# *Making a Living*



*Son Hei Sou*

***Making a Living*** *by Son Hei Sou*

*Integrating income generation schemes into urban housing redevelopment as foundation for future economic growth and urban densification*

*Global Housing Studio: Addis Ababa Living Lab*
*Mcs 3 Graduation Studio AR3AD132 (2019/20)*
*TU Delft - Faculty of Architecture and the Built Environment*

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*Delegate Examiner:* *Joris Hoekstra*

*Cover image: The City of Saints X (Jirenga, 2017)*

***Foreword***

*In this booklet you will find my graduation report for the Global Housing Studio: Addis Ababa Living Lab. In my past academic career, I have chosen two dwelling studios, one of which the Global Housing studio in Ghana. My interest in housing amongst the diverse architectural field can be attributed to my background. Born and raised until the age of seven in Macau, and since then growing up in the Netherlands, I have experience incredibly different living environments. The way how dwellings from different cultures influence the lives of the inhabitants sparks my interest in dwelling and thus led me to choose Addis Ababa Living Lab as my graduation studio. Operating in a totally unfamiliar environment while answering to the common issue of the shortages in affordable housing that we are expected to face all around the world, I think this studio will help me in preparing challenges ahead of me.*

*I 'd like to thank my three mentors Harald, Nelson and Frank for giving me new perspectives on housing architecture. As I am also thankful for the always poignant remarks on the design, as well as the wonderful experiences in both Ghana and Addis Ababa.*

*Index*


# I. INTRO

**8** *The Downward Spiral Of Poverty*
**14** *Research Methodology*

# II. RESEARCH

**21** *Housing Provision In Addis Ababa*
**38** *Demography, Density And Migration*
**47** *Income Level*
**51** *Social-Economical Instruments*
**52** *Climate*
**61** *Graphic Novel*
**80** *Interview*
**82** *Patterns Of Inhabitation*
**108** *New Ways Of Work*
**110** *Living Border*
**111** *Typological References*
**114** *Urban Context*
**123** *Kolfe Zoom In*

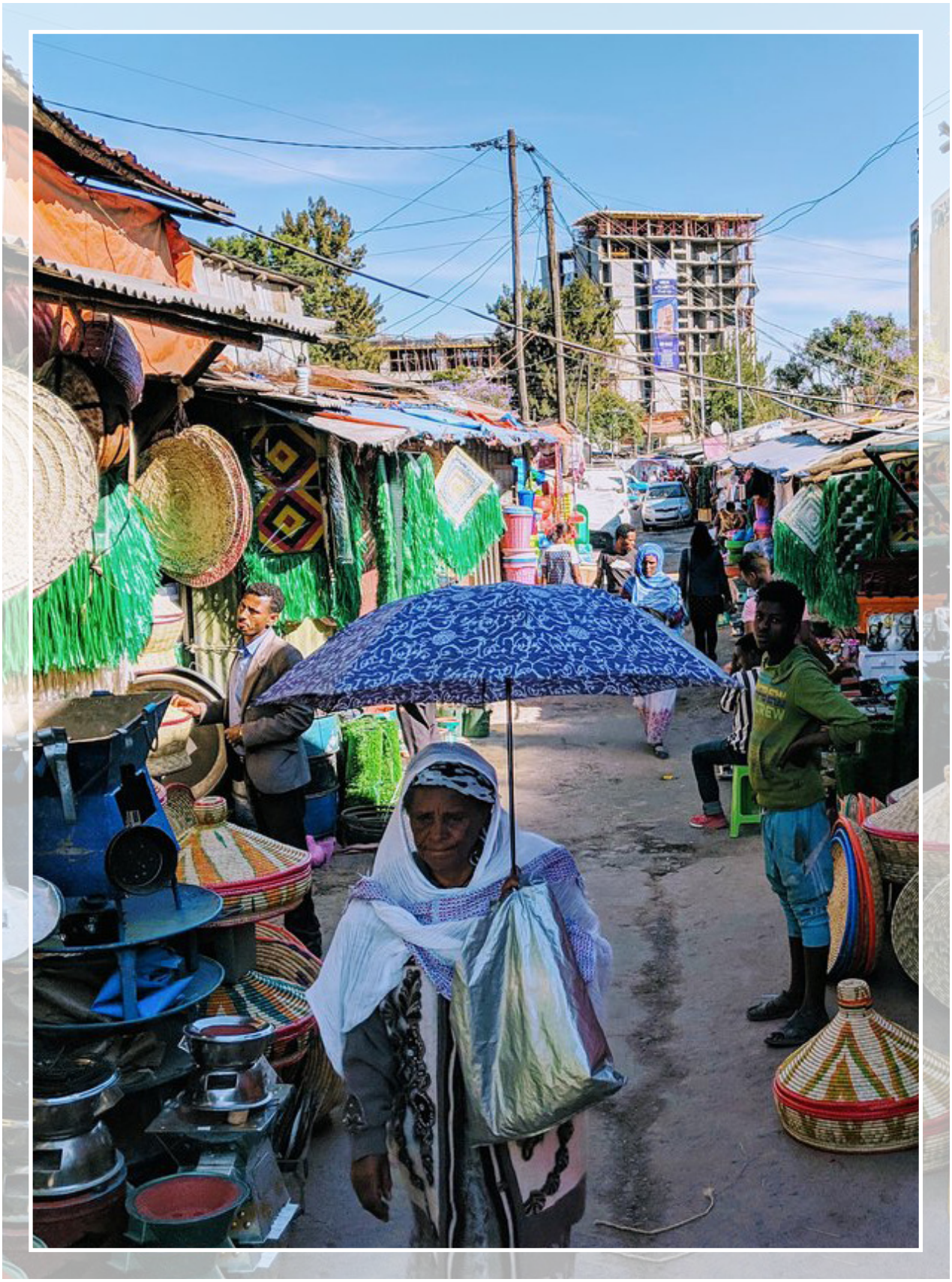
# III. DESIGN

**137** *Urban Strategy*
**154** *Stakeholders Analysis*
**157** *Urban Spaces*
**170** *Informal In The Formal*
**176** *Urban Cluster*
**185** *Dwelling Types*
- *Type 1: Adaptive Modular Gallery*
- *Type 2: Middle Income Portico*
- *Type 3: Urban Corner*
- *Type 4: Workers Co-Housing*

**214** *Building Technology*

# IV. OUTRO

**276** *Reflection*
**280** *Bibliography*



*Chapter I*

# INTRO

*"These desperately poor migrants come to towns and cities to look for work. Housing has a very low priority on their list of needs. They want to be where the jobs are. Hence their willing acceptance of life in crevices of the city, as illegal squatter and pavement dwellings."*

*Charles Correa (Correa, 1989)*

## *THE DOWNWARD SPIRAL OF POVERTY*

*problem statement*

*According to the IMF, Ethiopia is forecast to be the fastest growing economy in Sub-Saharan Africa with a predicted growth of 8.5% this year and an average of around 10% of economic growth in the past decade. (Giles, 2018) Partly due to this economic growth, the urban population is expected to increase significantly in the coming decades. The current urban population of Ethiopia is at 21%, one of the lowest percentages in the African continent. In the group of urban migrants, 55,4% comes from rural areas, indicating a large sum of poorly educated, low skilled workers as major part of the migrant group. The main reasons to migrate to urban areas is the increased job opportunities and education. (Barbero et al., 2020) These influxes of low skilled workers to the urban areas intensify the informal sector in cities like the Ethiopian capital, Addis Ababa. Due to different definitions of the informal employment in various studies, there are a wide range of numbers available. As much as 69% of all employment in Addis Ababa and 65% of urban Ethiopia is informal. This comprises those working in informal business, as well as a huge group of domestic workers, apprentices and unpaid family workers. (Fransen & van Dijk, 2008) Other studies estimate that 25% engage in the informal sector. (Zewdie, 2015) This shows the overall scale of the informal sector present in Addis Ababa.*

*Being able to participate in productive commercial activity is the first step to alleviate oneself from poverty. As Dovey noted: "High levels of informality enable micro-flows of information, goods, materials and practices that produce income and make life sustainable under conditions of poverty… Informality is no to be confused with poverty; it is indeed a resource for managing poverty." (Dovey, 2013)*

*The problem is that the formal, governmental institutions reject the idea of informality in areas where government is in managerial position.*





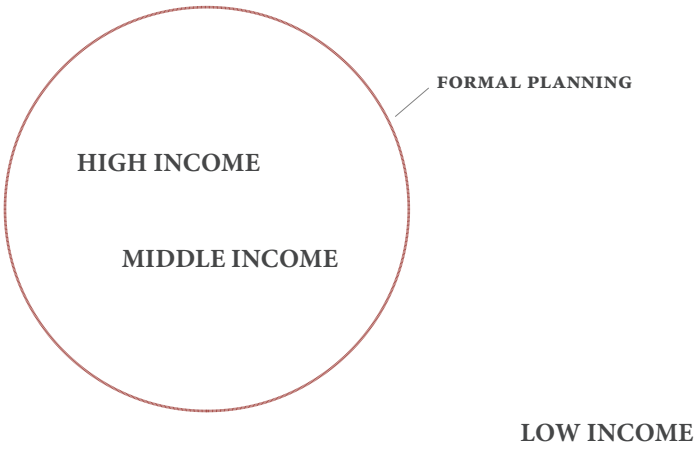



*Informal economies are banished from government-controlled housing areas. This is out of fear for the unbound nature of informality, while the formal intuitions main drive is to control everything. The lack of informality, be it informal housing or informal economy, creates order, stability and the ease for the government to exert oversight. However, this lack of informality would also create a vacuum of opportunities to make a living for people, as the informal ways of generating income would also be the only way of generating income for people lacking education and skills.*

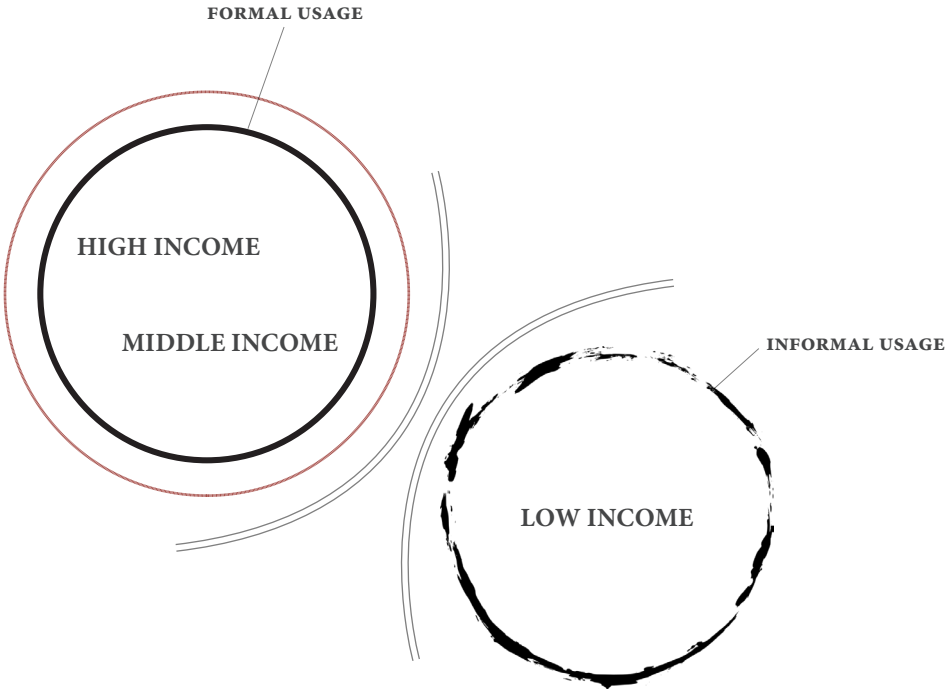
*The goal should therefore be to allow the existence of informal ways of living, while creating a formal framework on top, upon while which the formal institutions can still exert control and oversight. In trying to achieve this goal, I propose the design question: how can informal income generation schemes be integrated into urban-housing redevelopment to economically empower the low-income inhabitants, while answering to the need for urban densification and maintaining the social fabric of the existing community?*

