BUILDING TRUST

preserving an inclusive Addis Ababa

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Mentors:
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Frank Schnater
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FOR MY FAMILY WHO
HELPED AND SUPPORTED ME

out of

PASSION

/ˈPÆΣ.ƏN/

1. an subject of someone's love
2. suffering

CONTENT

“First live, then spaces, then buildings the other way around never works.“

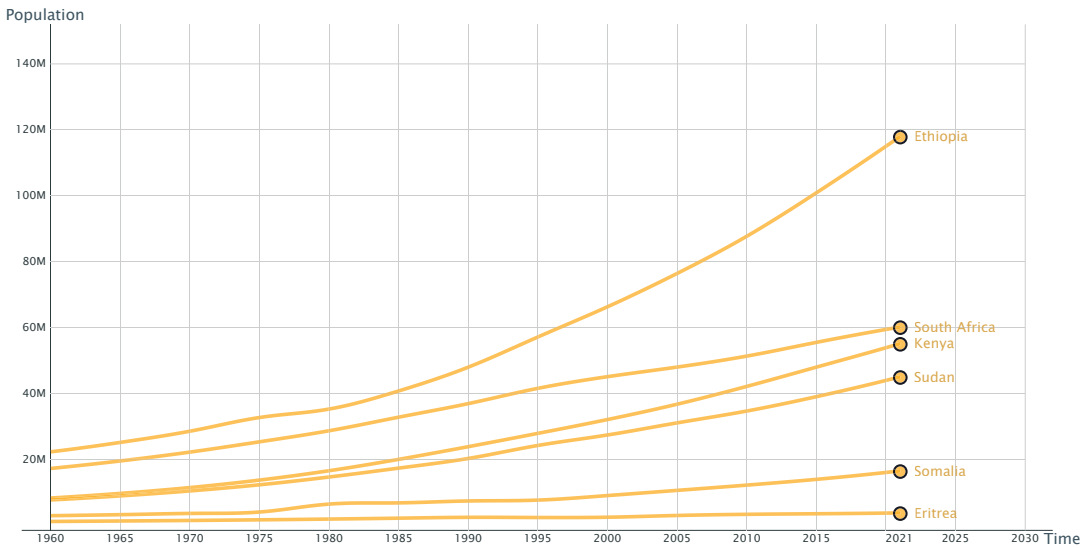
- Jan Gehl

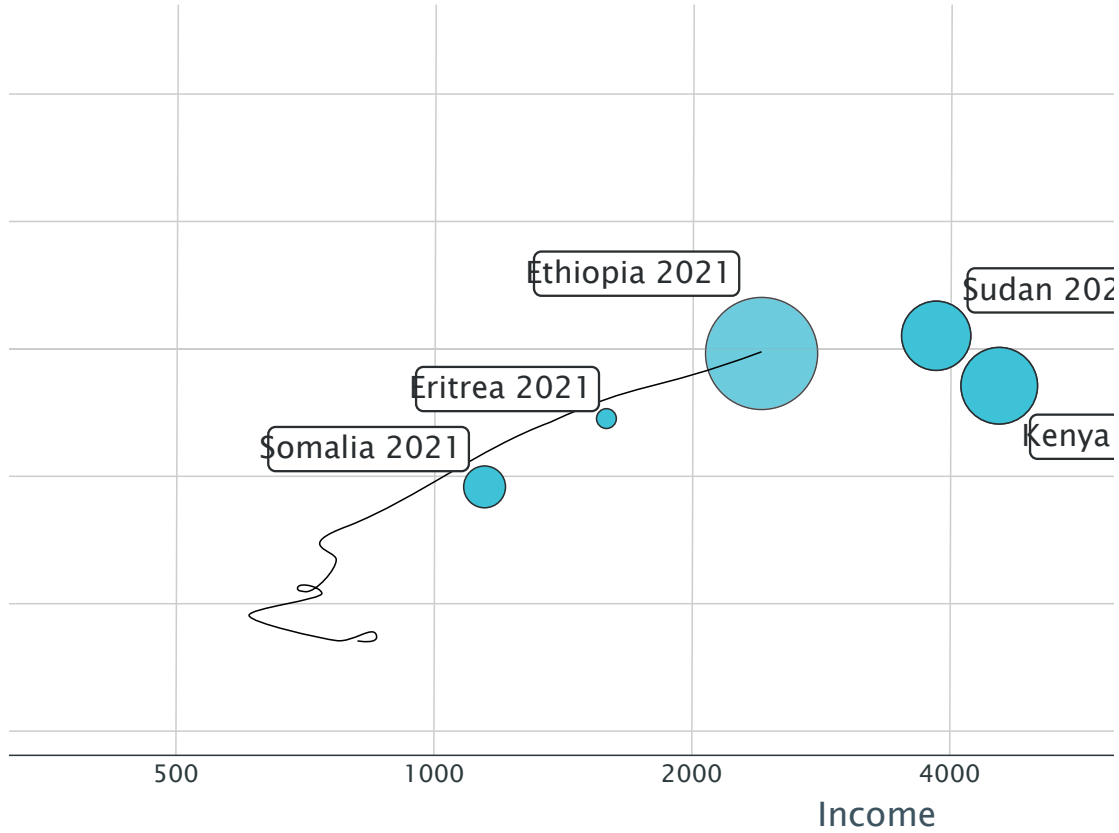
BACKGROUND

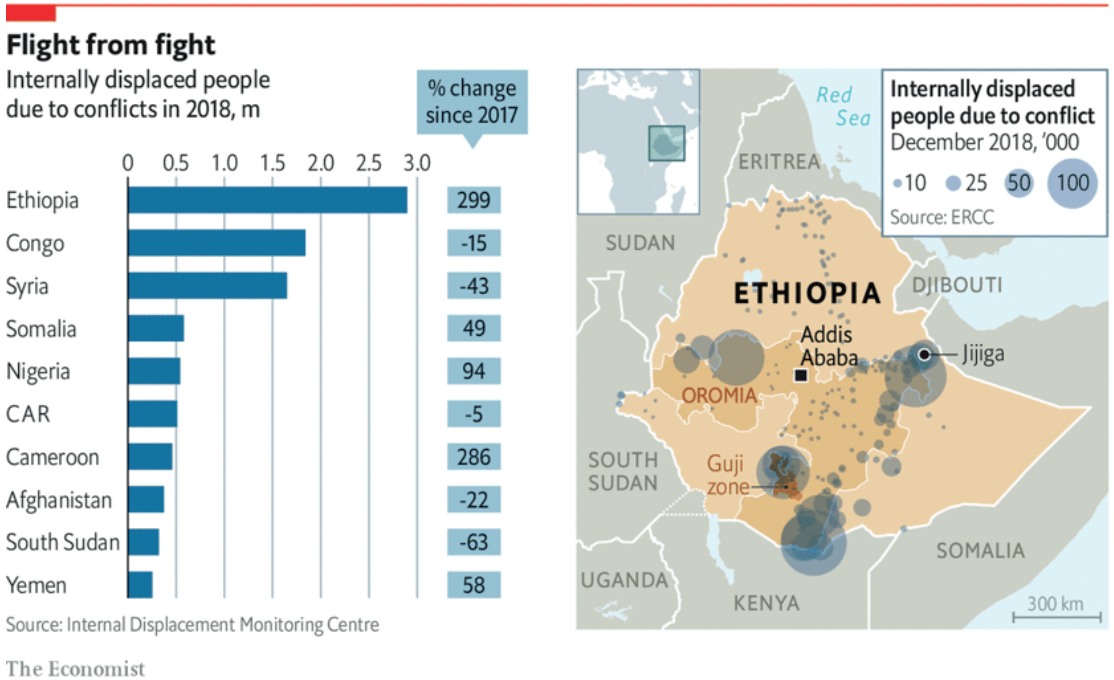
setting the stage

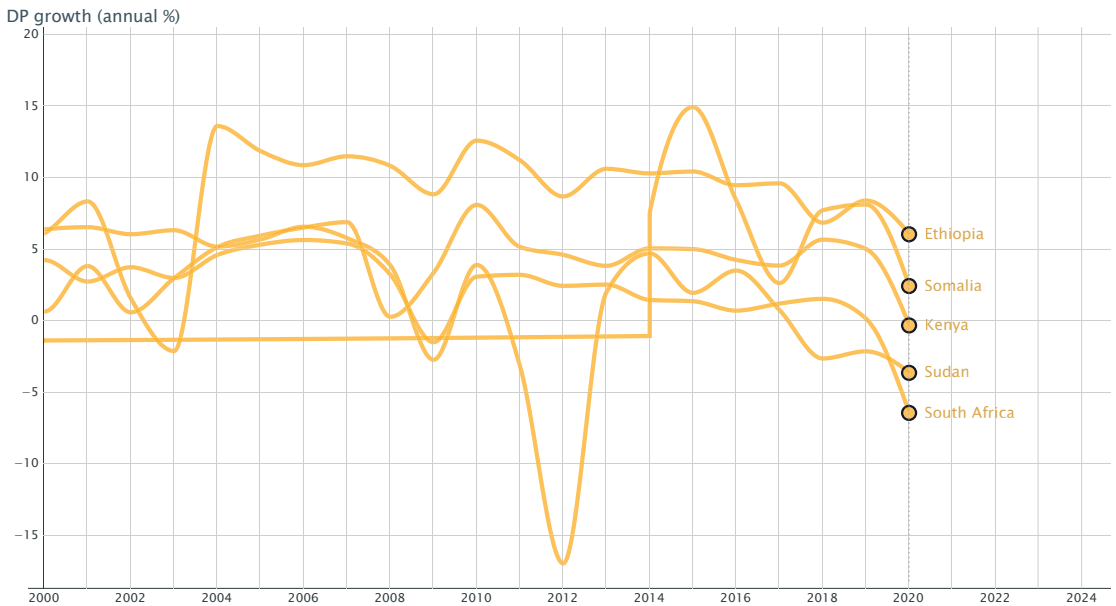
Addis Ababa is the capital of Ethiopia and is both the economic and administrative centre of the nation. With the headquarters of the African Union, UN Economic Commission for Africa and the United Nations Development Program, Addis Ababa has often been referred to as “Afrika’s diplomatic capital”. (Wubneh, 2013)

Despite generally increasing prosperity and life expectancy, (Gapminder Foundation, 2019) the city faces several problems. (Wubneh, 2013) Whit a population growth of 17% between 2007 and 2017 (resulting in 3.8 million inhabitants in 2018) and the expansion of the footprint by 51% between 2007 and 2017 (Addis Ababa City Administration et al., 2020), many of the problems are caused by the rapid growth. (Wubneh, 2013) Due to the fast urbanization that comes with the rapid growth (an annual population growth of 3.8%) (Addis Ababa City Administration et al., 2020) the government unable to provide adequate housing and basic amenities for all its residents. (Wubneh, 2013) As a result, the city densifies itself through informal settlements within the city and through urban sprawl on the city edges. Even causing ethnic tension through expanding beyond its administrative boundaries. (Burke, 2017)






Flight from fight
Internally displaced people due to conflicts in 2018, m
% change since 2017
0
0.5
1.0
1.5
2.0
2.5
3.0
Ethiopia 299
Congo -15
Syria -43
Somalia 49
Nigeria 94
CAR -5
Cameroon 286
Afghanistan -22
South Sudan -63
Yemen 58
Source: Internal Displacement Monitoring Centre
The Economist
Internally displaced people due to conflict
December 2018, '000
10
25
50
100
Source: ERCC
Red Sea
ERITREA
SUDAN
ETHIOPIA
DJIBOUTI
Addis Ababa
Jijiga
OROMIA
SOUTH SUDAN
Guji zone
SOMALIA
UGANDA
KENYA
300 km

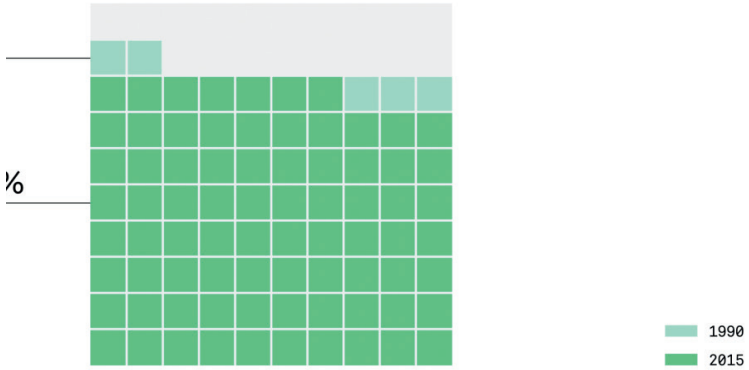

DP growth (annual %)
20
15
10
5
0
−5
−10
−15
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Ethiopia
Somalia
Kenya
Sudan
South Africa

sun rise real estate

ayat real estate

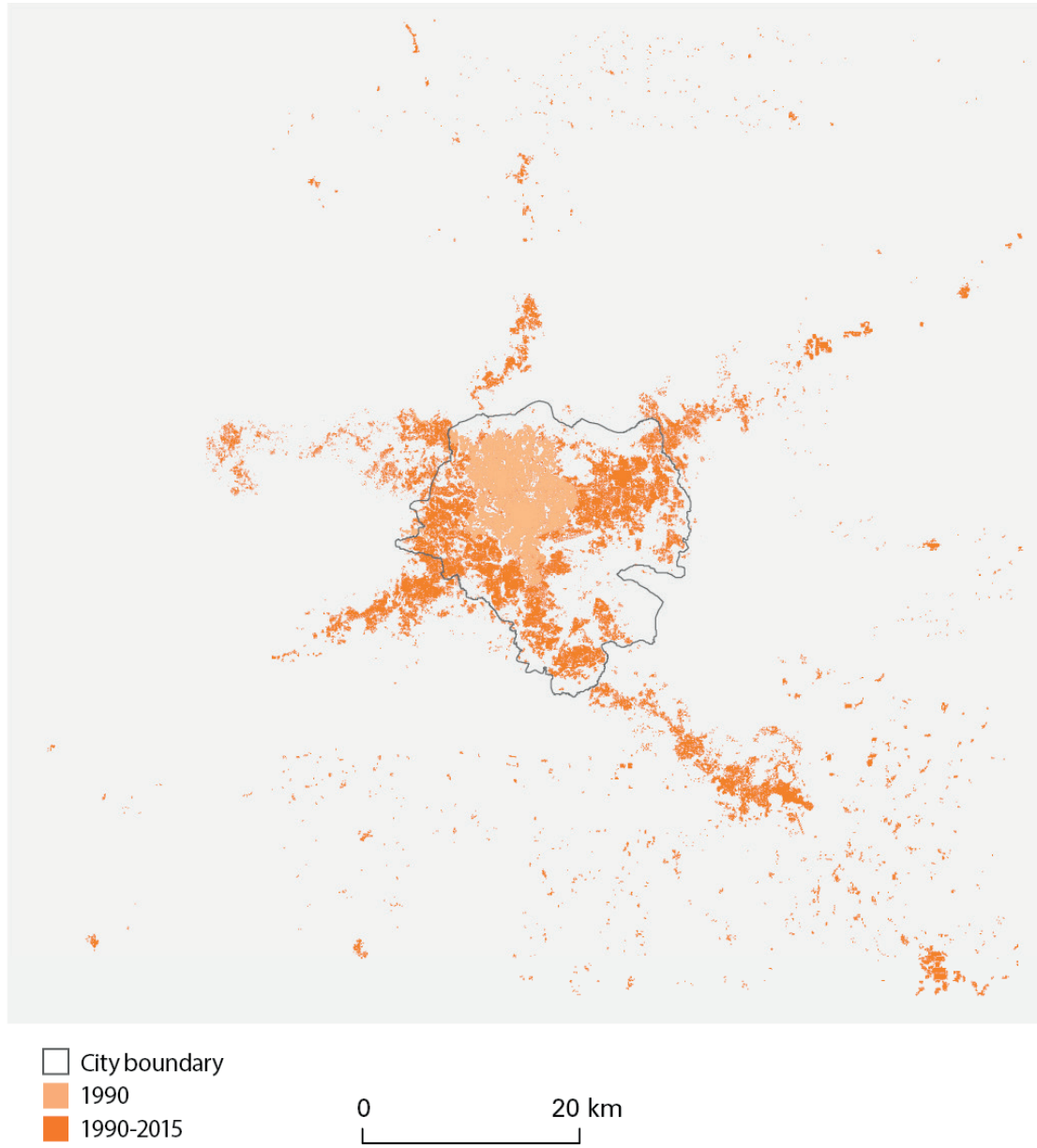
ayat real estate

free market



houses that are in slum condition (Walls constructed of wood and mud)

Infestment in public housing

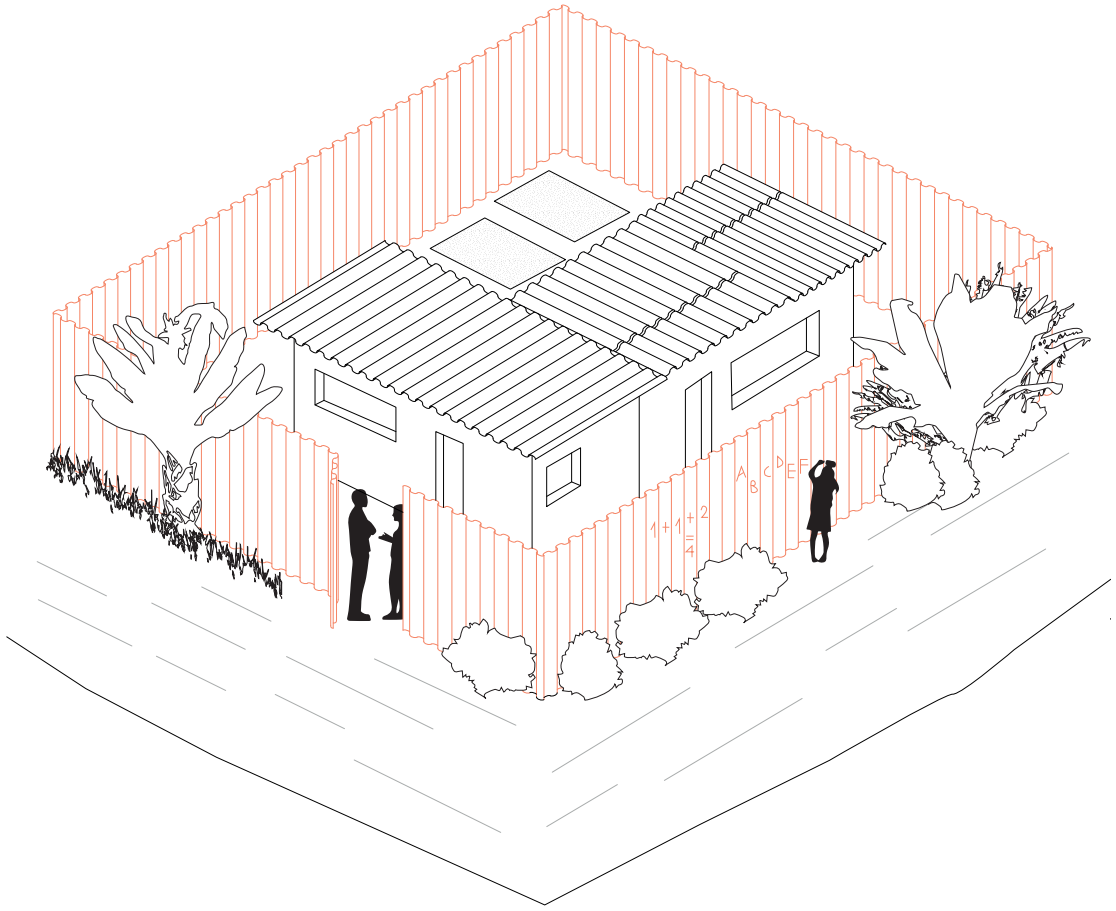


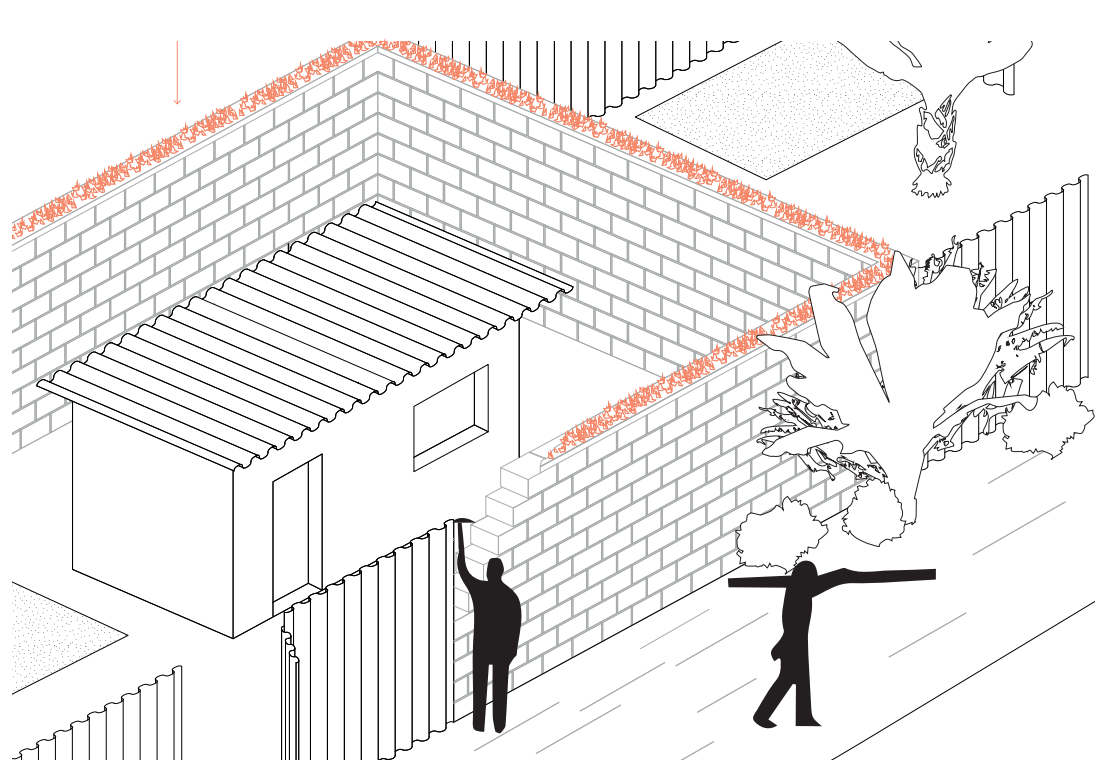
private develoment

not inaf housing

THEORETICAL FRAMEWORK

setting the scene


A
B
C
D
E
F
1+1+2=4



What is appreciated about them?

1. security
2. privacy
3. the barrin of unwanted strangers
4. fewer passers-by
5. higher property value
6. effective garbage collection
7. development activeties
8. iddir establishment
9. sense of community

Why are they created?

1. personal security and protection of property

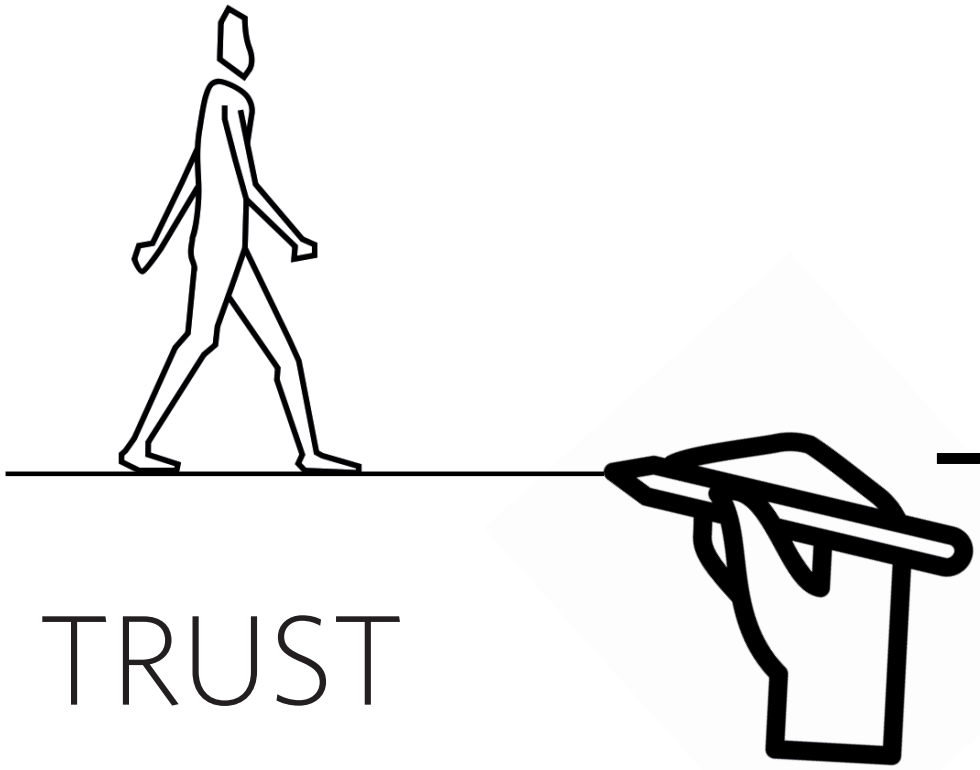
other “shared concerns“

2. noise polution
3. wast disposal
4. straying beggars and peddlers
5. joint investments

Admassie, Y. (2008). The Gated Communities of Inner-City Addis Ababa. Journal of Ethiopian Studies, 41(1/2), 111-141. Retrieved from http://www.jstor.org/stable/41967612

FEAR

SEGREGATION



INCLUSION

JOY

TRUST

"IN SHORT, DIVERSITY IS A CHALLENGE TO TRUST ONLY WHEN IT IS NOT ACCOMPANIED BY ENOUGH SOCIAL INTERACTIONS."

Stolle, D., Soroka, S., & Johnston, R. (2008). When Does Diversity Erode Trust? p.68

SOCIAL CAPITAL

- Typology; Social network
  - Size
  - Preferences
- Nature of the relationship
  - Friends
  - Family
  - Level of trust
- Resources
  - To get something done

BONDING social capital

- Strong ties
- Closed social structure

BRIDGING social capital

- Tolerance of differences
- Open social structures

Putnam, R. D. (2000). Bowling alone: the collapse and revival of American community. New York: The Brookings Institution.

Woolcock,M., & Nayaran, D. (2000). Social capital: implications for development theory, research and policy. World Bank Research Observer, 15(2), 225–250.

ASSOCIATIONAL MEMBERSHIP
in the locality

indicate a higher level ↓

SENSE OF COMMUNITY

consequently ↓

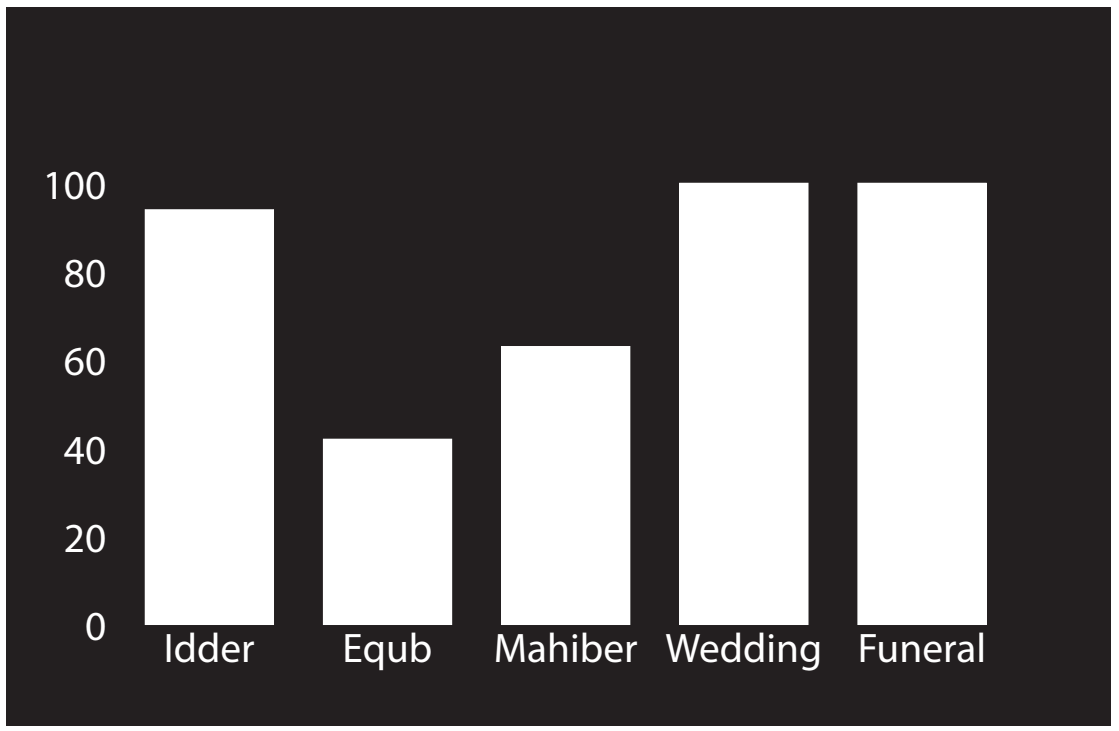
bonding and bridging type of

SOCIAL CAPITAL

significantly contributed ↓

SOCIAL TRUST
and confidence in institutions

Kassahun, S. (2014). Social Capital and Trust in Slum Areas: the Case of Addis Ababa, Ethiopia. Urban Forum, 26(2), 171–185. https://doi.org/10.1007/s12132-014-9235-3



PARTICIPATION IN SOCIAL ACTIVITY

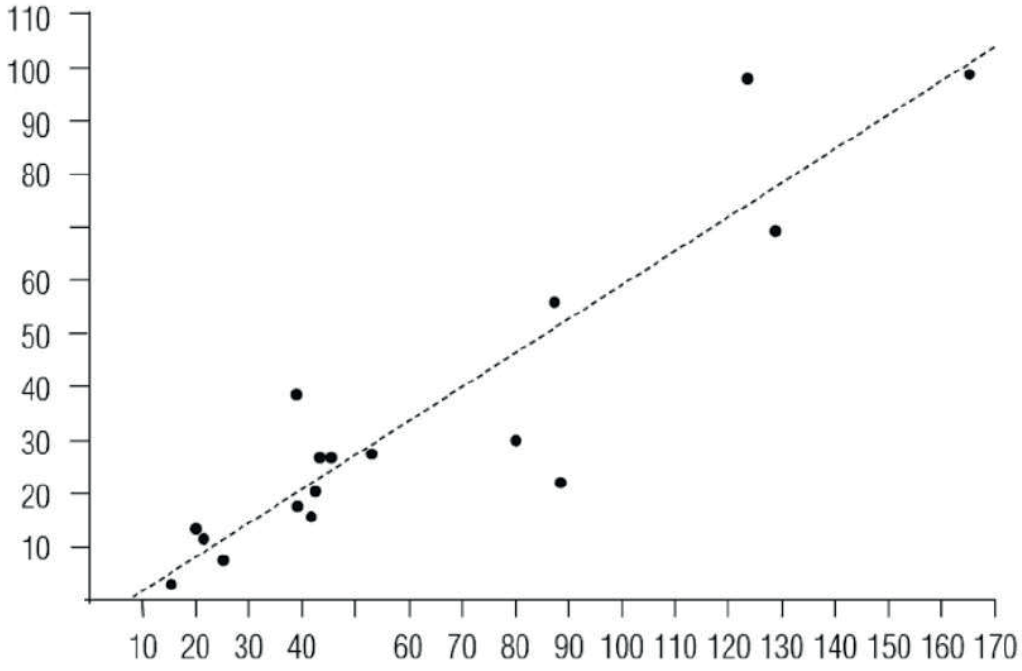
LOW AND HIGH INCOMES

"Moreover, almost all households in the locality appear to be members of a minimum of two local associations, at least the ***Idder***."

Yimam, H. F. (2014). Characteristics of Mixed Income Neighborhoods in Addis Ababa: The case of Aroge Kera. Ethiopian Institute of Architecture, Building Construction and City Development. http://etd.aau.edu.et/bitstream/handle/123456789/3106/Hellom%20Fantahun.pdf?sequence=1&isAllowed=y

"[...] *VIRTUALLY* ALL OF THE **NEGATIVE EFFECT OF DIVERSITY** OCCURS AMONG THOSE ***WHO DO NOT TALK TO THEIR NEIGHBORS***."

Stolle, D., Soroka, S., & Johnston, R. (2008). When Does Diversity Erode Trust? p.68



SOCIAL TRUST CAN BE BUILT THROUGH INTERACTIONS IN THE PUBLIC SPHERE

↓

MORE TIME SPENT IN PUBLIC SPACES LEADS TO MORE INTERACTIONS

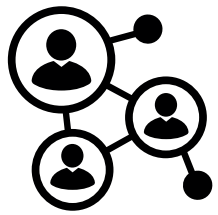
↓

MORE INTERACTIONS LEADS TO MORE TRUST

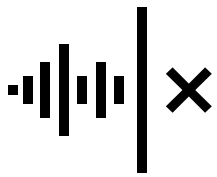
Friedenberg, E. (2018, June). Designing Trust: Building Social Trust Through Urban Design. https://www.emfriedenberg.com/designingtrust


Walking
54%
Minibus taxi
14%
Privae cars
15%
Anbessa, Sheger
8%
Intercity bus
7%
LRT
2%

FORMAL RELATIONSHIPS



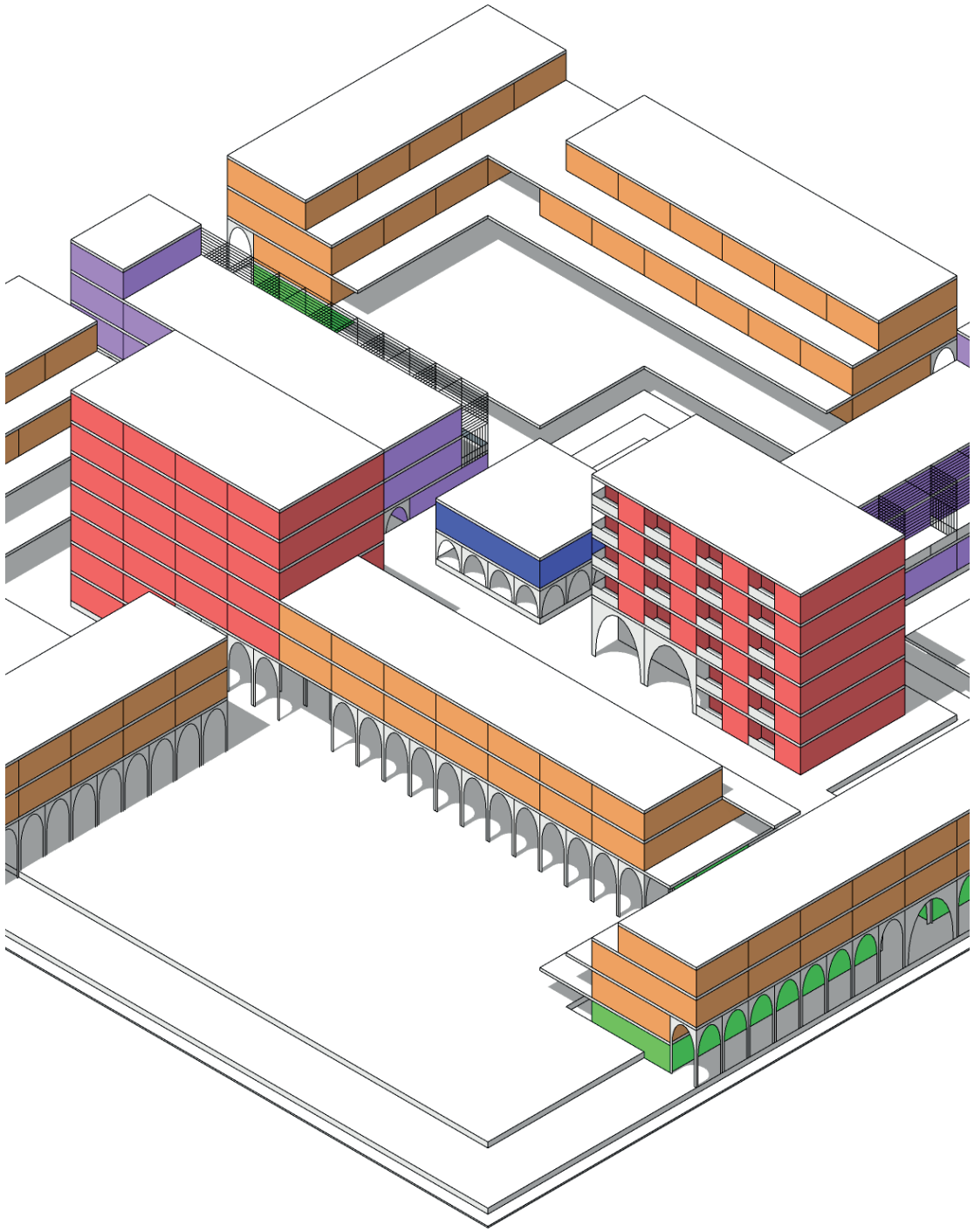
INFORMAL RELATIONSHIPS



INTELLIGIBILITY

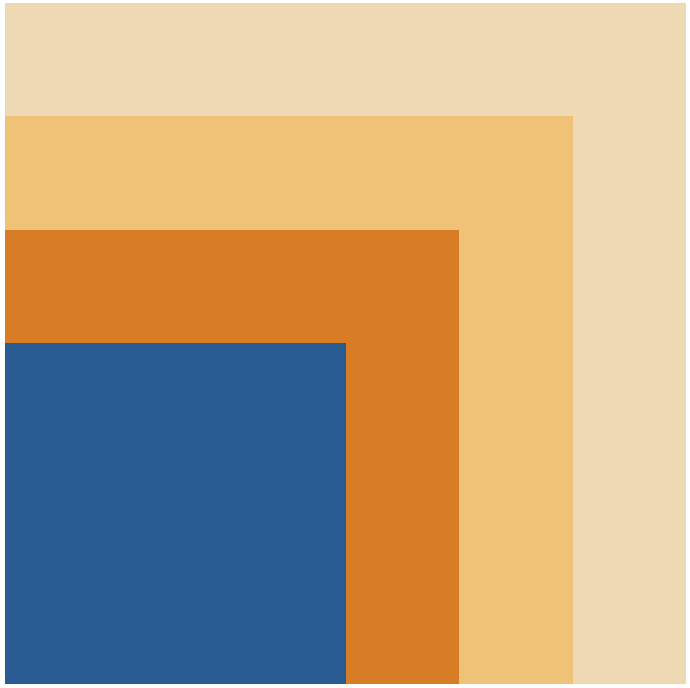
VISIBILITY

ENCOUNTERS



CONCEPT

bringing together

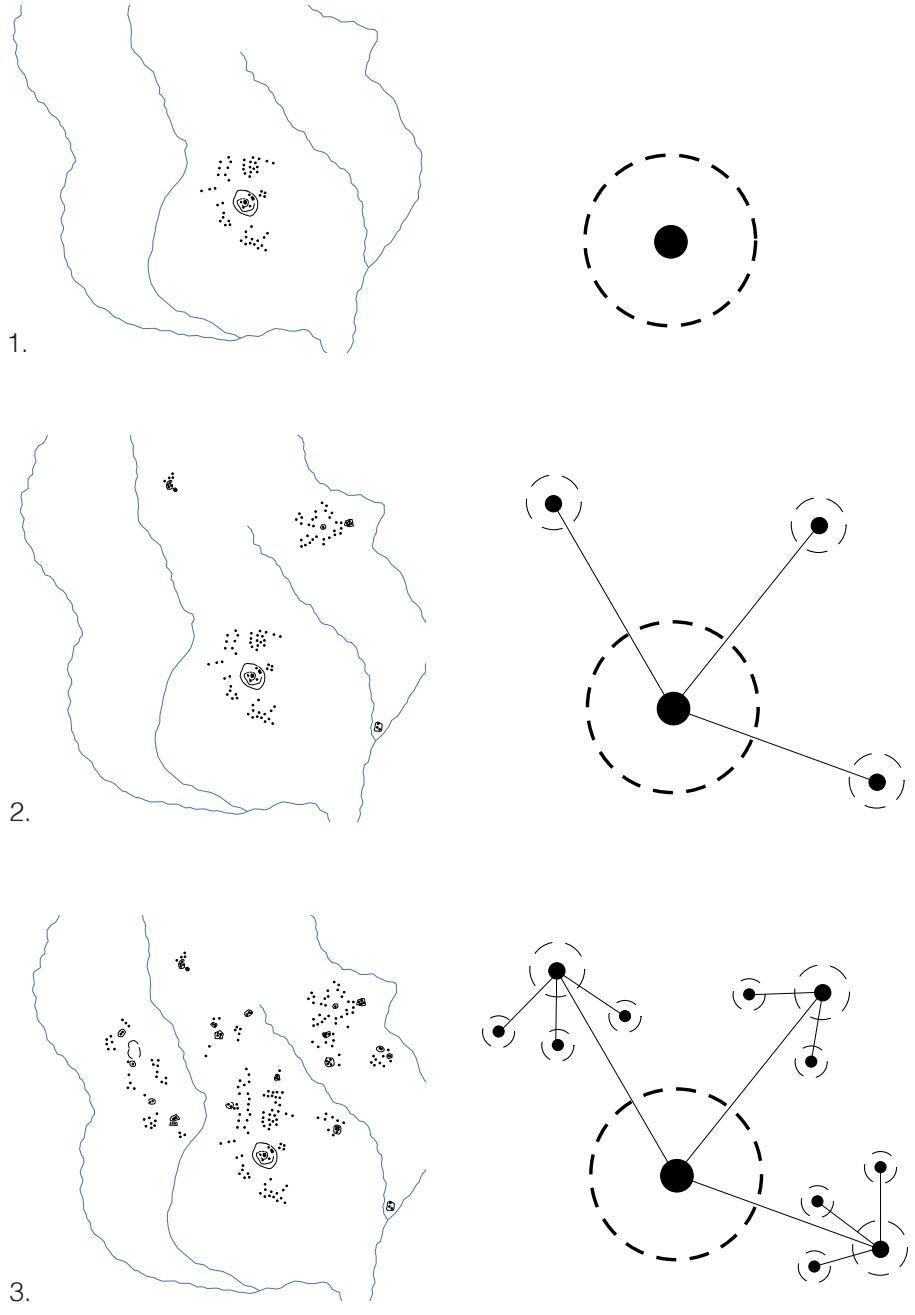


Public private gradient

One of the central themes that recur in the urban development structure is the transition from the public to the private domain. Whereby changes in the hierarchical structure of the road network, the transition from road to building blocks and ultimately to the individual home are articulated in different ways. Three fathers will be featured. Who make an important contribution to facilitating meeting.

