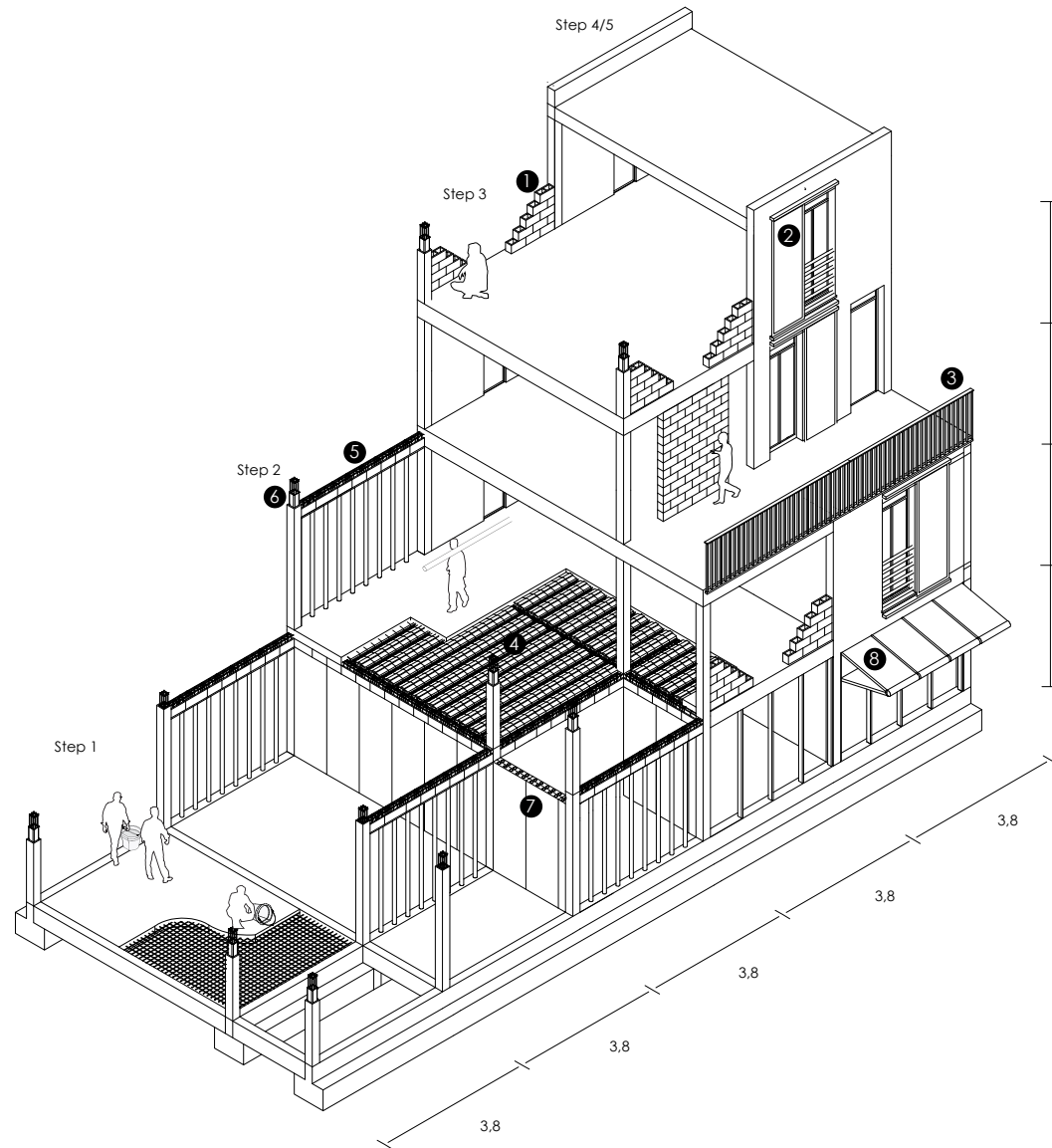
STREET



COURTYARD



CONSTRUCTION



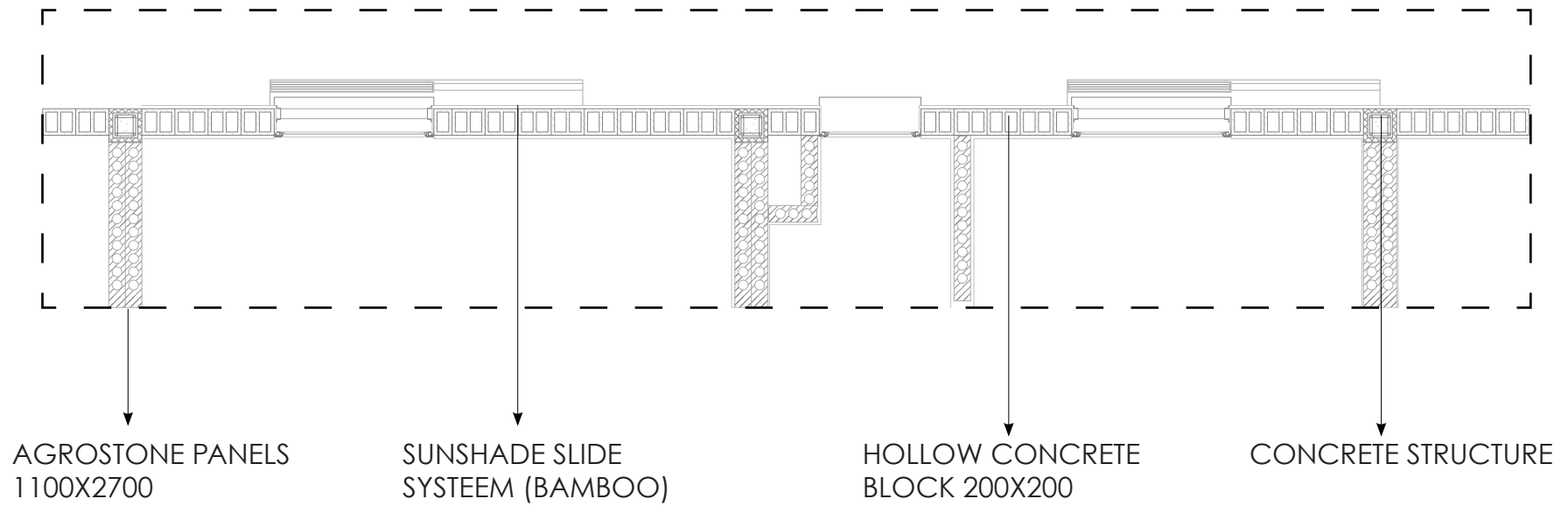
MATERIALS

1. HOLLOW CONCRETE BLOCK
2. SUNSHADE SYSTEEM (STEEL/BAMBOO PANELS)
3. STEEL RAILING
4. HOLLOW SLAB FLOOR
5. U-BEAM WITH REINFORCED STEEL
6. COLUMN WITH REINFORCED STEEL
7. AGROSTONE PANEL (PARTITION WALL)
8. BAMBOO PENT ROOF