## *THE DOWNWARD SPIRAL OF POVERTY*

*problem illustrated*



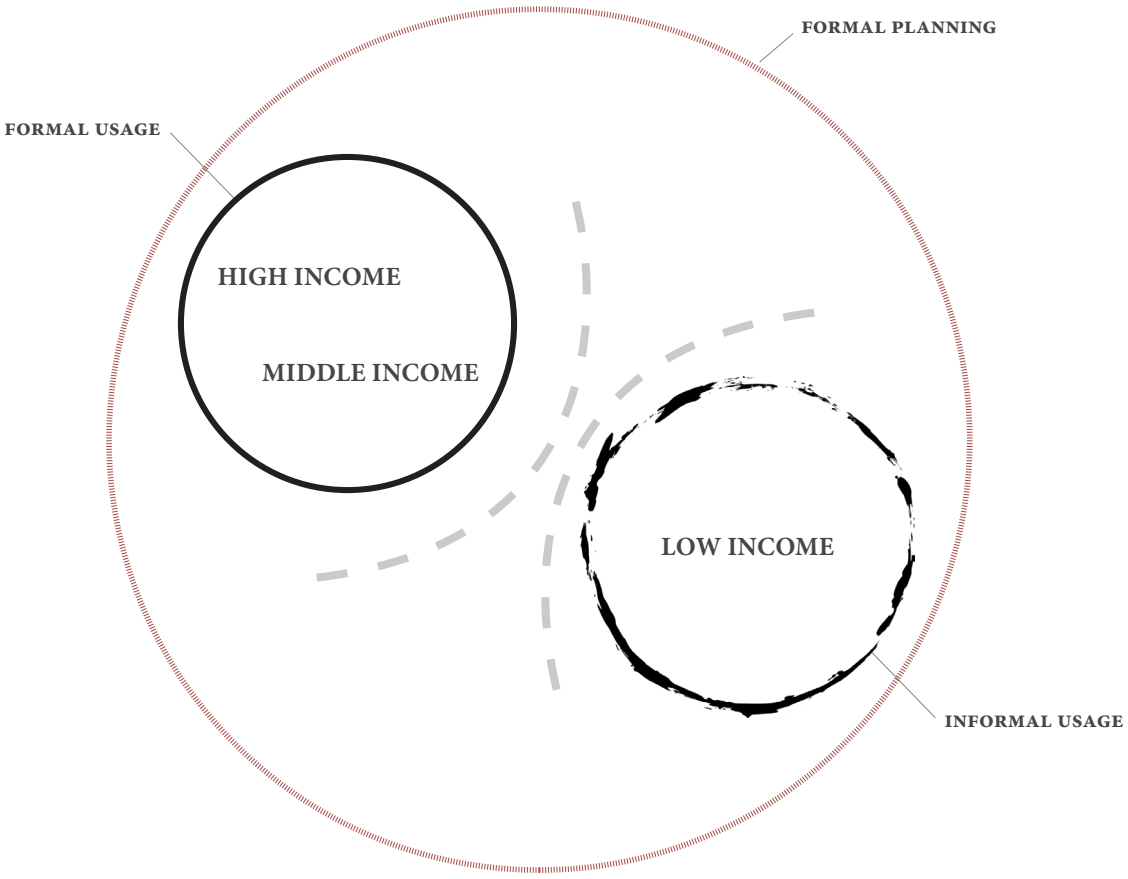

*The needs of low income households are often not included in the planning by formal institutions.*




*This results in the friction between the formal authorities and the low income groups as the latter would opt for a more informal ways of usage that are not foreseen by the formal authorities*

## *THE DOWNWARD SPIRAL OF POVERTY*

*problem illustrated*




*The solution is to incorporate the informal lifestyle and usage of the low income households into the formal planning so the informal is not only seen as a problem anymore but as a part of the solution*

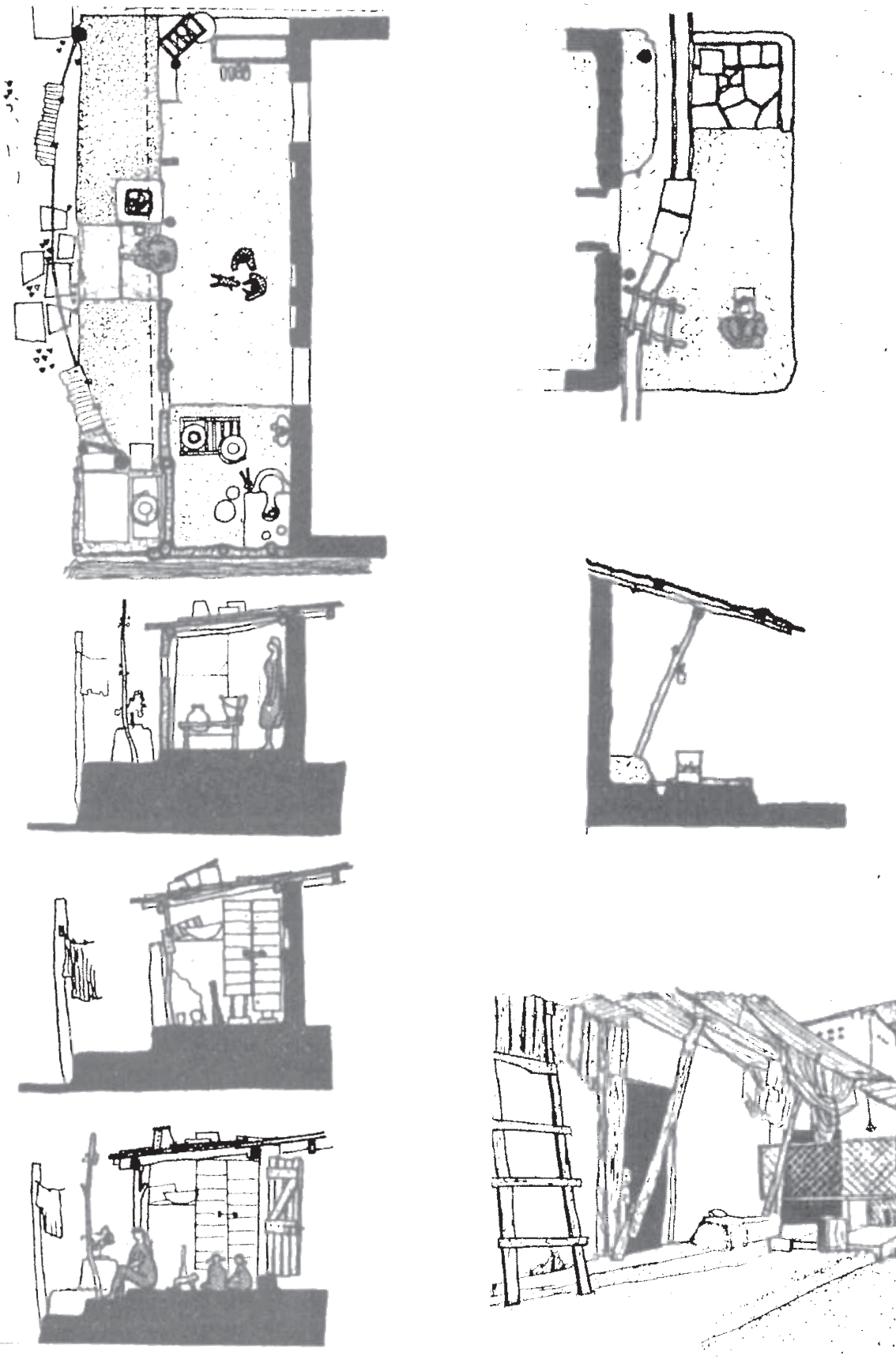
## *RESEARCH METHODOLOGY*
### *planned vs used*

*In the studio 'Global Housing: Addis Ababa Living Lab', I intent to do research upon the interaction between formality and informality in the design for low income people in the Global Urban South, specifically in Kolfe Keranio, Addis Ababa, Ethiopia. Often, the formal and the informal are seen as opposite to each other. McFarlane and Waibel (2016) noted that there is "a need to move away from dichotomous approaches and to rethink both the very notion of the formal-informal divide and the implicit idea of formality as the norm and informality as a deviation."*

*The question concerning the research methodology would be: How to study the formal (planned) city and the informal (used) city, in order to improve low-income quarters in Addis Ababa? In this study the formal city is understood as the physical space on different scales, from the urban system (open spaces and social/commercial programs) to the dwelling unit. The informal city is interpreted as how these physical spaces are used or even adapted by the inhabitants. The research consists of two main parts: the study of the physical space and the study of the usage of the space. Due to the nature of both studies, two different research methods will be used.*

*In the study of the physical space, especially focusing on the dwelling scale, typological research will offer a systematic view on the morphological patterns on the local residential architecture. Especially relevant is that typological research can show how the "planned" types are developed under the (Ethiopian) contextual influences and subsequently allows for the theorization of how these influences are relevant for the design.*

*As the research is primarily serving as the foundation for the design studio, it would be beneficial to have a link between the analytical tools of the typological research and the tools used in the design process. According to*



*Architectural Ethinograpy (Rybczynski et al., 1984)*

*Van Dooren et al (2013), design can be understood as experimenting in different domains using a laboratory of visual language and afterwards being able to make design decisions based on the findings. In the laboratory of visual language, we can extract from the vast spectrum of design tools a set of analytical tools that can also be used in the typological research. It consists of, but not limited to, analytical drawings in the form of plans, sections, isometric drawings; diagrams; and (physical) model making.*

*In the study of the usage of the space, praxeology as the study of human action and conduct will be used as the research framework of the second part of the research. If typology is the study of the space, then praxeology would be the study of the people inside the space. The Ethiopian lifestyle is without saying very different from other parts of the world, with its emerging modernization while retaining traces of local traditional constructs. Through praxeological research it is possible to understand and document these subtle differences that would otherwise be inconspicuous to foreign observers.*
*The primary tool used in unravelling this non-familiar environment is engaging with local inhabitants in interviews. Through conversations with inhabitants we can derive their everyday living patterns and their opinions and aspirations on their living, working and communal spaces.*
*Architectural ethnography is a tool used to transform these findings into a documentation in the form of a graphic novel. This is essentially the reimagining of the stories of inhabitants as a visual anecdote.*

*Both the graphic novel as a praxeological visual account and typological research as an objective compilation have its challenges. Typological research is systematically comparing related but distinct categories. This comparison requires the distillation of non-essential information which led to the disregarding of for example the interaction between human and space. While the graphic novel as the ethnographic account of the interviews are subjective and never neutral. By Lucas' definitions it is noticeable that the two research methods are, so to speak, opposite from each other, and thus offer the possibility for both research methods to nullify each other's shortcomings and create a more comprehensive view on the subject.*

*Finally, to conclude on the combination of typological and praxeological research method in my graduation research. The typological method shows the possibility to systematically dissect the "planned" city and the architecture within, into a type that is, through its essence, made understandable, adaptable and re-imaginable. On the other hand, the architectural ethnographic technique within the praxeological framework offers an extensive range of possibilities in understanding the different ways of the human life in and around architecture. The combination of the two research methods will greatly and systematically enhance my understanding in the informal lifestyle.*