Urban clusters

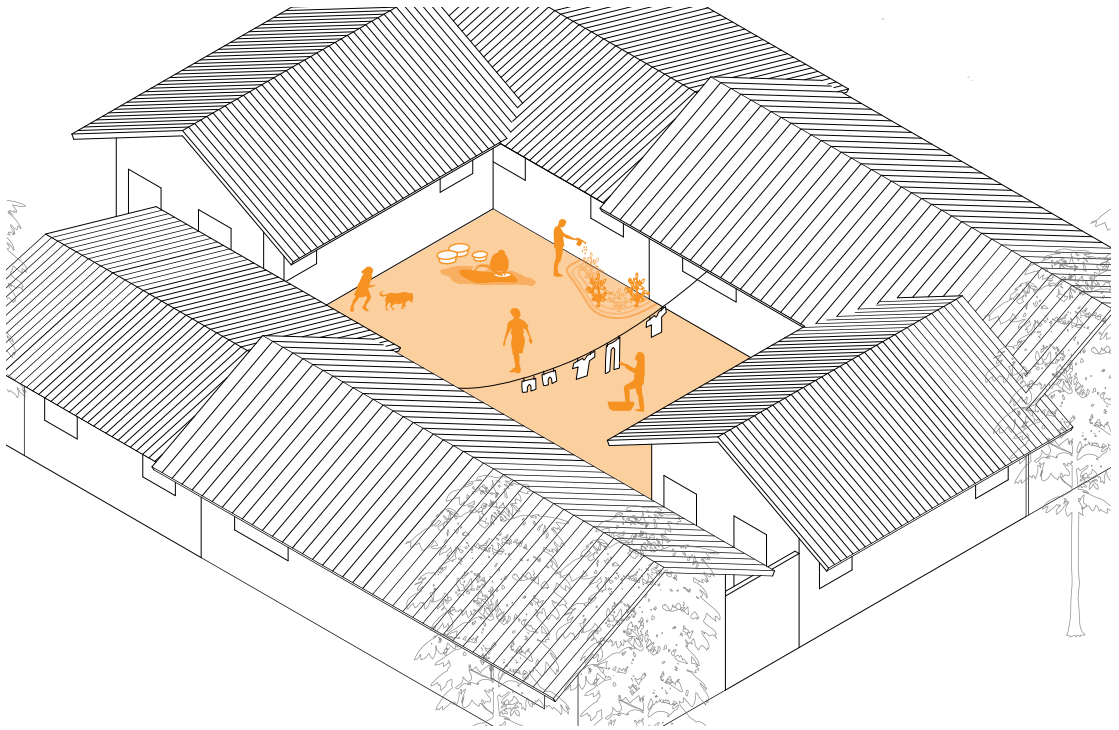
Image x on the adjacent page illustrates the urban structure during the founding of Addis Ababa in relation to the political structure. In the center the Negus (king) lives in his palace, surrounded by the Rasses (governors) around which the Dejazmaches (Commanderes or Generals) live again. However, it is an urban structure that still resonates in the current urban fabric of Addis Ababa. The political charge may have weakened over time. But the structure of clusters and different urban centers is still current.



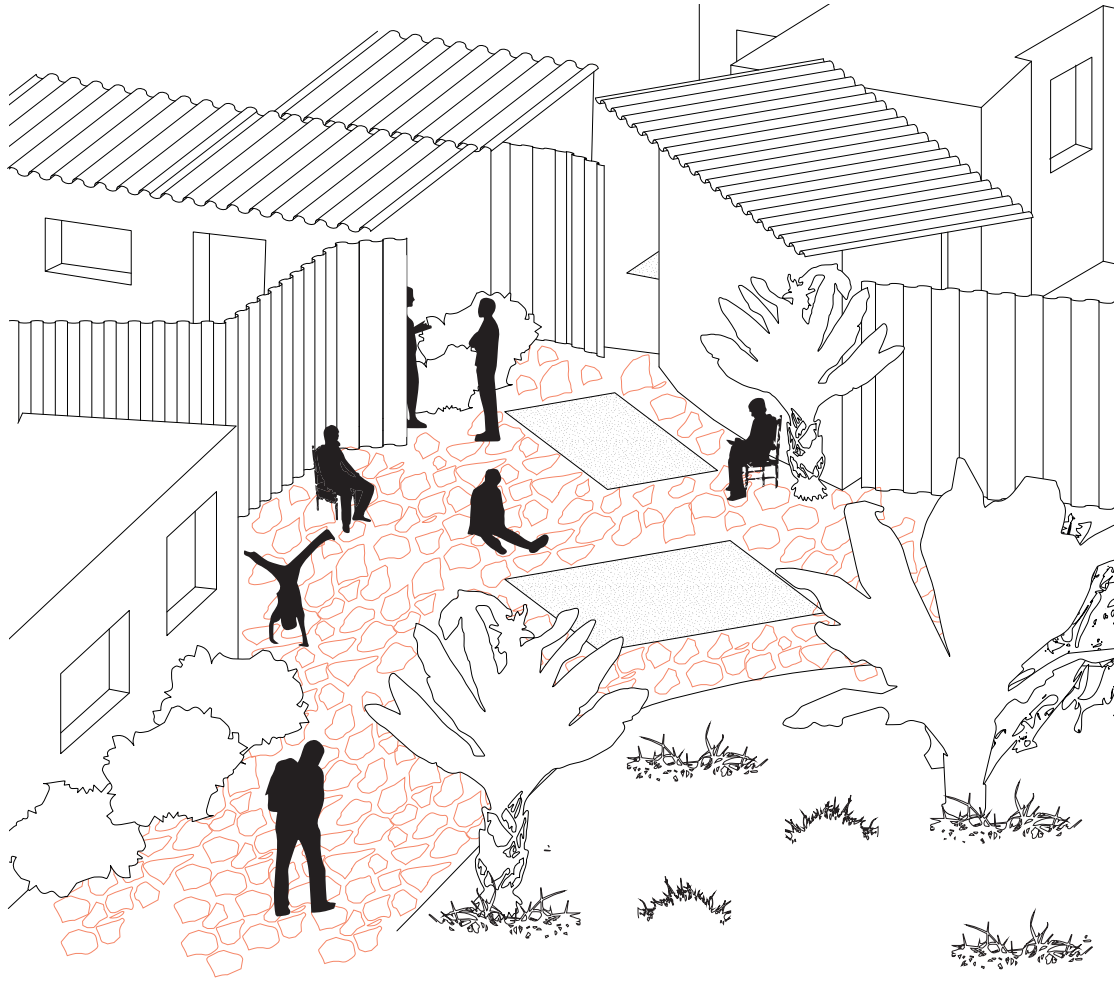
Afbeelding x: ...; source: Mota, N., & Mooij, H. (ca. 2014). Spatial political relation.

The courtyard

One of the characteristic features that characterize the current seffers is the spatial originization of a protected group of houses (cluster) around a courtyard. This in a place served several purposes. In the first place for domestic activities, like cooking and laundry. It also functions as a meeting place where residents of the cluster can meet and where children can play. But also economic related activities such as drying seeds that are sold take place here. This makes the courtyards a place of great importance for everyday domestic life, social structures and livelihoods.



Afbeelding : domestic and community life organized around a courtyard [1]



Afbeelding x: the the protected informal meeting space between buildings of a residential area; source: Turconi, P., & Fornasiero, A. (2017). The space formed by the cluster of compounds. http://resolver.tudelft.nl/uuid:cc52d057-7577-45d8-8e1e-f0883a241b5a

Inner streets

One of the elements that form part of the gradient between public and private are the inner streets. Often less or not accessible for car traffic, this space functions This space therefore as an extension of the clusters and a place for encounters and social interacti-on. But also economic activities take place here, such as selling goods.

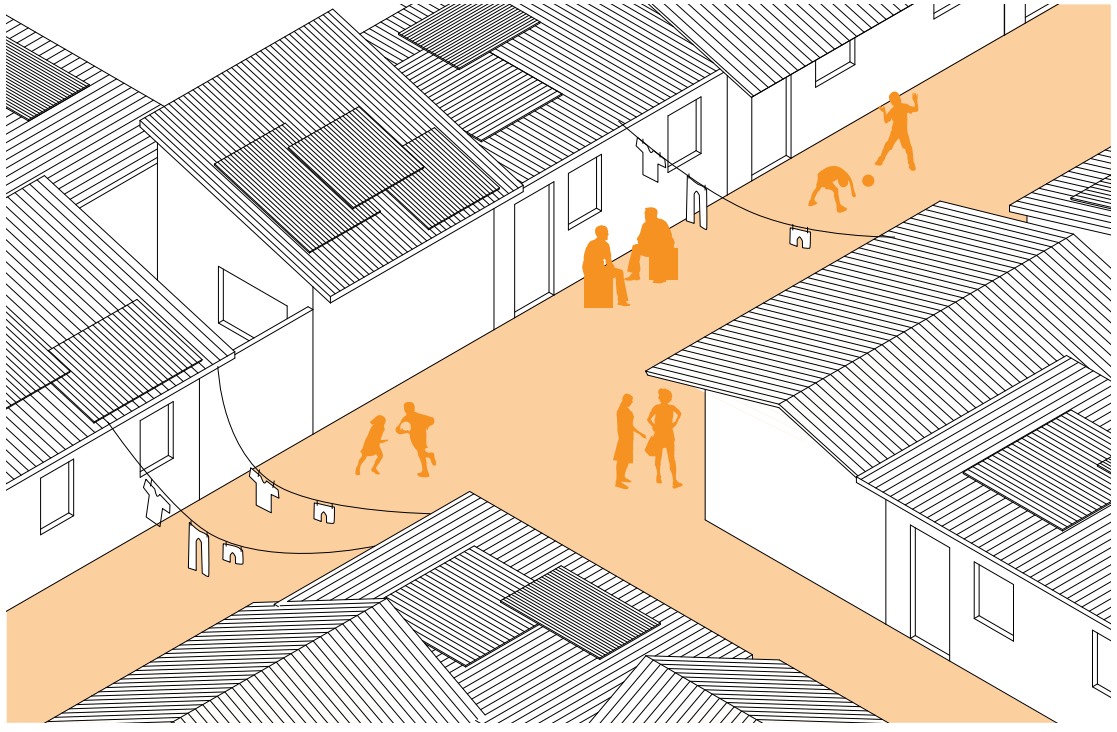


Image x: ...; source: de Man, M., & Yau, C.

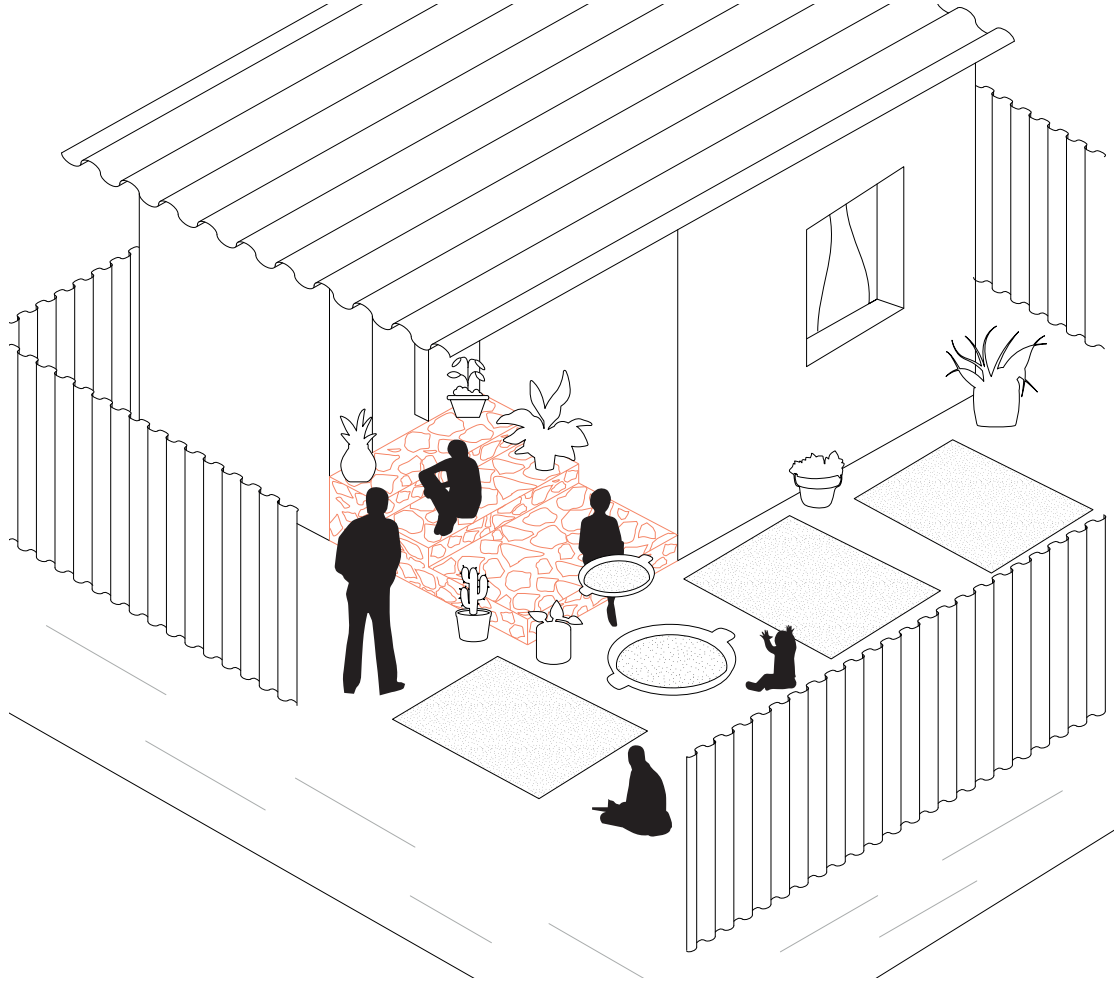
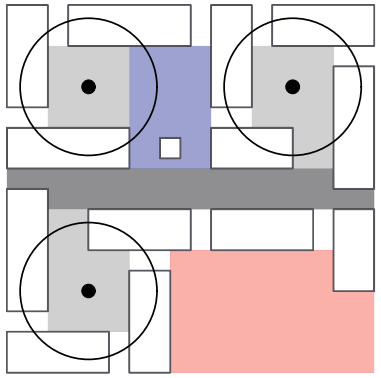


Image x: ...; source: Turconi, P., & Fornasiero, A.

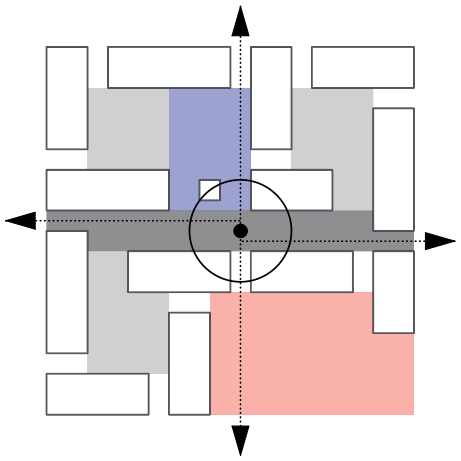
Threshold

One of the important transitions of a home between public and private are the steps at the door. These doorsteps emphasize the transition between the two domains but also create a threshold. In addition, the steps serve as an extension of the home, where household activities such as cooking take place, but also function as a meeting place between residents.



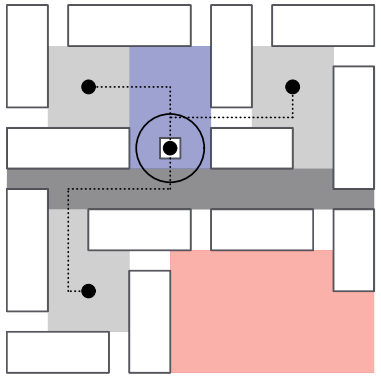
Cluster orginisation

A core strategy for facilitating interactions as a precondition for creating mutual trust is organization of the homes around a cluster. This design tool stems from the current urban planning organization of the sefers.



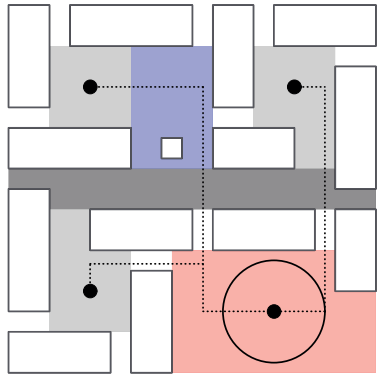
Connecting inner street

As previously substantiated in: theoretical framework / walking, setting up a pedestrian area is one of the strategies for building trust. This strategy is expressed in the central inner street that connects the various clusters and facilities.



Social institutions

One of the facilities in which citizens participate regardless of their class or background is the Iddir. By facilitating a place for this organization, neighborhood residents are brought into contact with each other. But other facilities can also contribute, such as education and health institutes.



Socio-economic interaction

In addition to the fact that economic activities are of great importance for the creation of trust because they trigger interactions, are they also of great importance for livelihood, in particular of low-income households.

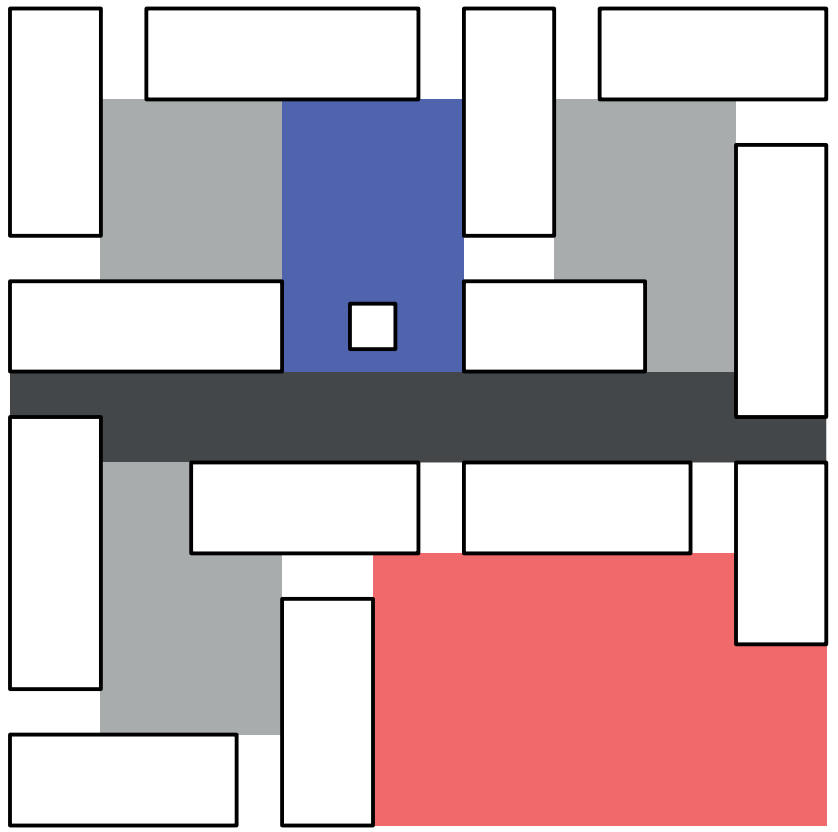
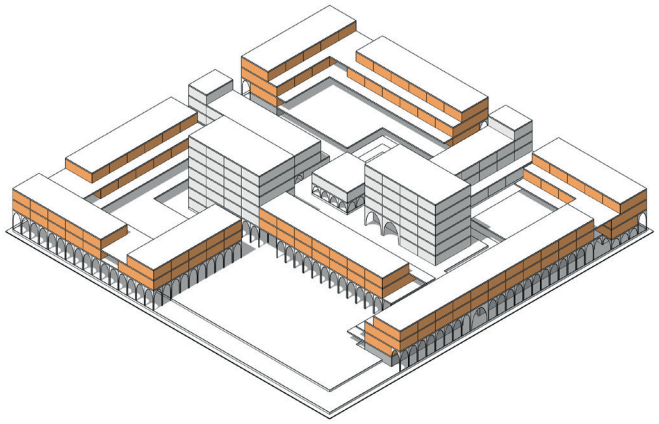


image x: Schematic overview;
Source: authors drawing



Low income

Fifty percent of the homes are allocated to low-income households. Because contact with the street and relative proximity to economic activities is of great importance to this group.

Middel income

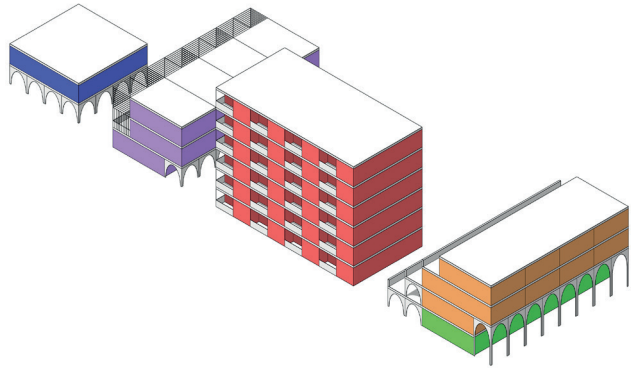
Twenty-five percent of the home is reserved for middle incomes. In order to create a sheltered living environment for this income group, these are centrally located within the plan. They also form the middle group that is close to the experience world of high and low incomes and therefore also fulfill an important binding role.

High income

The last twenty-five percent of the home is intended for high incomes. By placing them along an inner street, these houses are characterized by their own characteristic typology. Because these houses are adjacent to the courtyard but not connected, the residential block has a more private character.

Typologie mix

By facilitating different housing types tailored to their different wishes, an attractive neighbourhood is created for all. Bringing these groups in close proximity to each other increases the likelihood of interactions, which are vital for creating mutual trust.



Commercial space

By integrating the economic activities along the the edges the protected character of the clusters is preserved. The location of an arcade at the front creates a protected and intimate space that provides a transition between the street and the commercial space. In addition, extending the retail space on to the street.

Social institutions

Due to the central location of the community center/ Iddir, this facility binds the different clusters together. This also ensures equal accessibility, whereby the facility does not belong to a specific cluster. Because the neighborhood center borders on an inner street, it also helps to activate this space.

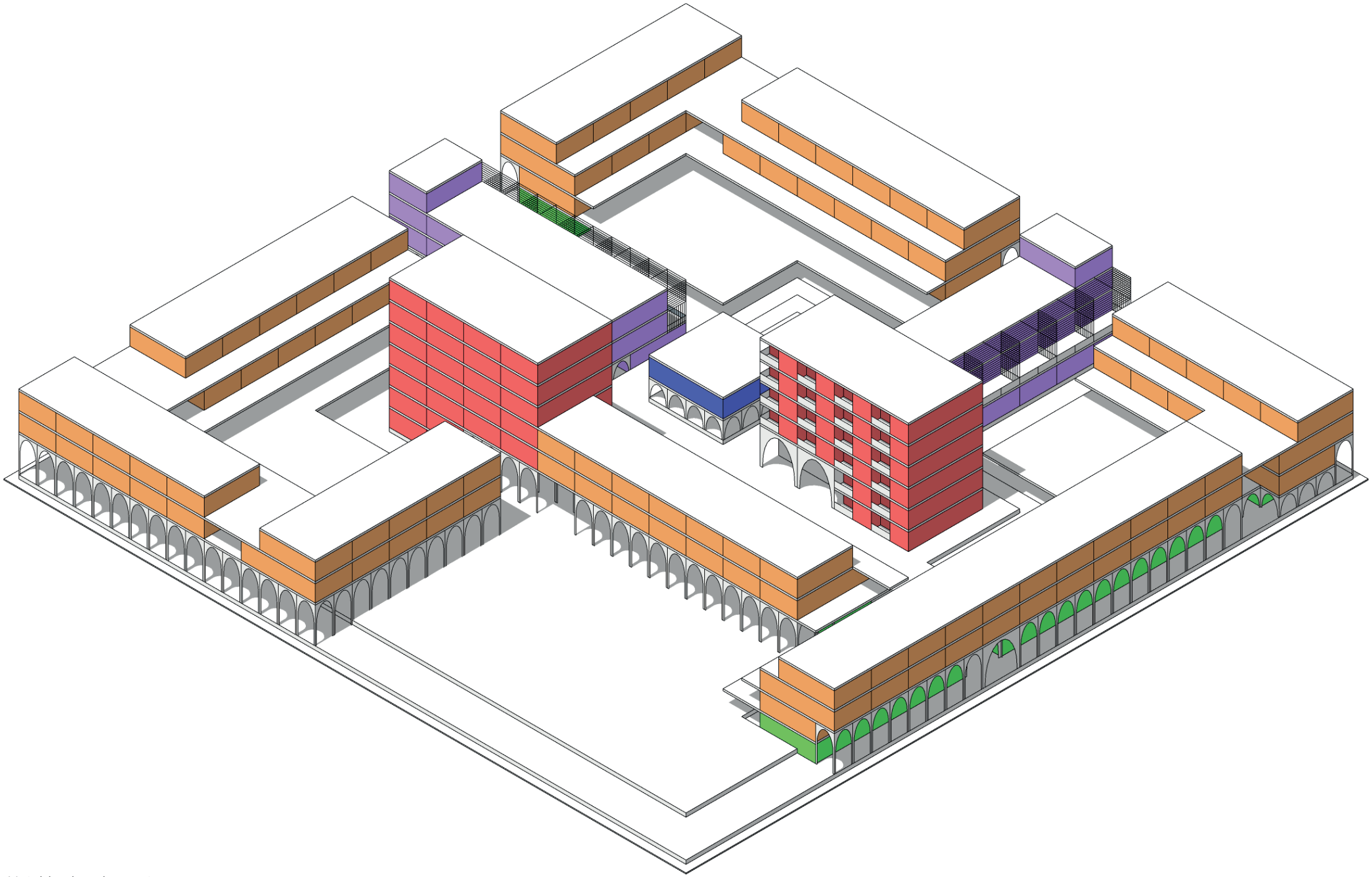


image x: Neighborhood overview;
Source: authors drawing

System repetition

Just as the clusters repeat themselves in different forms, the different neighborhoods can also repeat themselves into a larger district. The filling in of the square that is situated within each district can change its function in order to achieve a rich and lively living environment.

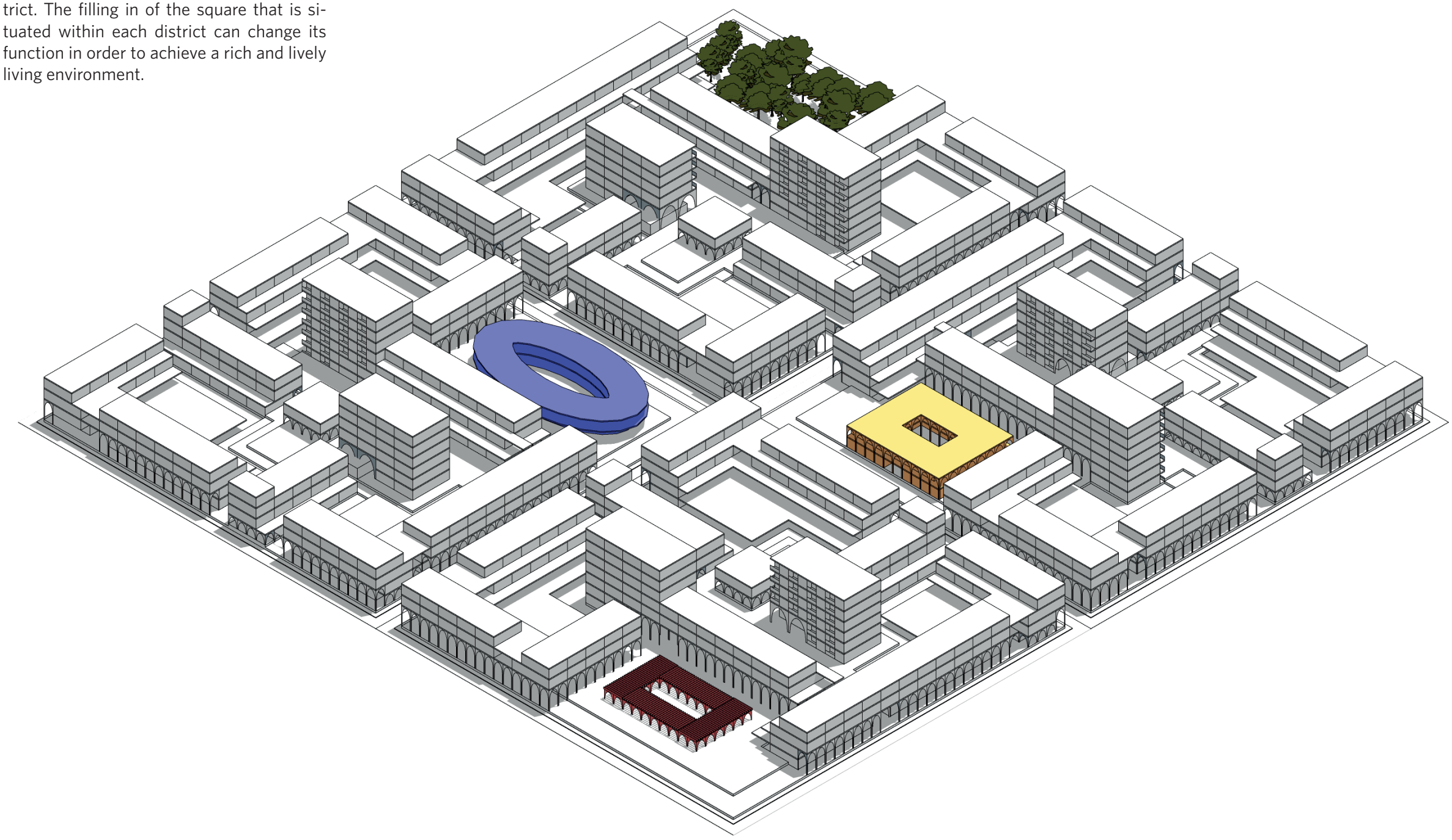


image x: Neighborhood overview;
Source: authors drawing

image x: view from the street of the stairs to the first floor house;
Source: Vandkunsten Architects

TINGGAAR-DEN

Herfolge, Denmark

Architect: Vandkunsten Architects
Date: 1971 - 1978

Tinggården is a low-rise, high-density neighborhood in central Denmark, 55 km south of Copenhagen. This non-profit housing experiment is characterized by an emphasis on community and the influence of future residents during the design process.[2]

Urban design

One of the striking features of Tinggården is its urban design. Six clusters are situated along a low-traffic central street, each cluster with its own communal space. In addition, the district, which has a total of 78 homes, has a central community hall.

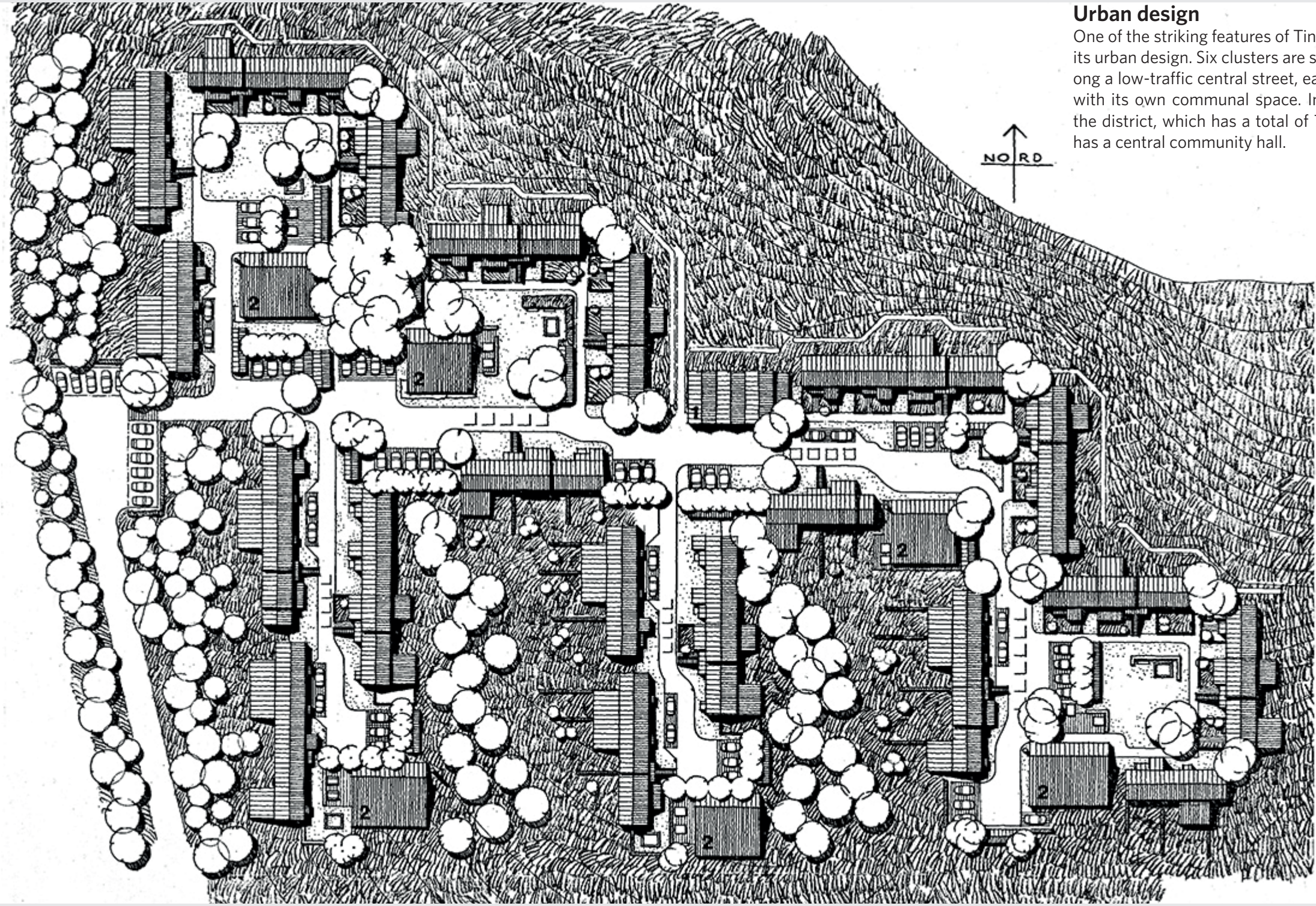


image x: the master plan of Tinggaarden;
Source: Vandkunsten Architects

The collective, outside

The exclusion of traffic in the clusters creates shared outdoor space with all the space for meeting. By placing stairs in the courtyard that provide access to the homes on the first floor, all homes have access to the courtyard garden and the collective character is further enhanced.

image x: view from the courtyard of the stairs to the first floor house;
Source: Vandkunsten Architects

The collective, inside

Each cluster has its own neighborhood center. This space makes an important contribution to the sense of collective and facilitates encounters. In addition, the district has a community hall where residents from different clusters can meet.

image x: the interior of one of the community centers;
Source: Vandkunsten Architects

image x: aerial view of Sandbakken;
Source: C.F. Møller Architects

SANDBAKKEN

Aarhus, Denmark

Architect: C.F. Møller Architects
Date: 1989 - 1990

Sandbakken is located in Aarhus on the east coast in the middle of Denmark. The project consists of 212 homes ranging from 35 m2 tot 148 m2 en is characterized by the connected cluster organization of the homes.[3,4]

Thresholds

Due to the elevation of the inner garden for parking and the natural height differences of the site, there is a threshold in the form of a staircase for access to the courtyard. Although this height difference can be seen as a problem in terms of accessibility, it further emphasizes the private character of the courtyard.