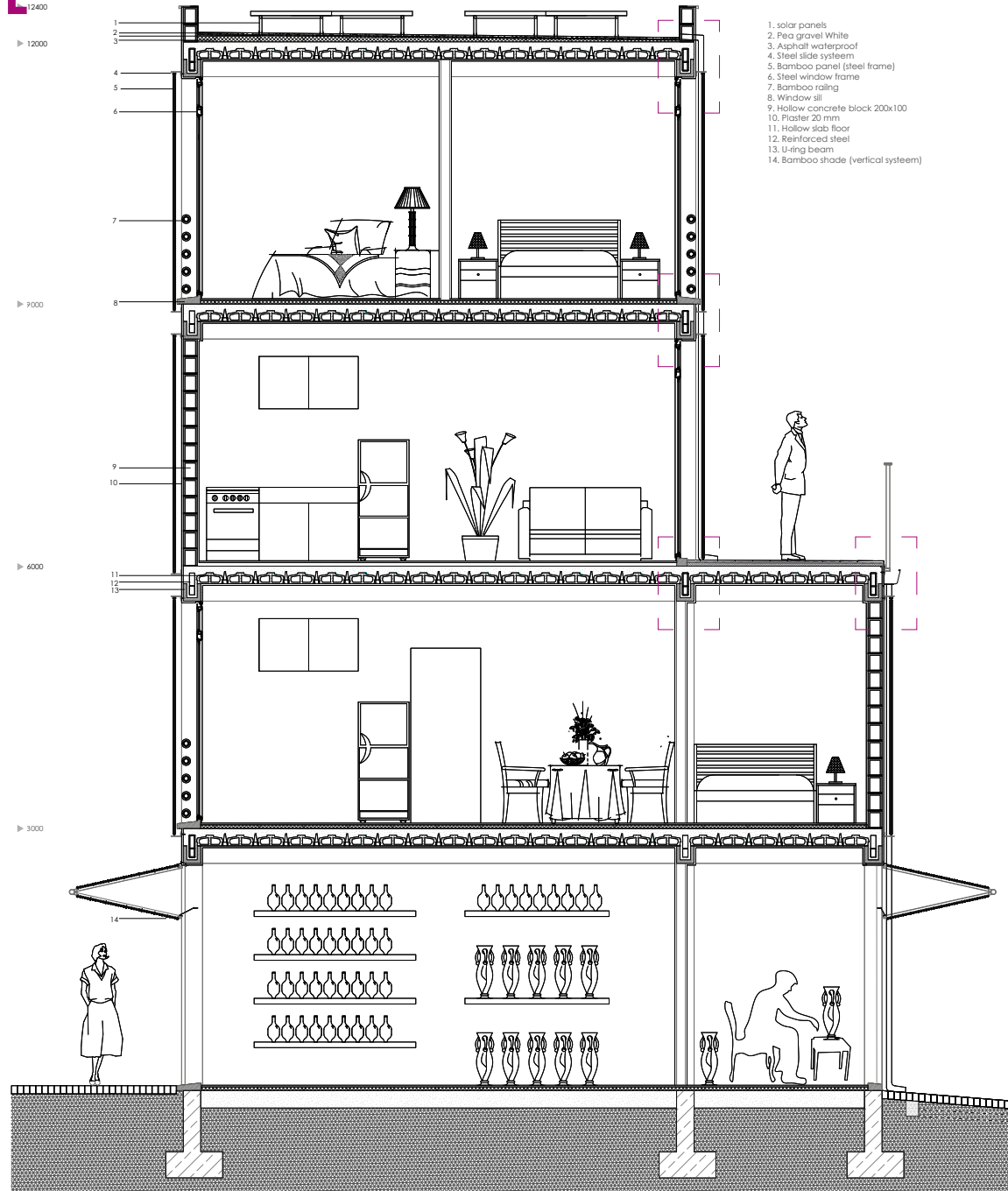
FACADE

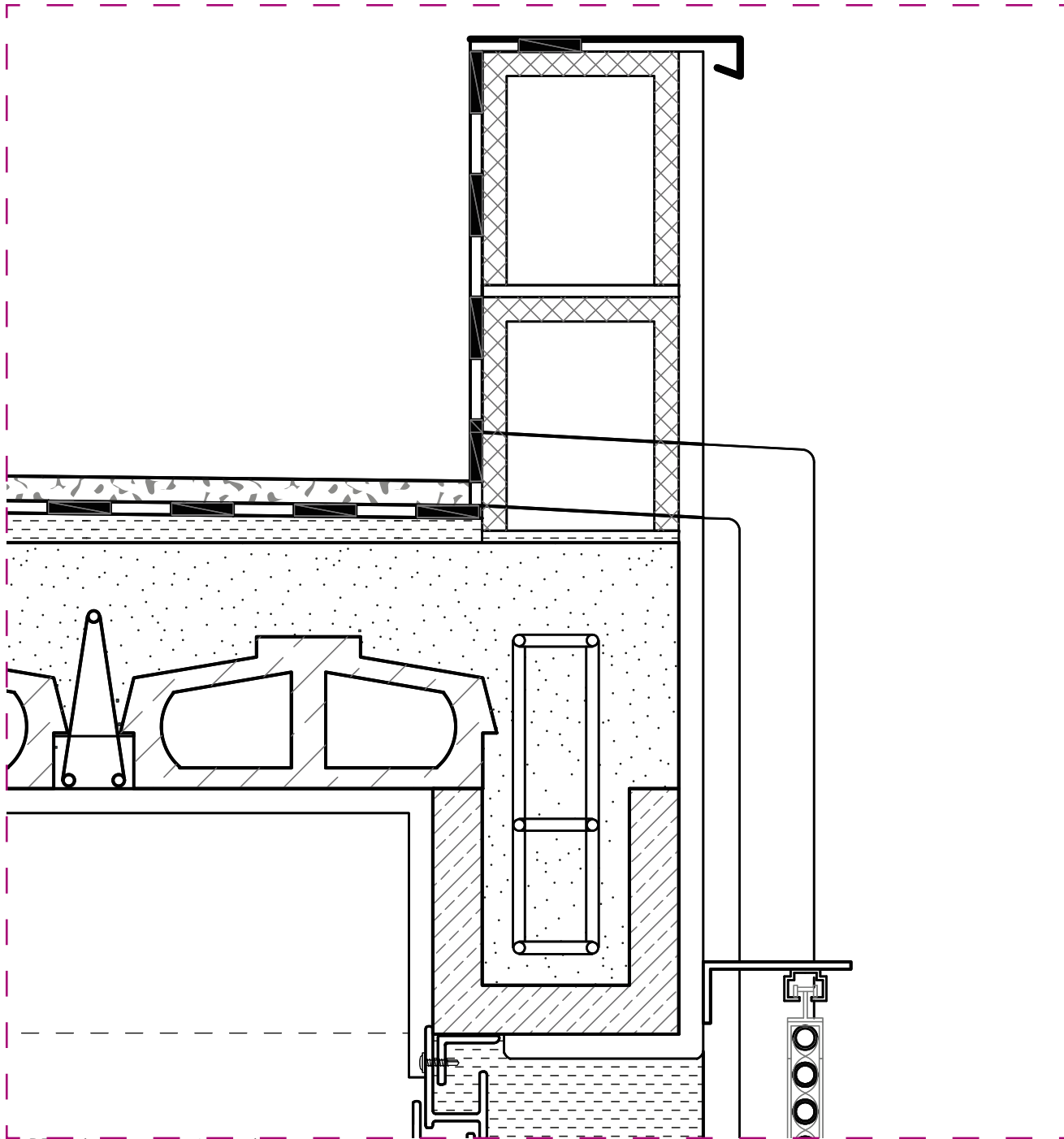


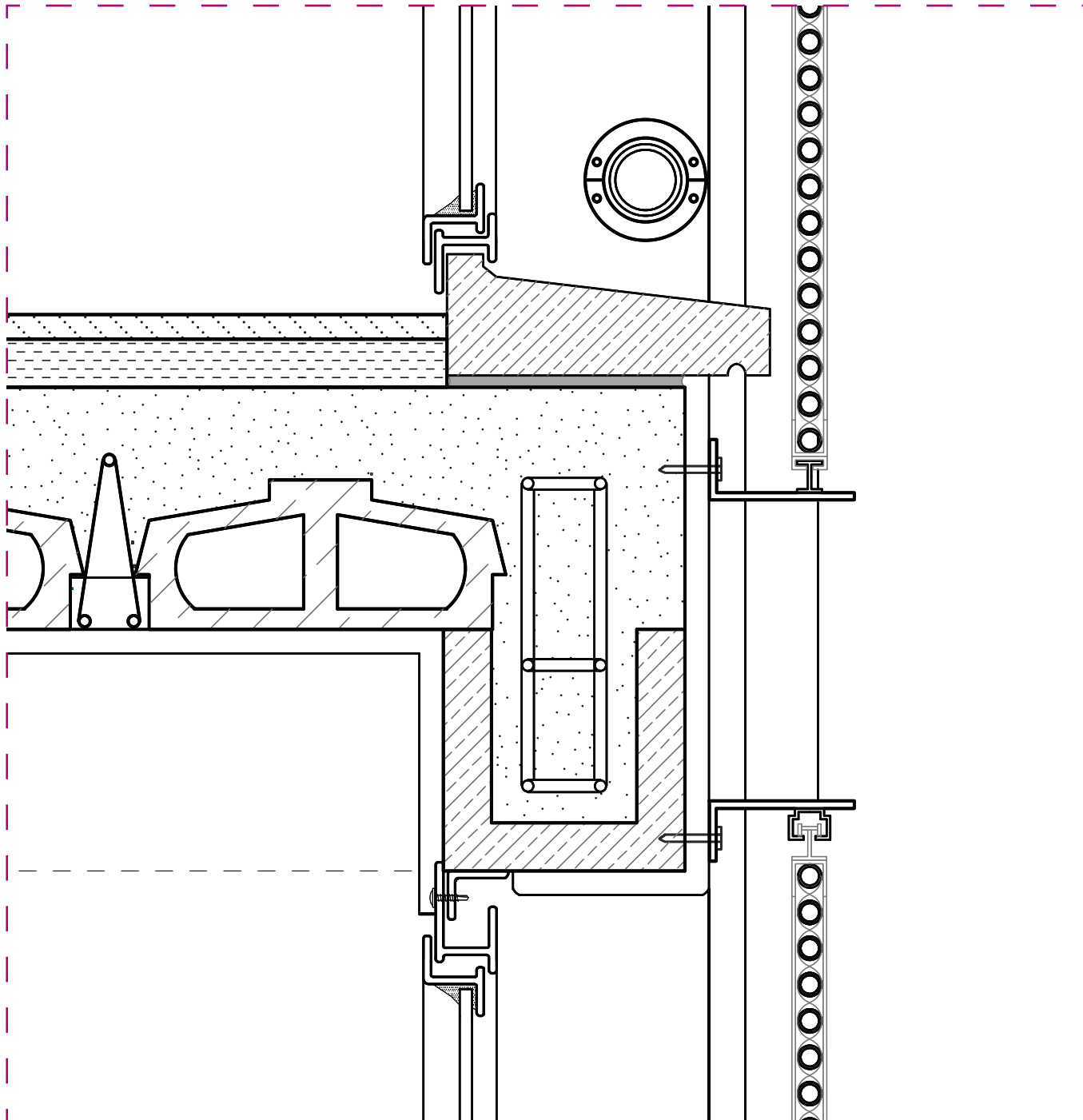
SCALE 1:40

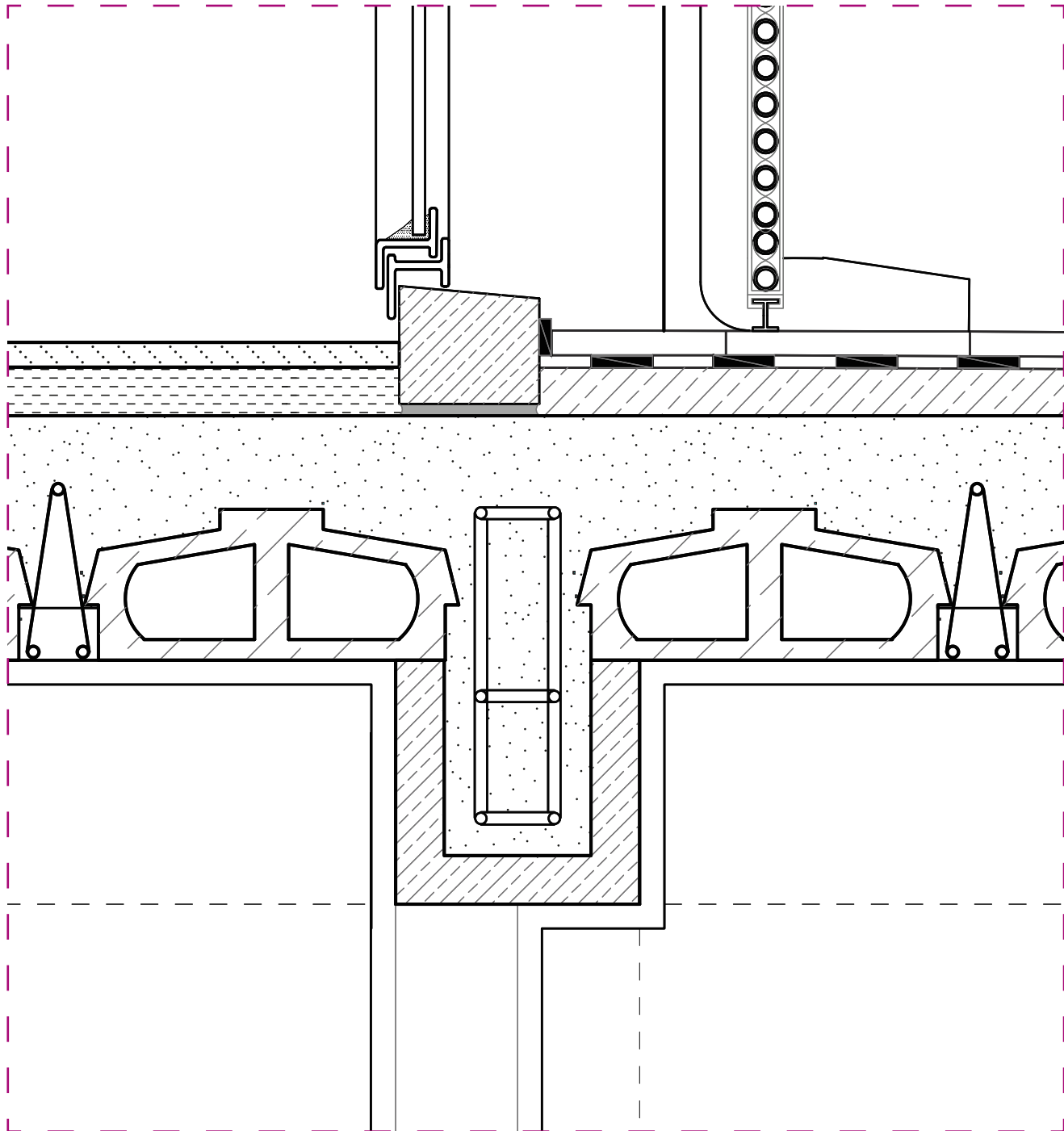