*Interview with inhabitant*

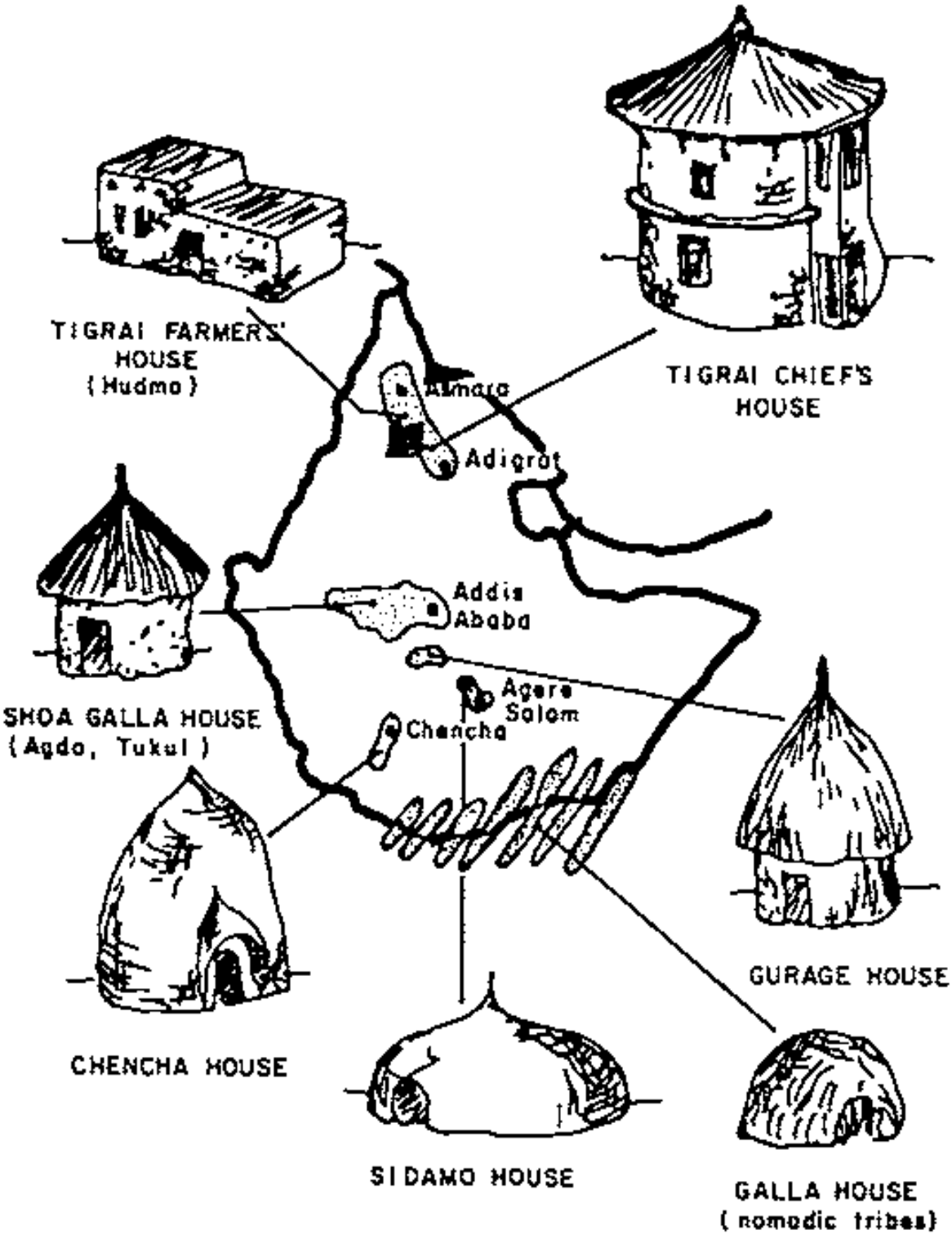


*Chapter II*

# RESEARCH

## *HOUSING PROVISION IN ETHIOPIA*

*The history of social-political changes in Ethiopia have created unique forms of housing development. The tribal housing clusters still dominates the ways of living in the countryside. When urban migrants moved to the cities, these forms of communal living have also been adapted and integrated into the city. The differences with the countryside is the ever increasing density in the urban clusters of the kebele housings. The expansions of the neighbourhood are often pushed to the boundary of the area, leaving little space to be used for social functions. Observing this saturation in the urban housing expansion, the government set up multiple public housing programs in order to increase the population while still trying to create qualitative outdoor spaces and dwellings. This has resulted in the construction of condominium neighbourhood all around cities like Addis Ababa...*

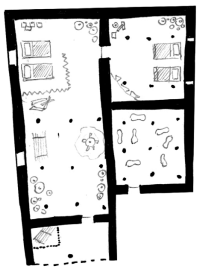



*(Buondonno et al., 2020, p.8)*

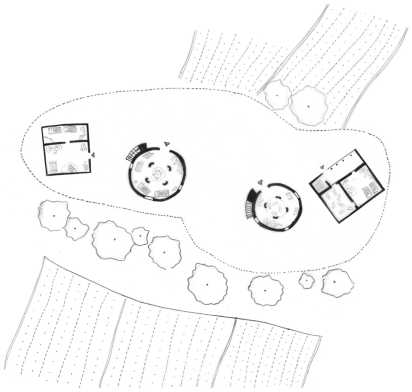
## *HOUSING PROVISION IN ETHIOPIA*

*Tigray region*

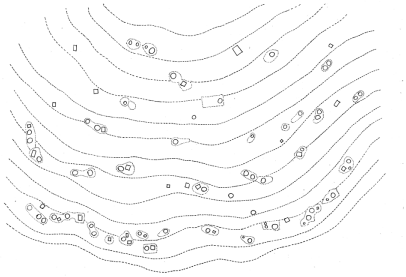








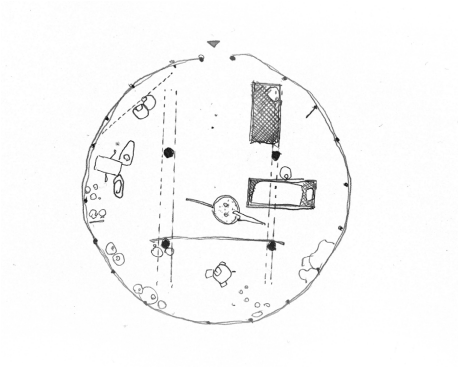




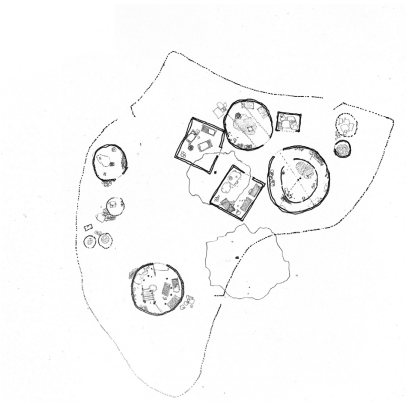
*(Buondonno et al., 2020, p.12-13)*

*This mountainous region is characterized by drought and earthquakes and with massive stone resources that have been historically used by its inhabitants to build their houses. Terrace farming is common, and deforestation is an important issue. Villages usually are made up of scattered houses forming parishes. Livestock is kept safe in a courtyard with a high stone wall. When the family has several buildings, they usually build stone boundary walls to confine their compound. Roofs are often flat with wide overhanging eaves that help protect the earth and straw mortar rendered walls from the heavy rains. Exterior stone staircases are common and lead either to the roof, that is used for many purposes, or to the upper floor, which may be used as bedroom, living room or guest room. The interior space is usually a single room with a fireplace dug in the earth floor. There are some windows and a main door. (Buondonno et al., 2020, p.10)*

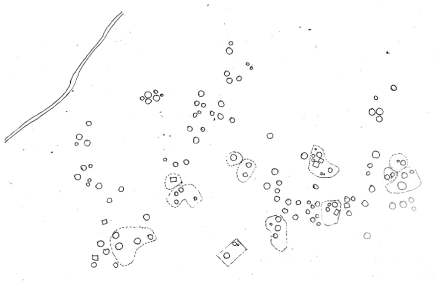












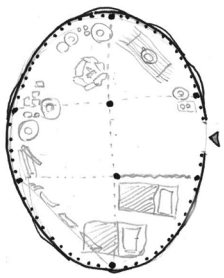
*(Buondonno et al., 2020, p.16-17)*

*The region of Benishangul-Gumuz is predominantly mountainous and characterized by a dry climate which is often cause of drought. Berta and Gumuz are the prevailing ethnic group in this region. Their life is mainly based on agriculture and they usually live in villages of a few hundred people. Settlements are subdivided in family compounds containing several constructions surrounded by bamboo fences. Houses are not plastered, what allows cross ventilation, what is important in this hot humid climate region. Different uses of interior spaces coexist in the Berta society, but externally all houses present similar external attributes: round interwoven bamboo walls with conic thatched roofs crowned by four wooden poles. The history of slavery of part of this region people has an effect on settlements through fences and labyrinth-like pathways. This helped dwellers to escape and better defend the villages. (Buondonno et al., 2020, p.14)*

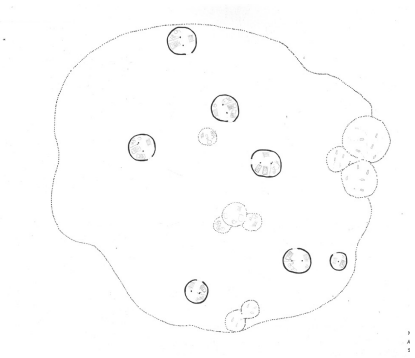
## *HOUSING PROVISION IN ETHIOPIA*

*Afar region*

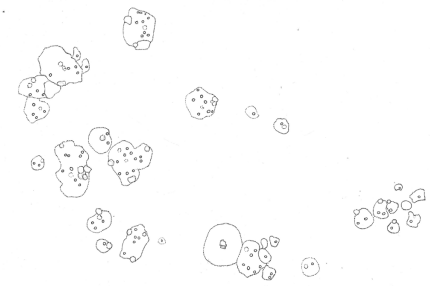








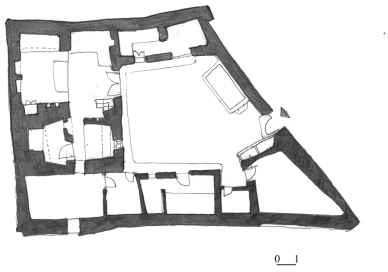




*(Buondonno et al., 2020, p.20-21)*

*Due to the extreme climatic conditions in the region of Afar, mainly characterized by hot, sunny and dry climate, tribes are mostly nomads, living in small isolated groups, scattered on desert or semidesert areas. Usually moving camp is made of about 20 huts with livestock and a meeting place. Camps are surrounded by vegetal barricades, which protect them from the attacks of wild animals and from domestic animals' theft. The Afar nomad huts are oval-shaped and are erected by women. The structure of the hut is demountable, erected making a domed armature of branches which is bound with palm fibre. Then the covering is made with palm mats. Usually huts are grouped in "family compound", and differently from other regions, these compounds are scattered oh a huge surface, since the environment is mainly flat and desertic. Other kind of dwellings exist, often used by sedentary people or by semi-nomadic groups having a fix sedentary place to go back. One of them is a stone house called dabou which is found at the foot of the highlands where the soil is constituted of sandstone or pumice. These houses have thick stone masonry bearing walls and a thorn and rubble roof. (Buondonno et al., 2020, p.18)*











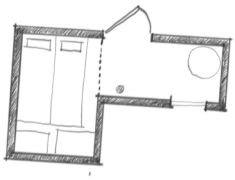




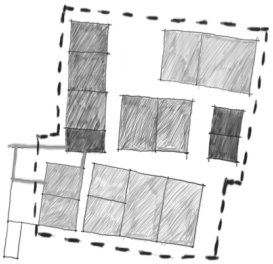

*(Buondonno et al., 2020, p. 24-25)*

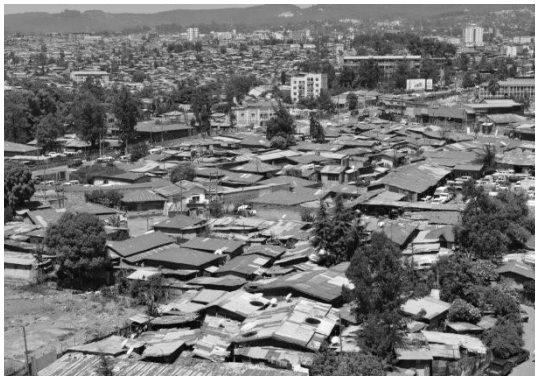
*The historic city of Harar is located on a plateau surrounded by valleys and its climate is mainly dry and arid. As a historical trading centre, many buildings are quite unique to Ethiopia, with Indian and Islamic architectural details being quite noticeable within the fortified walls at the centre of the city of Jugol. Its building typology and its urban structure are unique in the country and are a reminiscence of Islamic and Indian traditions. Two kinds of houses are found in vernacular architecture in Harar: chikka houses and stone flat-roofed houses. Men build both kinds of houses and repair wall and roofs when necessary, women are used to paint it and to do the daily maintenance. Stone and flat-roofed are rectangular and often two-stories high, surrounded by an about 2 m high wall. They have a white-washed or pastel colour exterior which is painted twice a year. The interior of the houses has different rooms, one of which is used to receive guests. Several niches in the walls contain ceramics. Many houses have balconies. The most common traditional dwelling unit in Harar consists in 3 rooms on the ground floor and service areas located in a courtyard. (Buondonno et al., 2020, p.22)*