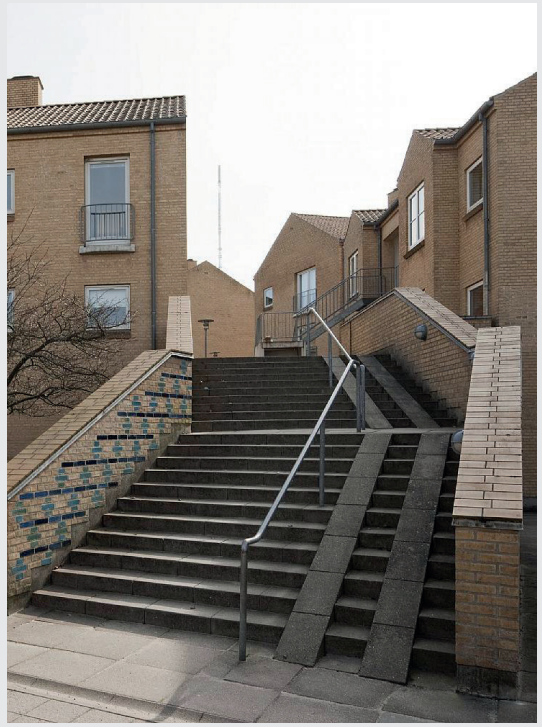


image x: entrance stairs to the courtyard;
Source: C.F. Møller Architects

image x: view of the courtyard;
Source: DEAS Group - Property Asset Management

image x: top view of two of the clusters;
Source: C.F. Møller Architects

Urban structure

One of the core aspects of the design is the interconnected clusters around which the houses are situated. By making use of the landscape and situating the parking under the clusters, a courtyard is created promoting and social interaction between the residents but also facilitates, for example, a safe place for children to play.

image x: Front view of Tara housing;
Source: The Charles Correa Foundation

TARA HOUSING

New Delhi, India

Architect: Charles Correa
Date: 1975 - 1978

The Tarra housing complex is located in New Delhi and consists of 160 duplex houses located around a courtyard. In addition to the characteristic courtyard, the collective space is characterized by the open staircases that give access to the homes from the courtyard.[5]

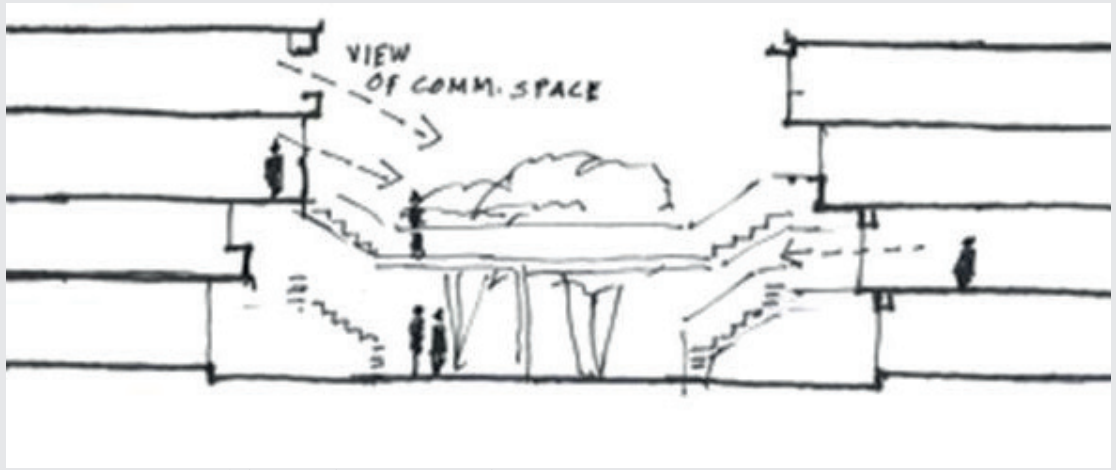


image x: Sections of the Tara housing complex
Source: Kumbhare & Dhepe, 2020

image x: Masterplan of the Tara housing complex;
Source: Kumbhare & Dhepe, 2020

Community space

image x: Masterplan of the Tara housing complex;
Source: Bahga & Raheja, 2018

image x: satellite image on February 2022 of the project site;
Source: Google Earth

LOCATION

image x: map of Africa with Ethiopia highlighted
Source: author's drawing based on

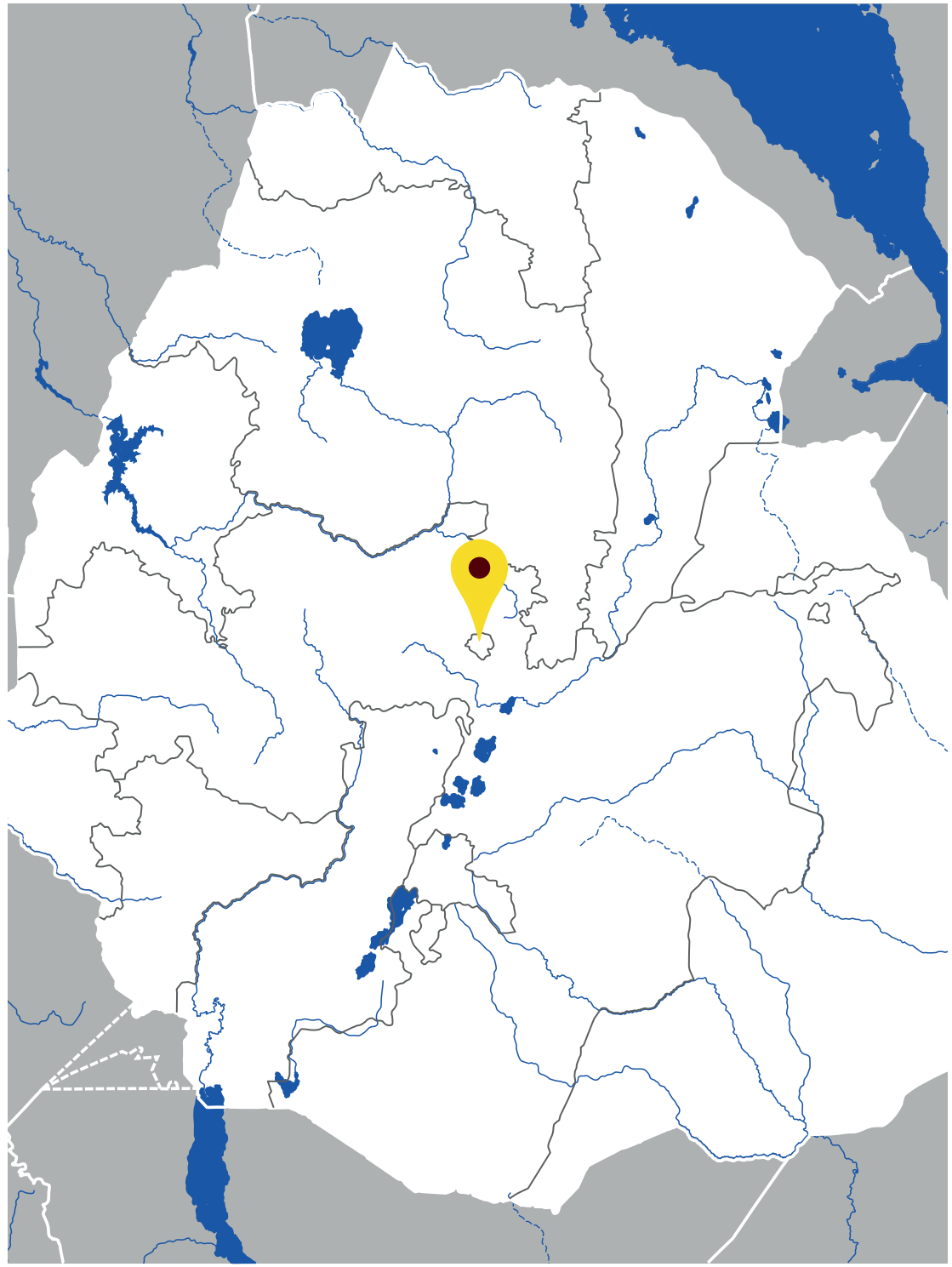


image x: map of Ethiopia with Addis Ababa pinpointed;
Source: author's drawing based on

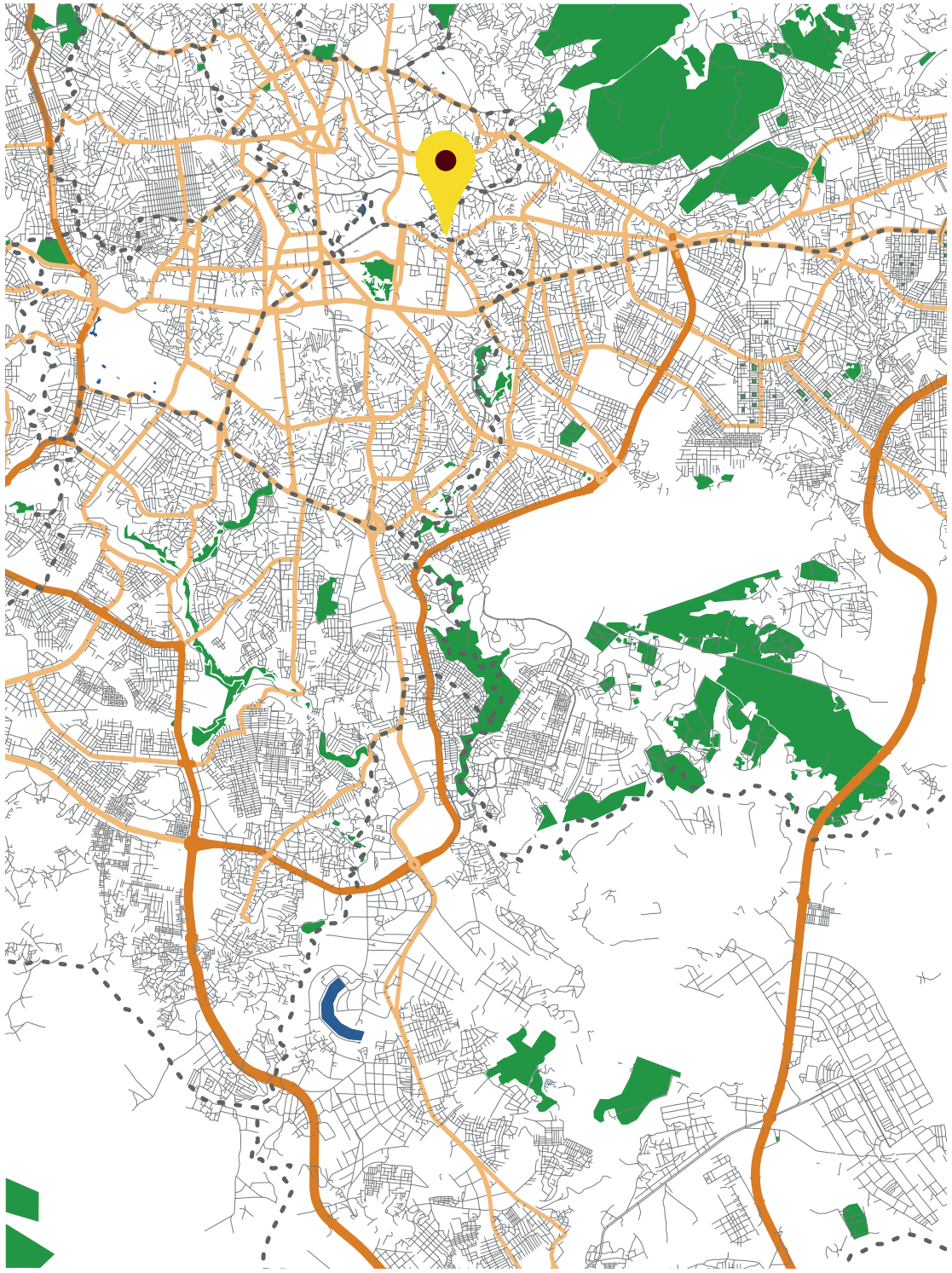


image x: road map of Addis Ababa with nature and water areas
Source: author's drawing based on Open Street Map

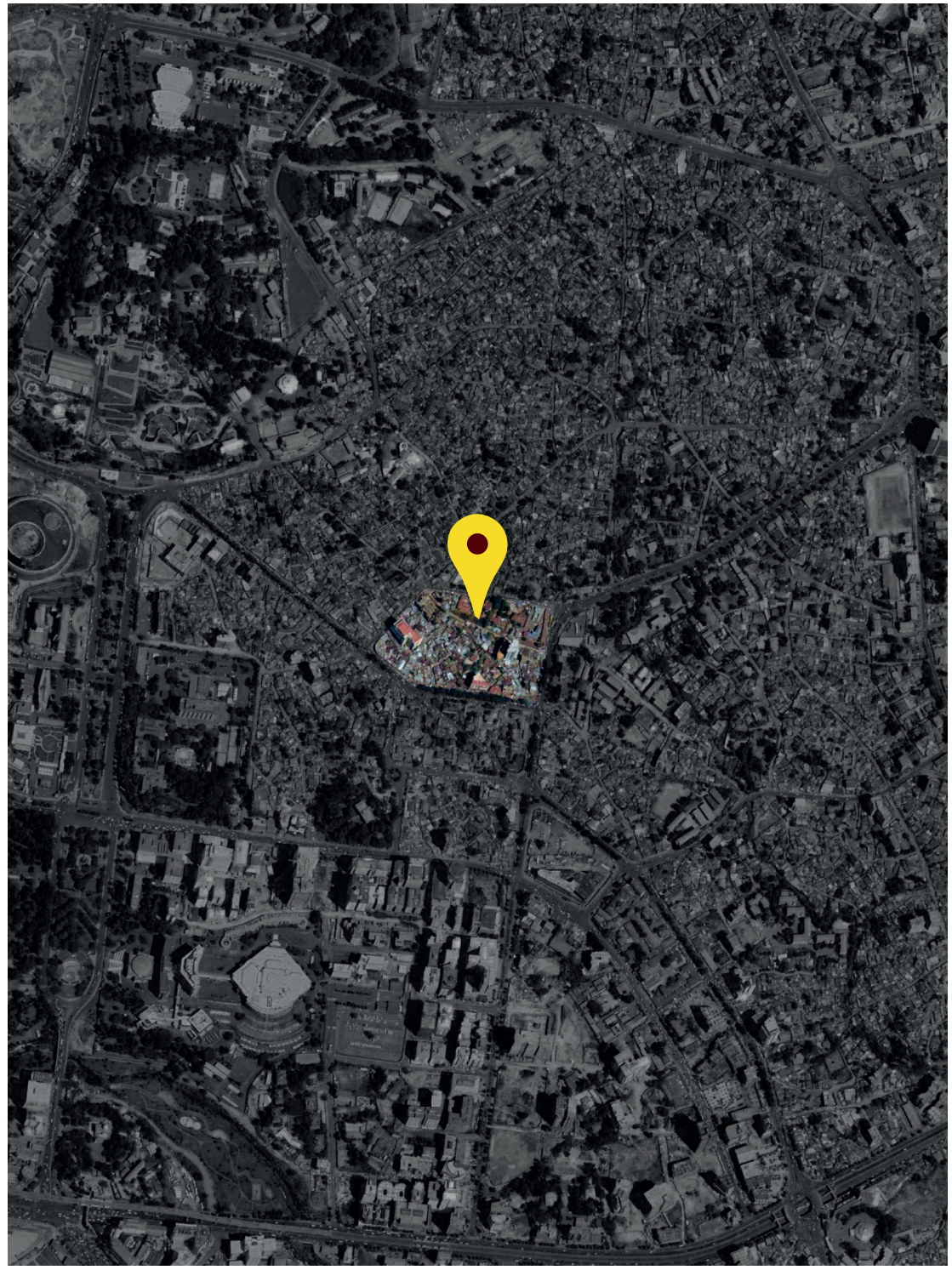


image x: satellite image on February 2022 of the location and the surrounding area;
Source: author's drawing based on Google Earth

image x: satellite image on February 2022 of the location and the surrounding area;
Source: author's drawing based on Google Earth

image x: satellite image of the west side of Afrika Park in 2011 before redevelopment;
Source: Google Earth

Urban renewal

In an effort to improve the cityscape and housing quality, large-scale redevelopment projects are being carried out by the city, for instance on the west sides of Africa Park. Unfortunately, these developments often go at the expense of existing communities and living standards of residents. By only re-building homes in the higher segment, and offering alternative housing outside the city center, old way of generating income is no longer possible. In addition, existing social structures that are of both social and economic importance are disappearing.

image x: satellite image of the west side of Afrika Park after redevelopment in 2022;
Source: Google Earth

Italian masterplan

Unfortunately, segregation is not a new problem for Addis Ababa. The originally inclusive city was also segregated on the basis of race during the Italian rule. Two residential sectors were realized based on an Italian masterplan, Ethiopians could live on the west sides and the Italians on the east. Parts of this master plan are still visible in the current Addis Ababba, such as at the design location.

image x: satellite image of Addis Ababa in 2022 aligned according to the Italian mast plan;
Source: Google Earth

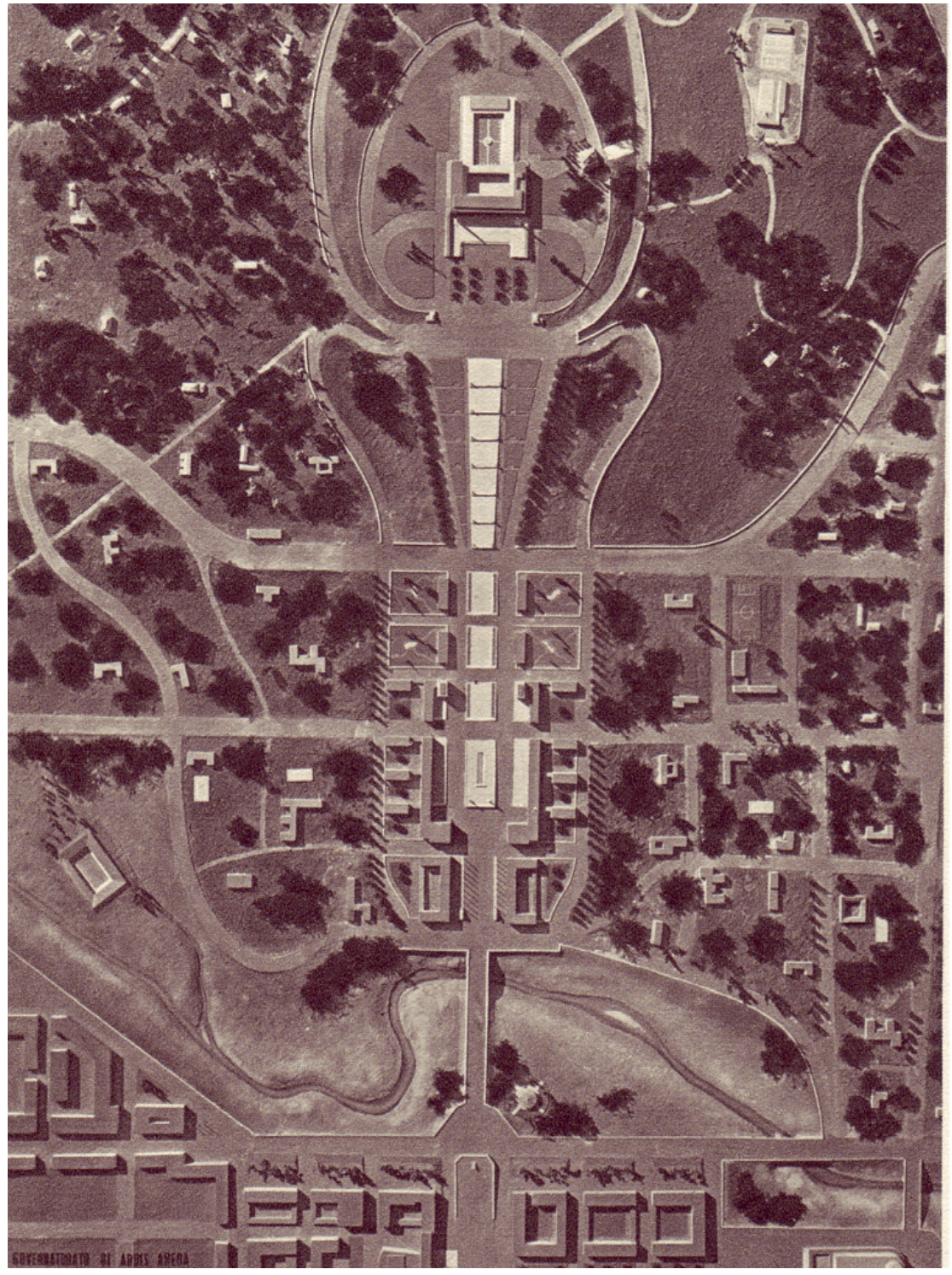


image x: the italian master plan with the current Africa Park in the middle.;
Source:

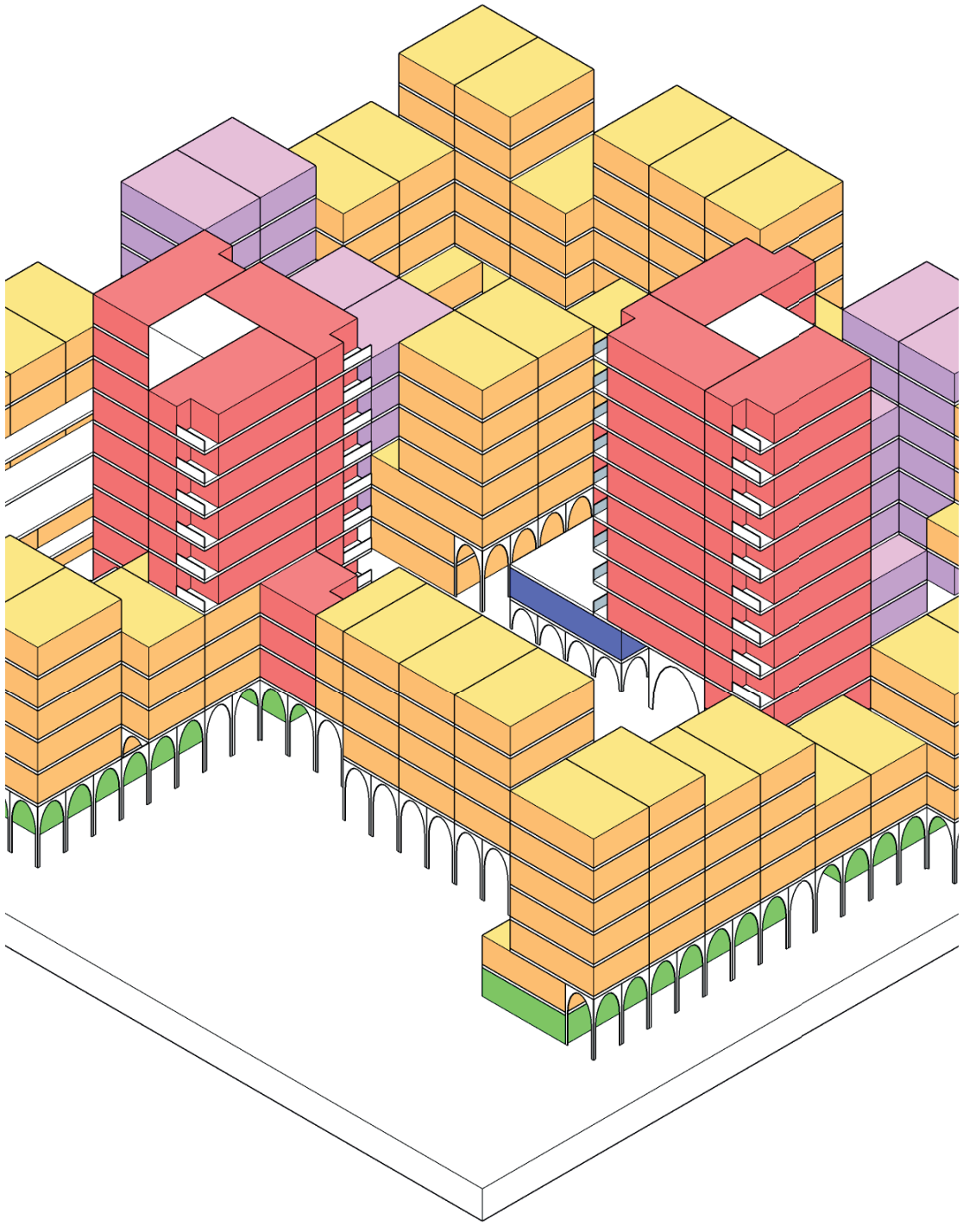


image x: schematic design of the master plan adjusted to the desired density.;
Source: author's drawing

DENSITY

Economic realistic
The central location of the site results in a high land value. In order to offer an economically realistic alternative, this must be taken into account in the form of the number of newly built houses.

Frame of reference

The Integrated Housing Development Program plays a major role in the redevelopment of Addis Ababa, with the condomiums being the elaboration. Should the location be redeveloped, this will most likely be done according to this system. An alternative can therefore best be compared with condominium housing. In the context of bringing together and mixing different income groups, it is most obvious to use the sums of the density of the two condominium housing schemes as a reference.

20/80 condominium

FSI 0,86
GSI 0,17
Density 164 dw/ha

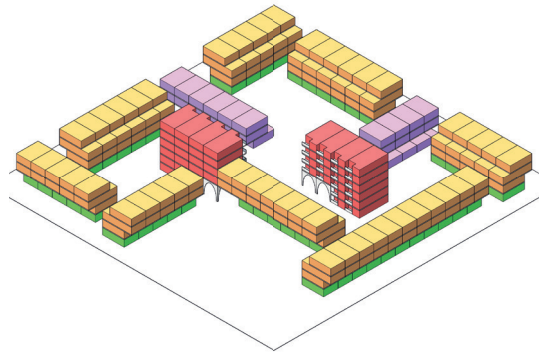
40/60 condominium

FSI 2,23
GSI 0,21
Density 131 dw/ha

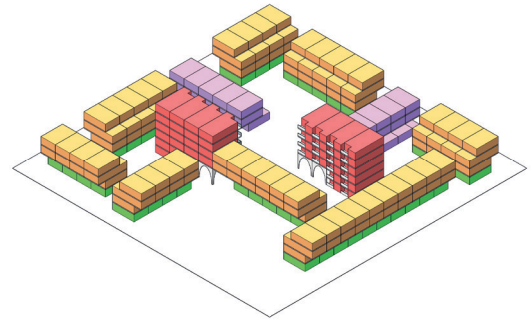
+

target

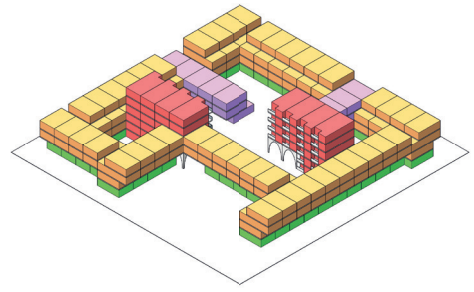
FSI +/- 3
GSI 0,38
Density 295 dw/ha



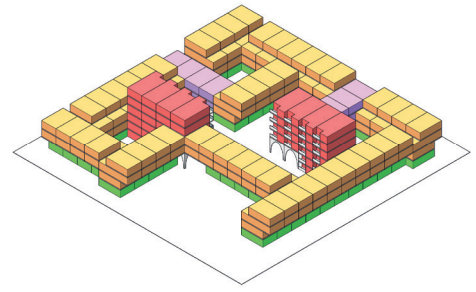
GSI 0,35
FSI 1,36
Density 170 dw/ha



GSI 0,39
FSI 1,46
Density 184 dw/ha

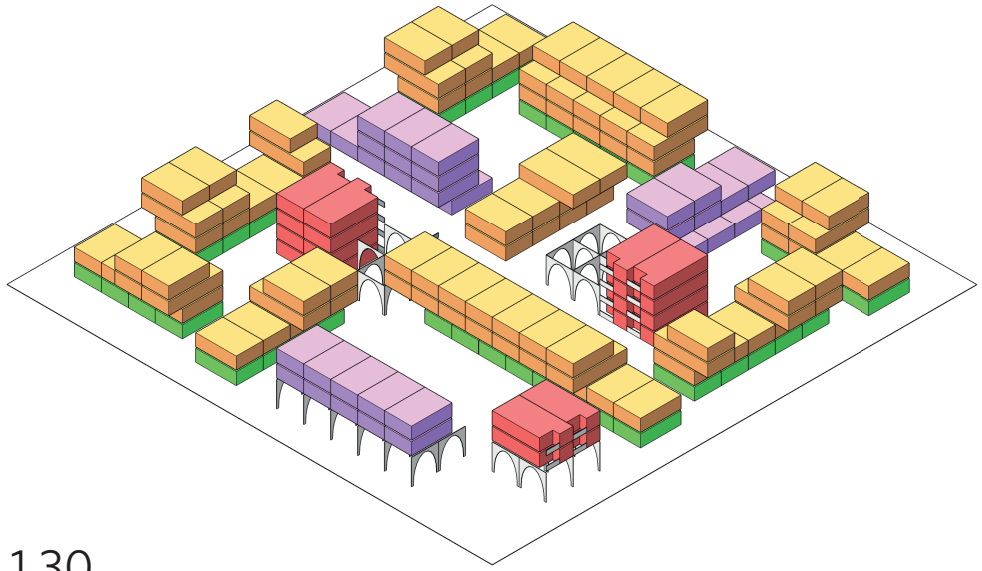


GSI 0,49
FSI 1,91
Density 247 dw/ha

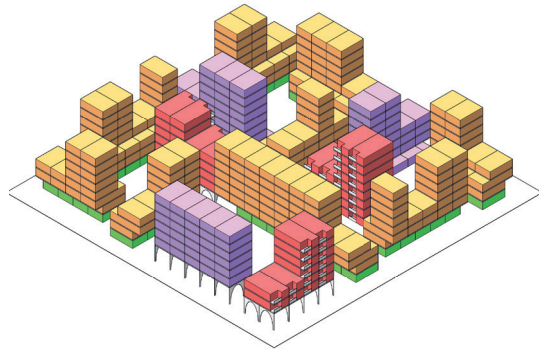


GSI 0,52
FSI 1,98
Density 253 dw/ha

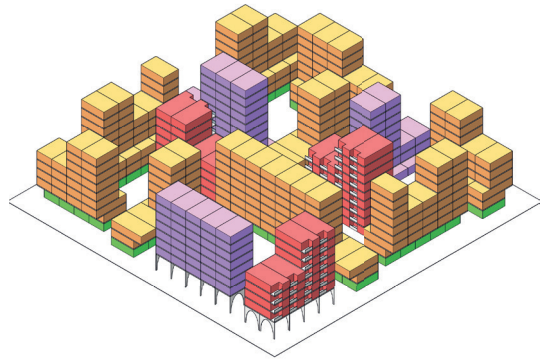
image x: study on different Ground Space Indexes (GSI) by compacting the same scheme; Source: author's drawing



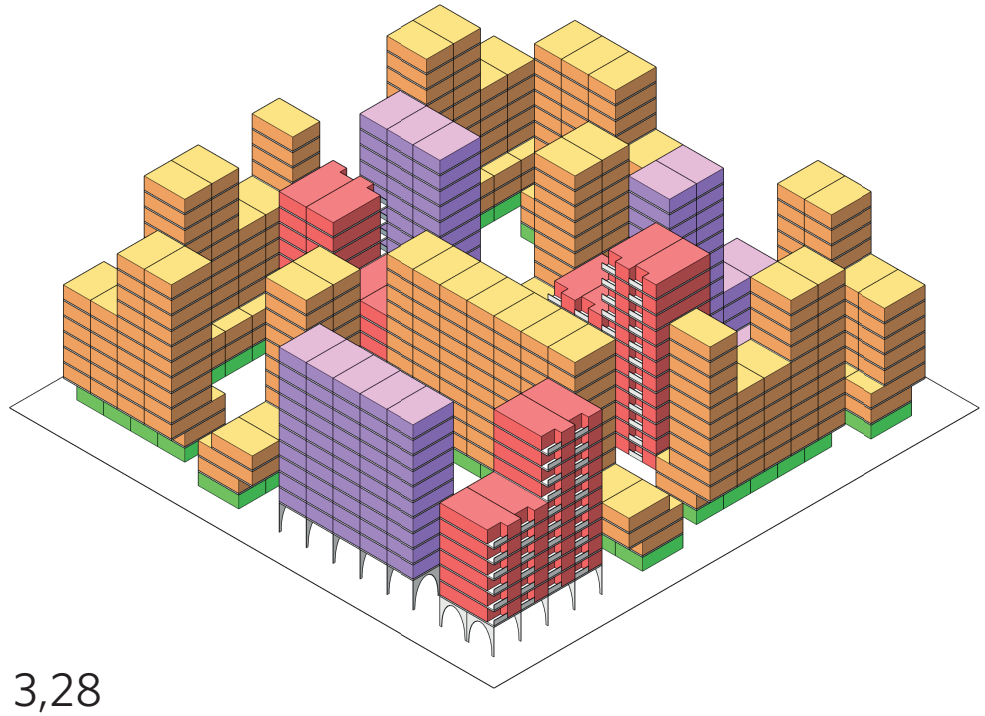
FSI 1,30
Density 180 dw/ha



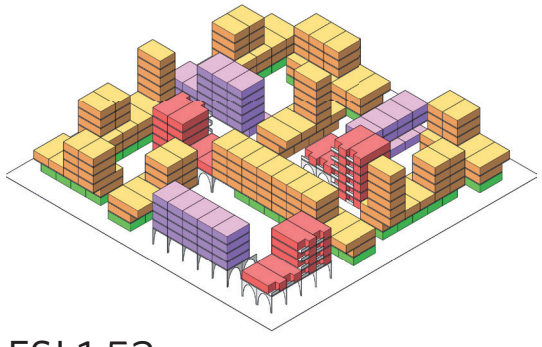
FSI 2,10
Density 326 dw/ha



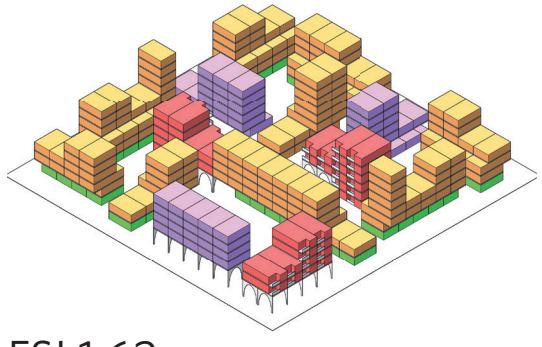
FSI 2,40
Density 378 dw/ha



FSI 3,28
Density 532 dw/ha



FSI 1,53
Density 226 dw/ha

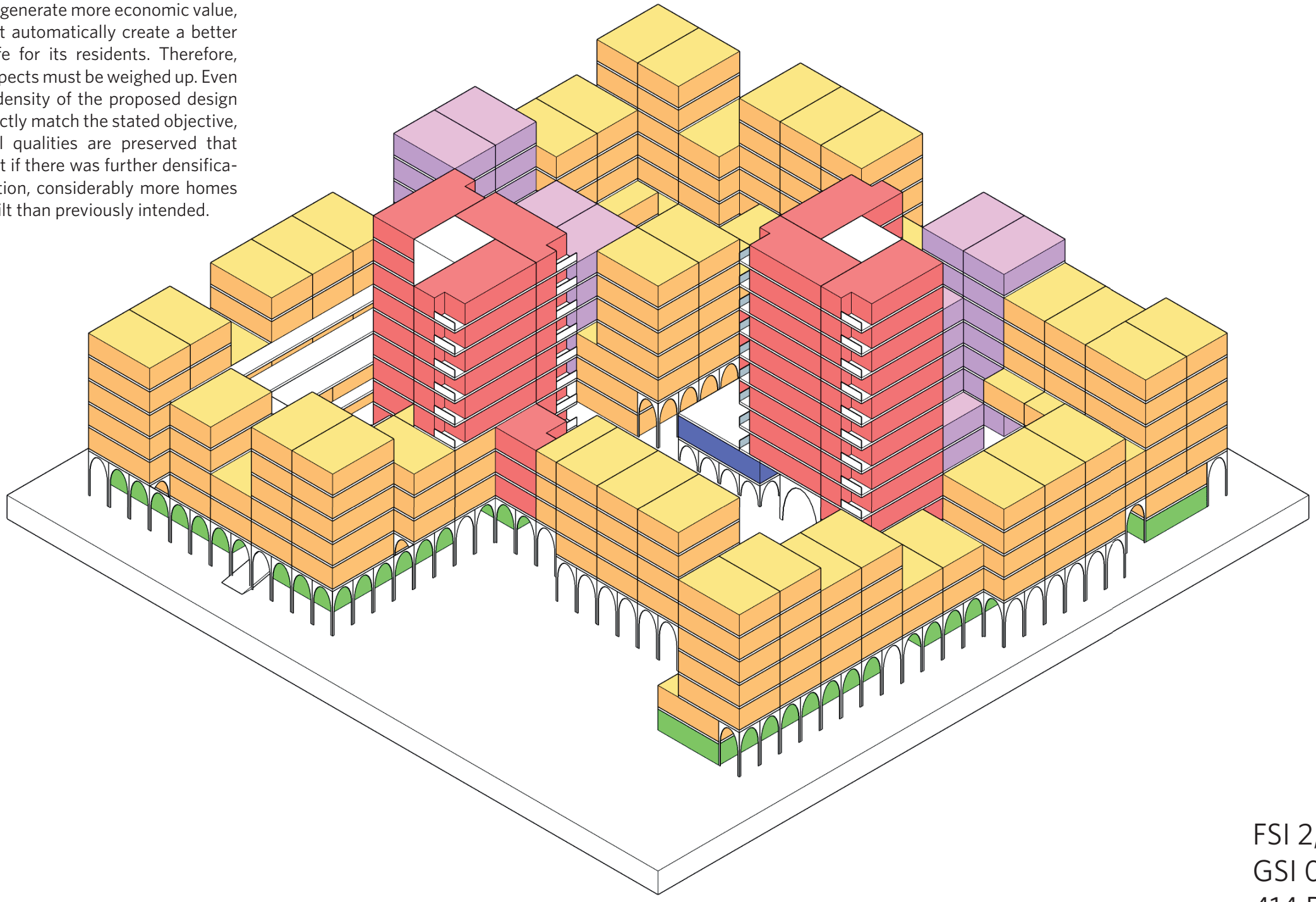


FSI 1,62
Density 243 dw/ha

image x: study of different Floor Space indexes (FSI) by densification of the same scheme;
Source: author's drawing

Spatial qualities vs economic interest

Even though building as many homes as possible will generate more economic value, this does not automatically create a better quality of life for its residents. Therefore, these two aspects must be weighed up. Even though the density of the proposed design does not exactly match the stated objective, more spatial qualities are preserved that would be lost if there was further densification. In addition, considerably more homes are being built than previously intended.



FSI 2,81
GSI 0,50
414 DW/HA

image x: heavy rain in Addis Ababa;
Source: Ralf Steinberger

CLIMATE

Architecture as a climate machine

Wind direction

The wind in Addis Ababa is mainly from the east. However, during the rainy months (from June to September) it rotates and mainly comes from the west. The whole year there is a weak wind and it is never windless. In addition, the wind speeds outside the rainy season regularly exceed 12 km/h and then rarely during the rainy season.

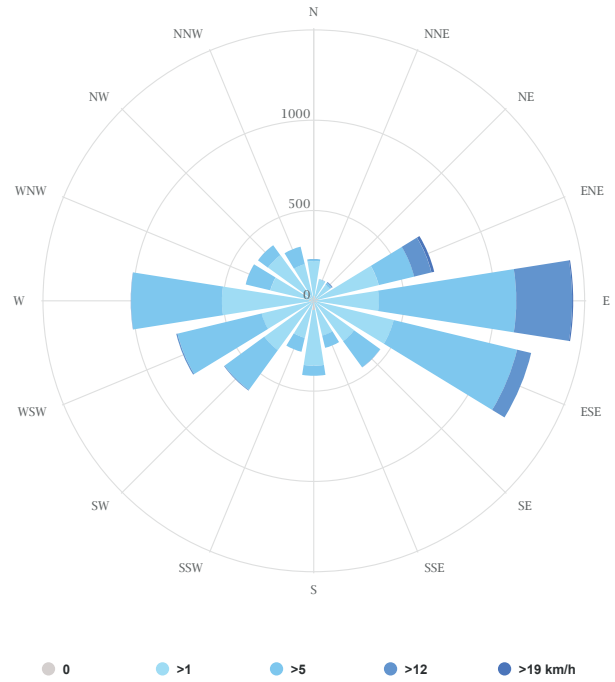


image x: wind directions and speeds in Addis Ababa; Source: MeteoBlue

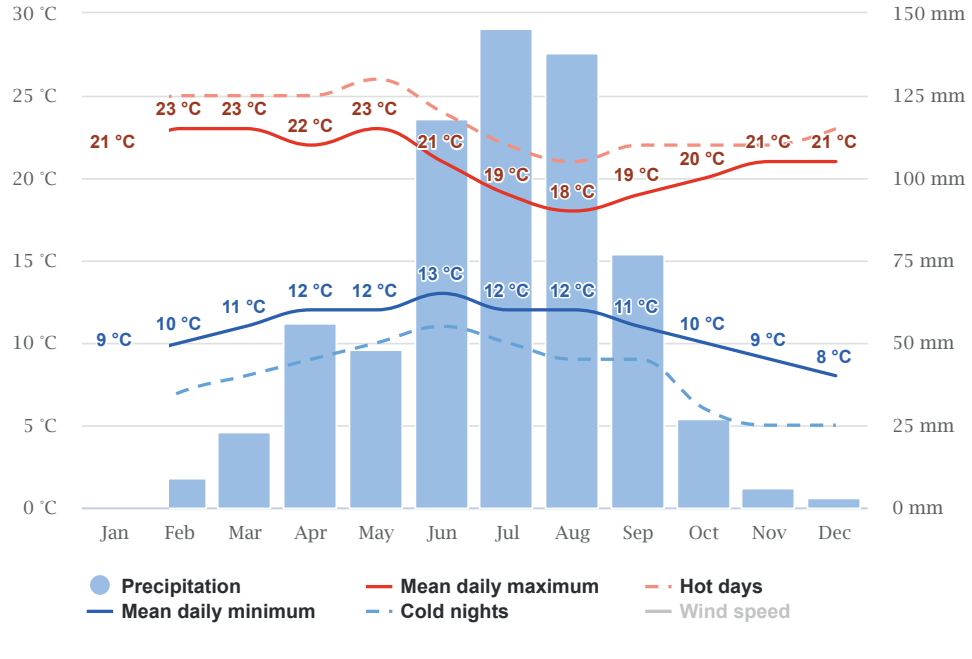


image x: average temperature and rainfall in Addis Ababa; Source: MeteoBlue

Temperature and rain

Addis Ababa is characterized by the relatively moderate temperature of 20 degrees throughout the year, with the daily temperature between the hottest and coldest month differing on average only 5 degrees. The city owes this mild climate in particular to its high location at over 2300 meters. Compared to Awassa, which is 100 kilometers south and at an altitude of 1700 meters, the temperatures are between 24 and 28 degrees.

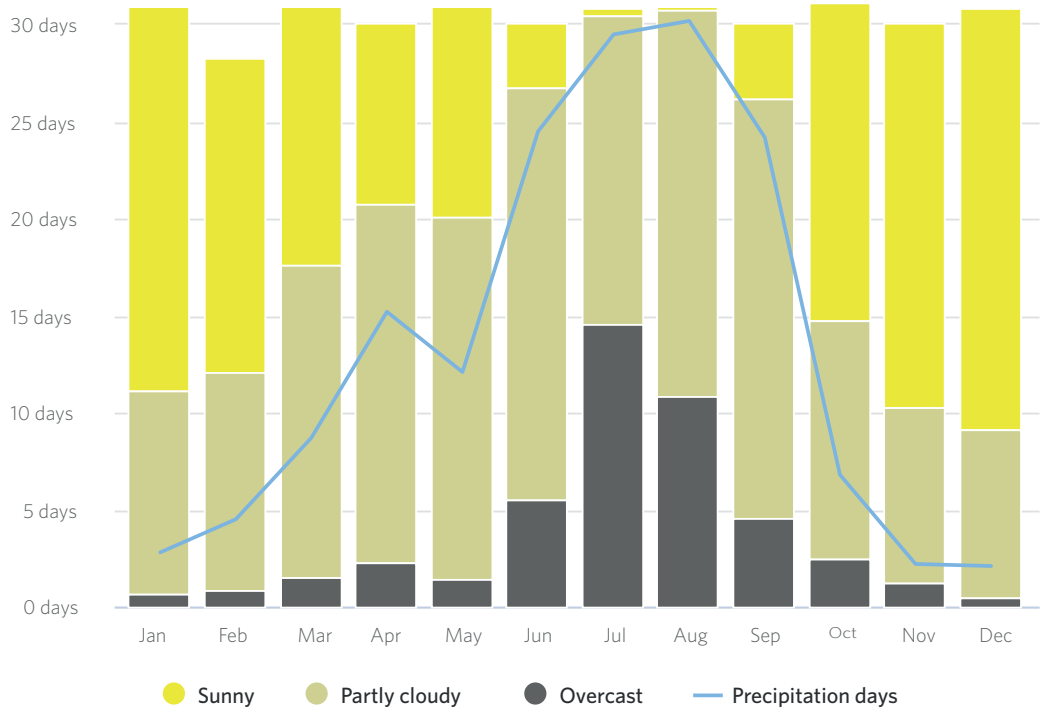


image x: overcast and rainy day's in Addis Ababa;
Source: Metreo Blue

Overcast

The rainy season, which runs from June to September, is naturally characterized by a lot of clouds. With an average of 290 mm of rain in the rainiest month of August. Compared to Adama, which is 100 kilometers south of Addis Ababa at an altitude of about 1700 meters, we see that there are more cloudy days and the rainy season lasts longer (from April to September).