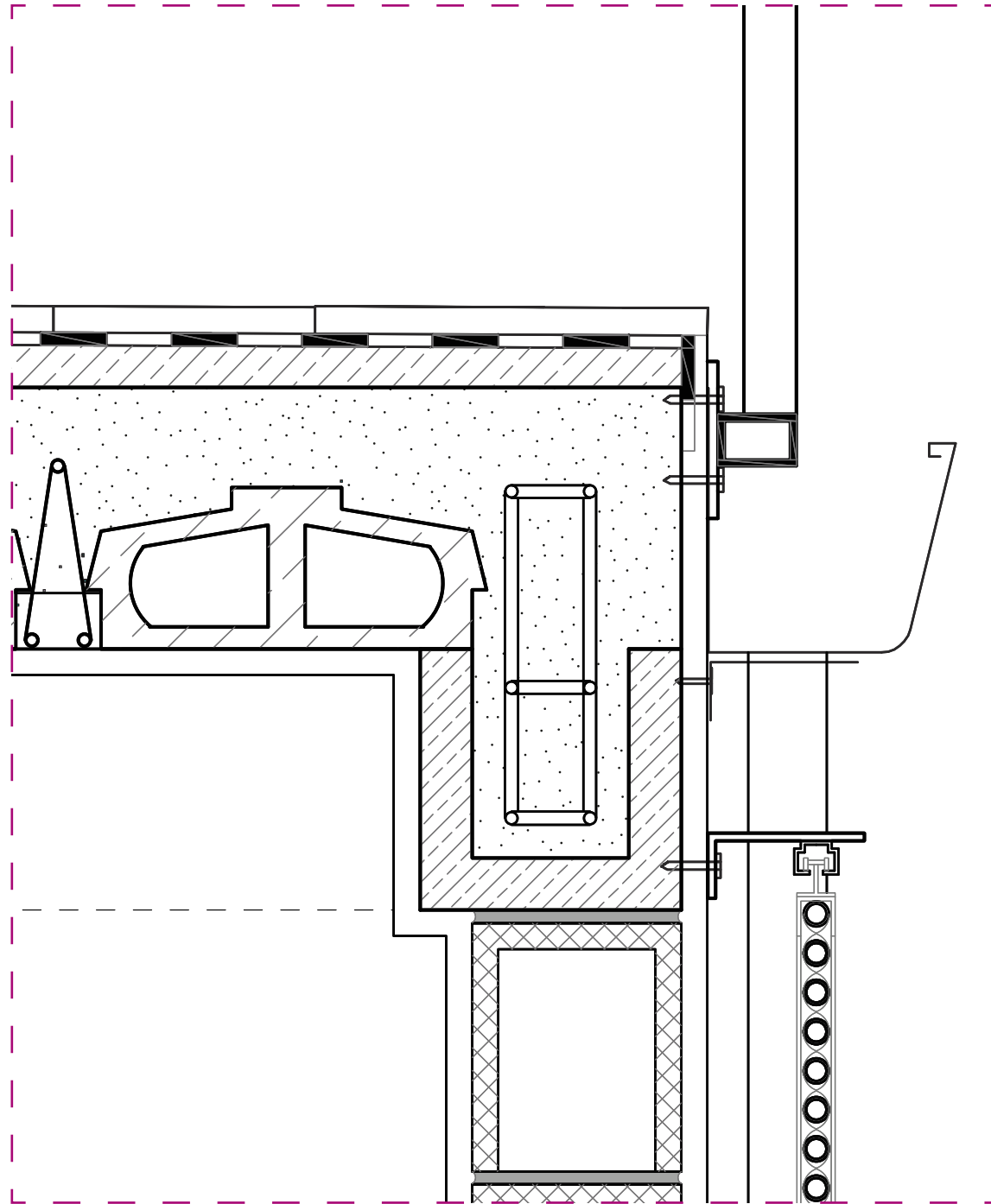
FACADE DETAIL



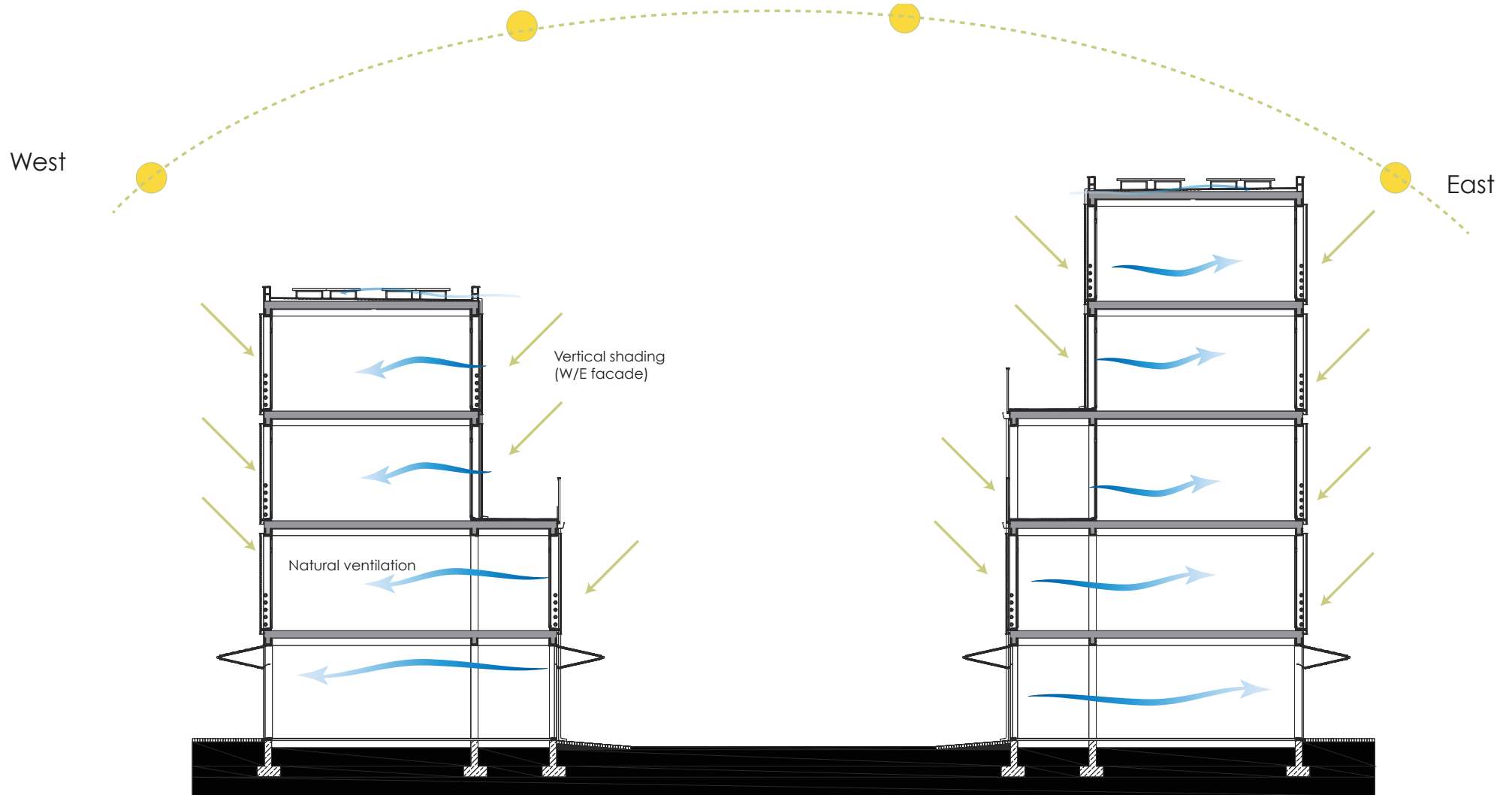








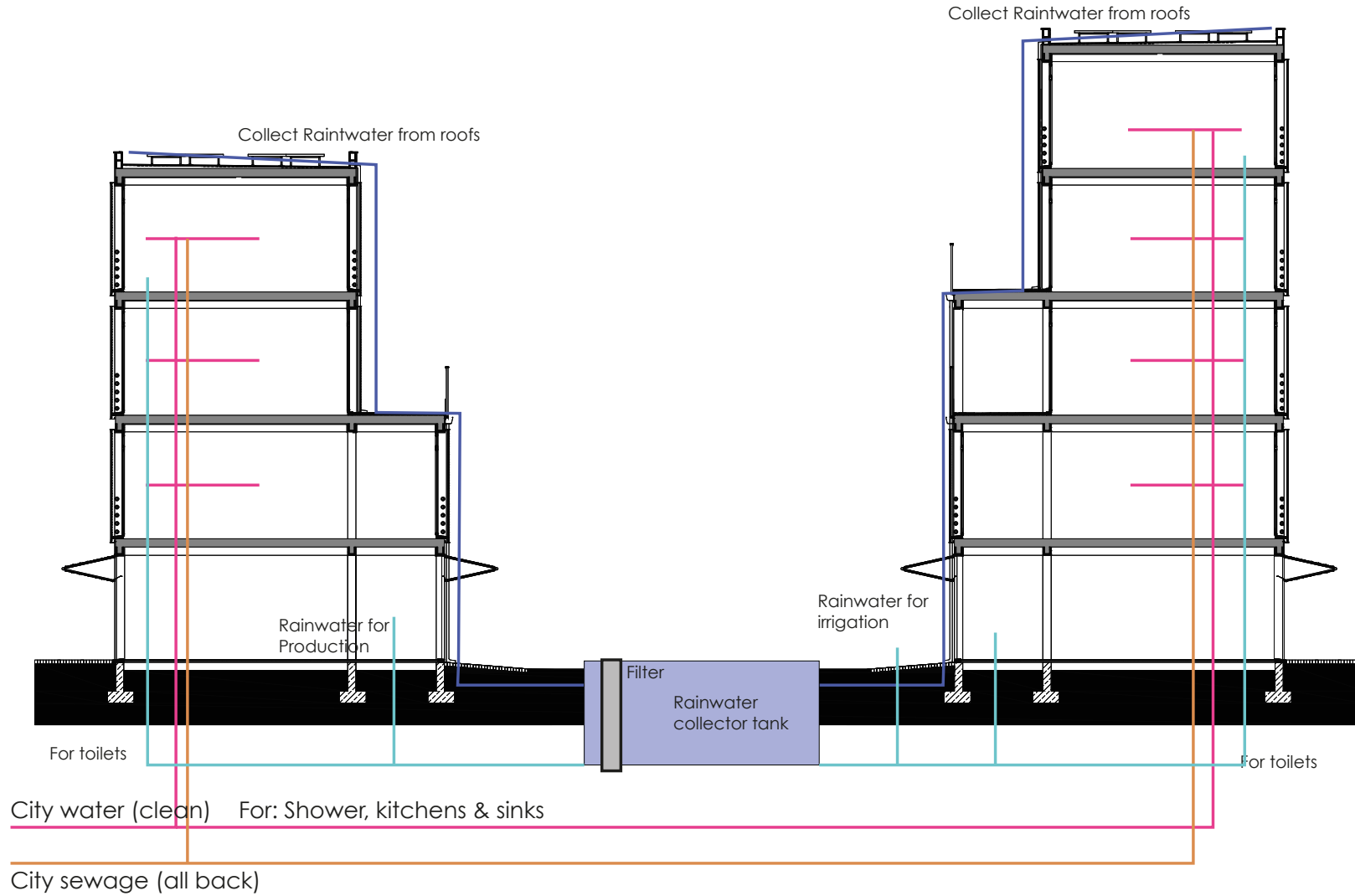
CLIMATE



By opening the doors and windows it is possible to make use of cross ventilation in each dwelling. On the construction site doors should be positioned in a way that allows the air to flow when they are closed, too. Therefore, there should be a gap between them and the floor or an operable window between them and the ceiling.

WATER SYSTEM

Each building is provided with a tank for the collection of raining water. The tank is positioned under the sidewalk while the system for its purification is in the underground of the building. Beside that, each dwelling is connected to the municipality water supply.













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