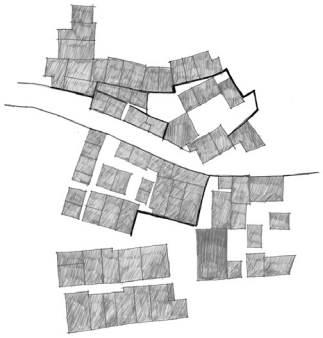








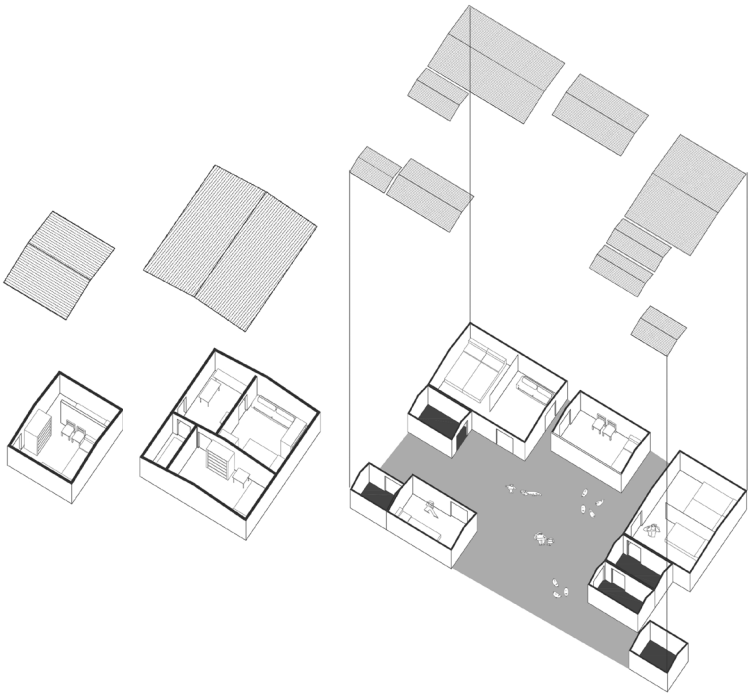




*(Buondonno et al., 2020, p.76-77)*

*After the return of King Haile Selassie to Addis Ababa on May 5, 1941, the international status of the city grew along with its housing shortages. The huge inequalities in urban land continued to intensify during the entire Imperial period. "In 1962, 58% of the land in Addis Ababa was owned by only 1,768 people, equivalent to more than 10,000 square meters per person, resulting in 55% of the houses being rented." During the population boom of the 1960s, the regime focused on Addis' international prestige, but ignored the problems of the national housing sector and lacked a structural strategy to adapt to population growth. Landowners are trying to meet the housing needs of a large influx of people in the city. They can only use the remnants of the infrastructure built during the Italian occupation to try to Housing Issues under Construction Boom fill the urban road network with countless crowded small houses. (Buondonno et al., 2020, p.71-72)*





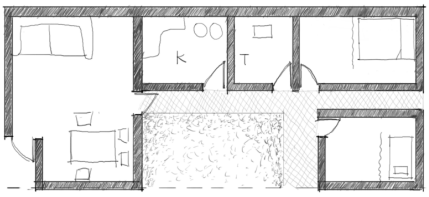
*(Buondonno et al., 2020, p. 81-83)*

*From 1974 on, the socialist regime Derg ruled Ethiopia. In July 1975, the state started to nationalize all urban land and houses. The government created the Kebele - the smallest administrative body in Addis Ababa, managing mostly small houses and sheds under 100 birr rent per month. The kebele rent out 148,645 housing units, which accounts for about 70% of all small houses and sheds in Addis Ababa. Old and new squatter settlements became pervasive in Addis Ababa's built landscape. The average small house or shed is 24m2 and houses an average 5.7 persons. Only 7% of small houses and sheds have a private toilet and access to water. The rest shares one within a compound or use the common ones for the district. (Buondonno et al., 2020, p.79-80)*

## *HOUSING PROVISION IN ETHIOPIA*

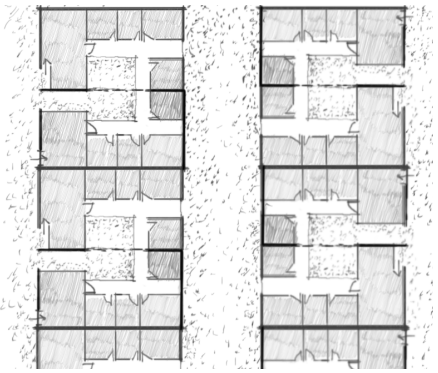
*Early "Low-cost" Housing Program*



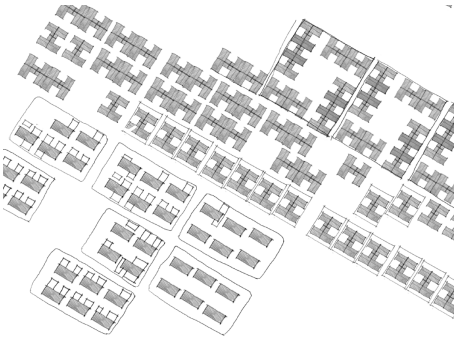












*(Buondonno et al., 2020, p.88-89)*

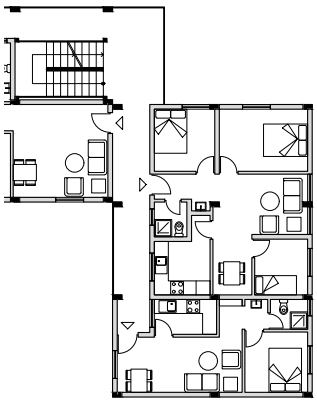
*From 1976 until 1984, the Rental Housing Authority has constructed a total of 2800 housing units, of which 32.4% are considered low-cost housing units. In the late 1980s Redd Barna Ethiopia (RBE) developed a new strategy to accommodate the urban poor, designing new types of cooperative housing mainly in suburban area. Each member entitled to have a plot of land ranging between Early "Low-cost" Housing Program 70m2 and 94m2 in size. The type of housing is back-to-back row housing with a building height ranging between two and three storeys. Residents targeted by the policy are middle income households but not the poor. The process usually starts with the construction of dwelling units followed by infrastructure, utilities, commercial areas, social and service facilities. (Buondonno et al., 2020, p.84)*



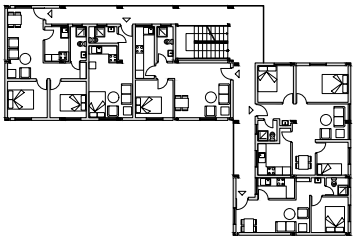
*(Buondonno et al., 2020, p. 90)*

*At the beginning of the 21st century, Ethiopia was facing an extensive housing shortage, which was affecting all income groups, in Addis Ababa especially. Indeed, in 2005, about 80% of Addis Ababa's residential areas were considered "slums". In 2004, the Urban Sector Millennium Development Goals Needs Assessment predicted that to meet the Millennium Development Goals in 2015, it required a total of 2,250,831 units, which equates to a considerable 225,000 houses per annum. To cope with the housing backlog, Ethiopia signed a bilateral agreement for technical assistance with the German government, in 1999. As a result, together with Germany's official development agency German Technical Cooperation, they developed a program divided into three stages: LCH technology (1999-2002); Addis Ababa Grand Housing Program (2002-2006); Integrated Housing Development Program (2005-2010). (Buondonno et al., 2020, p. 92)*

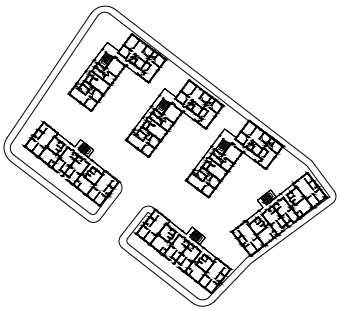






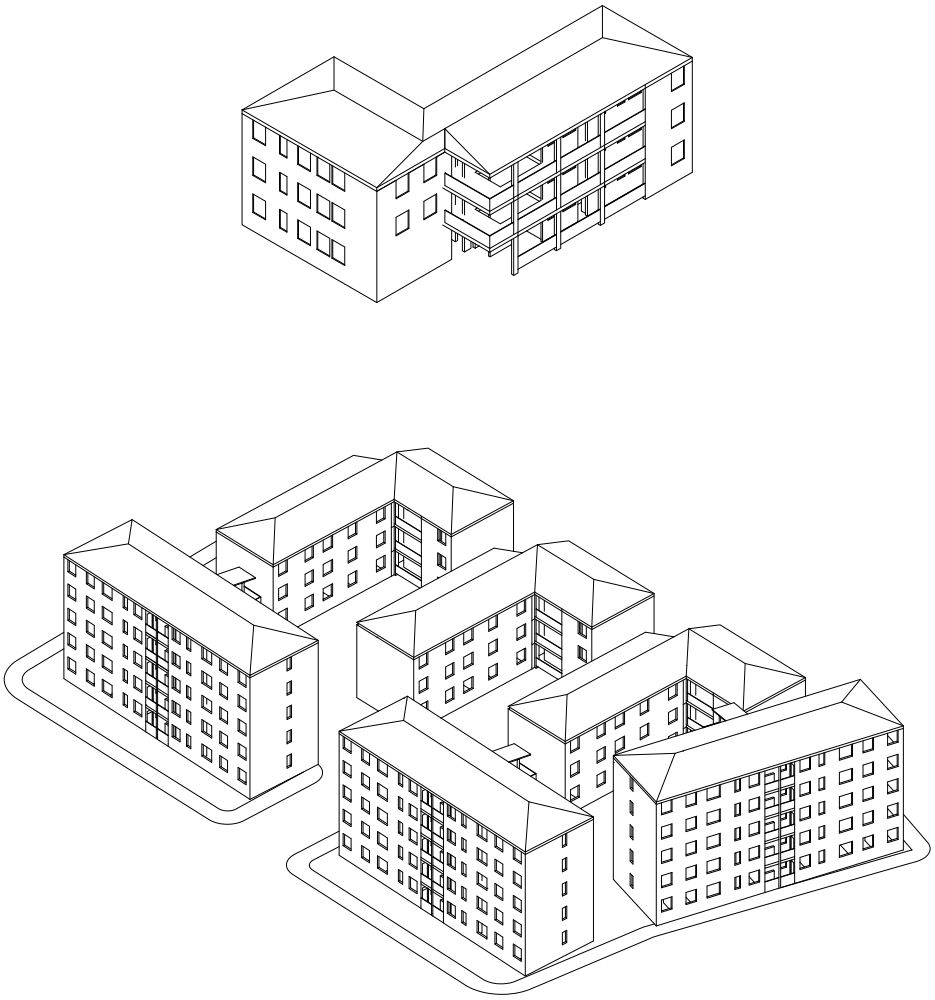






*(Buondonno et al., 2020, p.94-95)*

*The Integrated Housing Program (IHDP) set several goals, among which: reduce slum dwellings by 50%, build 150 000-200 000 housing units, create 60 000 jobs, and improve training procedures for the domestic construction sector. The resulting strategy was to use a standard mid-rise housing block type, a typology that could be cost-effective and drive densification, thus the condominium, a new structure made of reinforced concrete. As a matter of fact, until the mid-2000s, in Addis Ababa 97% of residential units were still single stories, while 75 % of units' walls were made of mud and wood. The pilot project started in 2005, took place on brownfield in the area of Bole Gerji (750 housing units: studios, 1 and 2-bedroom typologies, an office building, several commercial units). Government agencies were in charge of the water supply and electricity but were not effective. Regarding the cost of the construction, considering that the target was USD Condominium 61/m², they managed to achieve a cost of USD 68/m². (Buondonno et al., 2020, p. 92)*