Son path

At about 9 degrees latitude, Addis Ababa is relatively close to the equator. Due to this location, Addis Ababa has a relatively constant day length with the sun usually rising at a quarter past six and generally setting around twenty minutes after seven. In addition, the proximity to the equator ensures a high sun position which is used in March and September. The northernmost and southernmost positions (solstice) are reached in June and December, with the sun remaining on the north side all day in June.

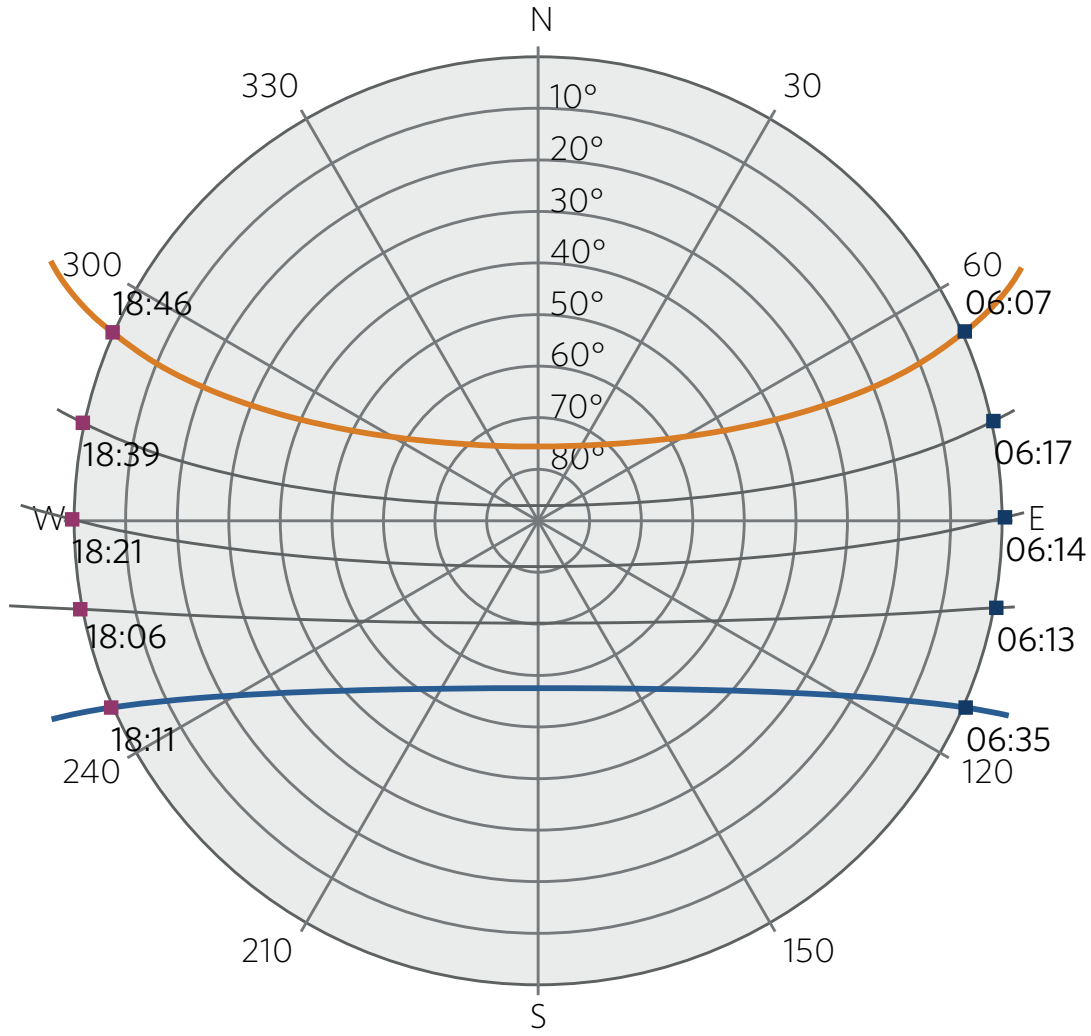
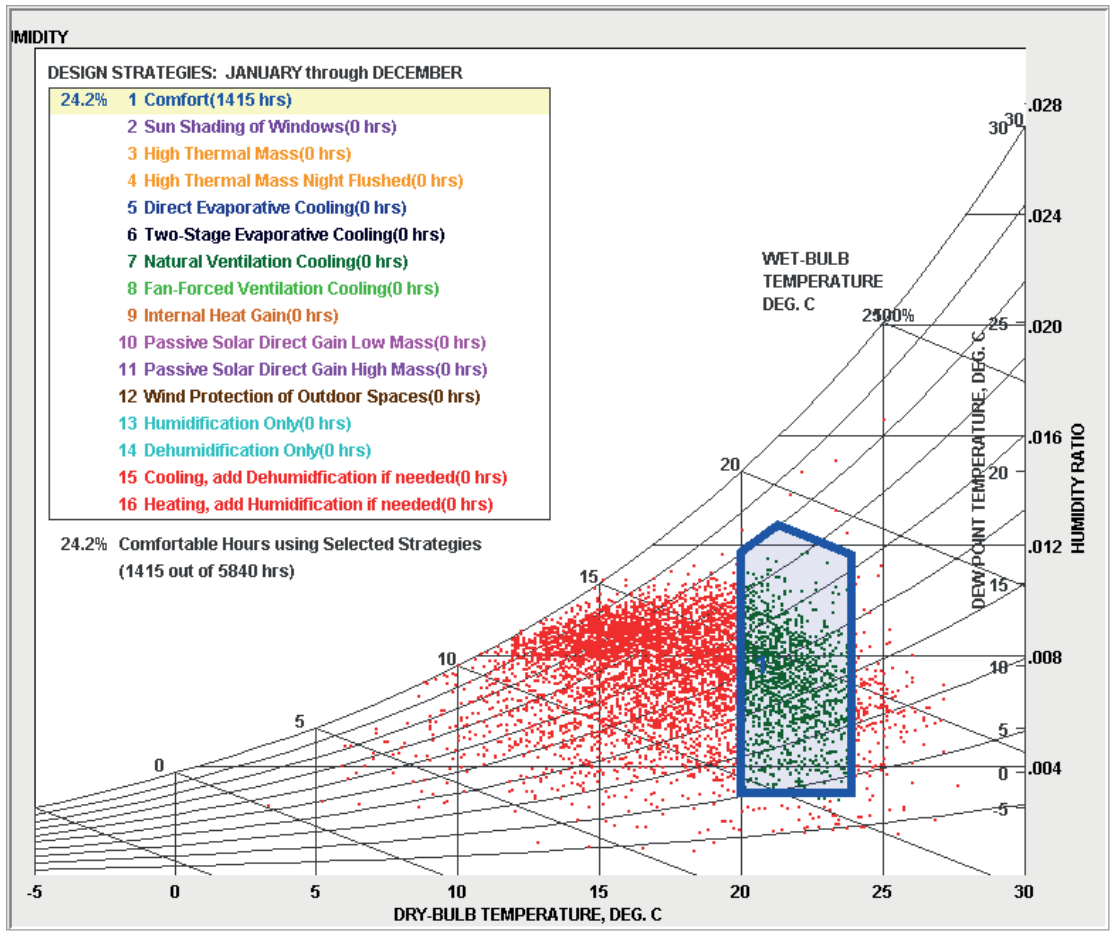


image x: sun paths across Addis Ababa;
Source: Gaisma, Matti Tukiainen

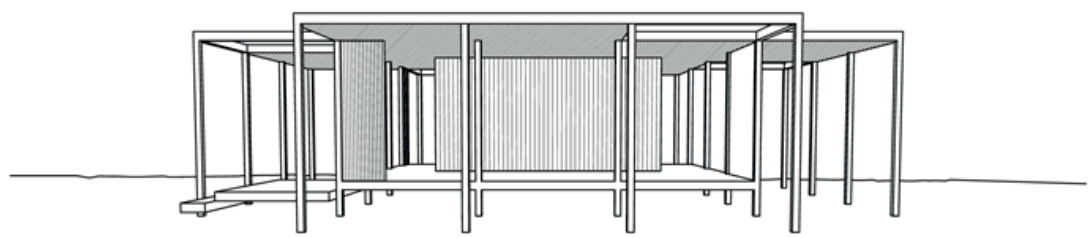


Comfort zone

The temperate climate in Addis Ababa provides a good starting point for a passive climate control system. By means of the computer program “climate consultant” the average temperatures in relation to the air humidity (which form the basic measurement for a comfortable indoor climate) can be plotted. This shows that a quarter of the time the temperature is already within the comfort zone. In addition, by allowing the warm winter sun and cool summer breeze, optimal use can be made of the mild climate.

Passive strategies

In the perspective of affordability, but also in the context of ecological sustainability, it is desirable to use as many passive technologies as possible to create a comfortable indoor climate. It is therefore of great importance to inventory these strategies early in order to be able to implement them at the scale level of district, site, buildings and materiality.



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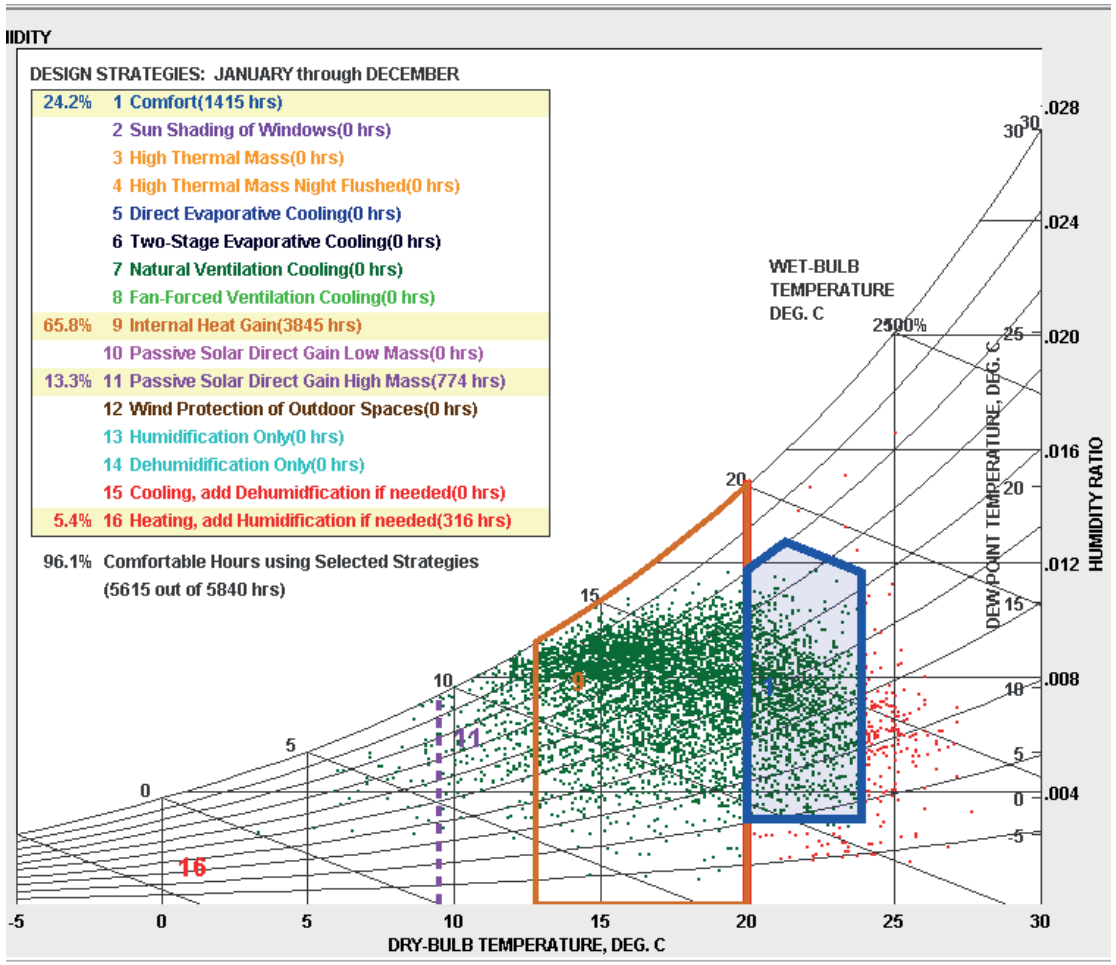
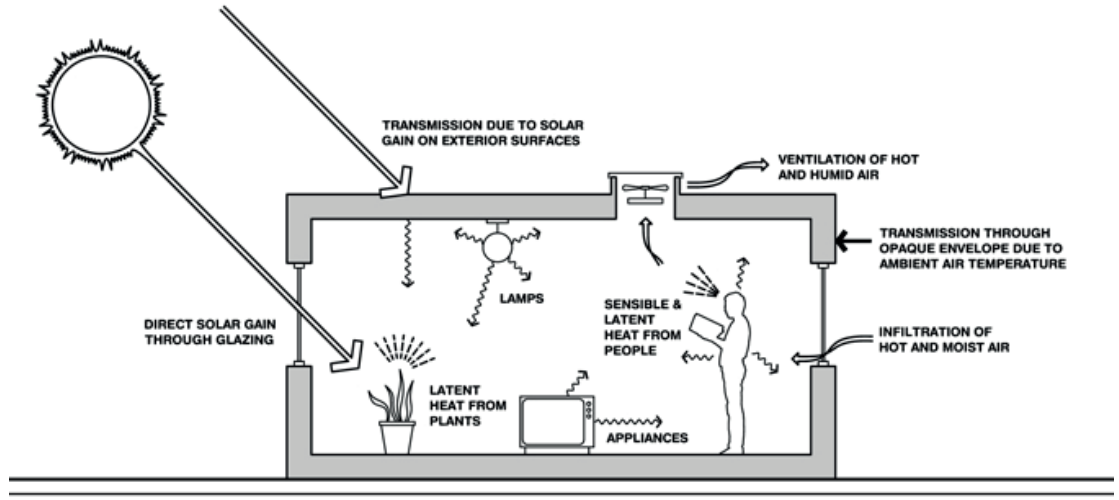
This is one of the more comfortable climates, so shade to prevent overheating, open to breezes in summer, and use passive solar gain in winter



Heating strategy

To increase comfort, different heating strategies can be used. One of the important strategies in the context of Addis Ababa is to maintain internal heat. By means of good gap sealing and regulating ventilation, the comfort within the home can be increased. Thanks to this strategy, a comfortable temperature can be achieved in the home for three quarters of the year. To further increase comfort, especially during colder days, sun exposure can be used. Sun exposer on materials with a high mass stores this heat and releases it slowly. For the rest of the year in which this strategy cannot provide for the heat (because the sun does not shine, for example), a heating system will have to be used. However, this only concerns 20 days in the year.



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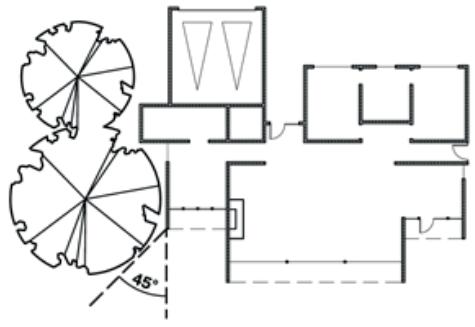

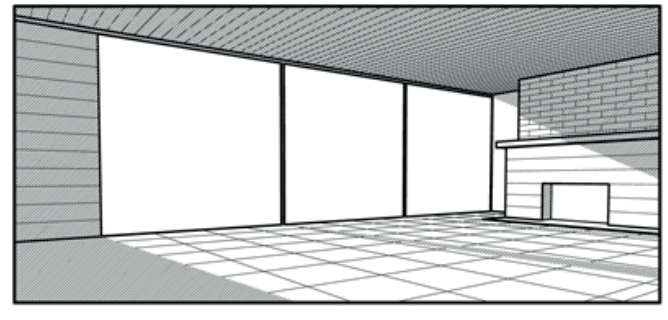

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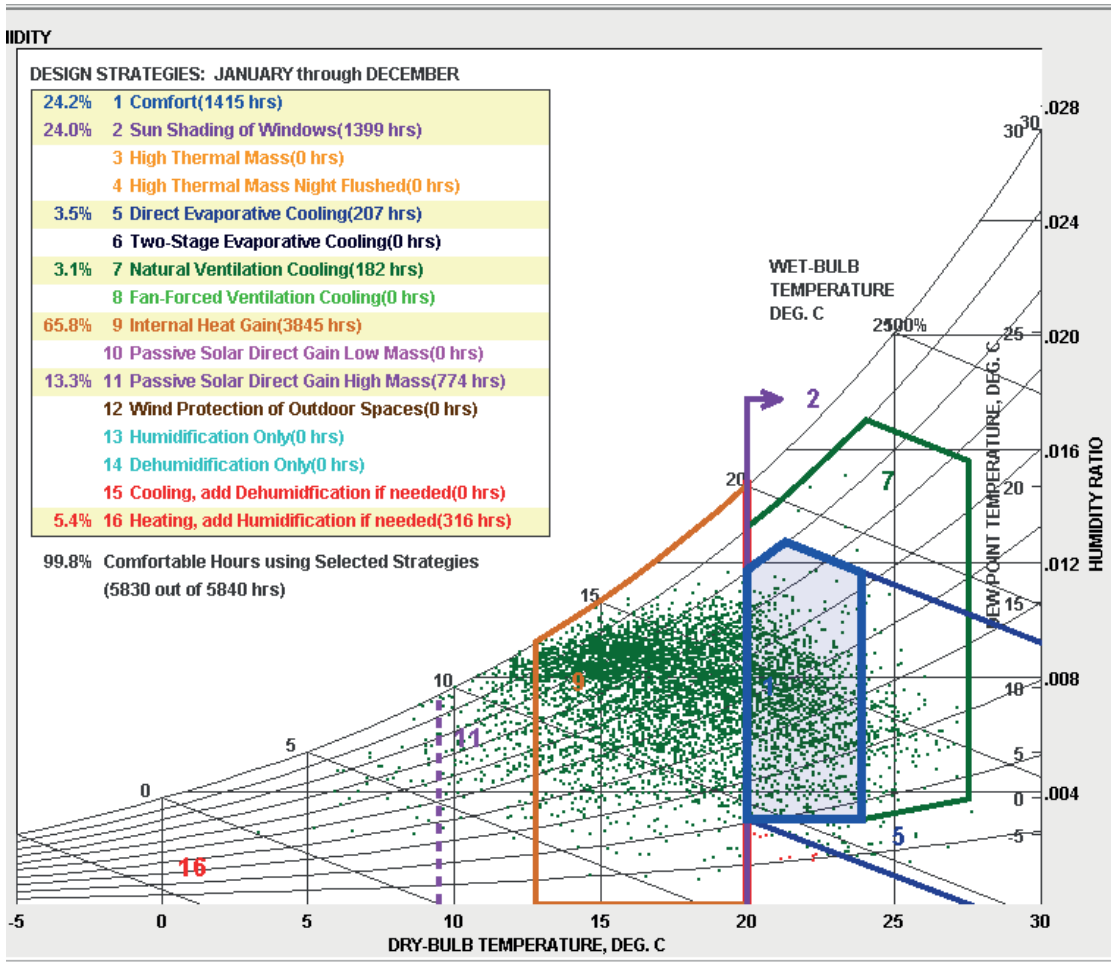
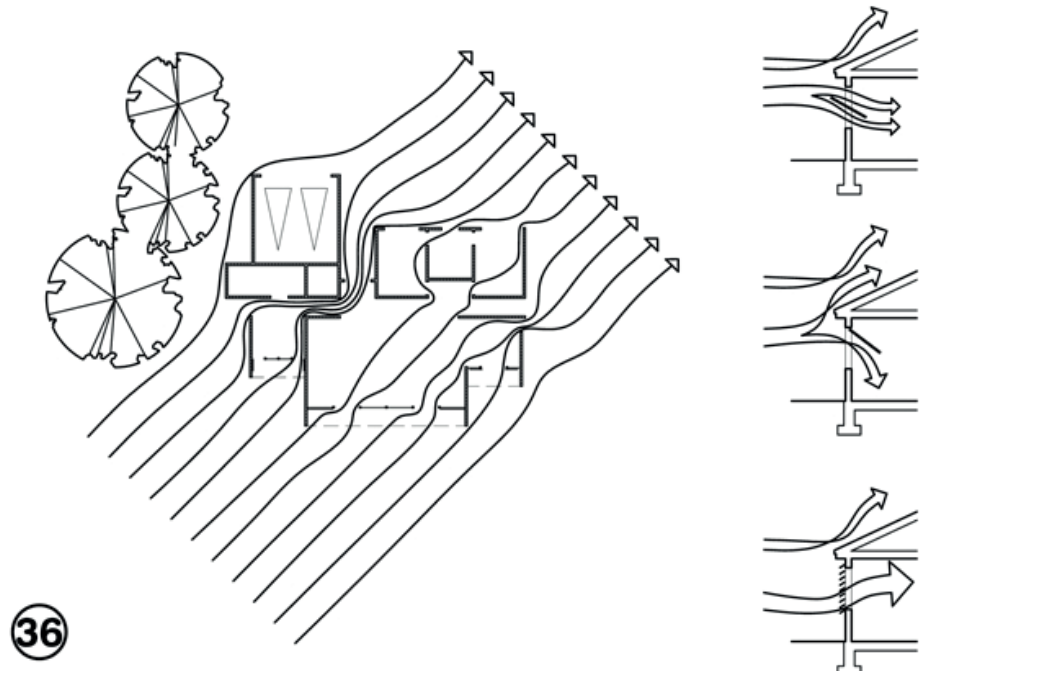


Cooling strategy

In terms of cooling there are two strategies that make a big contribution. The first is to reduce the sun exposure of the facade openings by using overhangs. This prevents further heating of the house. A second strategy is ventilation, in particular natural ventilation which provides cooling. Finally, the comfort zones can be expanded by means of evaporative cooling on hot days without wind. This combination of both passive heating and cooling strategies ensures a comfortable indoor climate during 99.8% of the days of the year.



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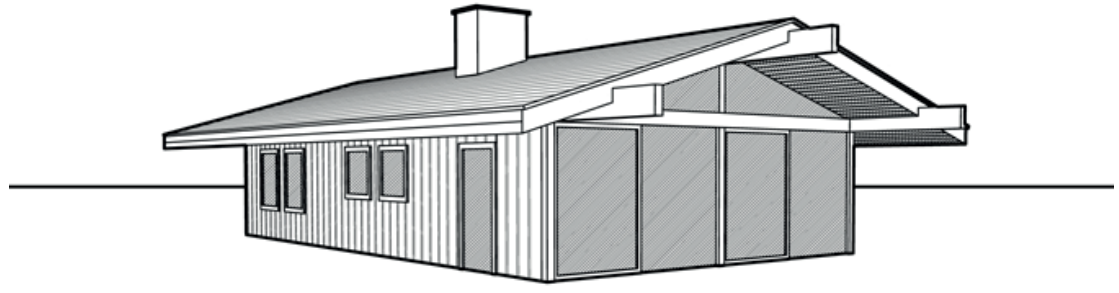
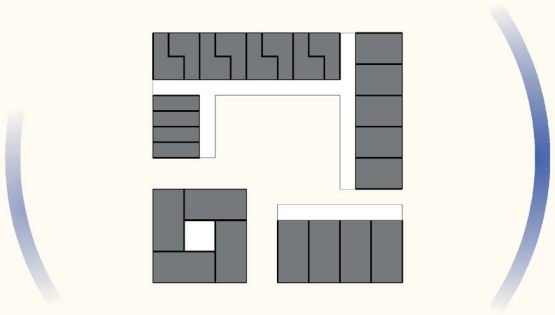


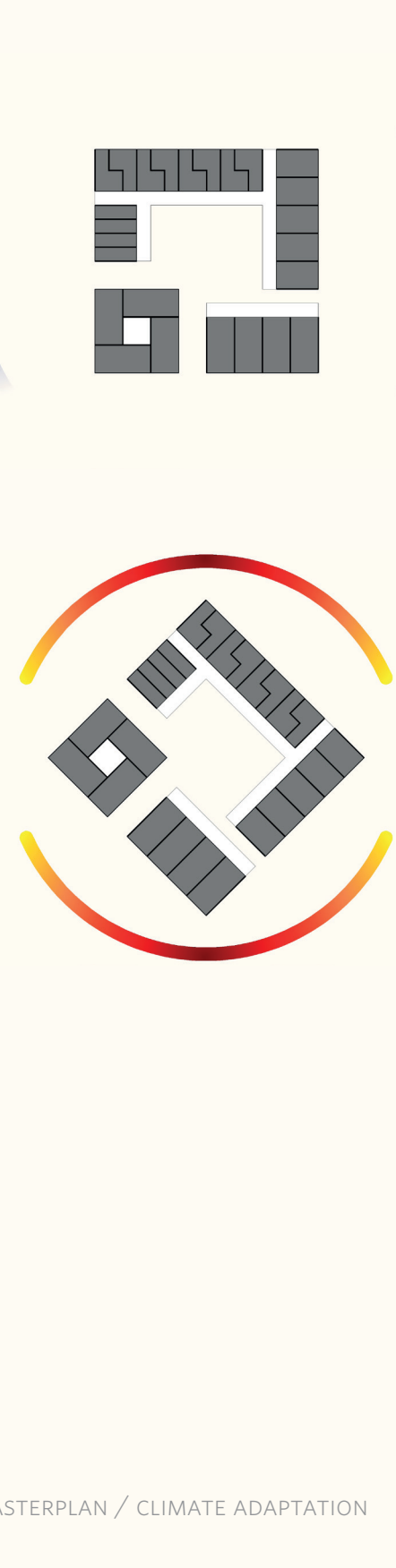
55

MASTER PLAN



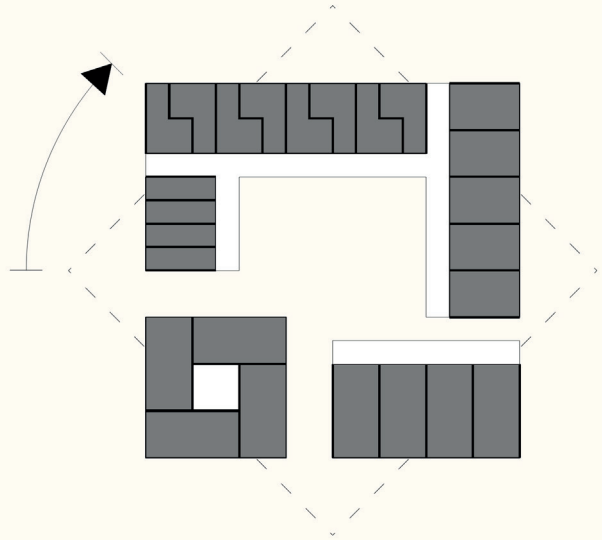
Problem

Implementing the passive climate strategies starts at the cluster level. With a direct north-south and east-west orientation, only half of the homes can be naturally ventilated.

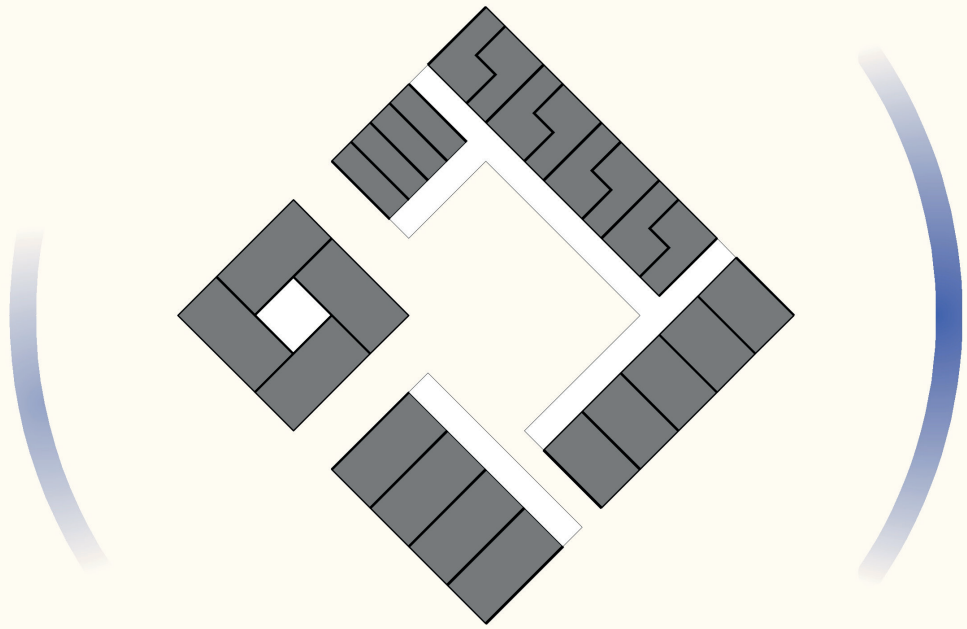


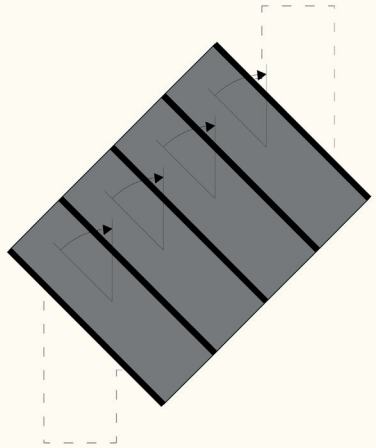
Complications

However, twisting the houses introduced a new problem. The true north south facades are lost, which are ideal for the realization of shaded facade openings due to the high sun position.



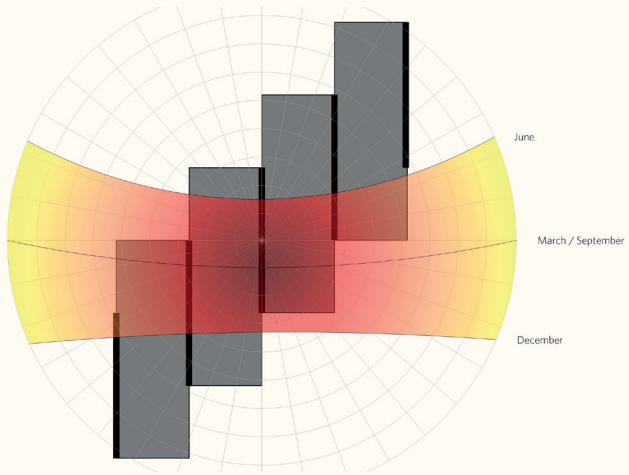
BY ROTATING THE CLUSTER 45-DEGREE IT BECOMES POSSIBLE TO VENTILATE ALL HOMES IN A NATURAL WAY.





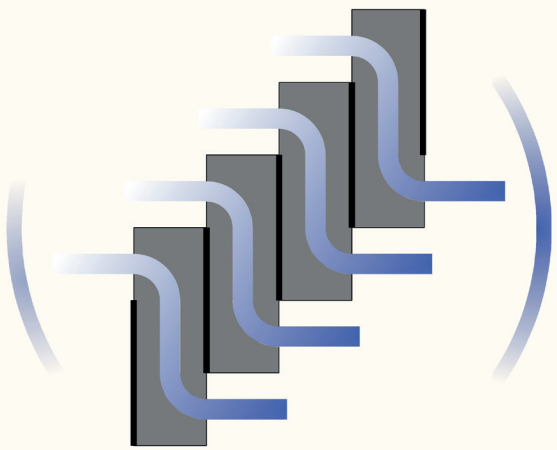
Turning

To solve the problem of the heat load on the facade, we have to zoom in on the house level. By turning each individual home counterclockwise, a true north south orientation is created again.



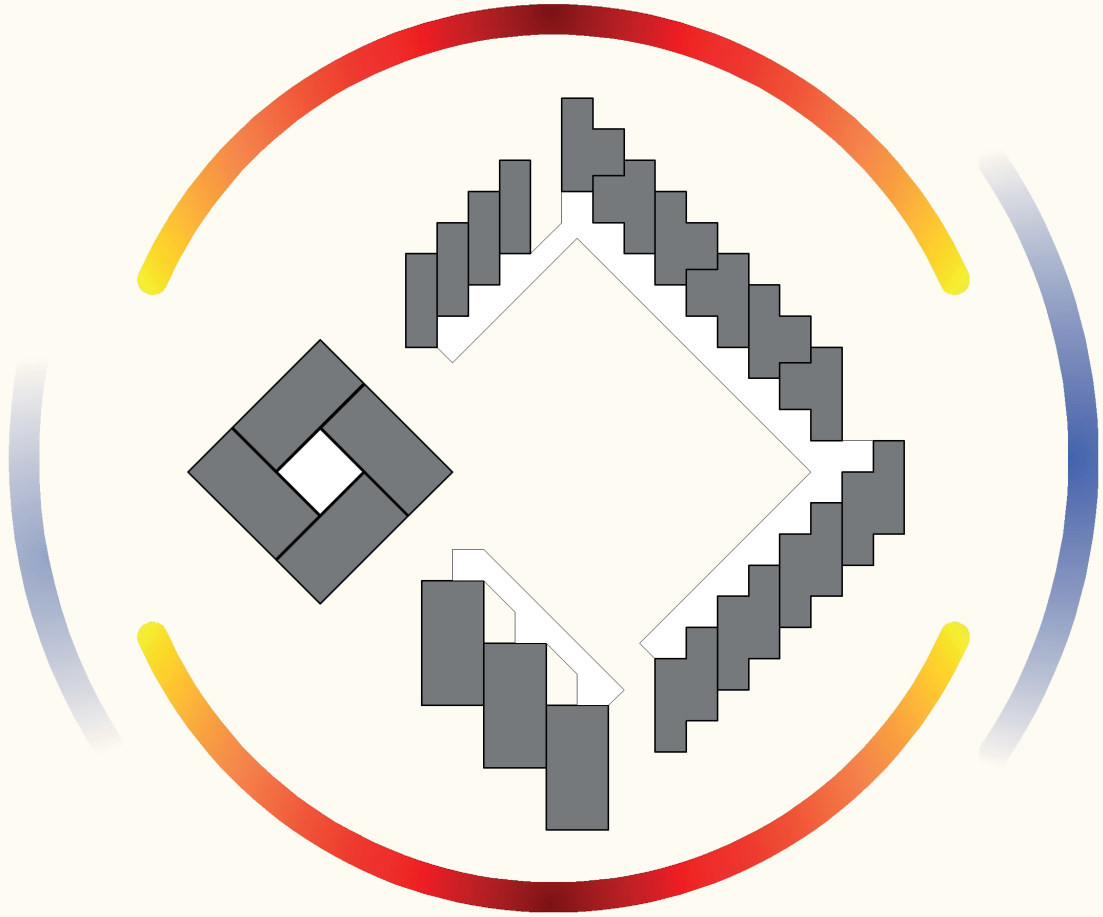
Sun orientation

Due to the north-south orientation, these facades can easily be protected from the sun using overhangs. In addition, protective measures can be taken on the east and west facades against the low and warm morning and evening sun while allowing the wind to pass through.



Ventilation

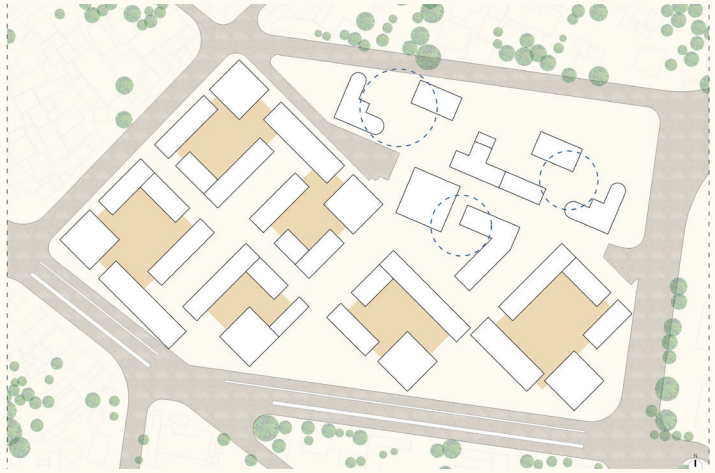
Due to the east-west facades, which are perpendicular to the wind direction, it is possible to naturally ventilate the house.



Overvieuw

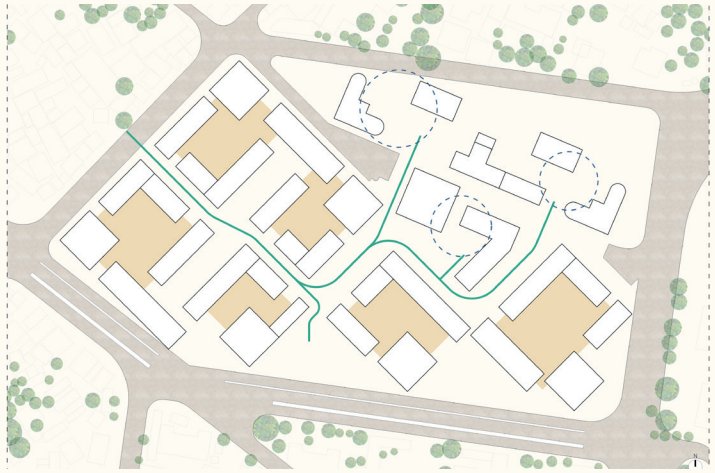
Carefully orienting both the cluster and the houses in the cluster creates the ideal exit position to regulate the indoor climate in a natural way.

Scale 1:700 @A2



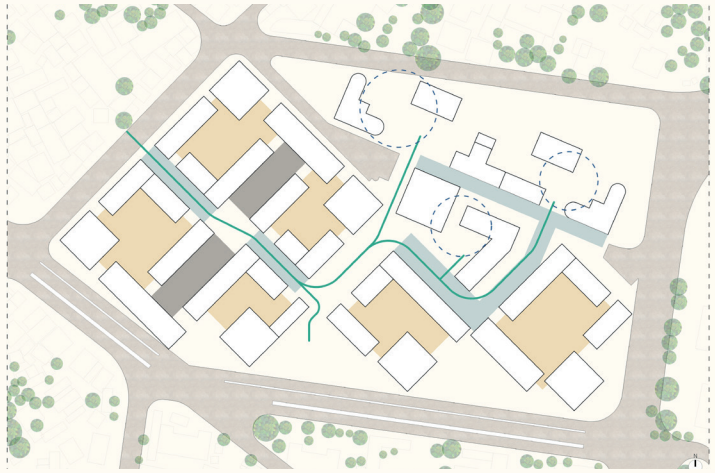
Clusters

The cluster has a key position within the social strategy to bring people together. In addition to the houses, the facilities are also clustered so that they can also benefit from each other's presence.



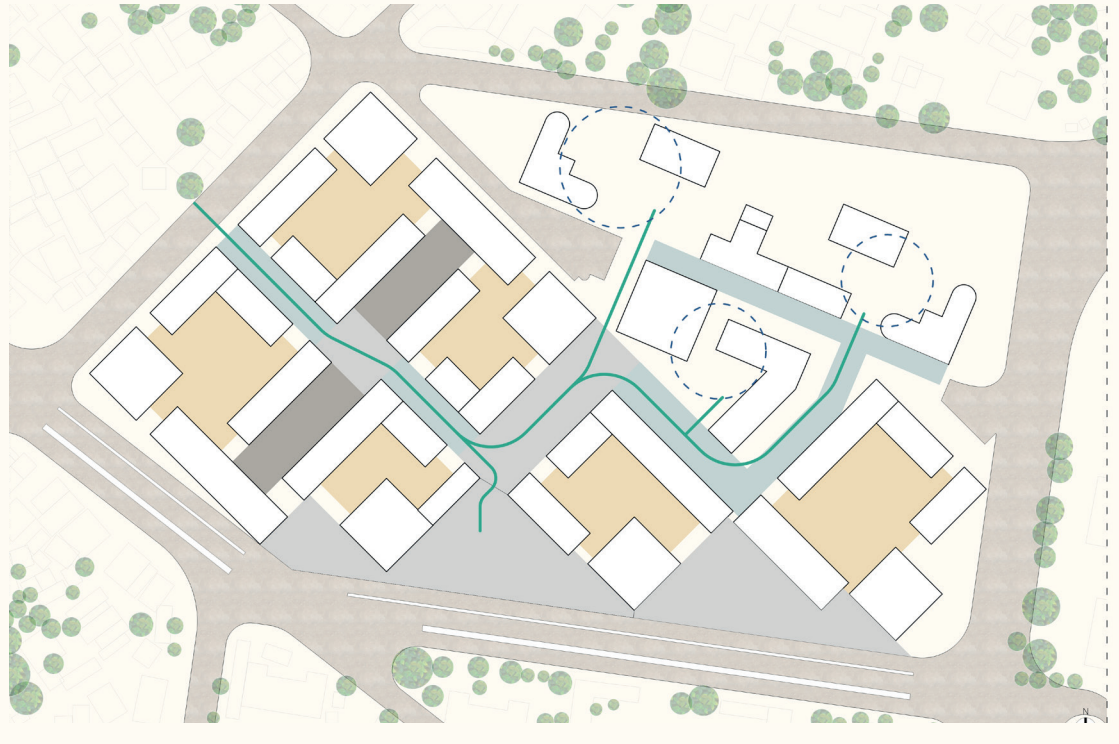
Pedestrian route

Organizing access for car traffic around the perimeter of the district creates space within the district for slow transport. Besides the fact that this ensures a safe traffic situation, the chance of social interactions are also greater. The connecting artery within the district is the pedestrian route that connects the various residential clusters with the facilities.



Streets

The walking route leads along and through two different types of streets. The route uses the continuous streets. By staggering these in relation to each other, it is prevented that these continuous streets acquire an anonymous character.



Pleinen

Streets

The second typolie streets that occur in the project are the dead-end streets. The emphasis is much more on the residential character of the street than on the movement-oriented continuous streets. The dead-end streets also have a much more private character due to their residential character and are therefore an extension of the courtyard of the cluster.

Scale 1:700 @A2

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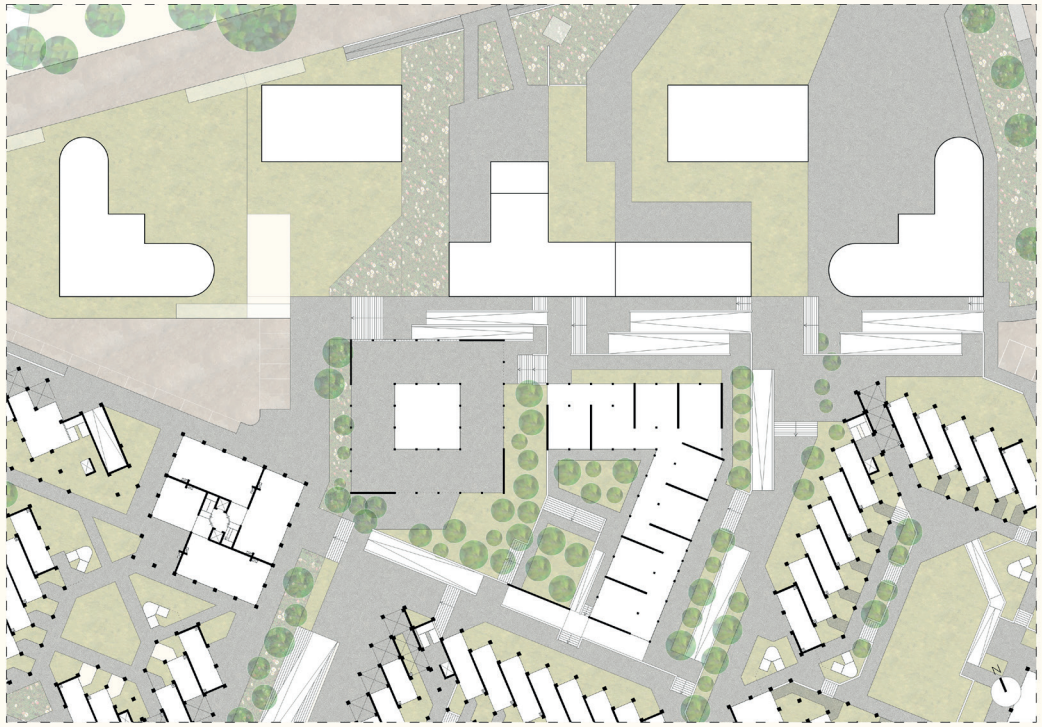
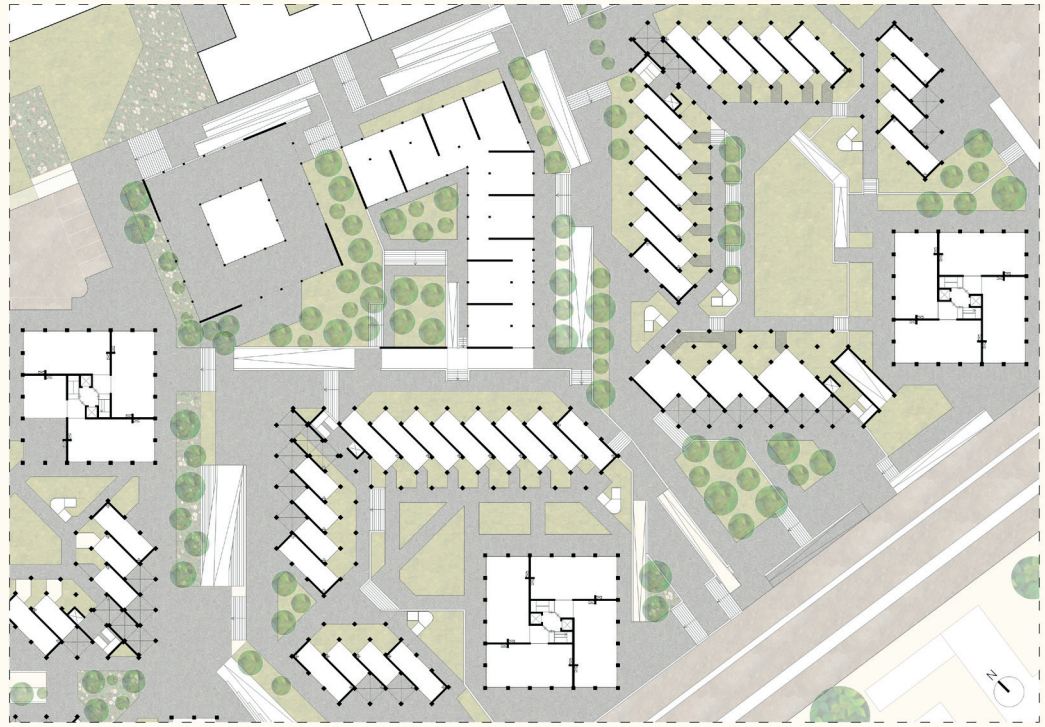
Scale 1:700 @A2

heritage, italian rule
new facilities (school and community center) form the connection
health center and high school





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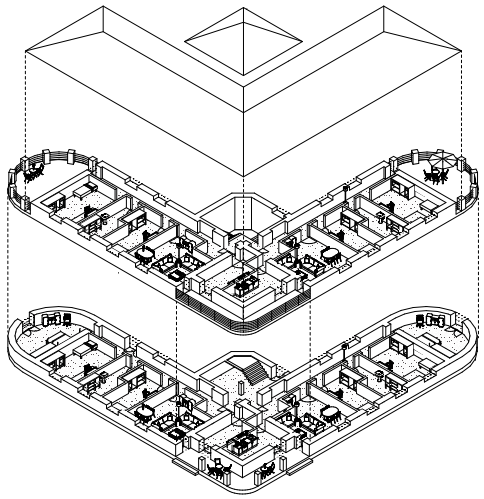
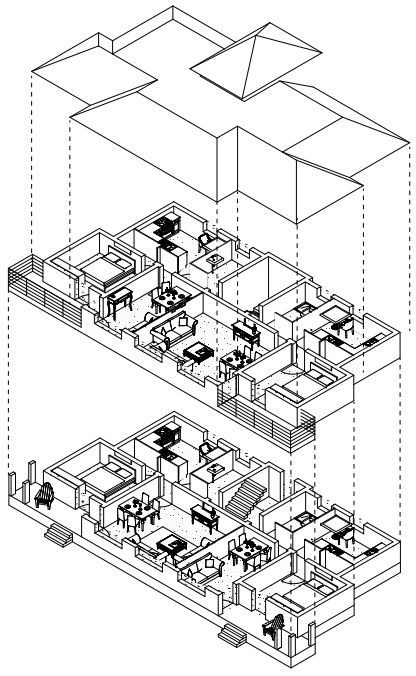
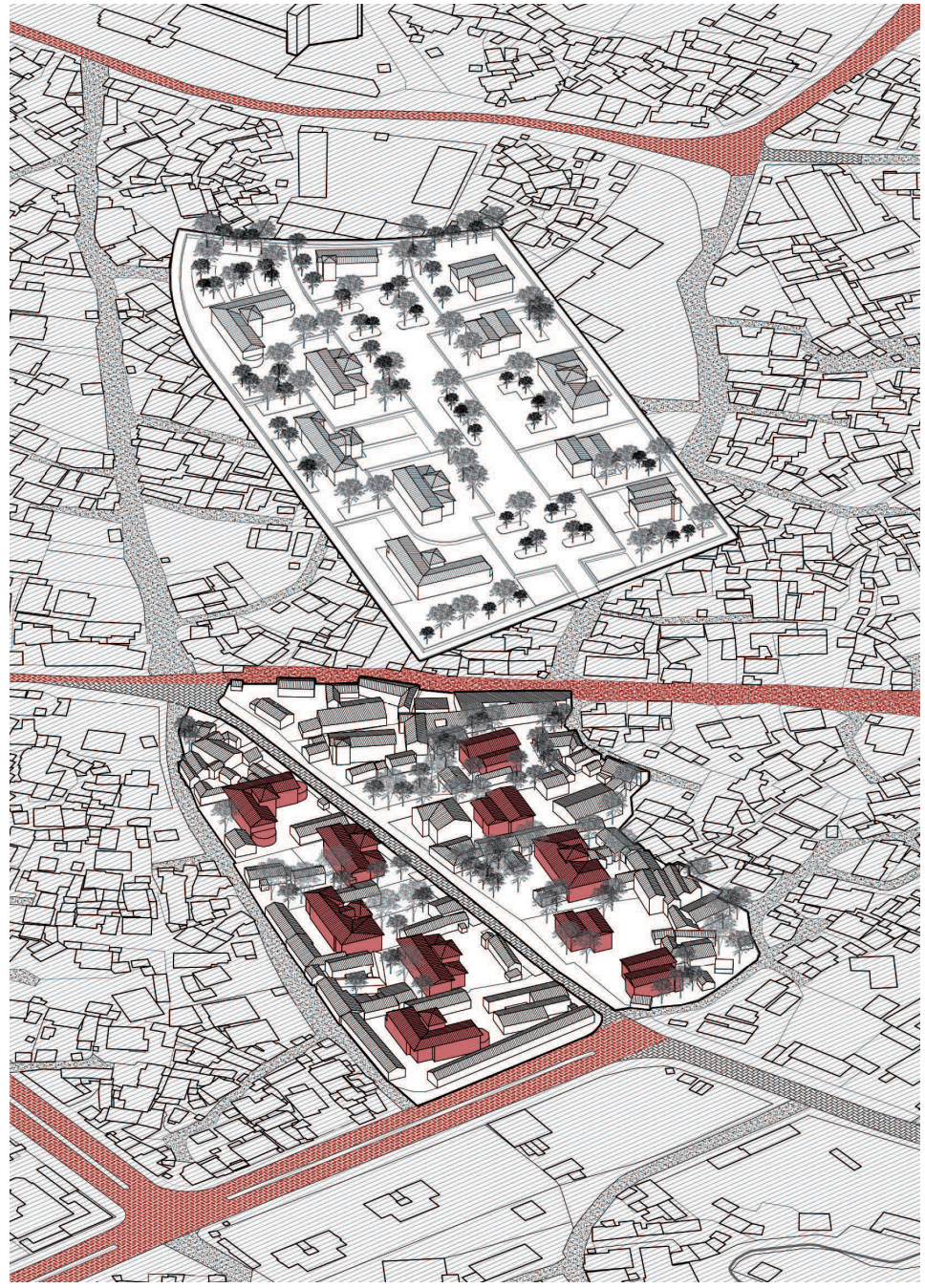
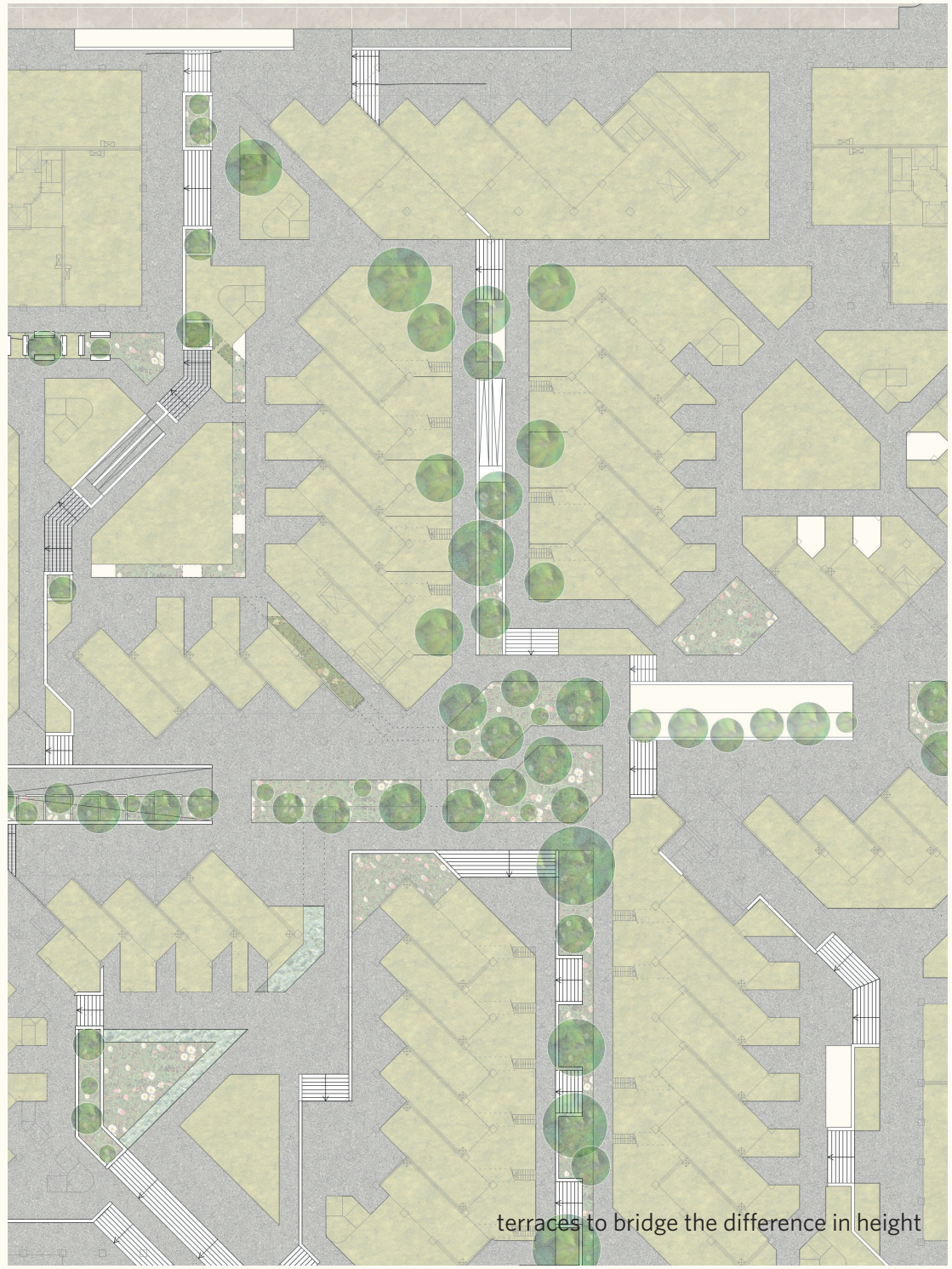
primary school
community center, Iddir





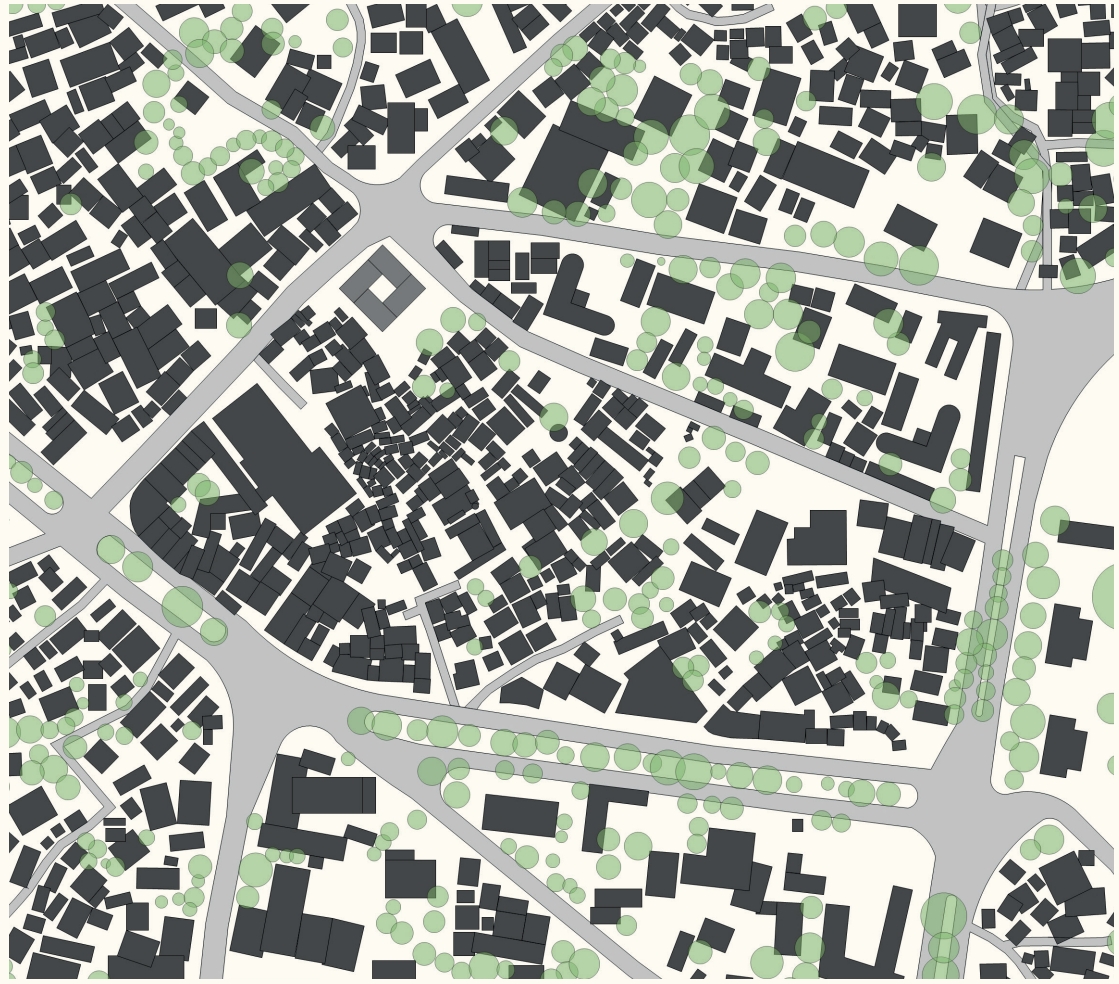


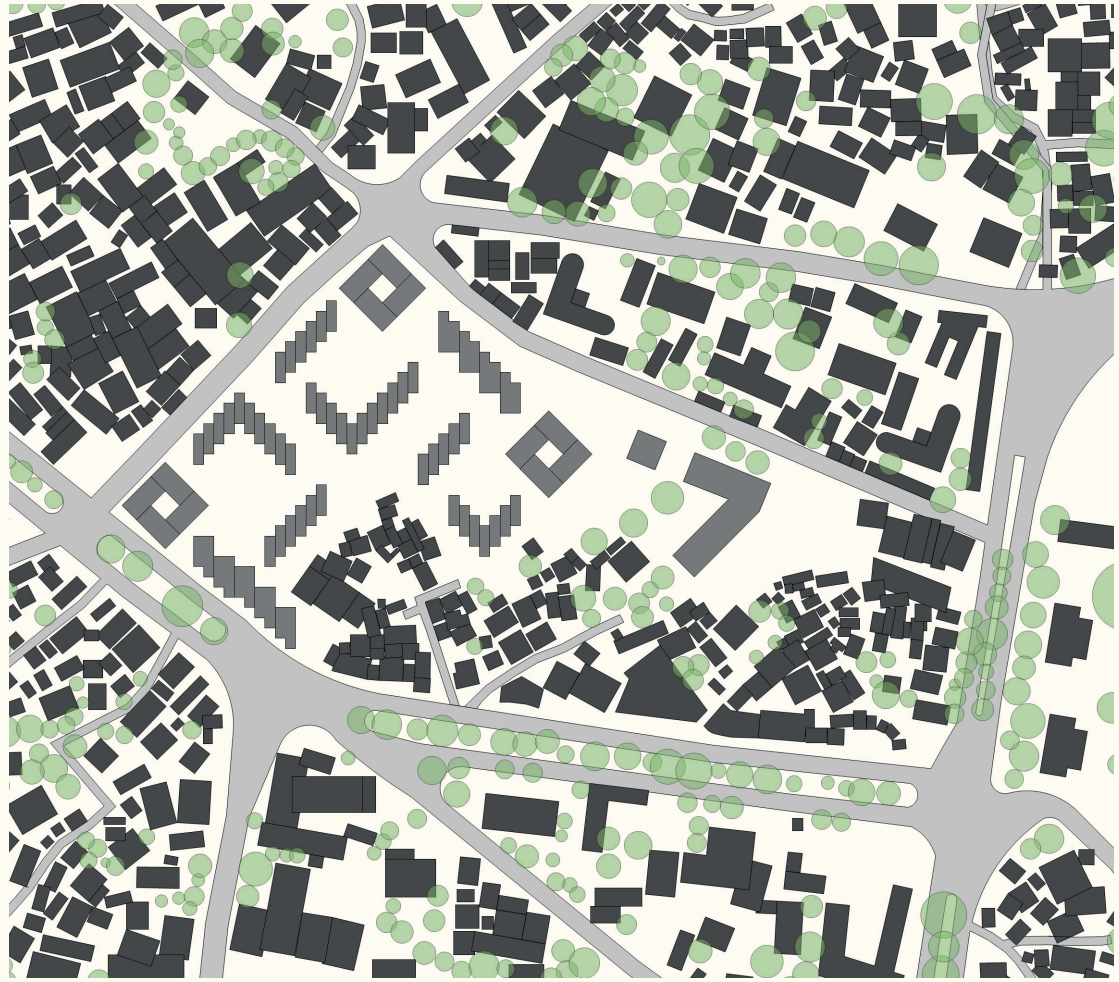
topography, medium to steep gradient



terraces to bridge the difference in height

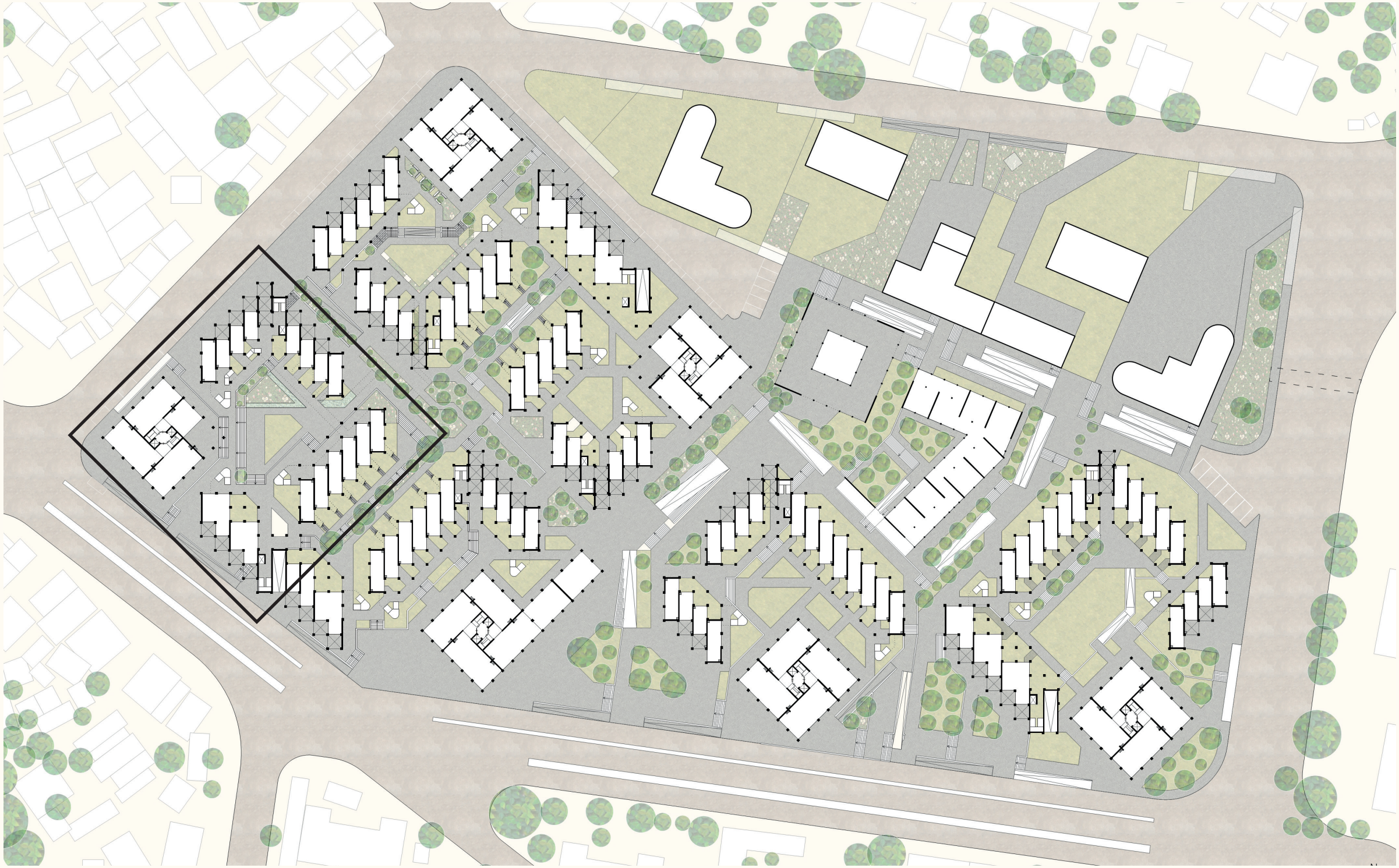
Isometrie Masterplan



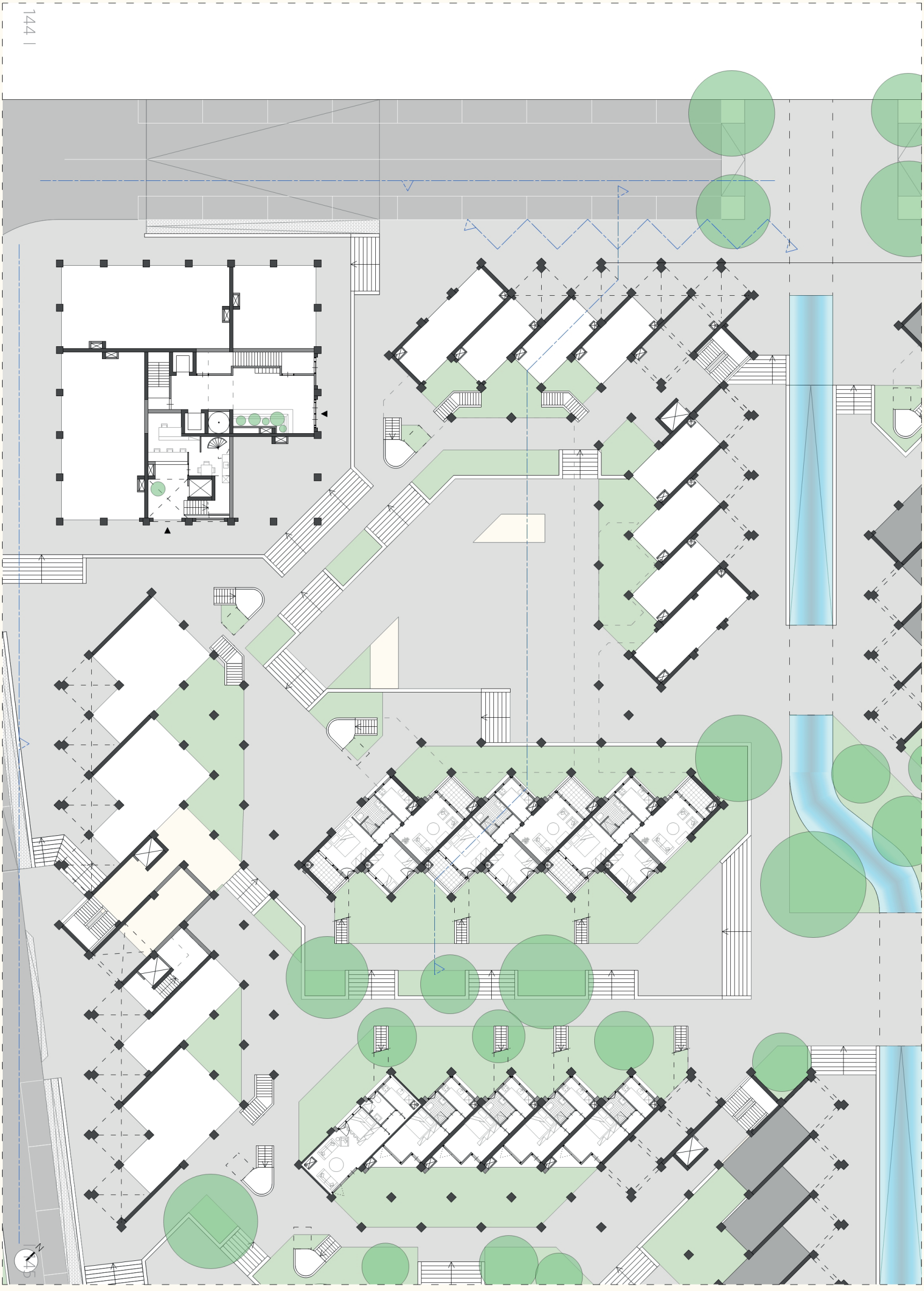


further development (phase x)

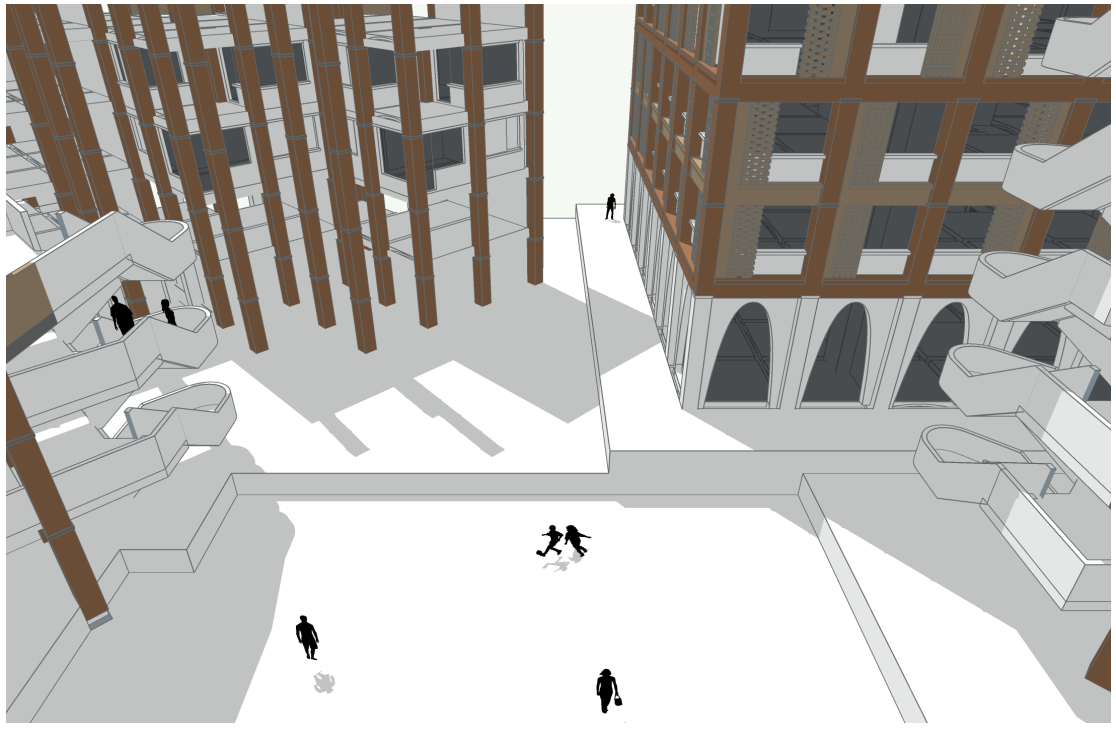
CLUSTER



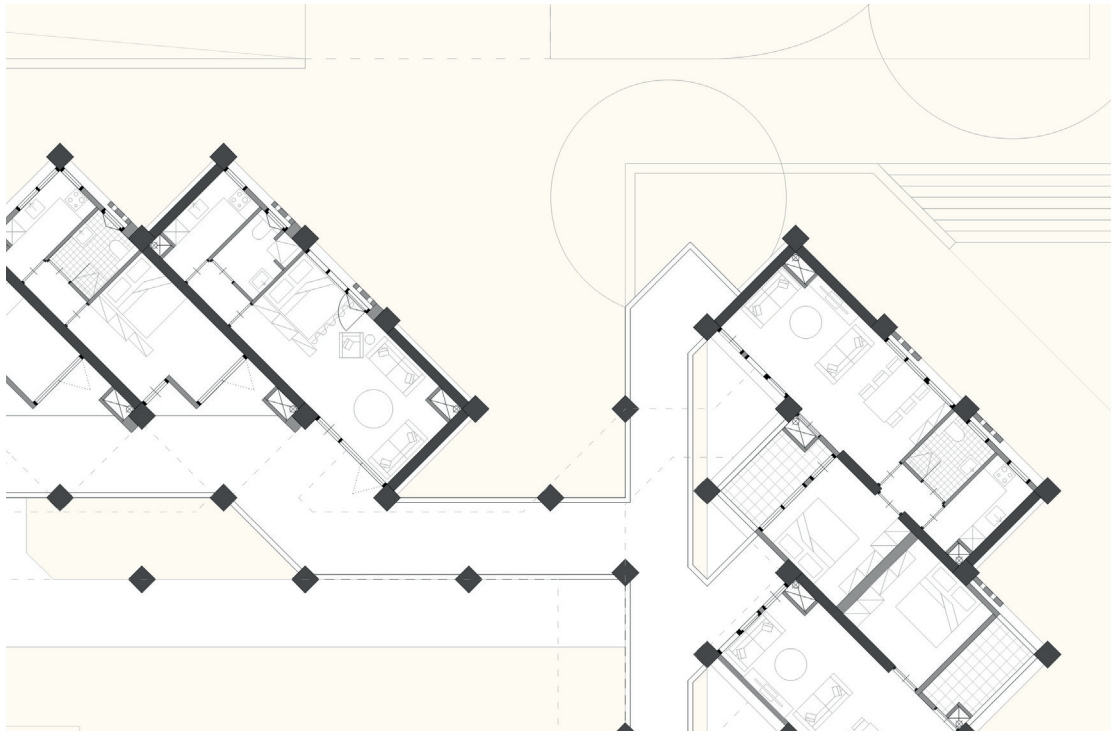
Cluster, ground floor



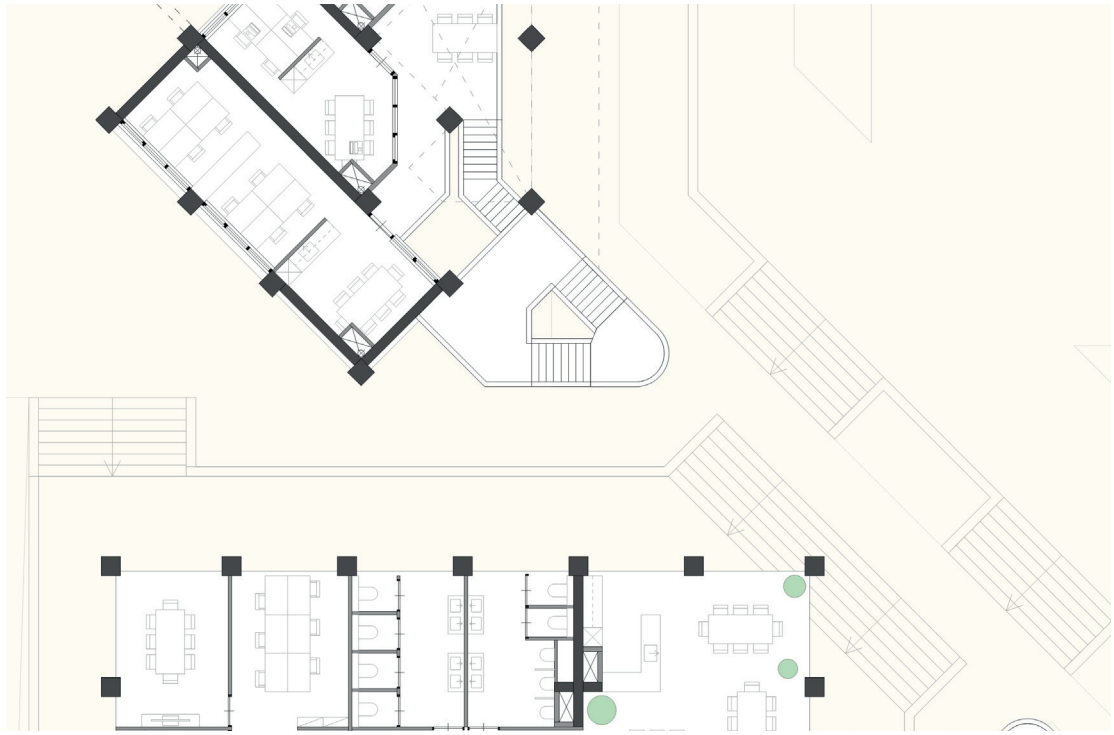
Scale 1:200 @A2



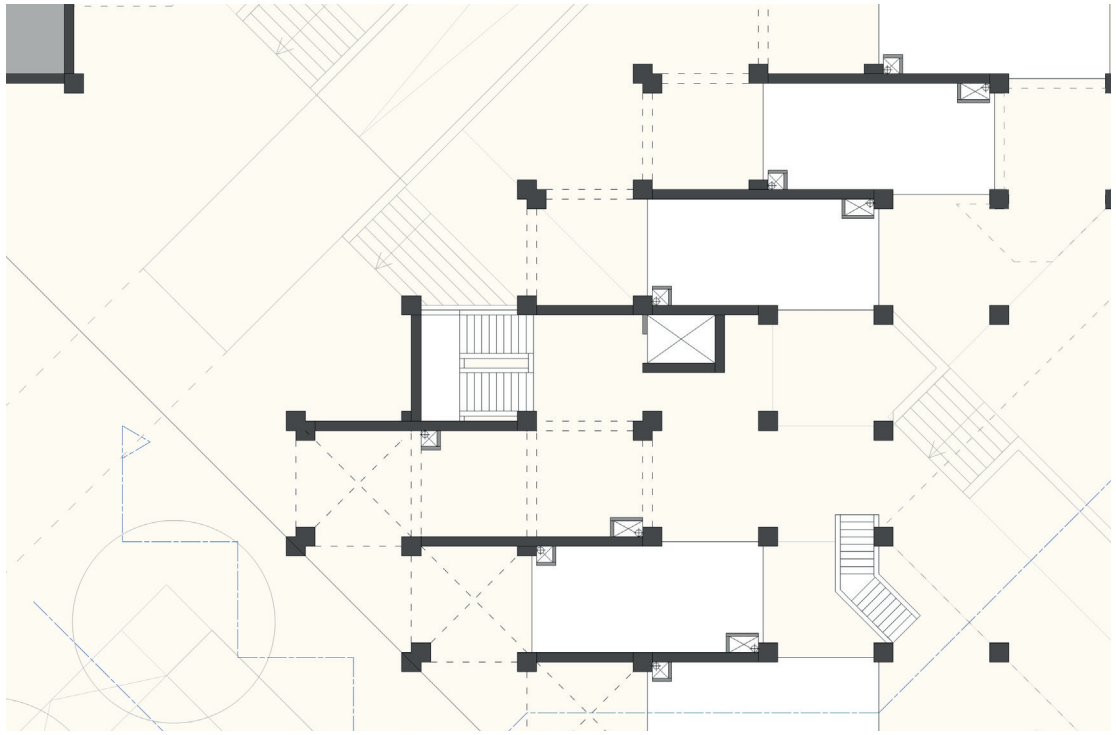
courtyard garden
meeting place
common ground between different income groups