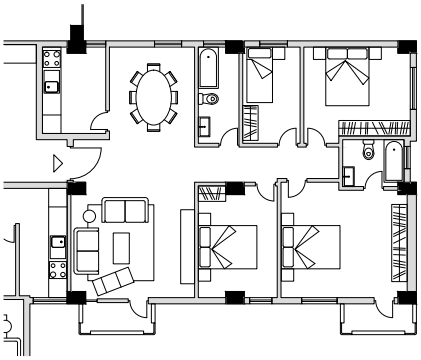
*(Buondonno et al., 2020, p. 96)*

*After the successful pilot project, GTZ ceased the actual collaboration with the Ethiopian Government, taking an advisory role. Thus, under their recommendation, the Housing Development Project Office (HDPO) was created to have a specific office for housing development (French & Hegab, 2011e). The success of the pilot project differs from the actual situation of condominium housing. Among the factors of the location, services, and affordability, which are all bound to economic issues. As a matter of fact, the first projects had a lower cost since were in brown or open fields in the periphery of the city, in order to avoid the cost and time of evictions. The social and economic effects of relocating people in areas far from the city centre have been overseen by the government. On the contrary, as time went by, the necessity to build in the inner city grew and thus costs. (Buondonno et al., 2020, p. 92)*

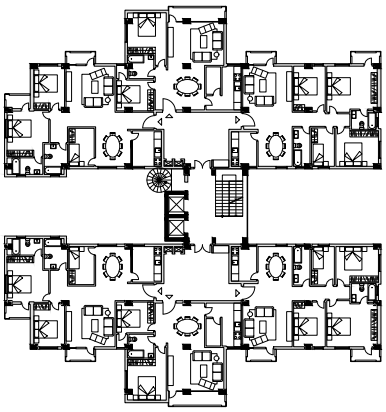


*Unfinished condominium constructions (Buondonno et al., 2020, p. 100)*

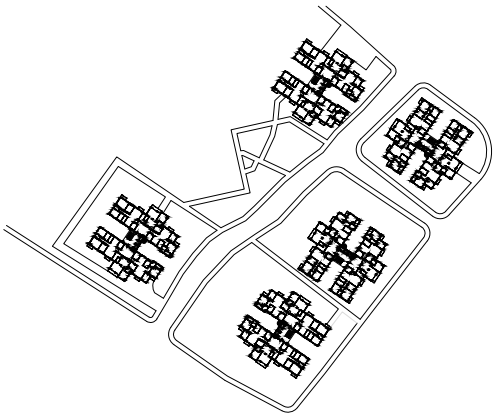












*(Buondonno et al., 2020, p. 104-105)*

*The 40/60 condominiums are the typology with the larger apartments, comparing to the 10/90 and 20/80. The 40/60 type apartments can have up to four bedrooms officially. They are built for the middle-high-income groups (more than ETB 1,200 a month) and are financed via a 40% down payment and 60% CBE mortgage. This housing development program is strongly bound to the urban redevelopment program designed to build the image and increase the competitiveness of cities. In order to implement this housing scheme, a Saving Housing Program has been set: participants have to save at least 40% of the value of the unit during a period of 5-year time by signing an agreement with the Commercial Bank of Ethiopia. Once the beneficiaries manage to save that amount, the remaining 60% of costs would be paid through a bank loan. Thus, the priority will be given to the aspiring residents that succeed in saving the required amount first. These high-rise structures have been widely spread throughout Addis Ababa. The condominiums are thus giving the city a new face. (Buondonno et al., 2020, p. 102)*

## *HOUSING PROVISION IN ETHIOPIA*

*shortcomings of condominiums*

*In trying to solve the problem of housing shortages, as well as providing an improvement of living quality for the low income inhabitants of Addis Ababa, the city's government also overlooked important qualities that has existed in Ethiopia from the traditional rural villages to the Dergue Era kebele housing. The need for a cost- and time-effective housing scheme has resulted in the asymmetric relation between the monotone housing provision and the diverse aspiration. Even the traditional customs like cooking injera and preparing coffee ceremonies have become an impractical task to do in the condominiums. As a lot of low income people would actually earn their income by producing injera and coffee at home to sell, the impossibility to do so in a condominium is the main reason why many low income people refuse to move to a condominium even when they are able to.*

*Another shortcoming of the condominiums programs is related to the location. It is shown from finished condominium projects that those condominiums closer to the city centre have significant higher chance to be well received. That is because within the condominium's periphery only a limited amount of commercial program is allowed. That means that most inhabitants need to work outside of the area. This is especially troublesome for the low-income inhabitants who are unable to travel far.*

*The open space attached to the condominiums is also an unfamiliar sight to the local inhabitants. Unlike the traditional rural housing clusters, this open space is not clearly defined. The inhabitants are not sure if they have ownership over this place and thus will only feel like a stranger in its own home.*

*The city's government made great effort in trying to provide adequate housing to the low-income citizens. However, these projects do show limitations when it comes to creating social communities and opportunities for work, something that are essential in the Ethiopia context.*





*Unfinished condominium constructions (Buondonno et al., 2020, p. 99)*

***DEMOGRAPHY, DENSITY AND MIGRATION***

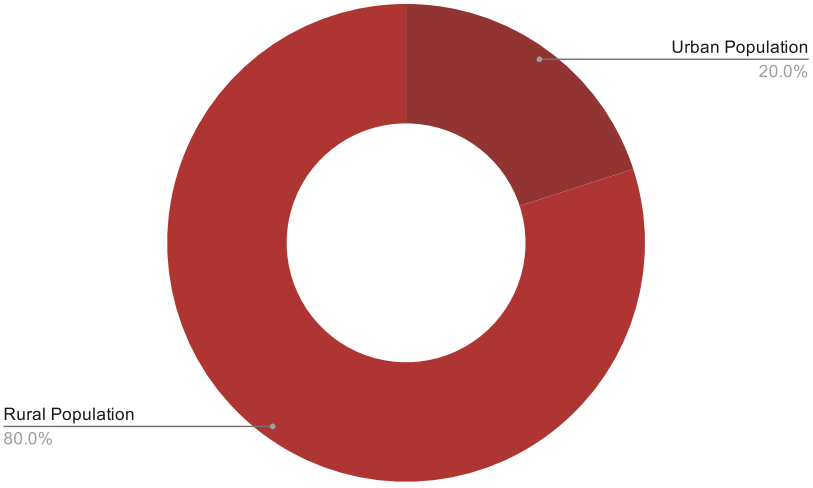
*This map, not to confuse with a night light photograph of the world, shows the population density around the globe. When the population density is over 500 people per square kilometre the area will show a bright yellow colour, and then gradually turns from purple to black when density decreases. The purple that colour the country of Ethiopia indicates the still relative dense rural areas. (Barbero et al., 2020, p. 18-19)*




Ethiopia

### *URBAN VS RURAL POPULATION*

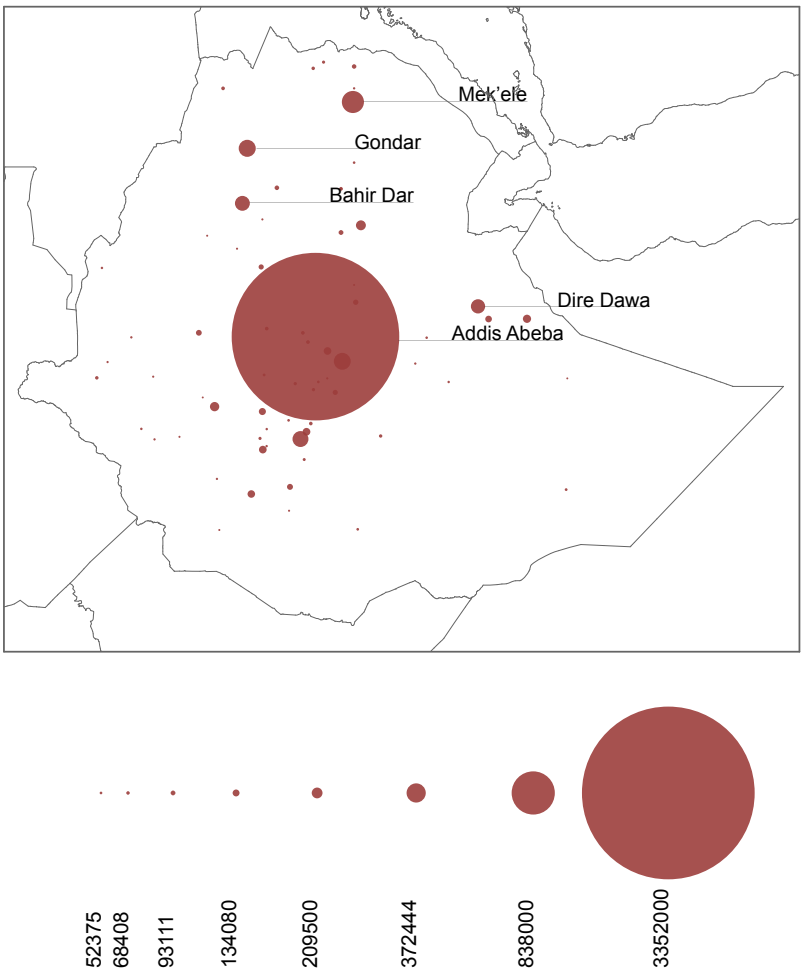
*Ethiopia is one of the least urbanized countries in the world. With an urbanization rate of 20% at the moment of 2019 it ranks 175th of 188 listed by the World Bank (World Bank 2019). Nonetheless it hosts in around a 110 million inhabitants. This means that there are 88 million people Population density living in rural areas. The map on the right shows the population density in people per square kilometre. The yellow areas indicate regions with over 500 inhabitants per square kilometre. The map makes visible that most of the people inhabit the Ethiopian high plateau. (Barbero et al., 2020, p. 20)*