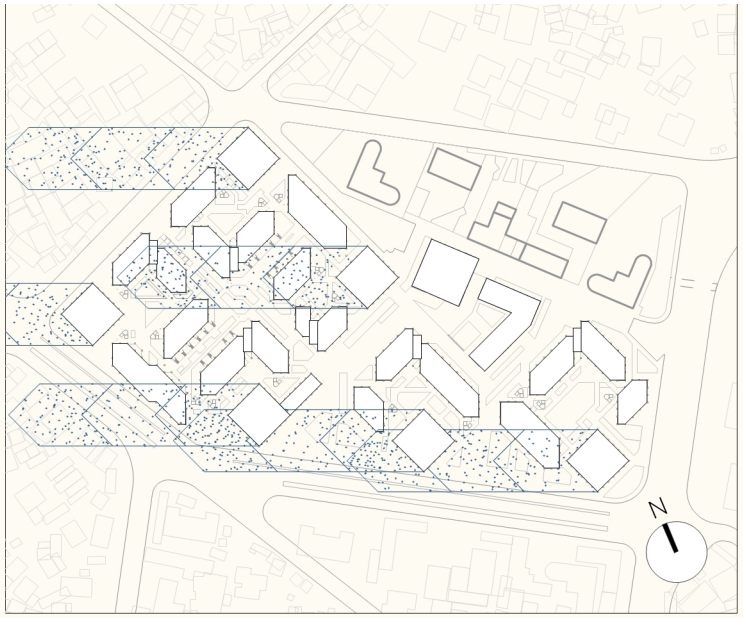
thresholds
transition between public and private articulated through a small opening and overhanging galleries



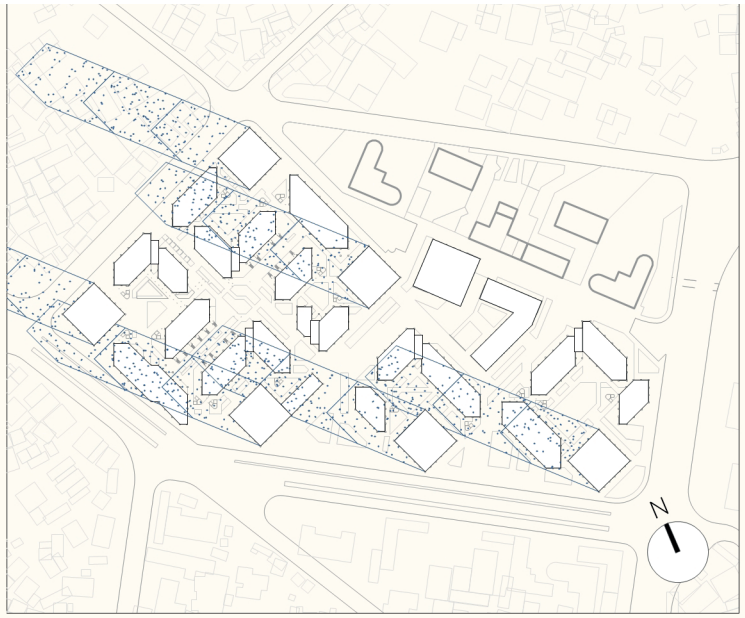
thresholds
transition between public and private articulated through a small opening even further reduced by the level difference



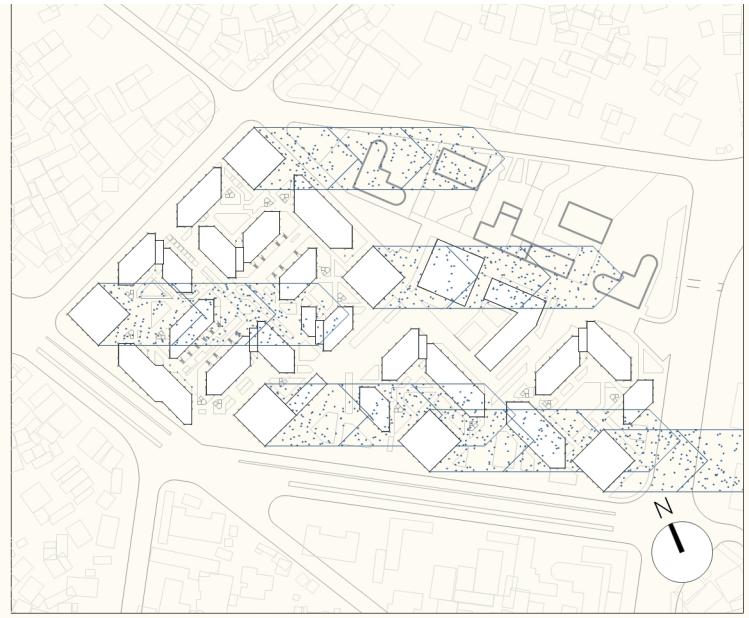
thresholds
transition between public and private articulated through arcade and floor height difference



1.437 h/year (16%)

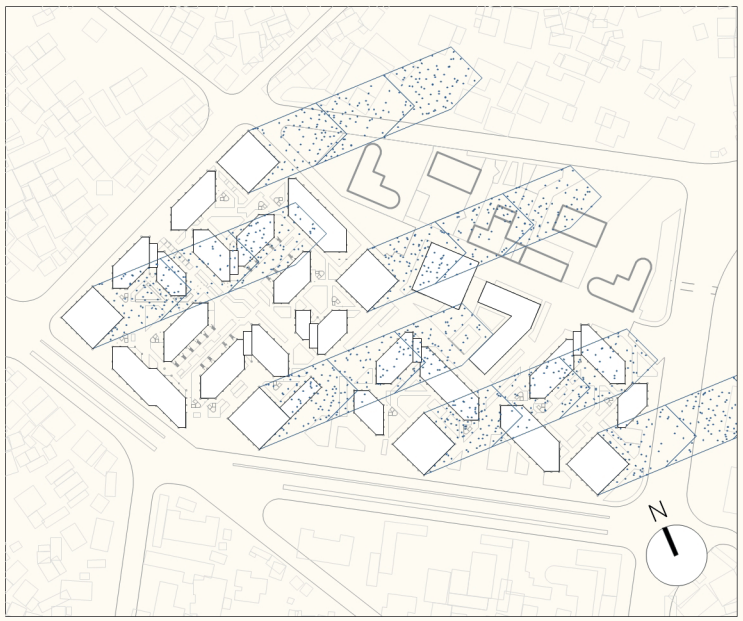


1.238 h/year (14%)

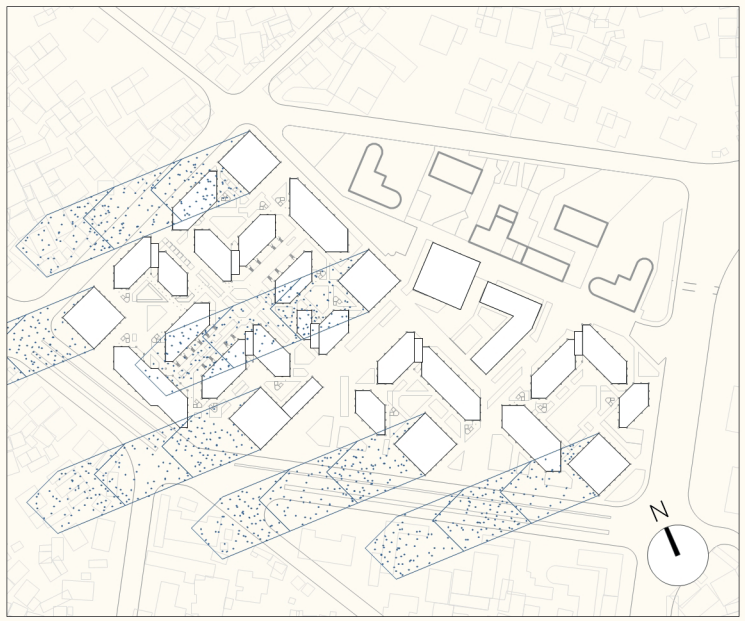


1.014 h/year (12%)

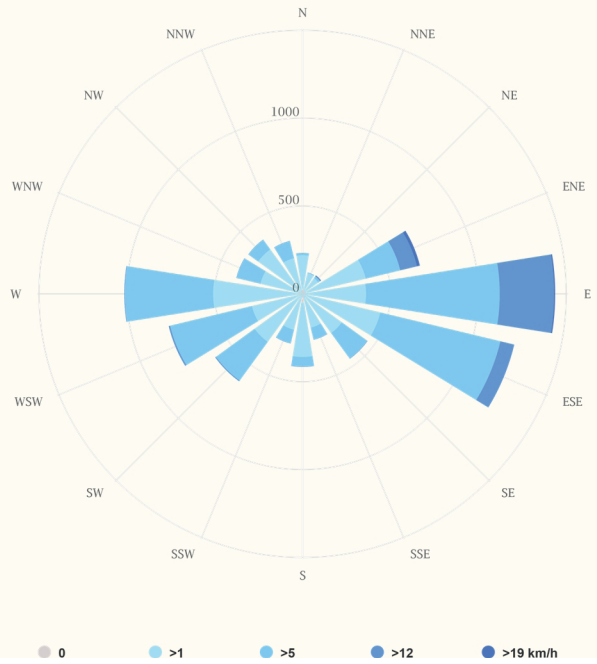
nd, prevailing directions



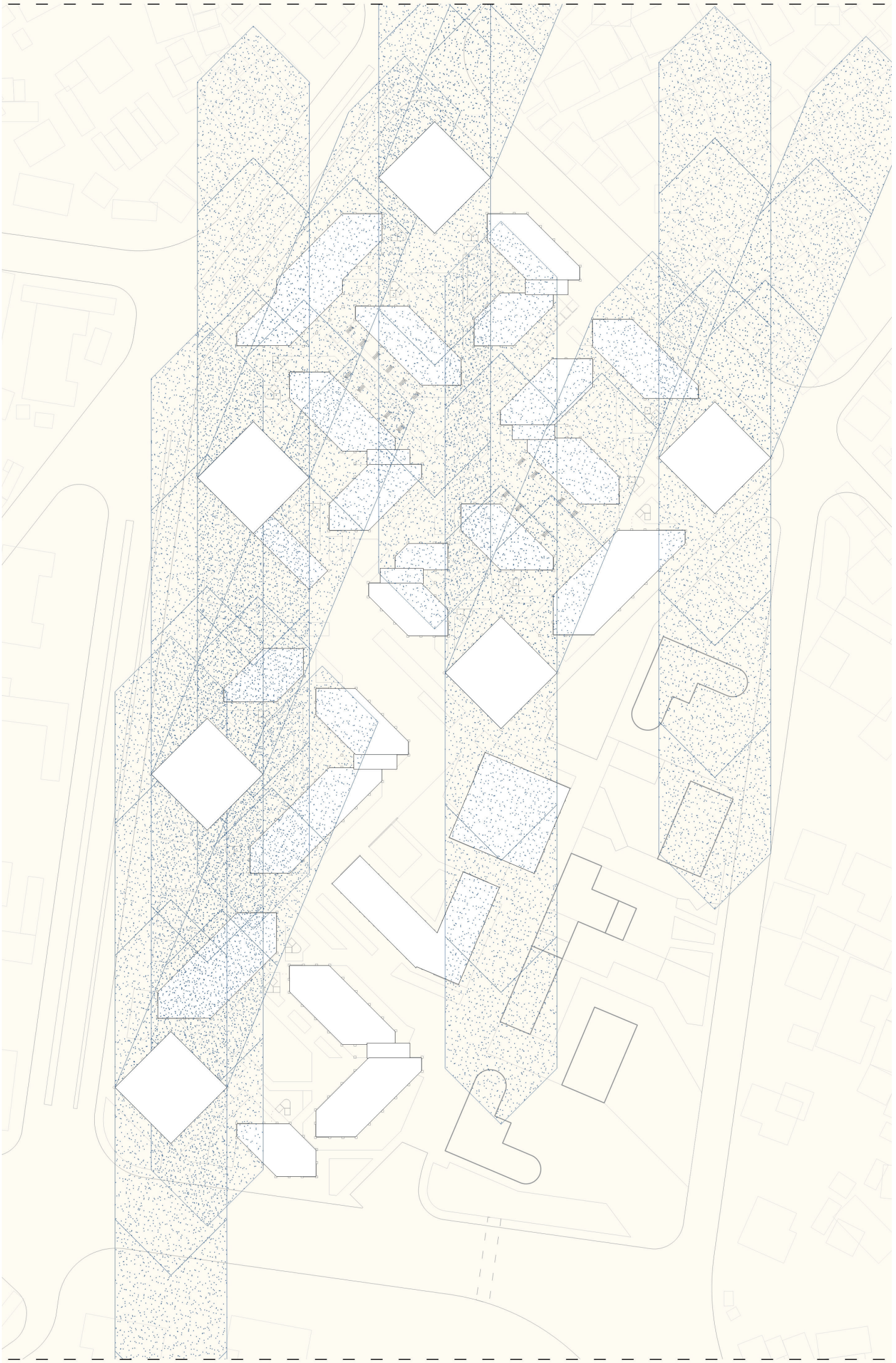
776 h/year (9%)



686 h/year (9%)



nd, three most prevailing directions



Wall properties

Binnen maten		
Lengte	0,6	
Breedte	1,2	
Hoogte	3	m
Thickness	0,3	m
Aantal finnen	2	
Dikte finnen	0,09	
Doorsneden kanaal	0,666	m2
Massa schoorsteen	2,862	m3
wall surface sunlight	11,07	m2

solar heat

specific heat (adobe)	2000	kJ/m3K
heat capacity (construction)	5724	kJ/K
sun radiation	1397,26	Wh/m2/day
received sun radiation	15467,67	Wh/day
	55683,62	kJ/day
reduction factor frame	0,85	n
	47331,07	kJ/day
ZTA	0,8	n
	37864,86	kJ/day
Abosption wall	0,8	
stored solar heat	30291,89	kJ/day
temperature difference	5,292084	K

Q = h * ΔT * A

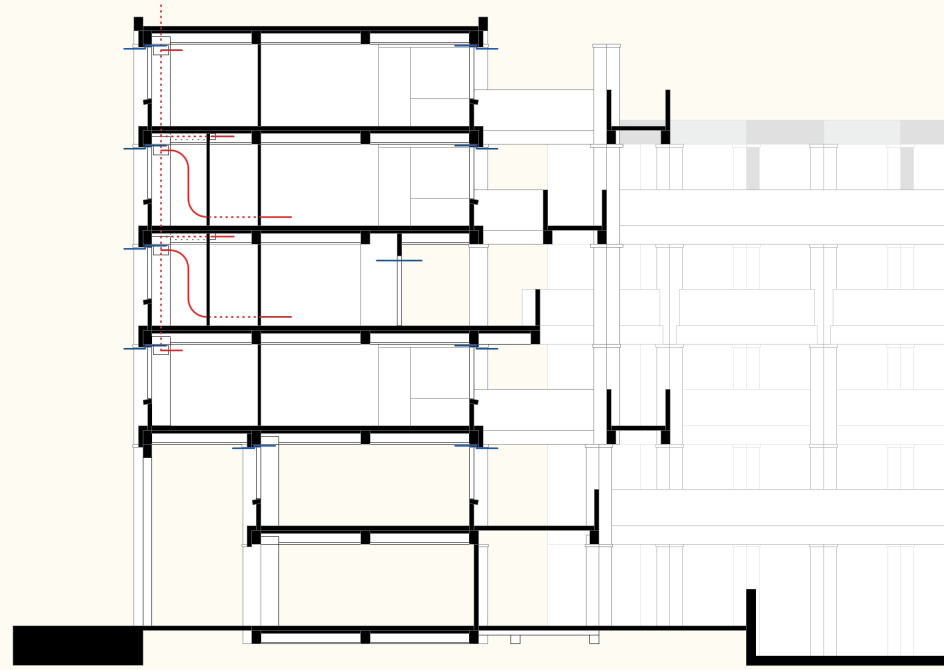
T warm	25,29208	K
T koud	20	K
delt T	5,292084	K
snelheid medium (lucht)	0,99	m/s
warmteoverdrachtscoëfficiënt	11,96444	W/(m²K)
Oppervlakte transmissie gebied	11,07	m2
Warmtestroom	700,9171	W

Lucht opwarming

Soortlijke warmte lucht	710	J/(kg·K)
Soortelijke massa	1,29	kg/m3
Soortlijke warmte lucht	915,9	J/(m3·K)
Gepaseerde lucht	0,662059	m3
Soortelijke warmte	606,3795	J/K
Exposur (air to wall)	3,01786	seconde
afgegeven warmte	2115,27	J
Temperatuur verschil	3,48836	K

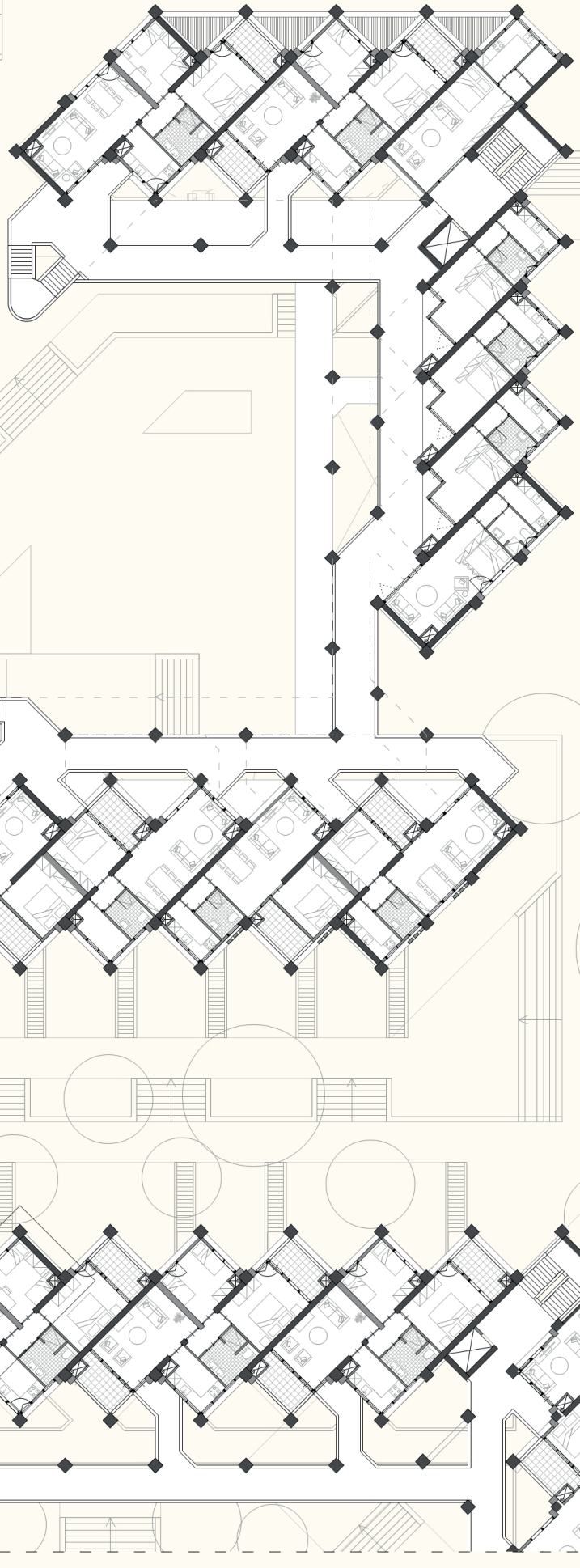
Solar chimney calculator

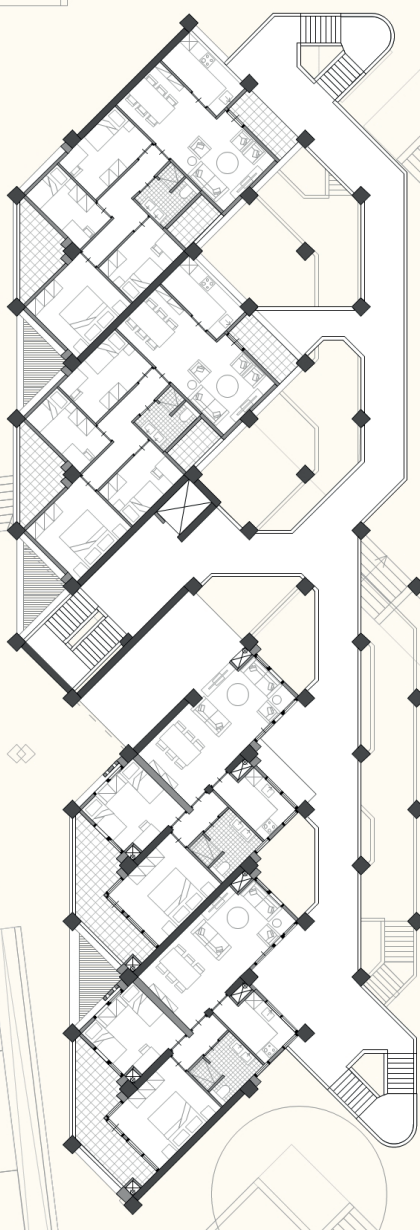
Gravitational constant	g	9,8	
Height difference	h	4,65	m
Atmospheric pressure at ground level	P0	78100	Pa
Gas constant of air	R	287	J/kgK
Outside temperature	T0	20	oC
Temperature in solar chimney	T1	23,49	oC
Pressure difference	DP	0,5	Pa
Discharge coefficient	Cd	0,8	
Inlet opening size	A	0,67	m2
Density of air	ρ	1,29	kg/m3
Airflow rate	Q	2383,41	m3/h
	Q	0,66	m3/s
	Q	0,99	m/s

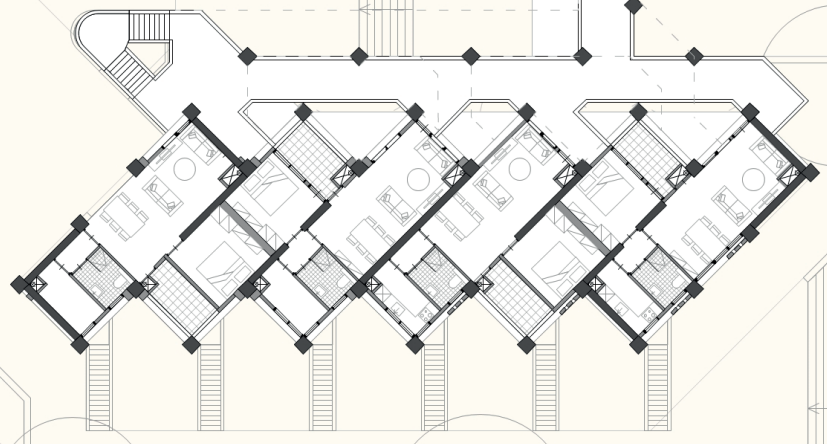


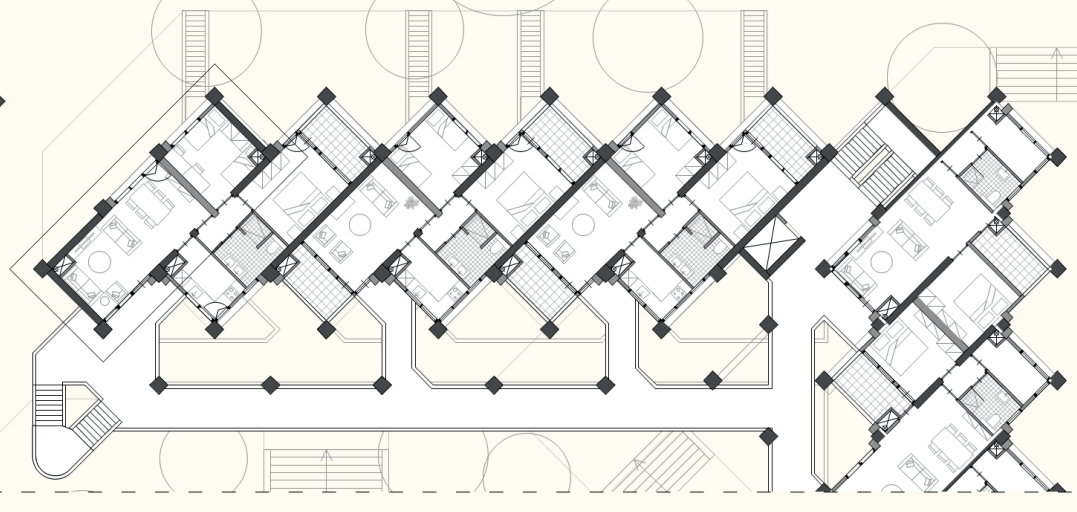
contact with ground level
extension of the living space
further activate the street
private character of the inner street

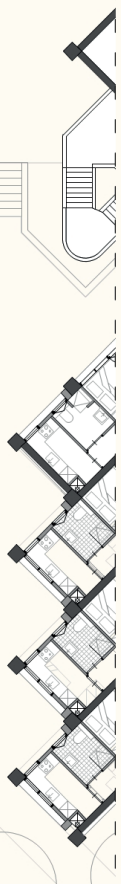
Cluster, second floor





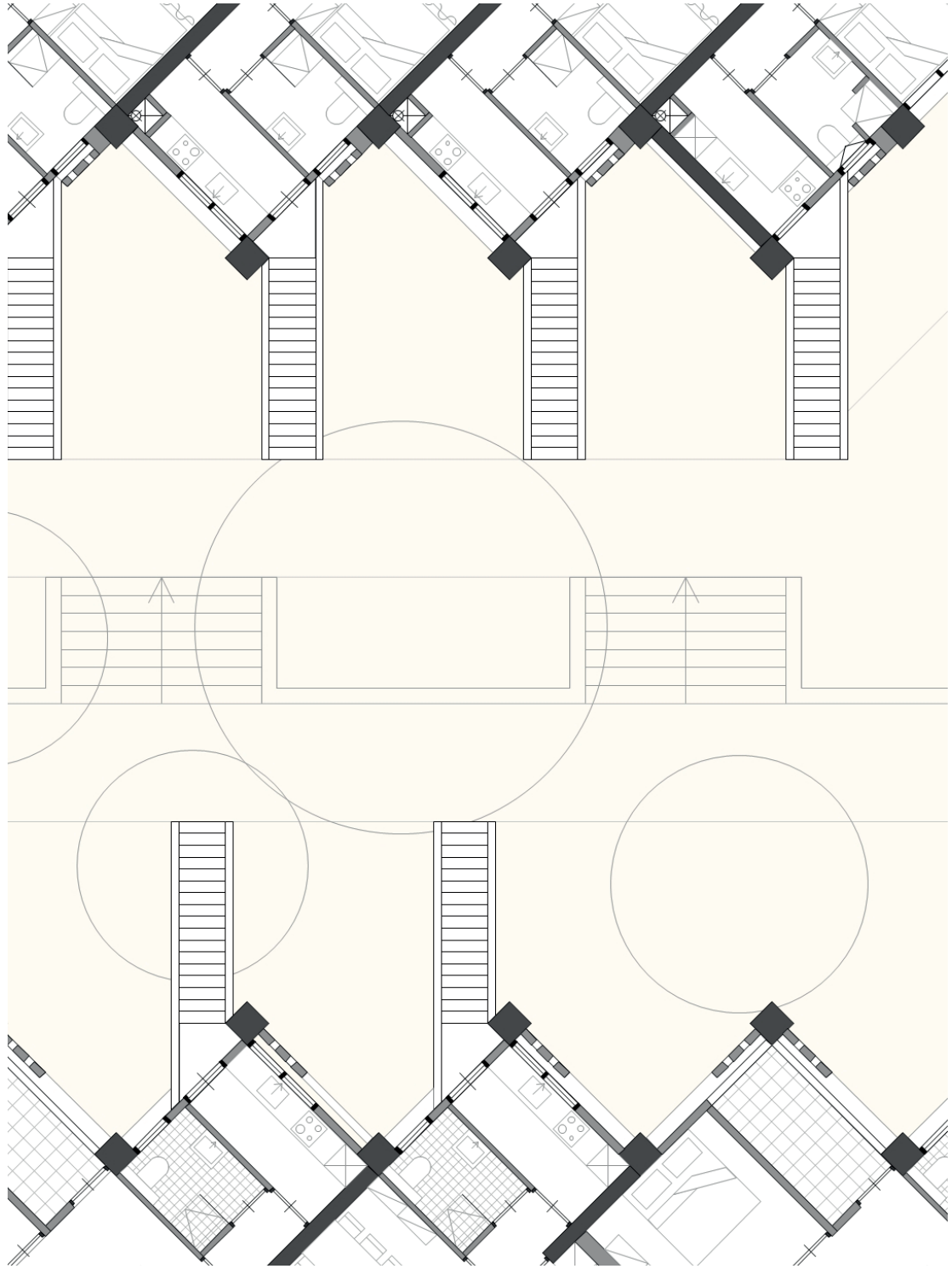


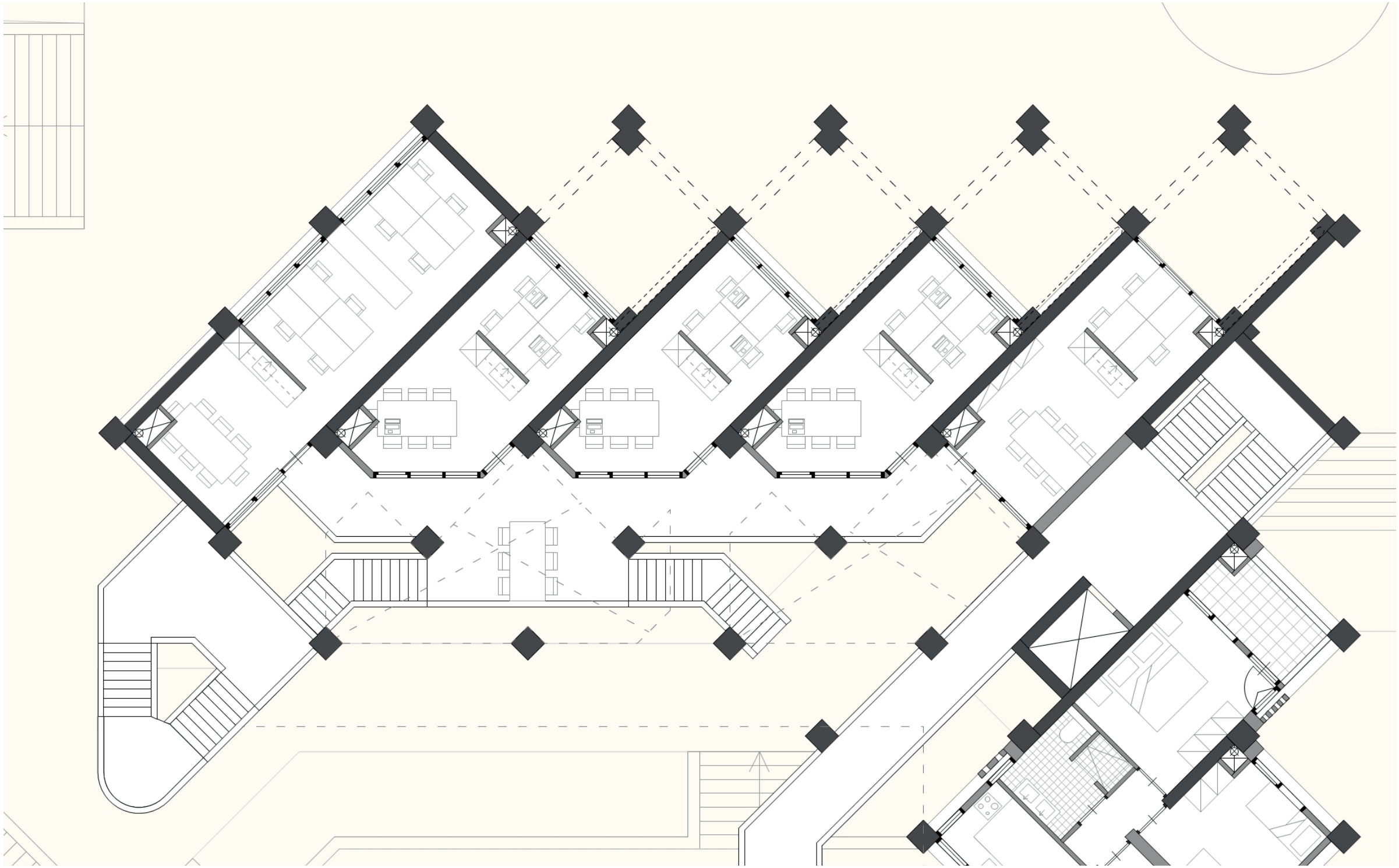




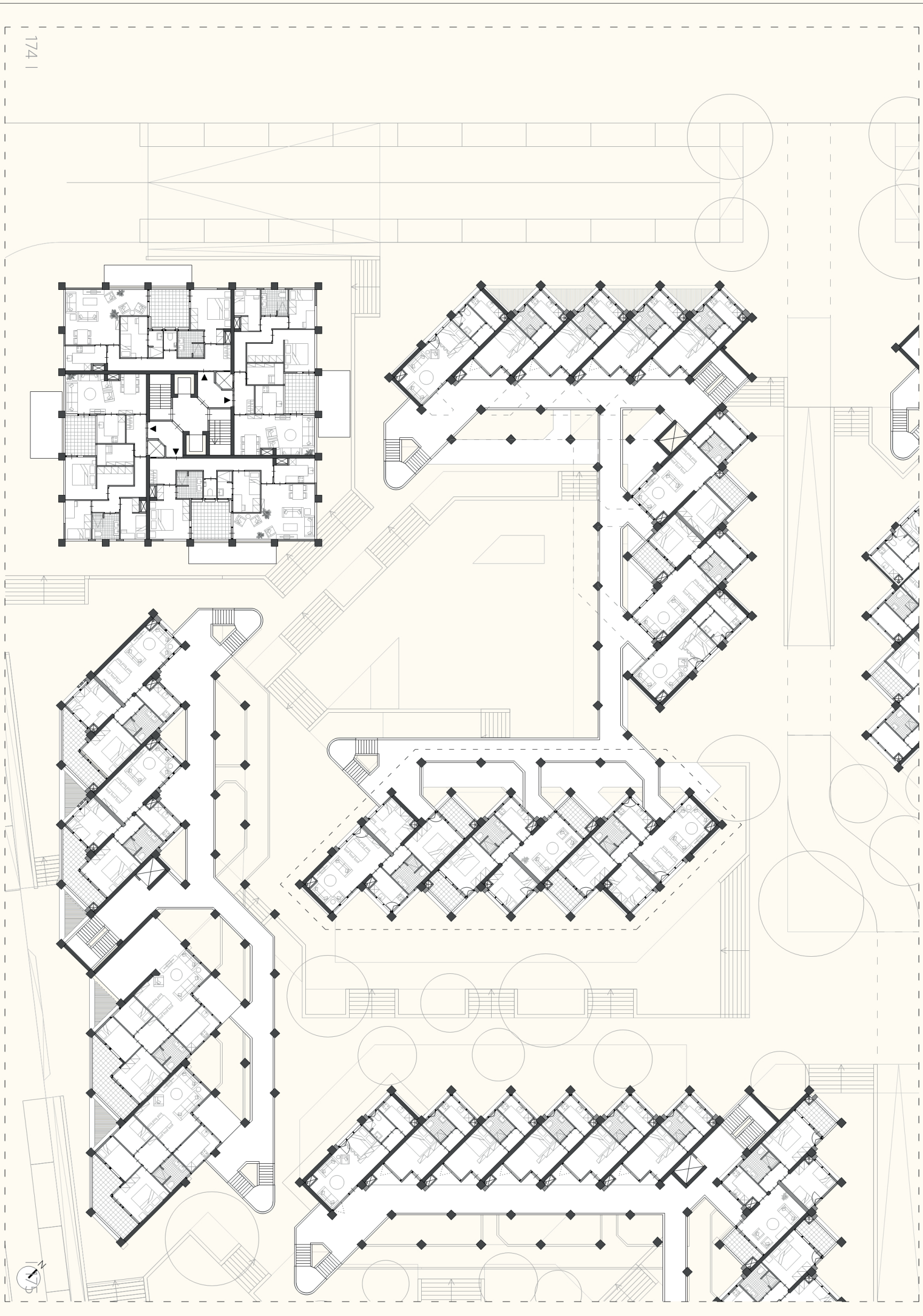
Scale 1:200 @A2

contact with ground level
extension of the living space
further activate the street
private character of the inner street