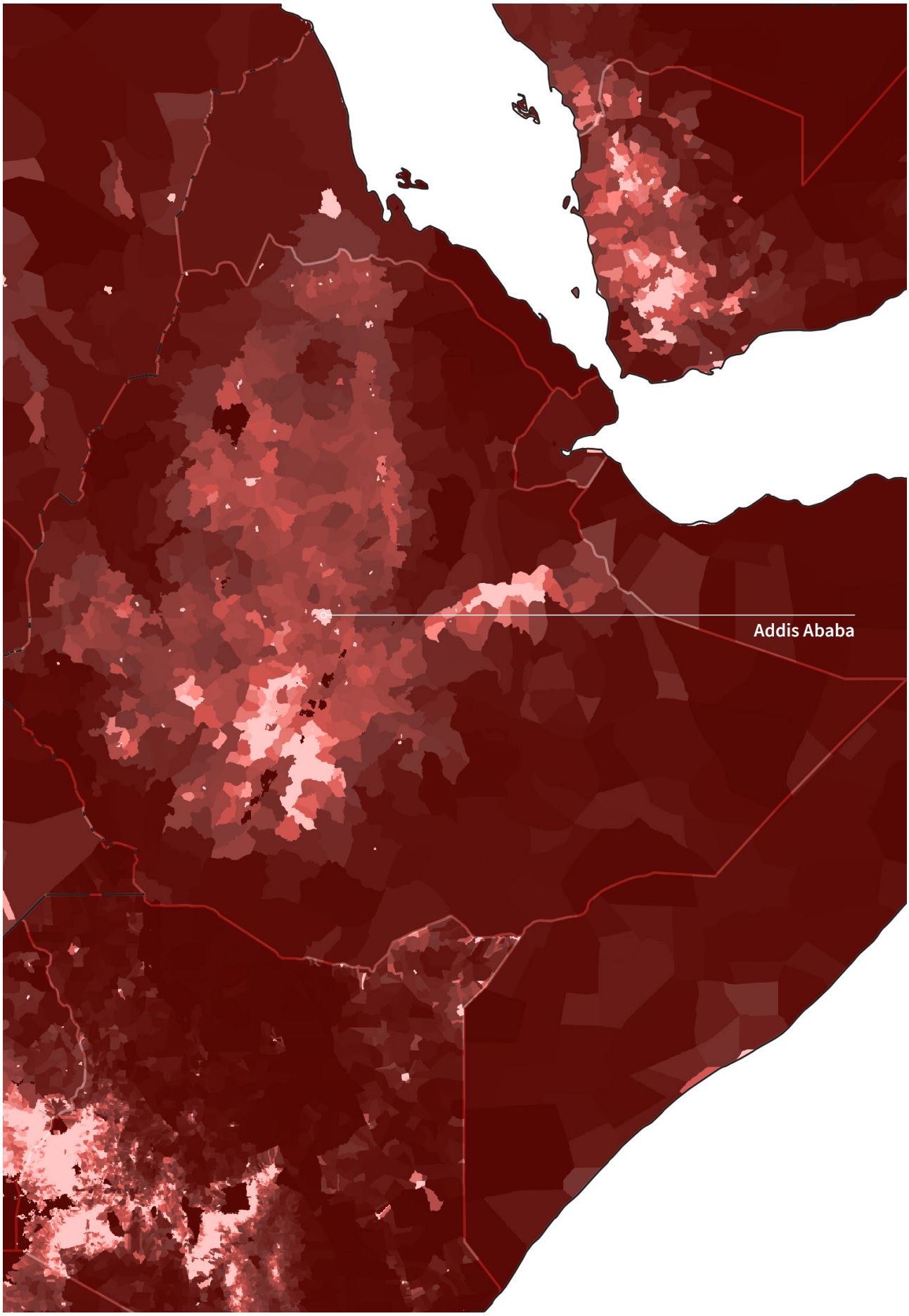

*(Barbero et al., 2020, p. 20)*

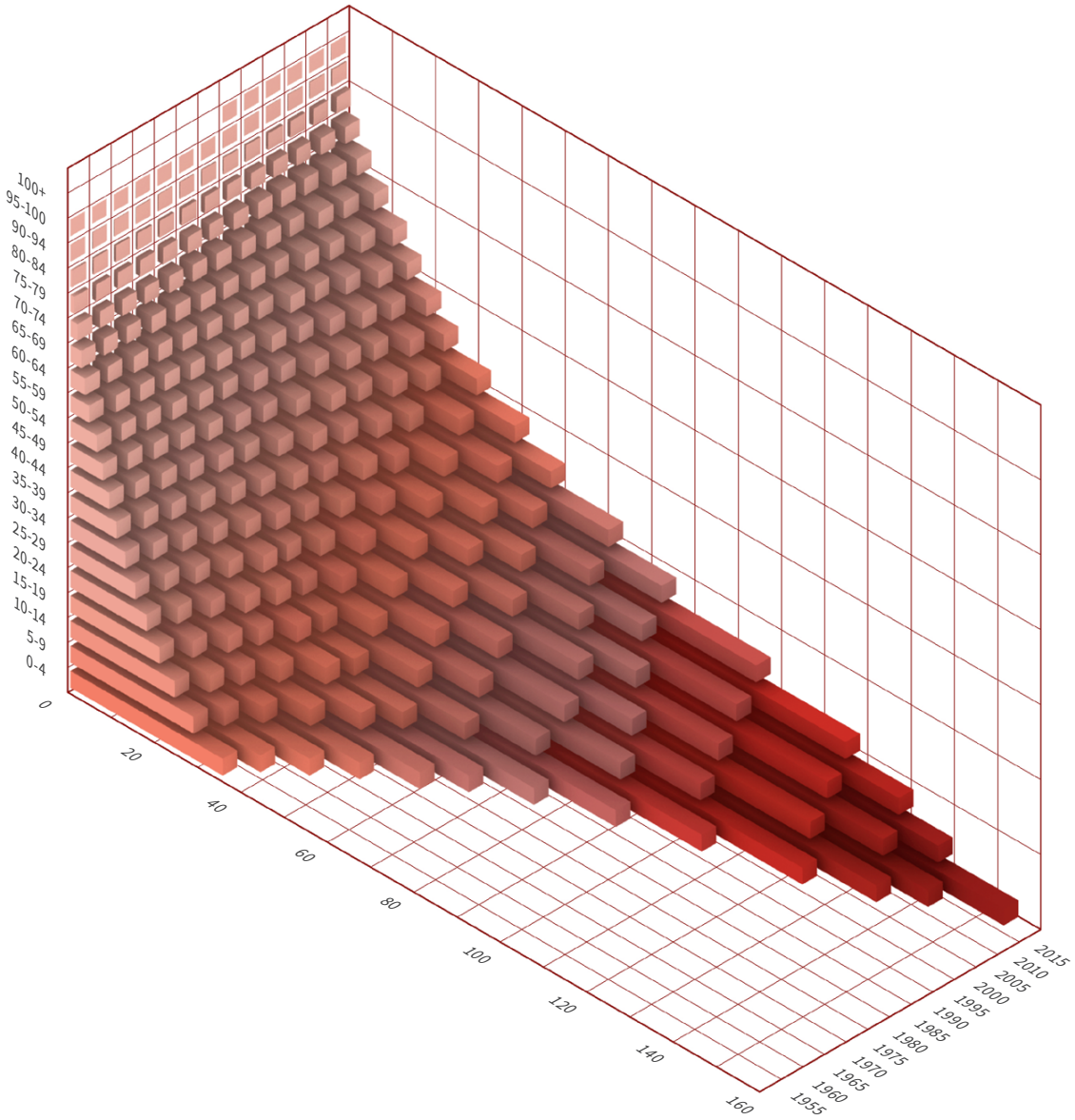
### *URBAN POPULATION*

*The distribution of the people living inside urban areas in Ethiopia is very unequal. From the 20% of urban population almost 1/5 was living inside Addis Ababa, with at the time of 2016 3352000 inhabitants. The second largest city was Mekelle with 441991 inhabitants. The drawing on the right is made to illustrate this. The radius of the circles represents the amount of people living in one city. (Barbero et al., 2020, p. 23)*



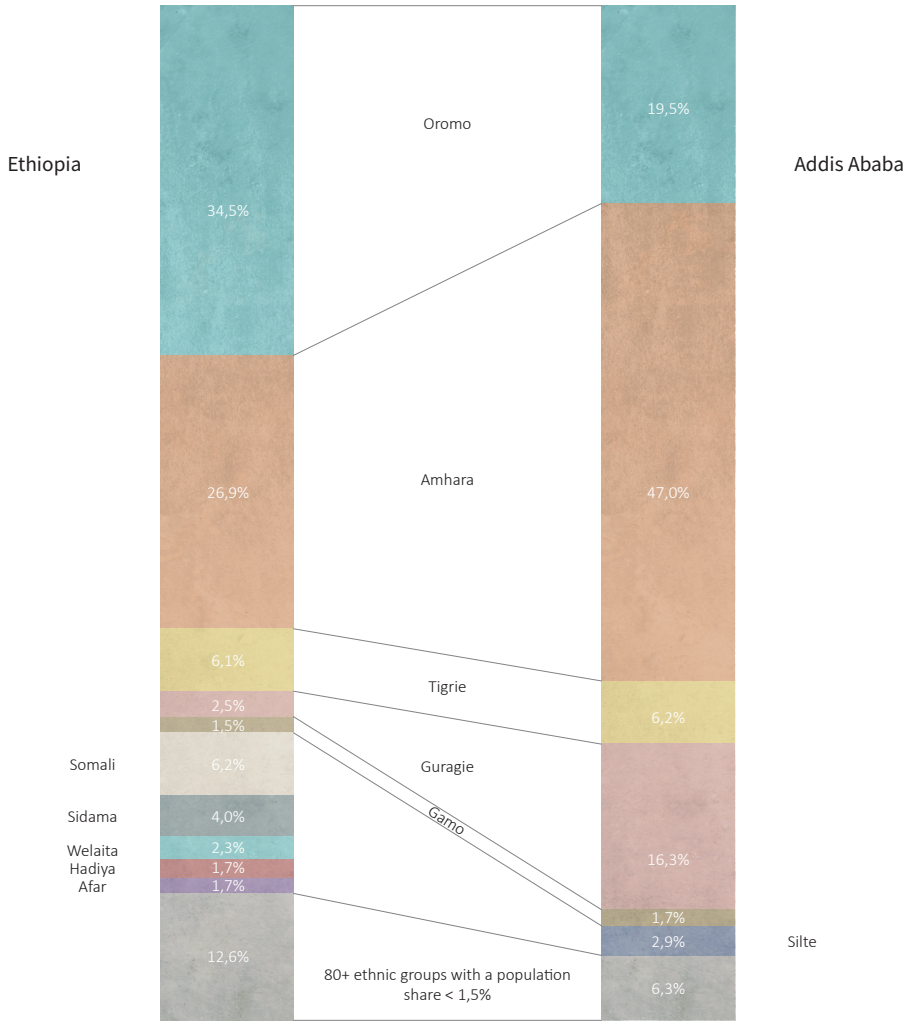

*(Barbero et al., 2020, p. 20)*


Addis Ababa



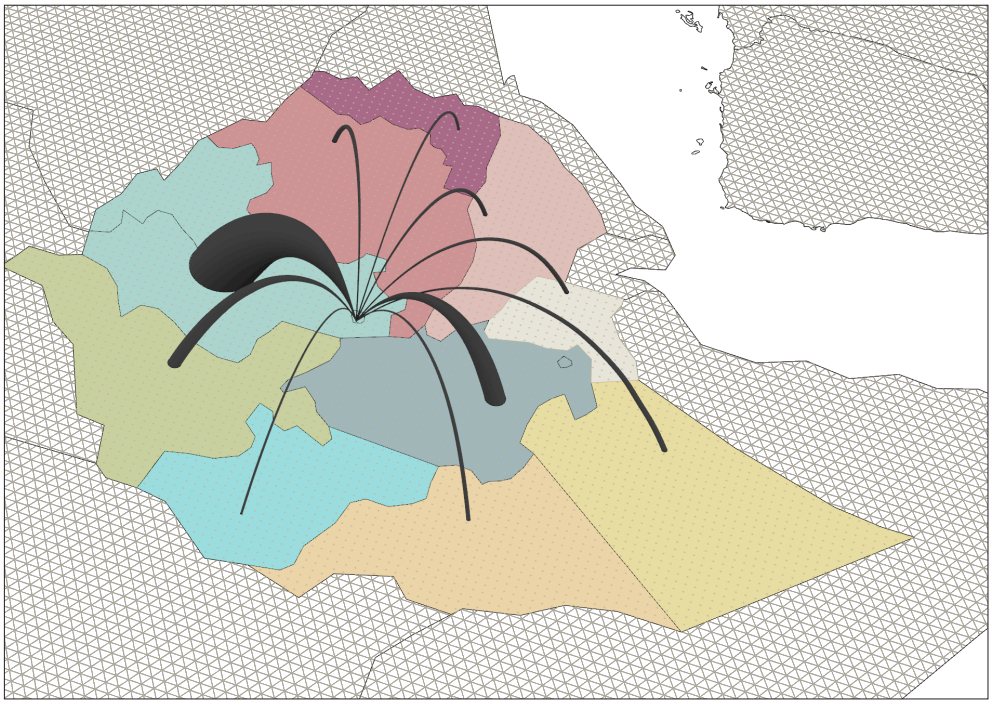

*(Barbero et al., 2020, p. 17)*

*Age distribution in real numbers as of October 2019, the current population of Ethiopia is 112,976,188, based on Worldometers elaboration of the latest United Nations data. Since 1955 the population quintupled from 20 000 000. This diagram clearly visualized the rapid population growth in Ethiopia. This is because infant, child, and maternal mortality have fallen sharply over the past decade, but with the fertility rate only slowly declining, the population continues to grow rapidly. Ethiopia's rapid population growth is putting increasing pressure on land resources, expanding environmental degradation, and raising vulnerability to food shortages. (Barbero et al., 2020, p. 16)*