Cluster, third floor



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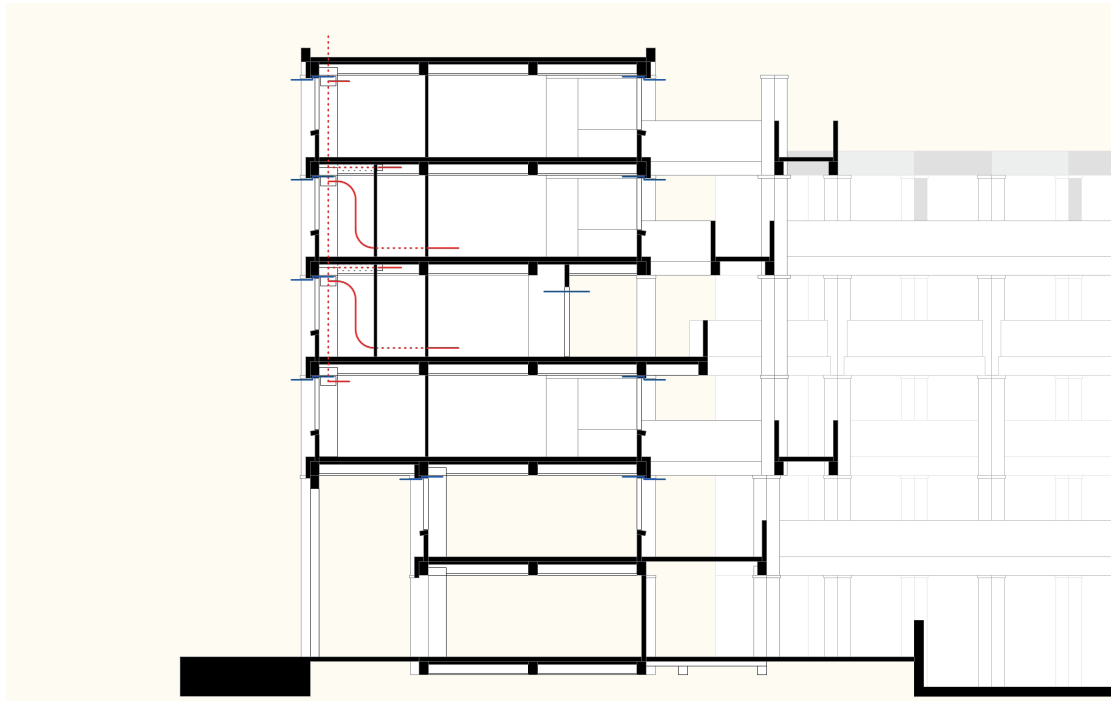
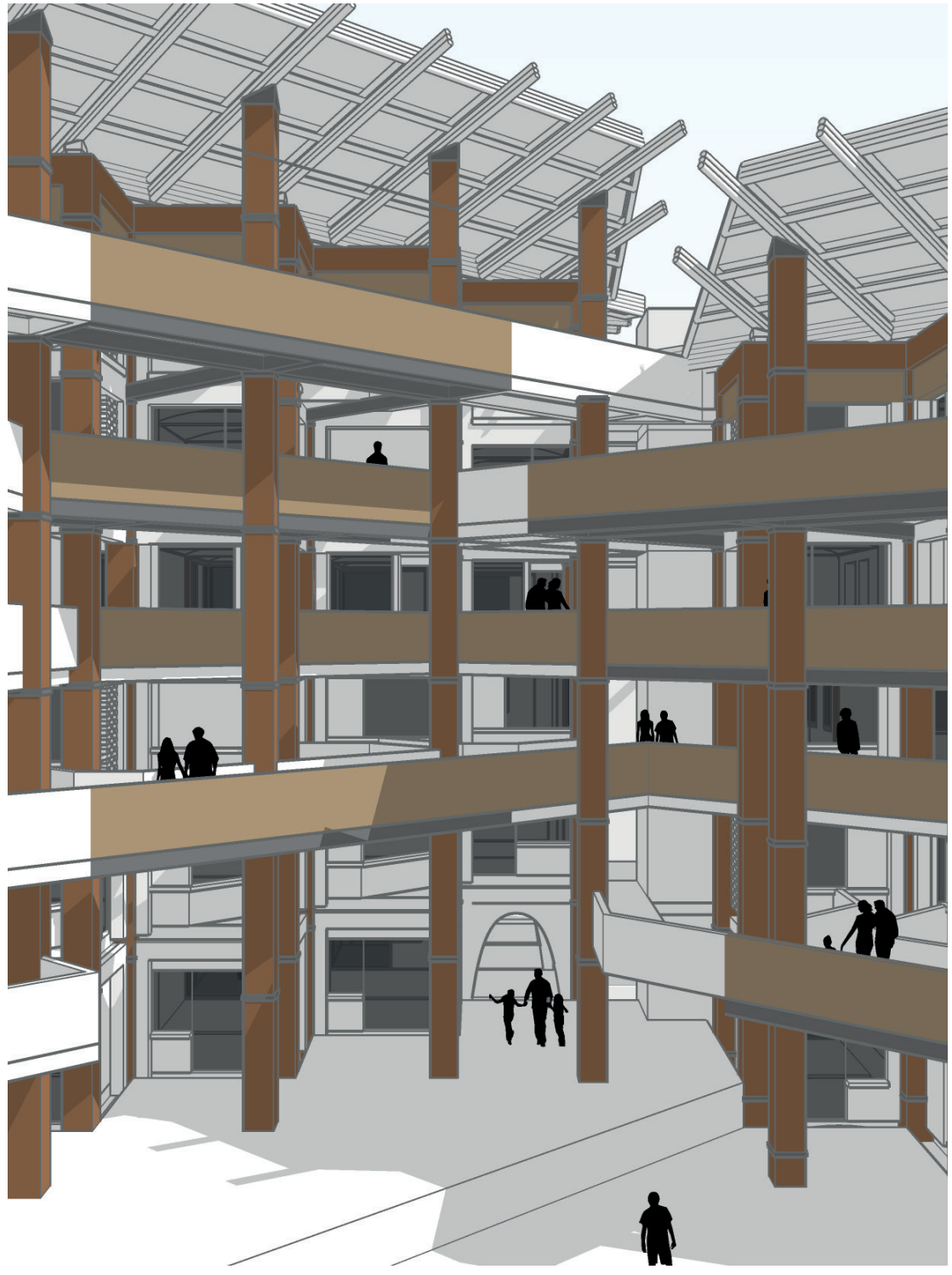
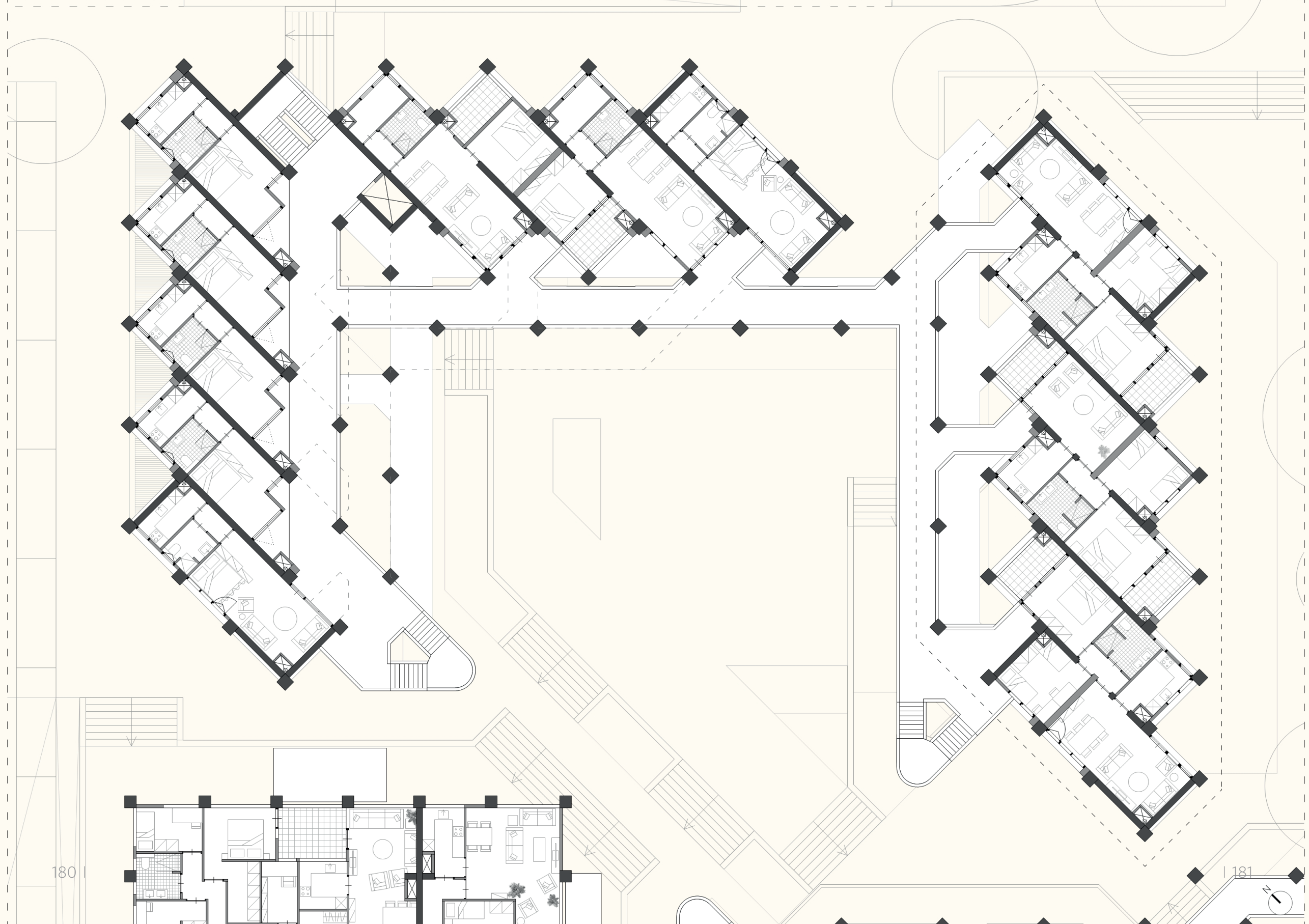
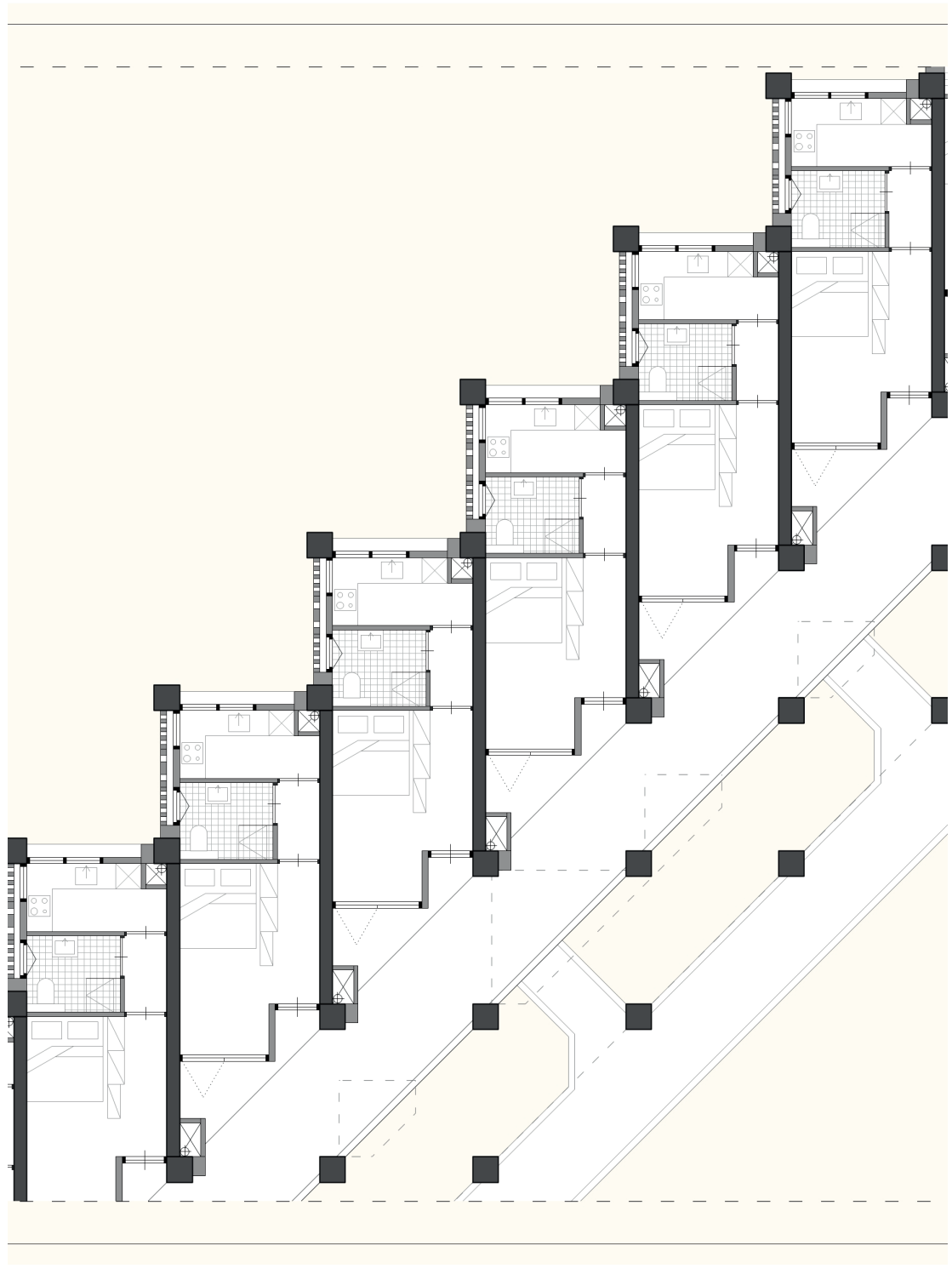




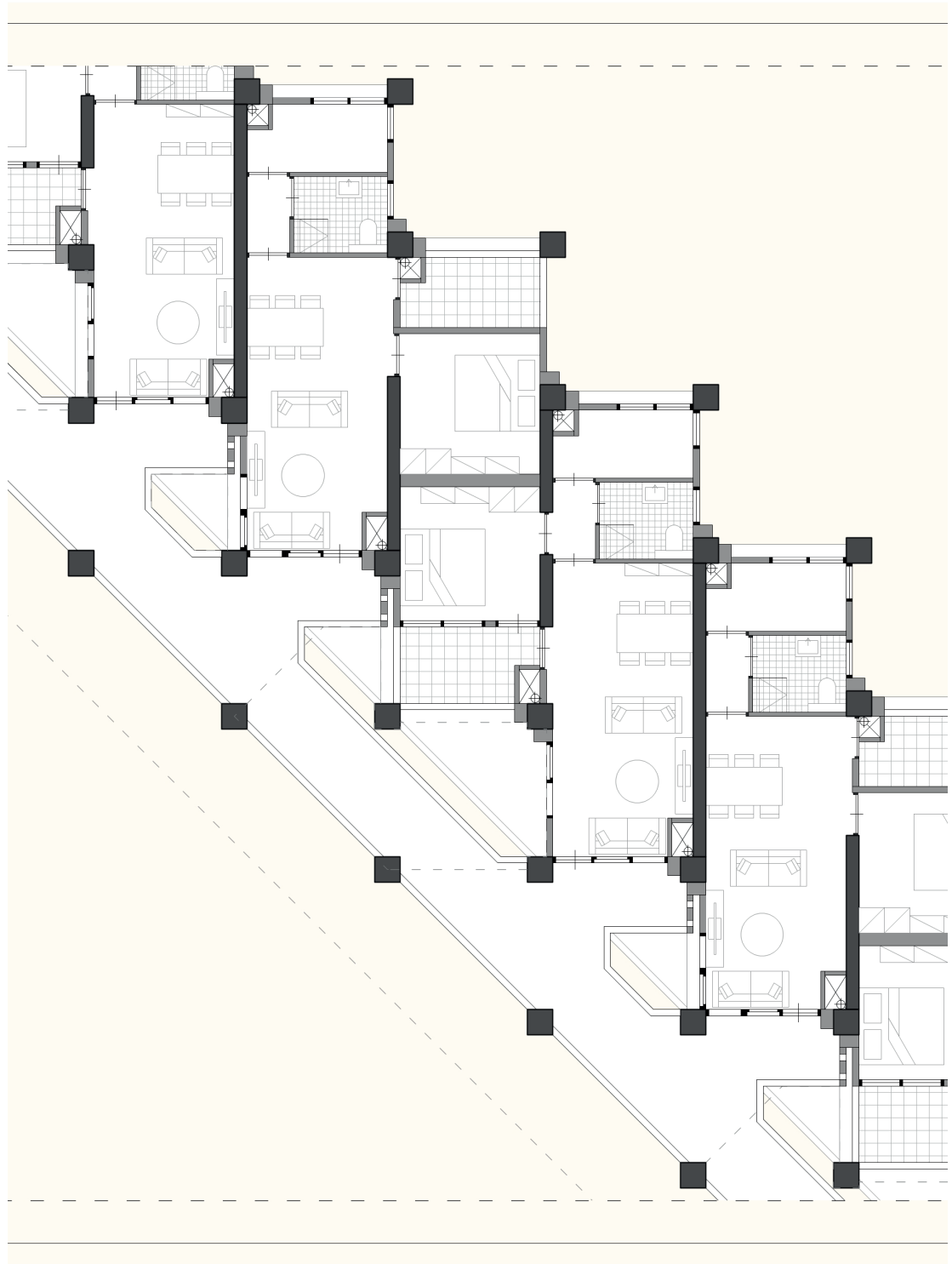
DWELLINGS



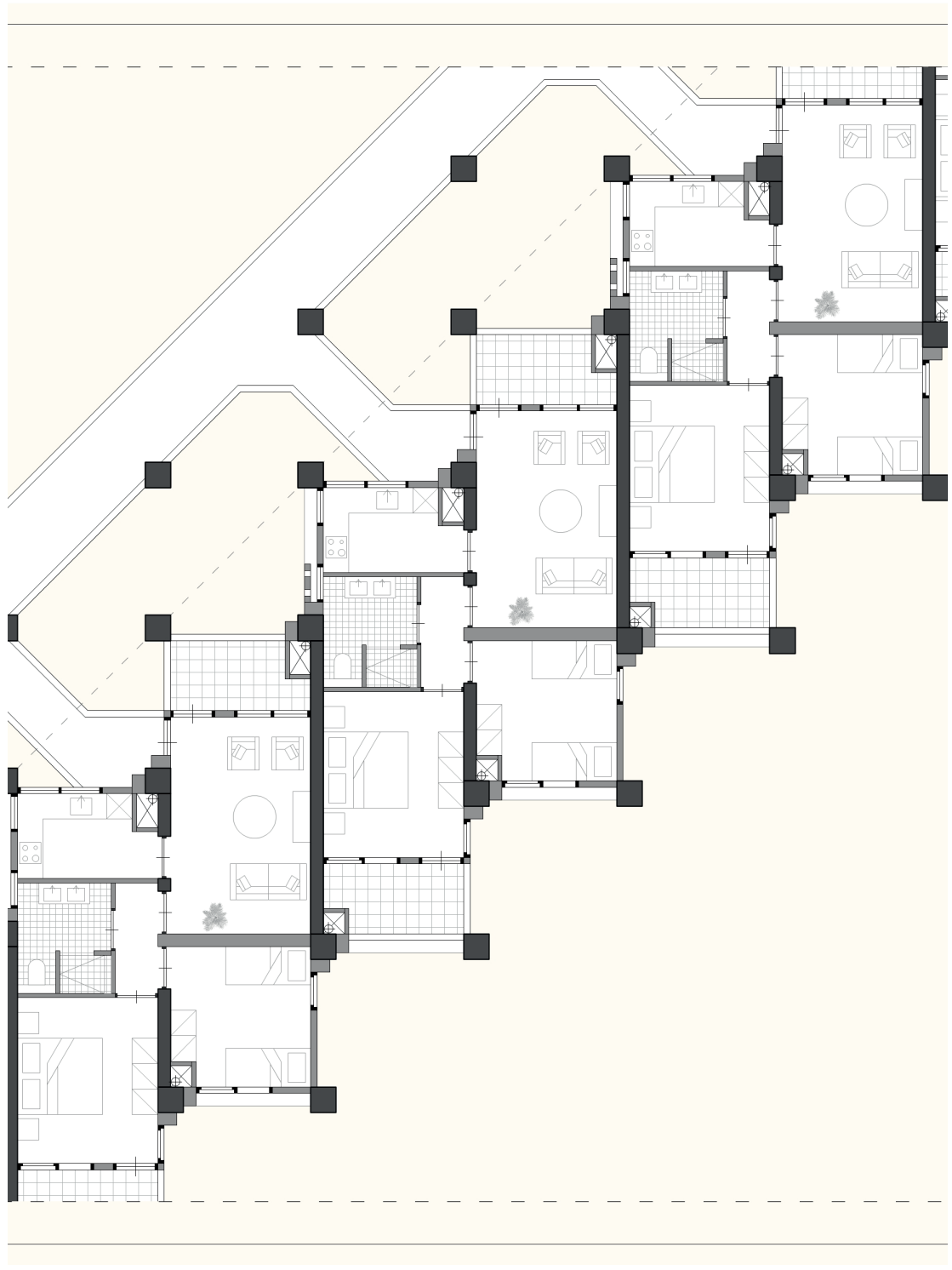
low incom
studio
gallery an extension of the house
own terrace at / on the gallery as a buffer zone
private bathroom and kitchen



low income
1 bedroom apartment
one privat outdoor space
living room to the gallery to promote inter-
action



low income
2 bedroom apartment

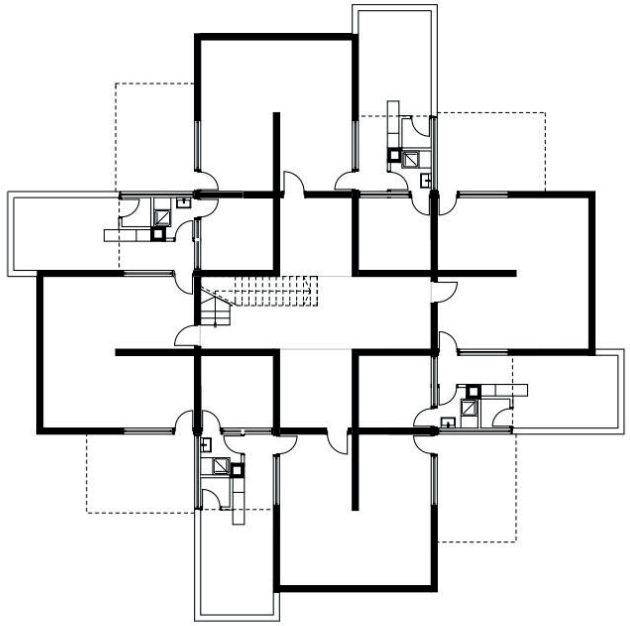


EL HANK

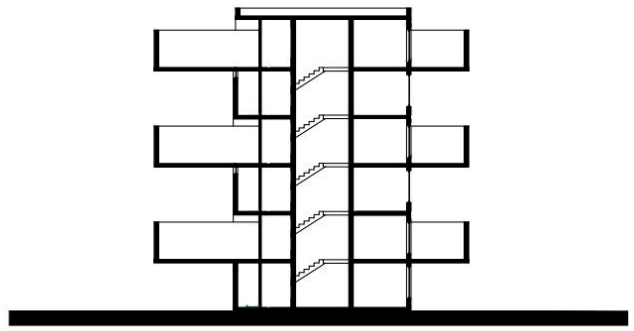
Casablanka, Maroko

https://issuu.com/somersg/docs/issuu_export

160
Original plan of the building block typology.

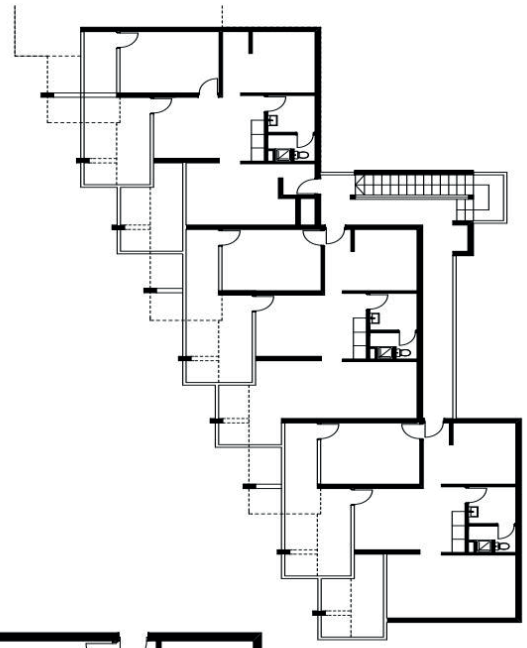


161
Section of the building block typology in its original state.

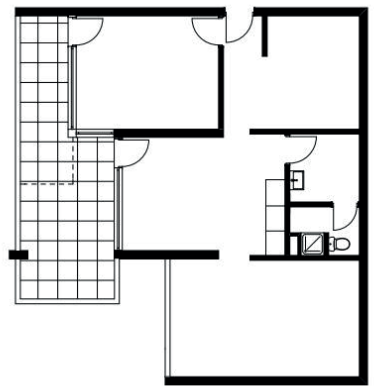


staggered balconies
vertical interaction
privacy
central access
expandability

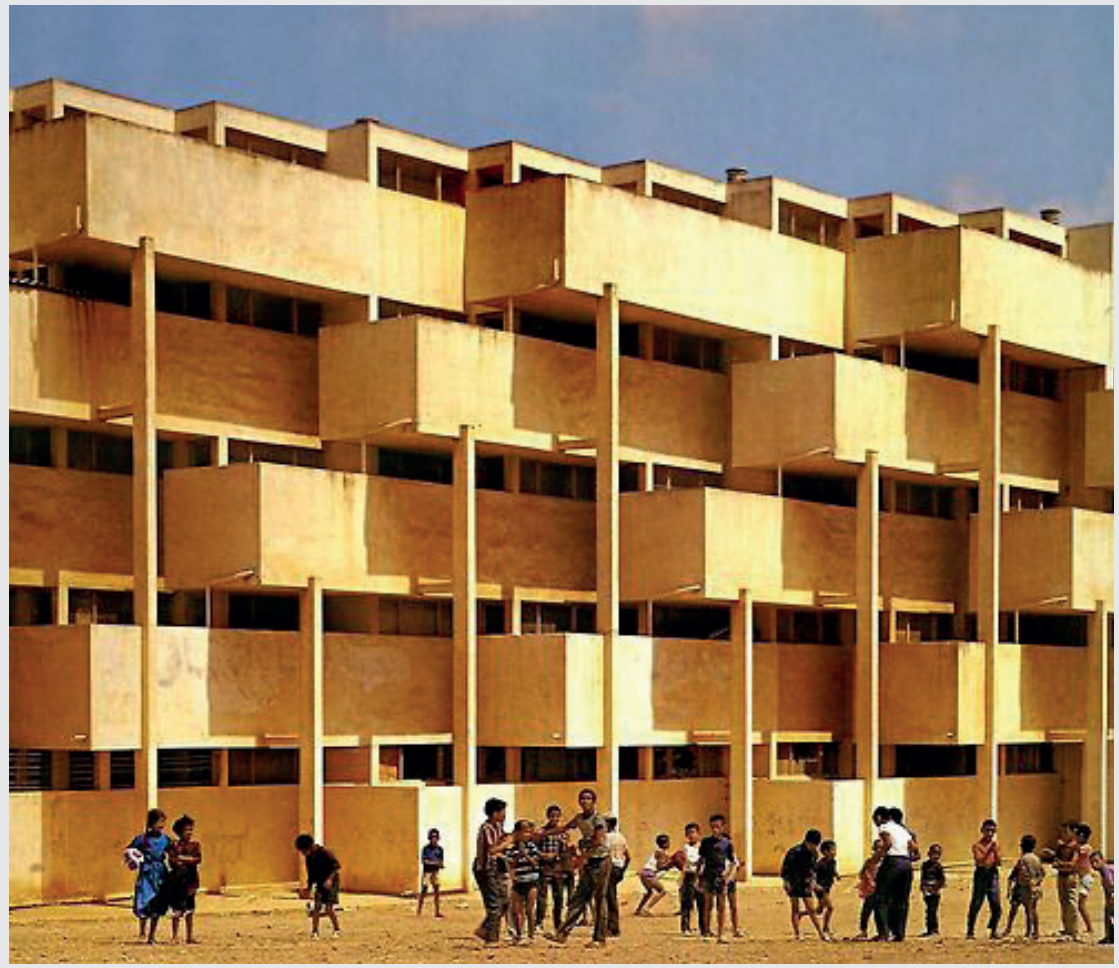
153
Original plan of the cascade patio slab. There is a clear distinction between the back and front façade.

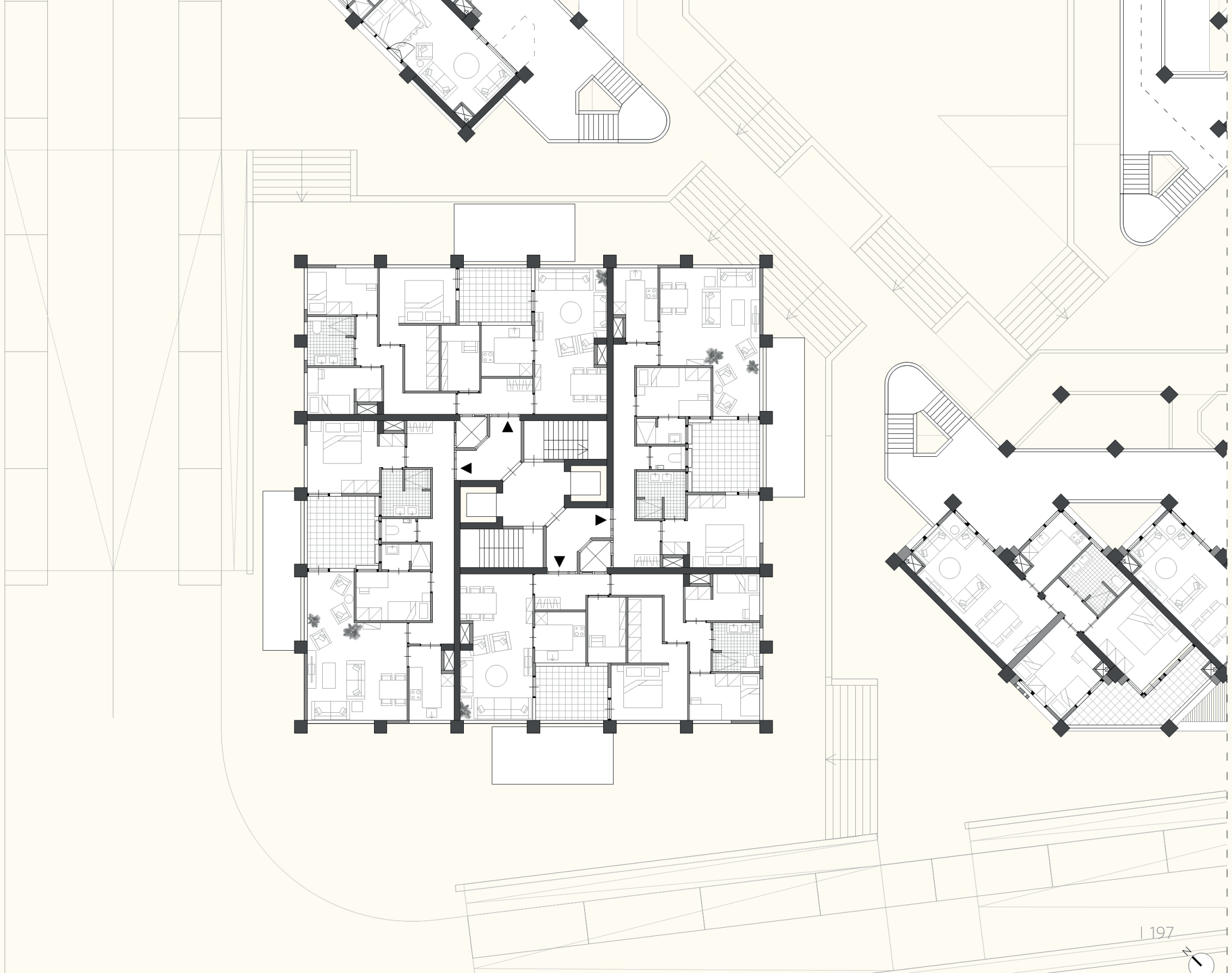


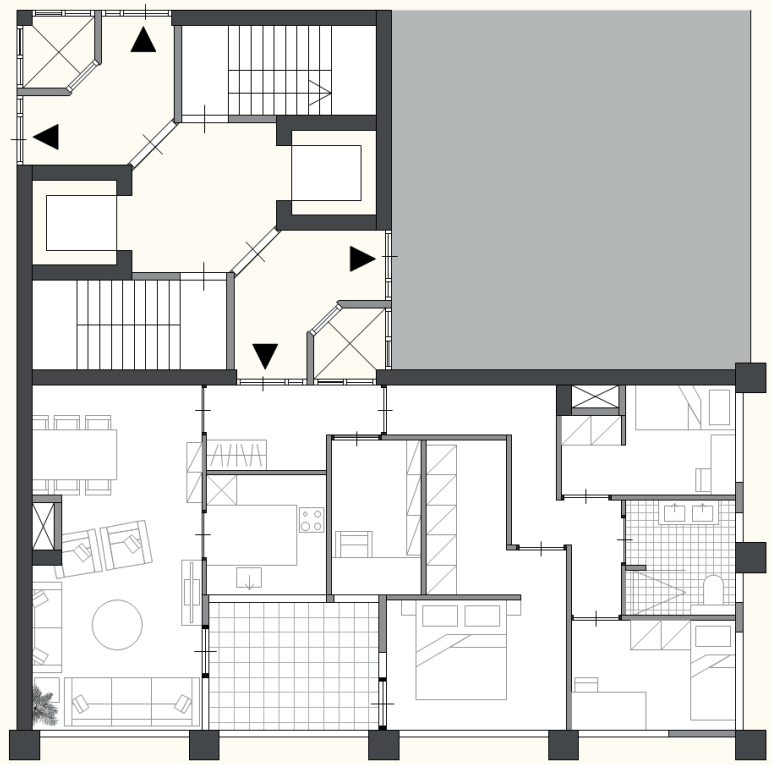
154
Original unit in the cascade patio slab.

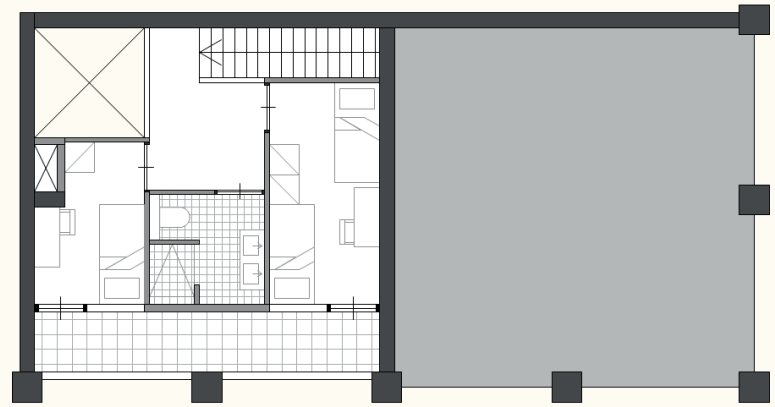


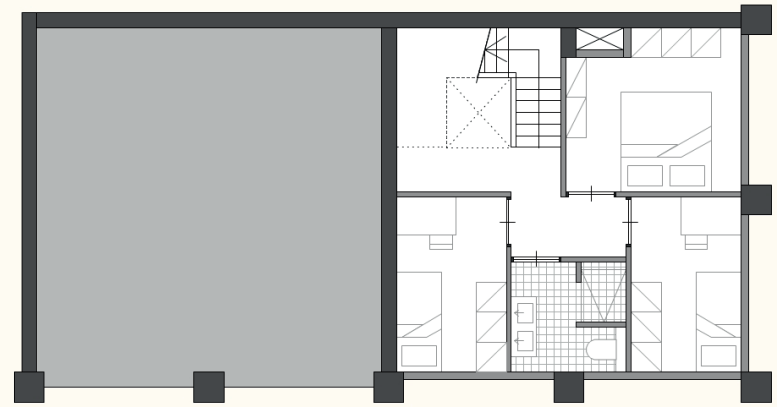
staggered balconies
vertical interaction
privacy
expandability

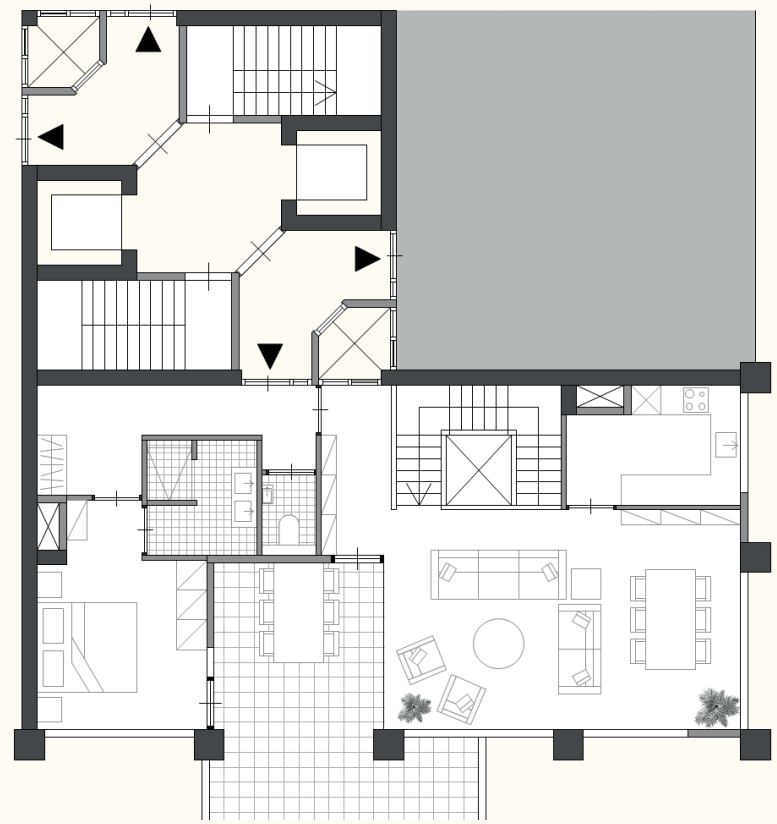


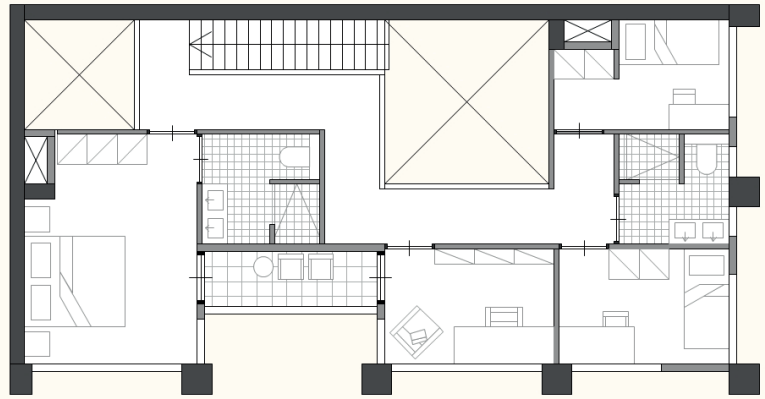




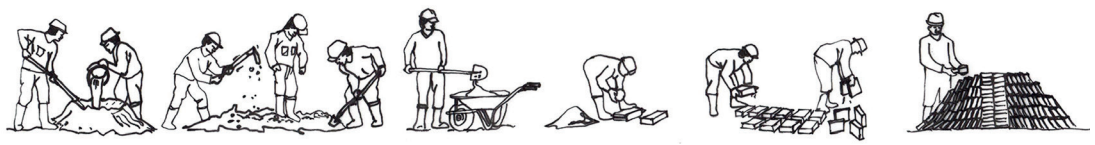


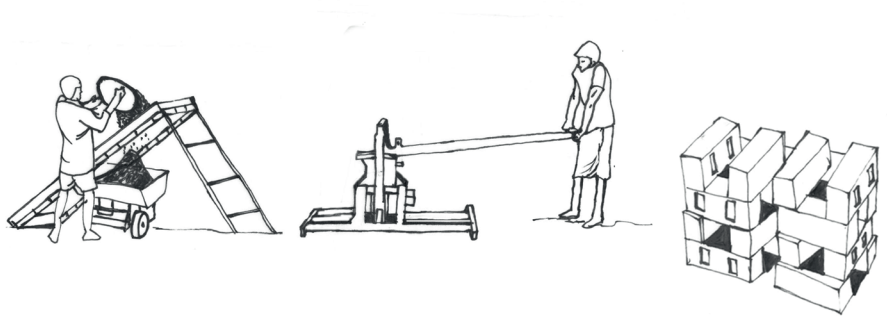






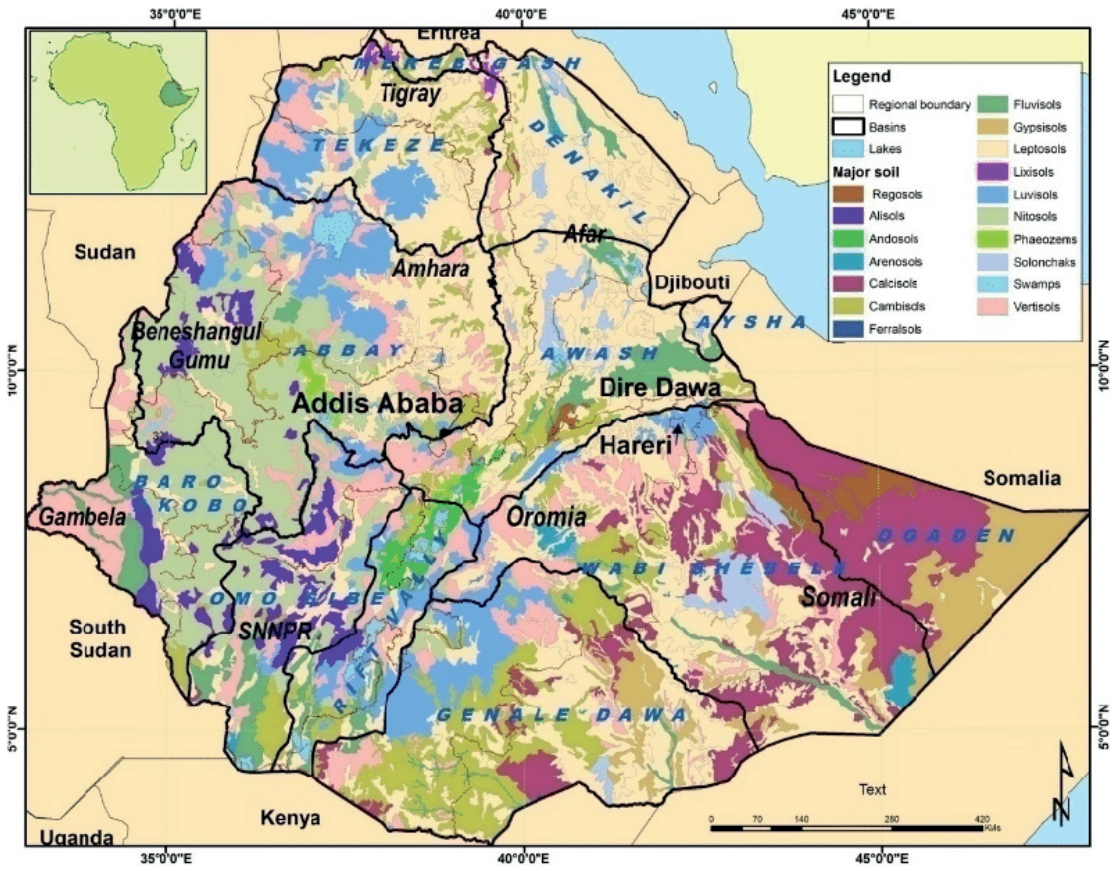
MATERIALS





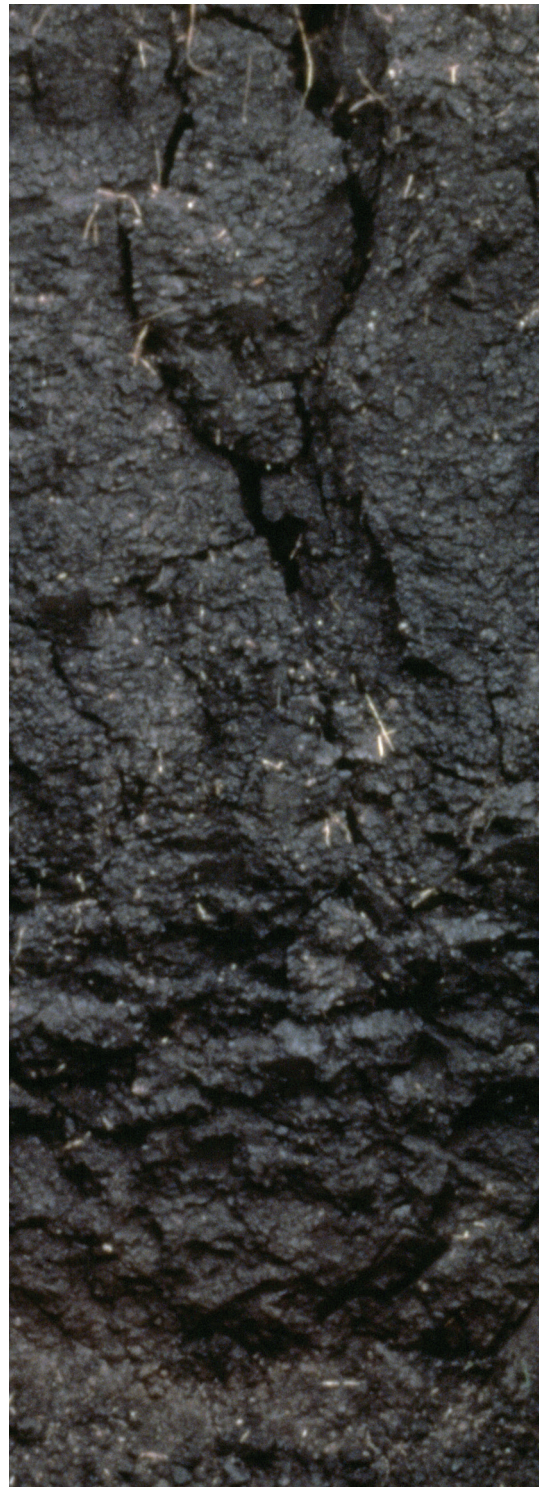
REVIEW

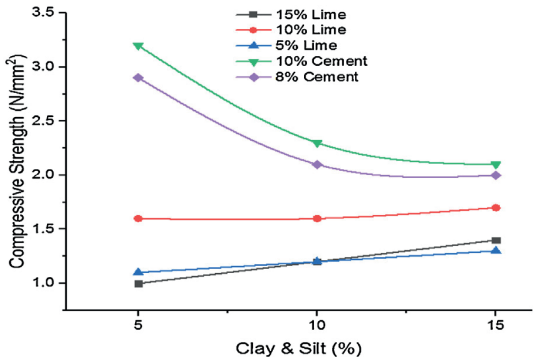
	Adobe		Rammed earth		compressed earth blocks	
Environmental impact	1		3		2	
Employment opportunities		1		2		3
Level of skills		1		2		3
Manufacturing speed		3		1		2
Required equipment		1		3		2
Machanical properties	3		2		1	
Termal poperties		2		1		3
Score		12		14		16
Weighted score	30		35		37	

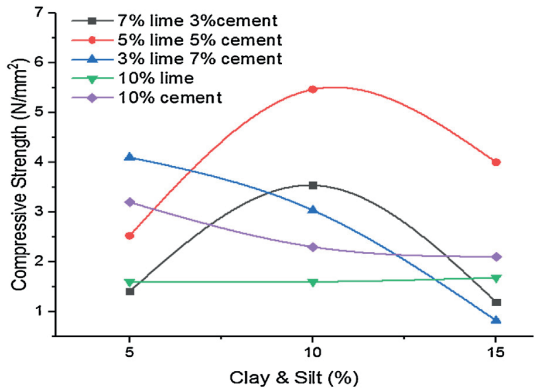


soil types: vertisols and nitisols
thirty percent or more clay

Lakew, Aschalew & Moog, Otto. (2016). Top-down operative stream classification system (typology) for Ethiopian highlands.