*(Barbero et al., 2020, p. 39)*

*The ethnic makeup of Ethiopia is defined by a vast diversity of indigenous groups and immigrants from mostly neighbouring African countries. Oromo, Amhara, Somali and Tigrayans make up almost three quarters of the total population. Besides these four major ethnic groups, there are more than 80 different ethnic groups throughout Ethiopia. The Oromos, predominantly concentrated in Oromia Region in central Ethiopia, are the largest ethnic group in Ethiopia, with a share of 34,5% of the total population. The second largest group is the Amhara, inhabiting parts of the northern and central Highlands of Ethiopia, particularly in Addis Ababa and the Amhara Region, constituting more than a quarter of the population. The following two large groups are Tigrie and Somali, both with around 6 percent of the population. In Addis Ababa, the ethnic makeup is still largely made out of the Oromo, Amhara and the Tigrie. In the capital city, the Amhara overtake the Oromo to be the largest ethnic group, with almost half of the city population. Oromo still constitute around a fifth of the city. (Barbero et al., 2020, p. 38) As the city's population rises, so does the tension between different ethnic groups.*



| | | | | | |
|---|---|---|---|---|---|
| 29928 | West Oromaria | 2366 | Amhara | 1345 | Tigray |
| 8751 | East Oromaria | 2175 | North Somali | 964 | South Omaria |
| 5790 | SNNP | 2078 | Afar | | |
| 2482 | North East Somali | 1702 | South Somali | | |

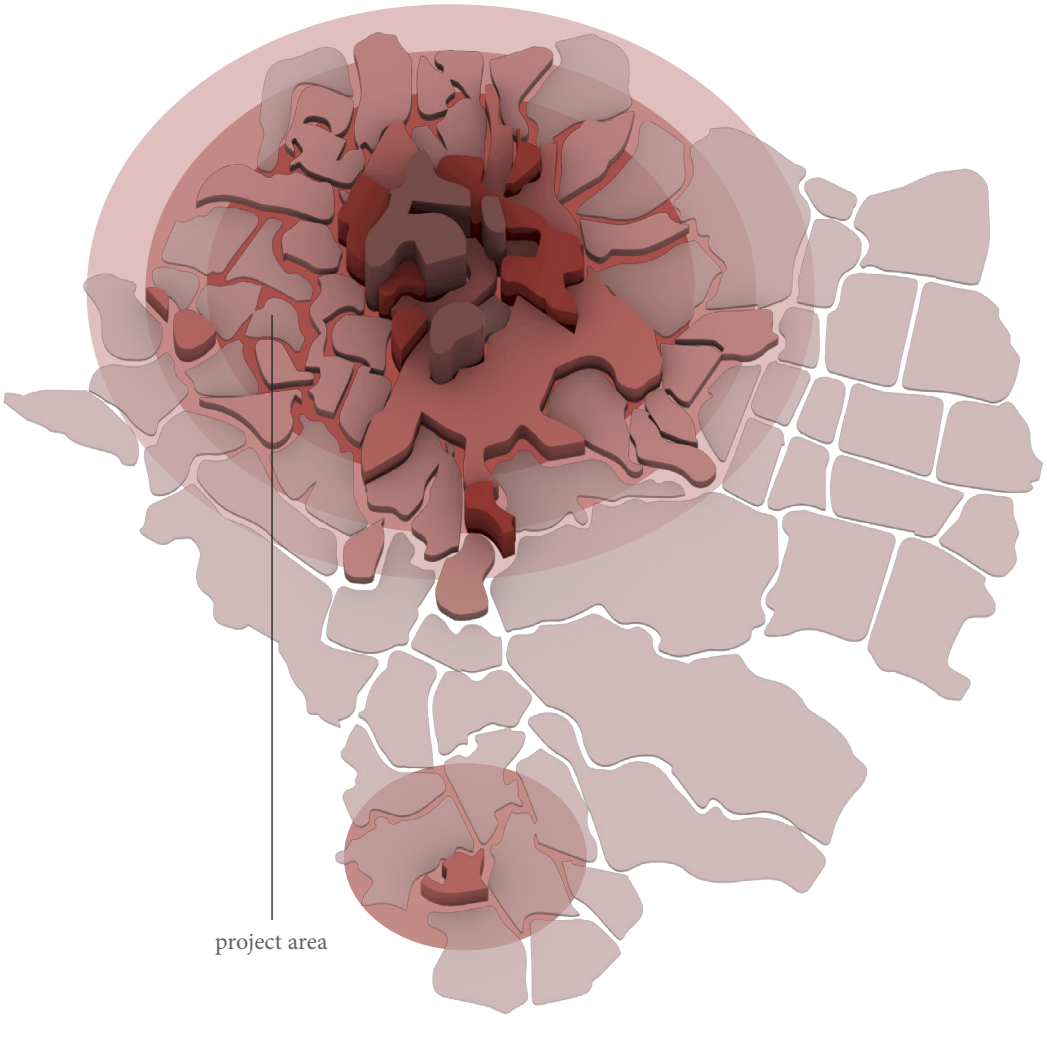
***MIGRATION PATTERNS***

*The diagram above represents national migration flows towards Addis Ababa. This map was created through information provided by WorldPop. Their work is focussed on quantifying human migration patterns at sub-national scales. In brief, the mapping of population movements was done through the use of mobile phone call data records (CDRs). Worldpop organisation shares data collected for many low and middle-income countries. Population flows, displacements and commuting patterns are estimated by tracking individual SIM cards through local phone towers. These numbers are an estimation based on this tracking methods.*

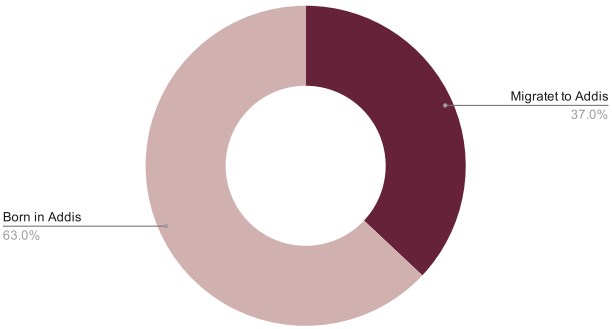
***ADDIS ABABA POPULATION DENSITY***

*In the figure on the right we can see the population densities in Addis Ababa. It can be observed that the central area has higher population. These areas correspond to the old city centre. Lower population density can also be observed in the southern part of the city where these areas are mostly agricultural areas. The two sub-cities Bole (East) and Nefas Silk Lafto (South-West) have large development of new real estate and flourishing suburbs with low population density.*

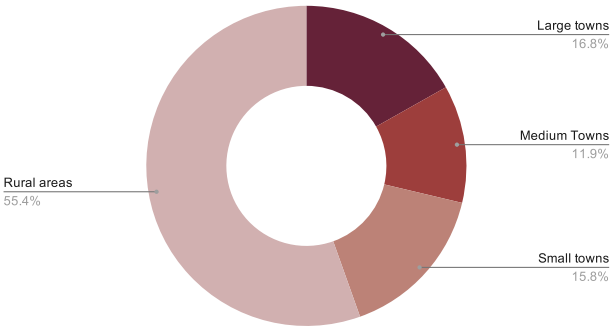
*The project area of Kolfe Keranio is located in the western part of the city, with a relative low density.*


project area
Density [p/sqkm]
101 - 5706
5707 - 15338
15539 - 30395
30396 - 52755
52756 - 95195

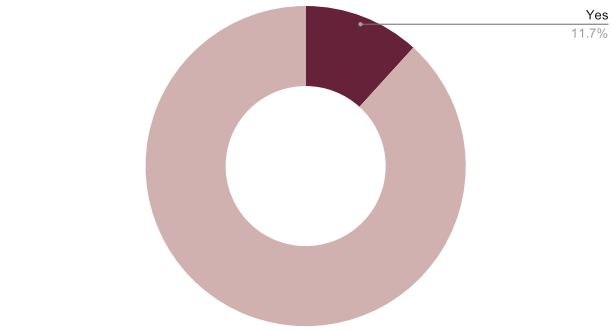
Population Addis Ababa



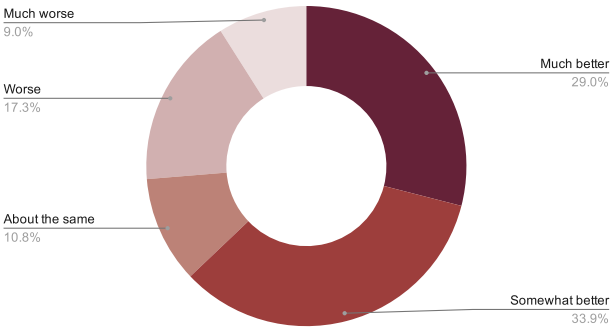

Origin of migrant



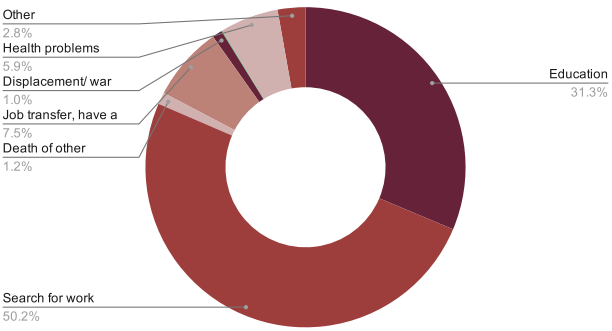

Expext to move within the next three years?