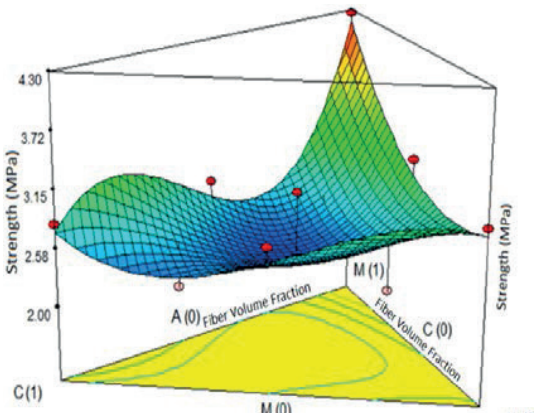




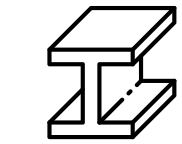
stabilizer
strength depending on the soil composition
in combination with the stabilizer type
cement better suited for sandy soils, loam better for clay-rich soils

combining cabelizers

adding fiber

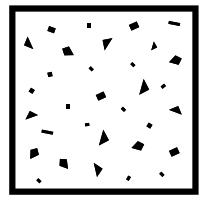


235 -355 MPa



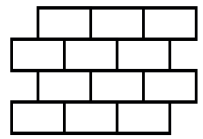
Created by Blair Adams from the Noun Project

15-115 MPa



Created by Leif Michelsen from the Noun Project

5 -140 MPa



Created by Melvin Salas from the Noun Project

16 -34 MPa

1 -7 MPa

Created by DPIcons from the Noun Project

Variabele

Aantal bouwlagen	7			
Lengte	600	mm	kloostermopformaat (295mm x 140mm x 90mm)	
Breedte	600	mm		
Oppervlakte	0,36	m2		
Wand hoogte	2700	mm	2,7	
Overspanning	3600	mm	3,6	
Draag gebied	12,96	m2		

Eigen gewicht wand

Soortelijk gewicht	2200	kg/m3	
Eigen gewicht	14969	kg/m3	
	146	kN	

Eigen gewicht vloer

Afwerkvloer (compact aurth	0,9072	m3	2000	
Vulling (zand)	1,338	m3	900	
Boog constructie (metselwerk)	1,683	m3	2200	
Constructie (beton)	0,621	m3	2500	
Gewicht	6,24	kN/m2		
Oppervlakte	12,96	m2		
Eigen gewicht	566,4	kN		

Veranderlijke belasting

Belasting vloer woning	1,75	kN/m2	woning eignelijk 1,75 kN/m2
Verdiepingsvloer	159	kN	

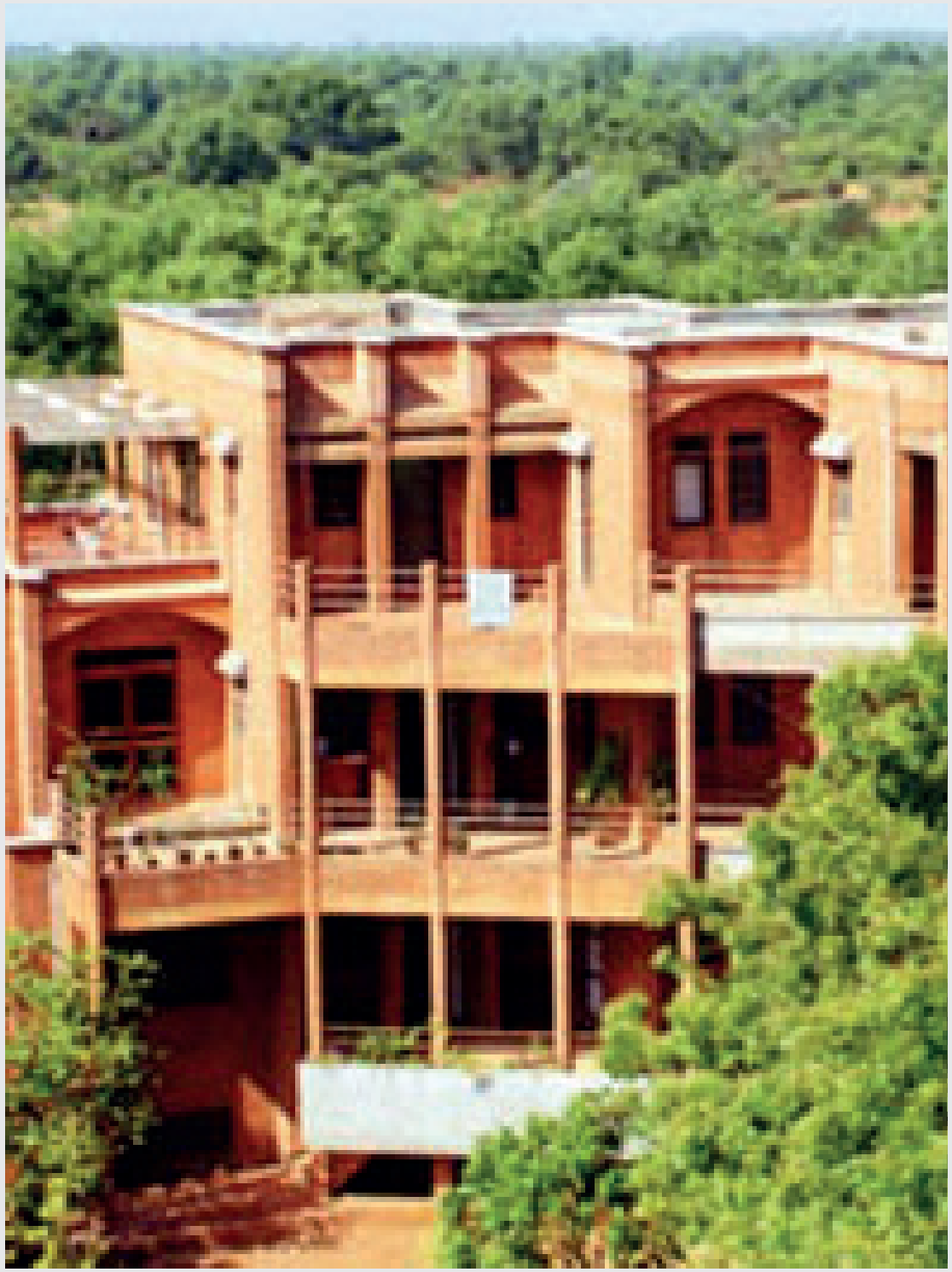
Rekenwaarde

Blijvende belasting	1,2	veiligheidsmarge
Veranderlijke belasting	1,5	veiligheidsmarge

Gkar	712,8	kN	karakterestieke waarde
Qkar	158,8	kN	karakterestieke waarde
Pkar	871,6	kN	
Ged	855,4	kN	rekenwaarde blijvende belasting
Qed	238,1	kN	rekenwaarde veranderlijke belasting
Ped	1093,5	kN	rekenwaarde belasting

Toelaatbare belasting

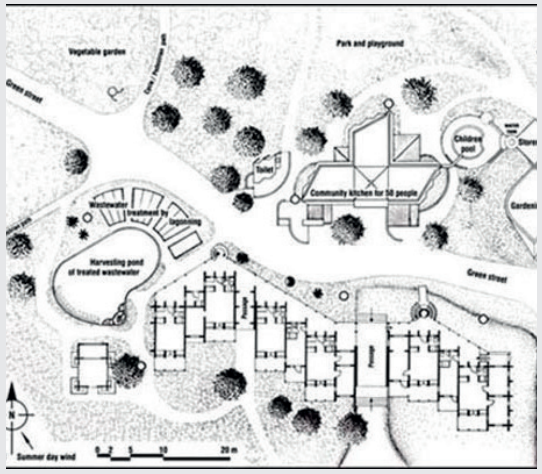
Druksterkte	4	N/mm2 (Mpa)	
Max druksterkte		1440000	N
	1440	kN	
Logische test	0,759385305		



VIKAS

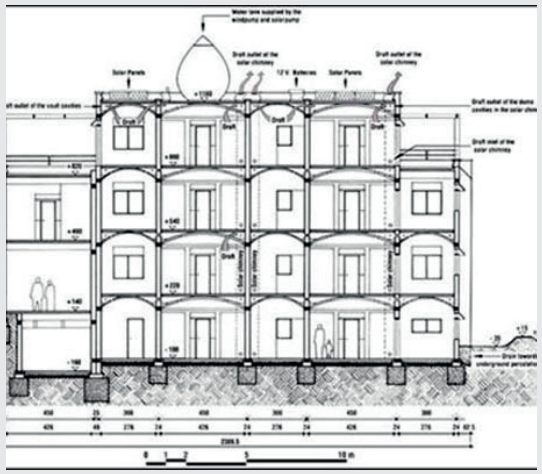
COMMUNITY

Auroville, India

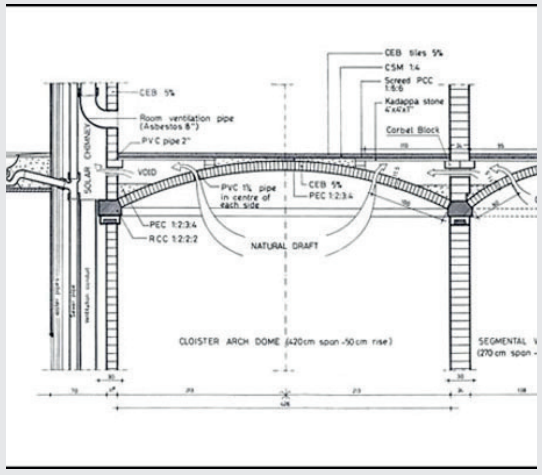


Sun and wind orientation
Comunety facileties

https://www.earth-auroville.com/vikas_community_en.php

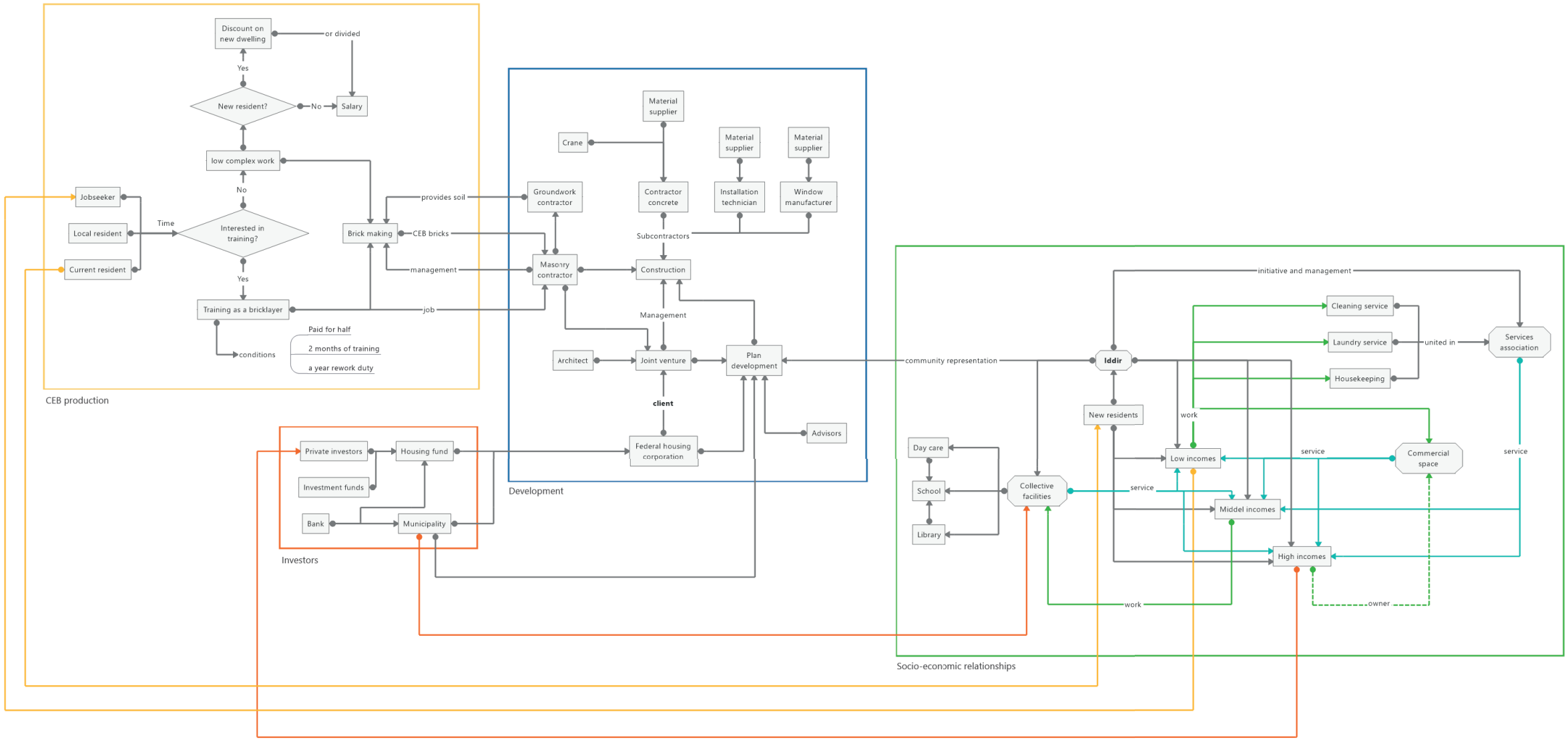


Amount of floors
Arch construction
Construction meterial

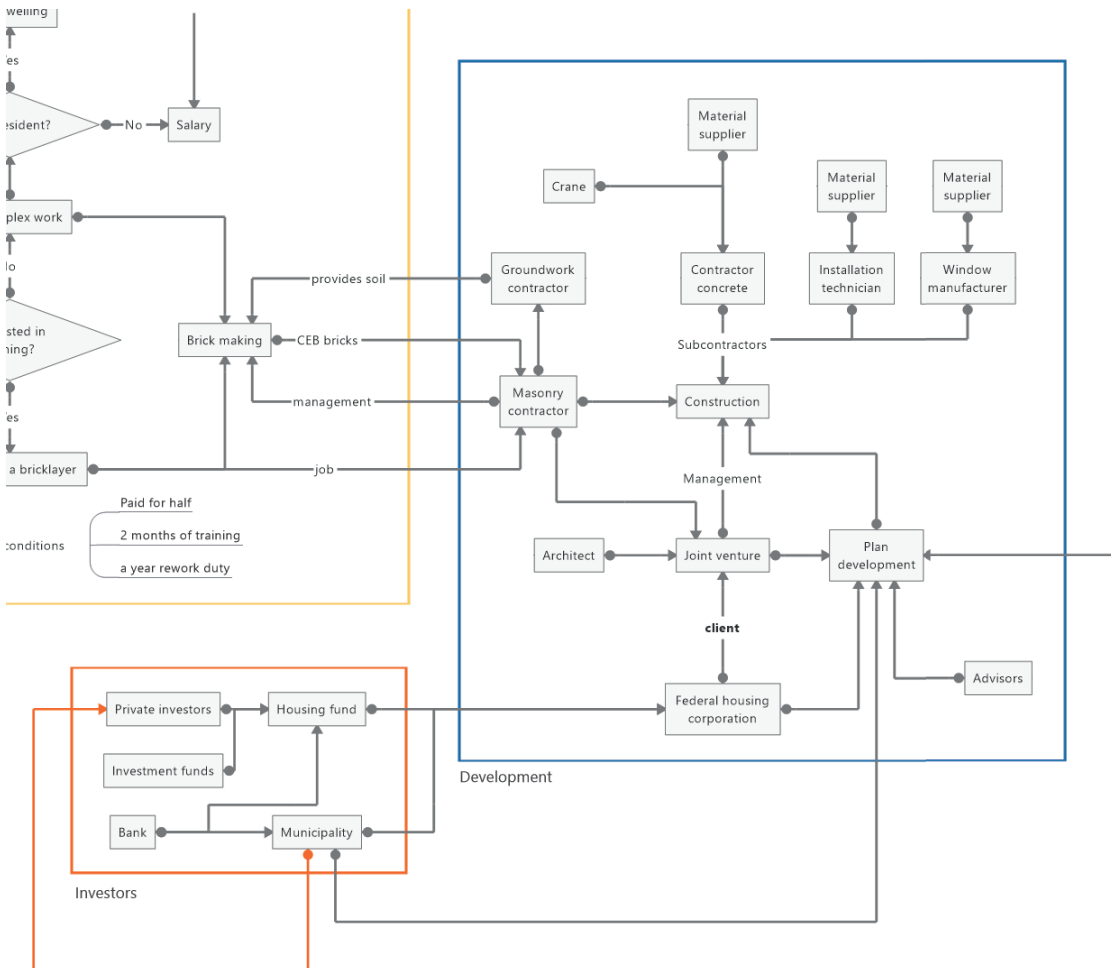


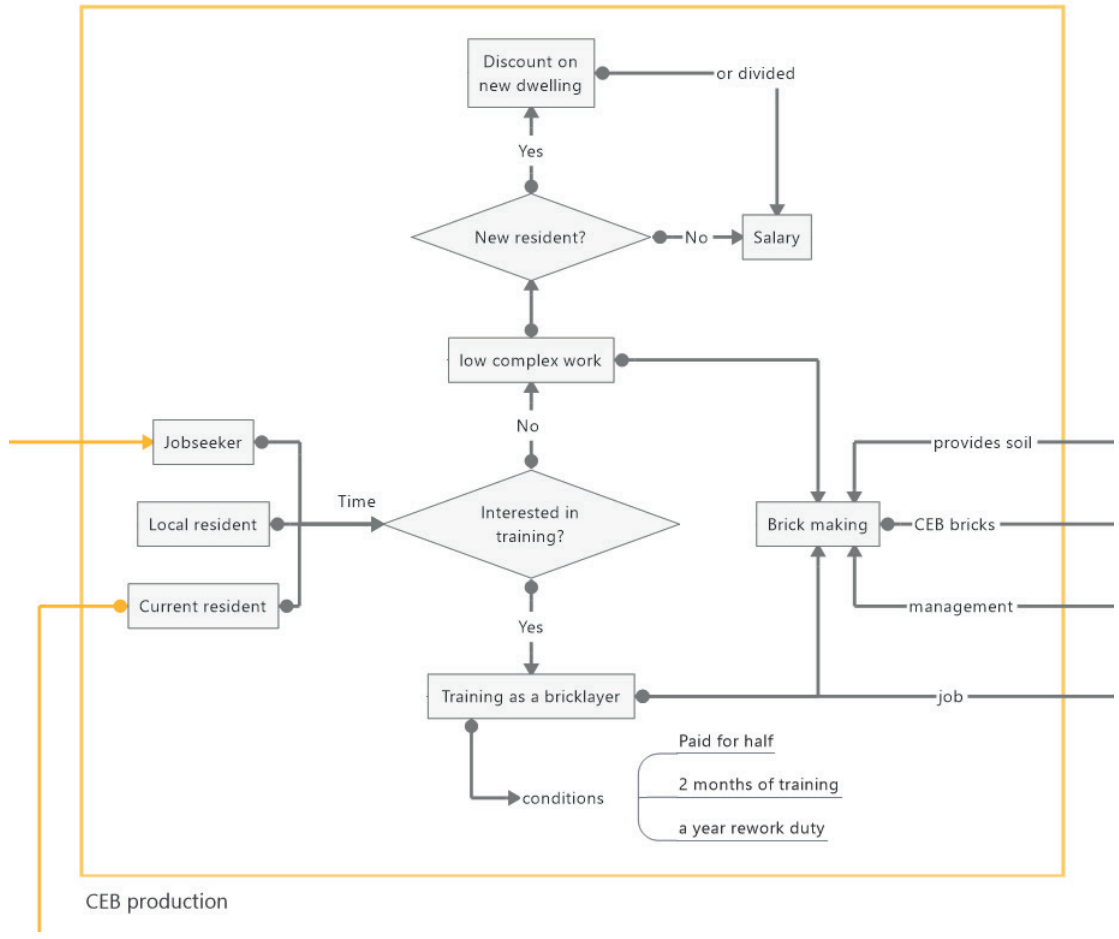
Arch construction
Ventilation system
Ring beam

MANAGERIAL STRATEGIES


Discount on new dwelling
or divided
Yes
New resident?
No
Salary
low complex work
No
Jobseeker
Local resident
Current resident
Time
Interested in training?
Yes
Training as a bricklayer
conditions
Paid for half
2 months of training
a year rework duty
provides soil
Brick making
CEB bricks
management
job
CEB production
Material supplier
Crane
Material supplier
Material supplier
Groundwork contractor
Contractor concrete
Installation technician
Window manufacturer
Subcontractors
Masonry contractor
Construction
Management
Architect
Joint venture
Plan development
client
Advisors
Federal housing corporation
Development
Private investors
Housing fund
Investment funds
Bank
Municipality
Investors
community representation
Iddir
initiative and management
Cleaning service
Laundry service
Housekeeping
united in
Services association
New residents
work
service
Commercial space
service
Low incomes
Middel incomes
High incomes
Day care
School
Library
Collective facilities
service
work
owner
Socio-economic relationships

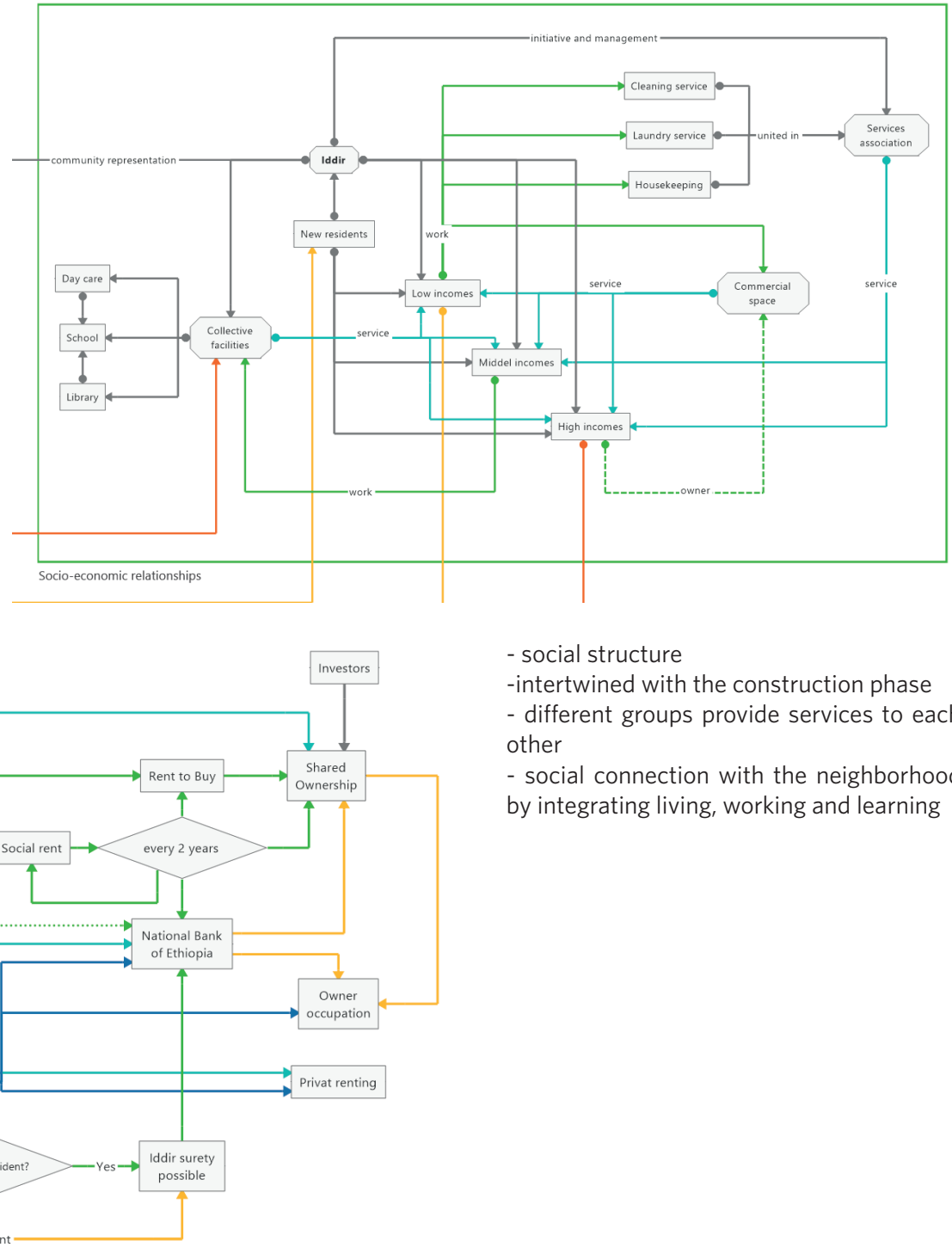
joint venture
design and build
contractor and plan development (architect and consultants)



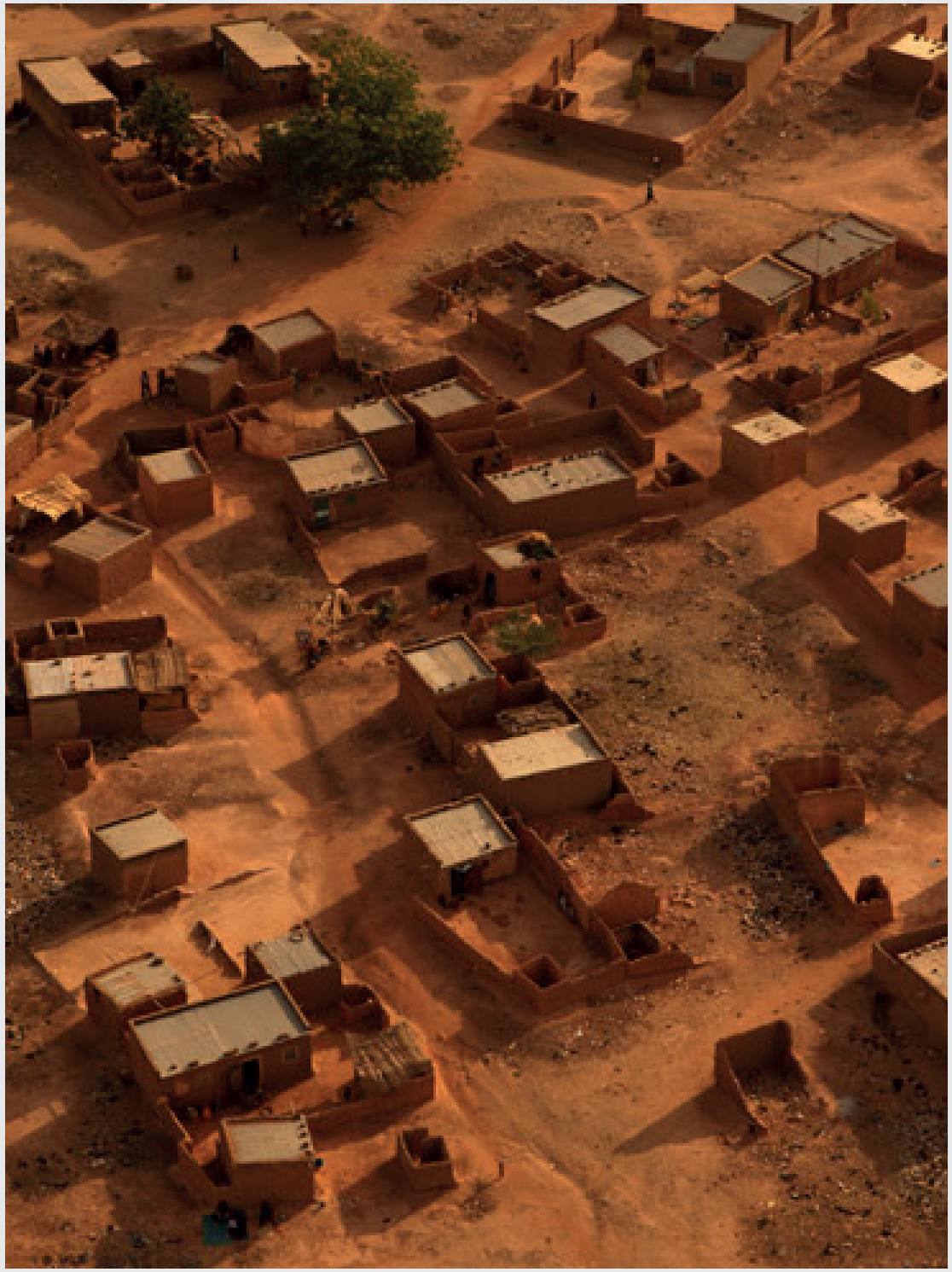


create employment
learning new skill
acceleration in the improvement of living conditions

preserve existing social structures
facilitating various financing options
rent to buy
financial guarantee by community



- social structure
-intertwined with the construction phase
- different groups provide services to each other
- social connection with the neighborhood by integrating living, working and learning



A ROOF, A SKILL, A MARKET

Burkina Faso

training
employment,
sustainable and affordable alternative

https://world-habitat.org/world-habitat-awards/winners-and-finalists/a-roof-a-skill-a-market/#award-content
https://www.lavoutenubienne.org/?lang=en

COST

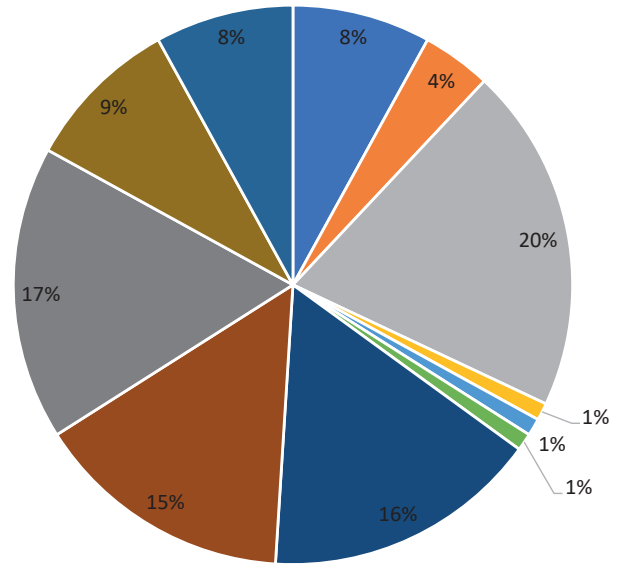
source prices: https://con.2merkato.com/prices
source processing speed: www.bouwkosten.nl

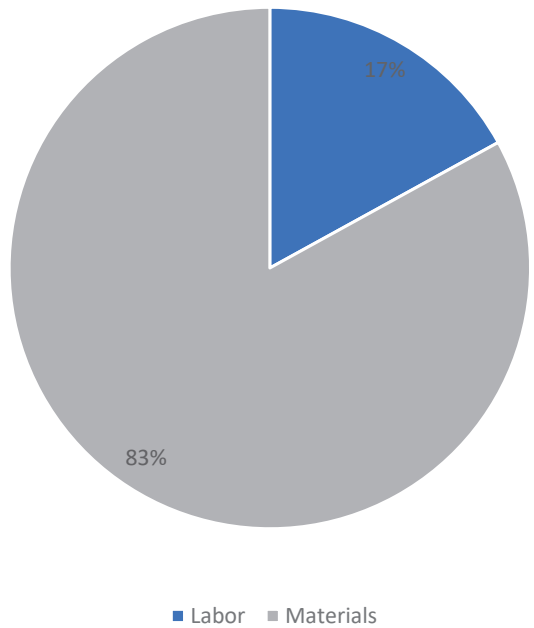
key figures; labor	
low-skilled labor	Br 15,00 / hour
Glazer	Br 25,00 / hour
Mason	Br 30,00 / hour
Tiler	Br 31,54 / hour
Carpenter	Br 31,56 / hour
Plumber	Br 33,95 / hour
Electrician	Br 35,00 / hour
Foreman	Br 40,00 / hour

	material				labor			total
	amount	unit	price / unit	subtotal	production	price / unit	subtotal	
brickwork; stone walls	118,35	m2	Br 330,67	Br 39.134,35		Br 45,58	Br 5.394,18	Br 44.528,53
brickwork; vaults	108,90	m2	Br 184,23	Br 20.062,99		Br 44,17	Br 4.809,92	Br 24.872,90
concrete; ringbeam	81,00	m1	Br 1.166,39	Br 94.477,79		Br 172,68	Br 13.987,08	Br 108.464,87
floor finishes	108,90	m2	Br 27,35	Br 2.978,00		Br 8,56	Br 931,83	Br 3.909,83
brickwork; outer walls	36,00	m2	Br 162,16	Br 5.837,67		Br 31,43	Br 1.131,64	Br 6.969,32
brickwork; inner walls	30,80	m2	Br 158,55	Br 4.883,40		Br 31,05	Br 956,41	Br 5.839,81
facade openings	37,58	m2	Br 1.985,18	Br 74.593,25		Br 333,51	Br 12.531,67	Br 87.124,91
interior doors	8,00	pc	Br 9.497,25	Br 75.978,00		Br 949,73	Br 7.597,80	Br 83.575,80
Installations	2,00	stuk	Br 38.667,50	Br 77.335,00		Br 7.192,16	Br 14.384,31	Br 91.719,31
Kitchen	2,00	stuk	Br 20.240,80	Br 40.481,60		Br 3.521,90	Br 7.043,80	Br 47.525,40
Badroom	2,00	stuk	Br 19.277,40	Br 38.554,80		Br 3.354,27	Br 6.708,54	Br 45.263,34
							total	Br 549.794,01 for 150 m2 (gross floor area)
							total	Br 3.665,29 /m2 / gross floor area
Foundation	**1,00**	**m2**	Br 2.012,35	Br 2.012,35		Br 260,64	Br 260,64	Br 2.272,99
Roof	**1,00**	**m2**	Br 1.468,66	Br 1.468,66		Br 255,55	Br 255,55	Br 1.724,21

Ground floor	Br	5.023,30 /m2
Floors (5 storey's)	Br	18.326,47 /m2
Roof	Br	2.639,19 /m2
Total	**Br**	**3.712,71** **/m2 / gross floor area**

cost estimate at element level
expensive materials, concrete, facade opening
material cost and labor cost ratio





key figures; labor		
low-skilled labor	Br 15,00	price/h
trained labor	Br 30,00	price/h
supervisor	Br 40,00	price/h
stones; weight		
specific weight: CEB	2200	kg/m3
specific weight; soil	1700	kg/m3
compression	1,294118	n
stones; dimensions		
lenght	0,295	m
wide	0,14	m
hight	0,09	m
volume	0,003717	m3
stones; required soil		
for 1 stone	0,005	m3
out of 1 m3 soil	207,890	stones
stones; production speed	390,000	n/h

calculation based on	*1000 stones*

soil composition			
Clay content	25%		
Added lime	7% of weight		
	share	m3	kg
other	58%	0,58	1050
clay	25%	0,25	450
sand	17%	0,17	300
total	**100%**	**1**	**1800**

	material				labor				total
Description	amount	unit	price/unit	sub total	production speed	unit	price/unit	sub total	
excavation and soil transport	4,0	m3	Br 112,50	Br 450,96	0		Br -	Br -	Br 450,96
churing soil	4,0	m3	Br -	Br -	1,5	m3/h	Br 15,00	Br 40,09	Br 40,09
screning soil	4,0	m3	Br -	Br -	1,5	m3/h	Br 15,00	Br 40,09	Br 40,09
adding sand	0,8	m3	Br 750,00	Br 601,28	0		Br -	Br -	Br 601,28
adding lime	606,1	kg	Br 3,00	Br 1.818,27	0		Br -	Br -	Br 1.818,27
mixing, semi automatic	5,2	m3	Br -	Br -	1,9	m3/h	Br 30,00	Br 82,98	Br 82,98
stacking stones	1000	stenen	Br -	Br -	720	n/h	Br 15,00	Br 20,83	Br 20,83
supervisor	1000	stenen	Br -	Br -	390	n/h	Br 40,00	Br 102,56	Br 102,56

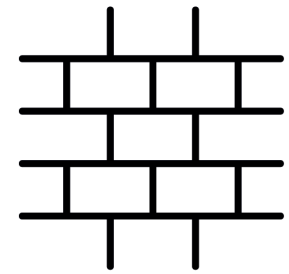
purchase equipment	purchase price	Br 8.761.373,52	production in 20 years	19531200	depreciation/ stone	Br 0,45	Br 448,58

total	**Br 3.605,64**	**1000 stones**
total	**Br 3,61**	**1 stone**

stone production on site
producing an affordable brick for affordable housing
generating employment
reducing transport movements
positive ground balance

Br 187,50 /m^2

VS



Br 119,13 /m^2

SAVING 36%
PRODUCTION
COSTS

+

GENERATING
EMPLOYMENT

CITATIONS

Bahga, S., & Raheja, G. (2018). An account of critical regionalism in diverse building types in postcolonial Indian architecture. Frontiers of Architectural Research, 7(4), 473–496. https://doi.org/10.1016/j.foar.2018.09.001

Eindnoten

1 de Man, M., & Yau, C. (2017). Compound Courtyard. http://resolver.tudelft.nl/uuid:0d2a88f2-904b-4126-b8a1-05753119b95a

2 Vandkunsten Architects. (n.d.). Tinggården - Communal building. Retrieved October 26, 2022, from https://vandkunsten.com/en/projects/tinggaarden

3 DEAS Group - Property Asset Management. (n.d.). Sandbakken. Cases - DEAS. Retrieved October 26, 2022, from https://deas.dk/en/property-investor/cases/sandbakken

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5 Kumbhare, S., & Dhepe, S. (2020). Design challenges in present day housing: Learnings from Tara apartments. Tekton, 7(1), 46–53. https://tekton.mes.ac.in/wp-content/uploads/2020/09/5-Tekton-Practice-Sanjay-Kumbhare-and-Sushama-Dhepe-volume-7-issue-1.pdf