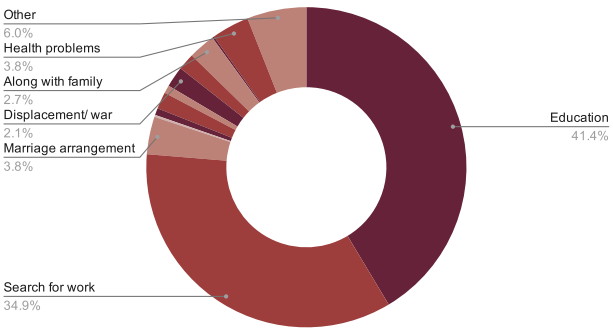

Current life conditions compared to previous condition



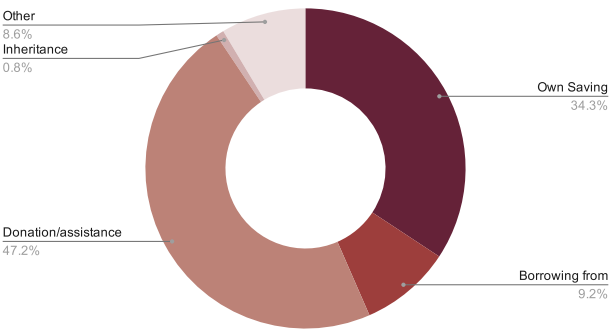

Males vs. Reason to migrate




Females vs. Reason to migrate



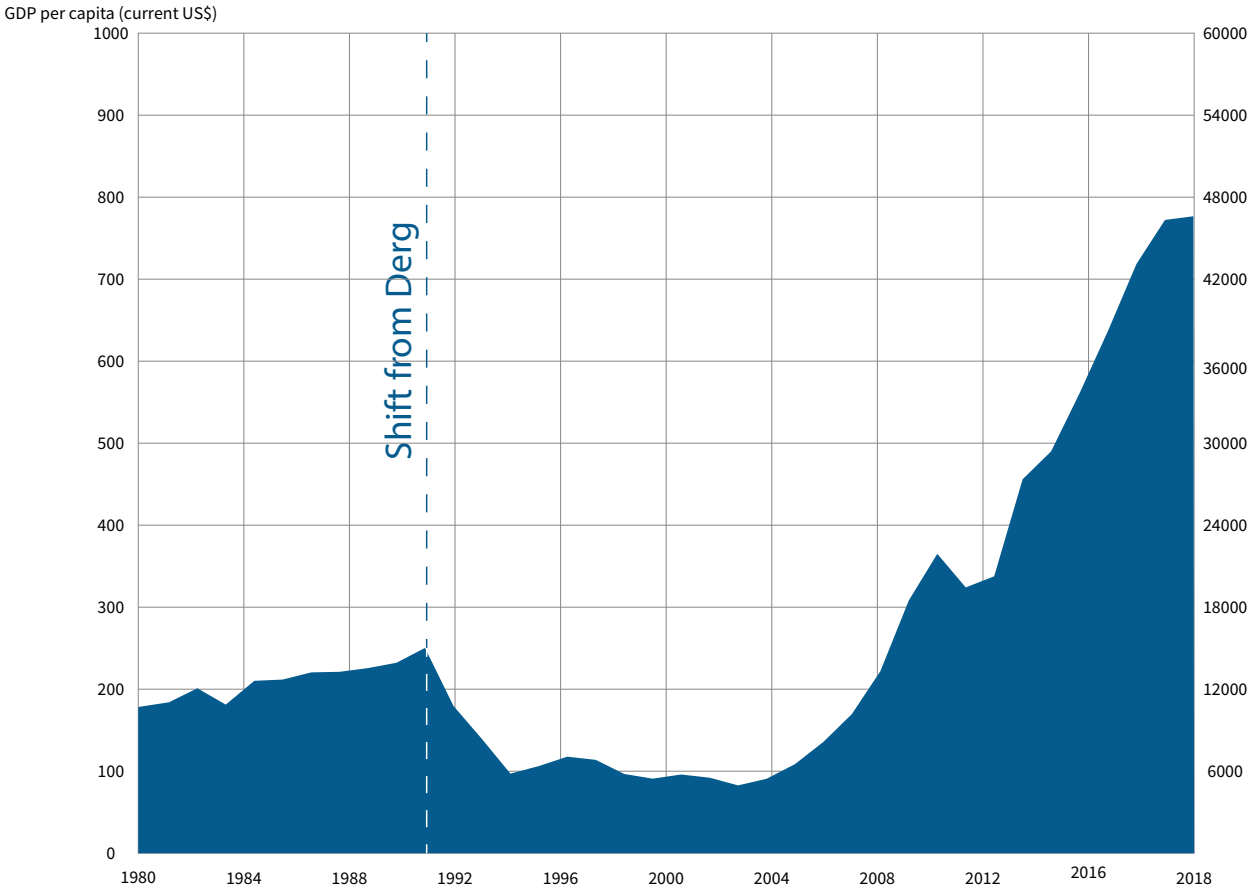

Source of capital for transport cost of migrating




*(Barbero et al., 2020, p. 37)*

## *INCOME LEVEL*

*GDP growth*

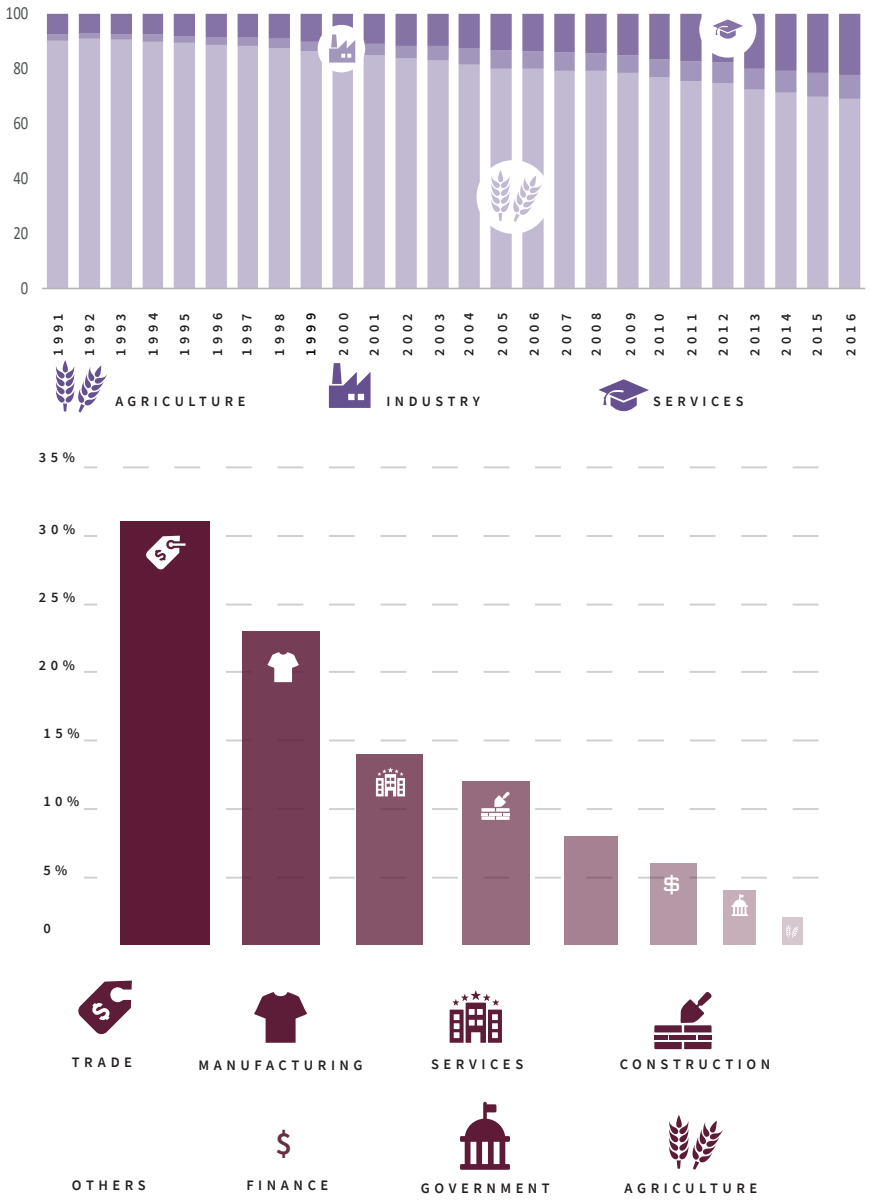



*(Barbero et al., 2020, p. 45)*

*Since the nineties the Ethiopian government has been in the process of privatizing many of the state-owned businesses and moving toward a market economy. During this course the private sector has boosted Ethiopia's GDP to the extent that it is now perceived as the fastest growing economy in the world. The GDP diagram shows a fluctuating GDP which is mainly a result of political changes. After the fall of the Derg regime in 1991, there was a sharp drop in the GDP which did not really recover until 2005. The economic instability regained its balance mainly due to a national focus on production and industrialization also supported by foreign investments. In 2010 these strategies proved successful as the growth reached double digits and has remained to do so until this day. (Barbero et al., 2020, p. 44)*

## *INCOME LEVEL*

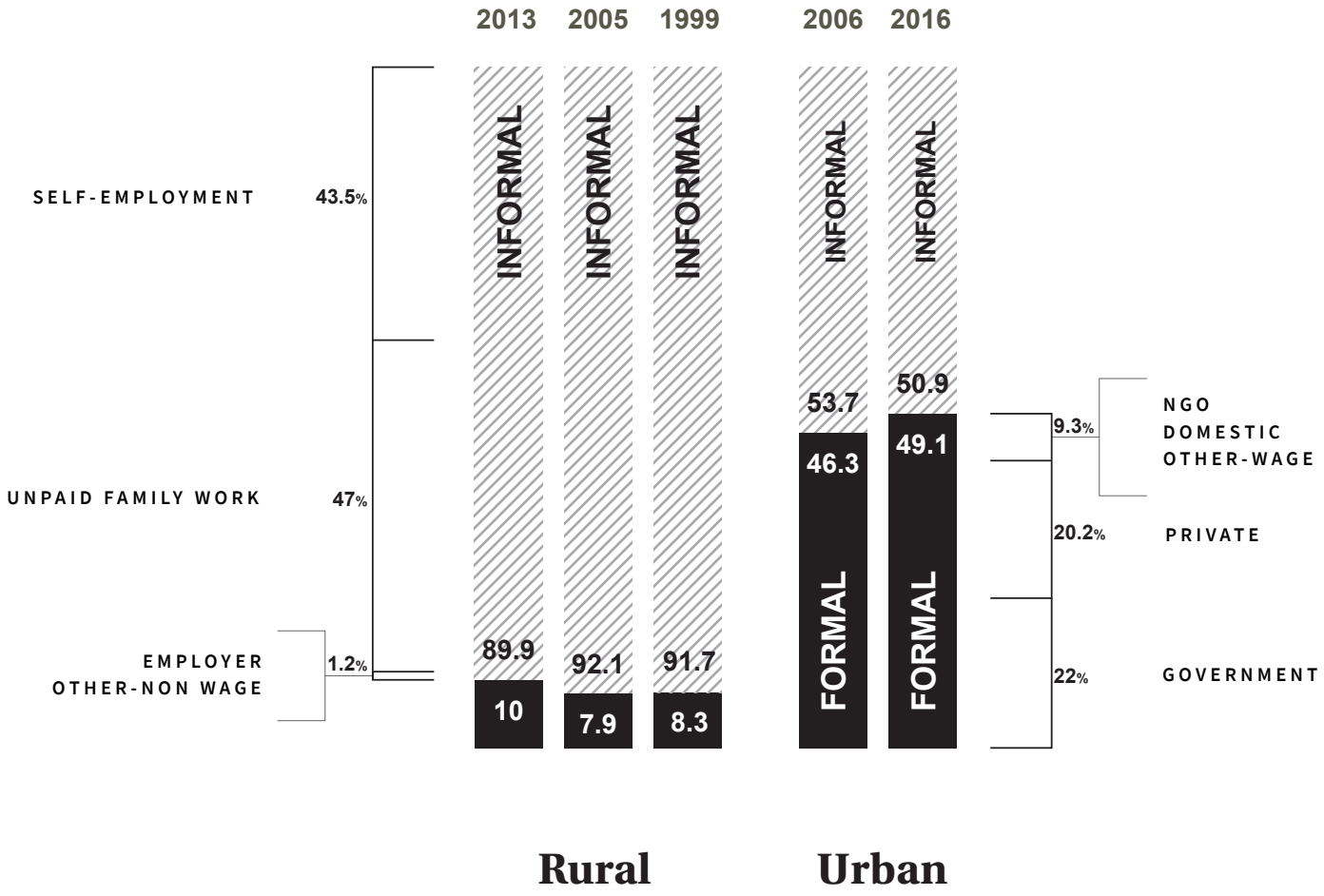
*employment sector Ethiopia and Addis Ababa*




*(Barbero et al., 2020, p. 48-49)*

*As 80% of the total population in Ethiopia remains rural, agriculture is the main source of income for the majority of population. Still nowadays, more than 70% of the total working population is employed in the agricultural sector, whereas the other two sectors employ the 30%. The service sector has had an important increase since the 1990's, employing 20% of the population, and today, as it is seen on the graph Percentage shares of GDP, has become the principle source of the GDP. However, retail prevails, and with it, informality (World Bank, 2018). On the other hand, the industry sector which represents just the10% of the employed population has emerging as a very fruitful business. On it, construction and manufacturing will enhance productivity and will improve the livelihood and living conditions of the population. By contrast, in Addis Ababa, the service sector employs the majority of the population within the trade and manufacturing sub-sectors (30% and 23% respectively), whereas the urban agriculture do not exceed more than 5% of the employments.*

***INCOME LEVEL***
*informal and formal in rural and urban*

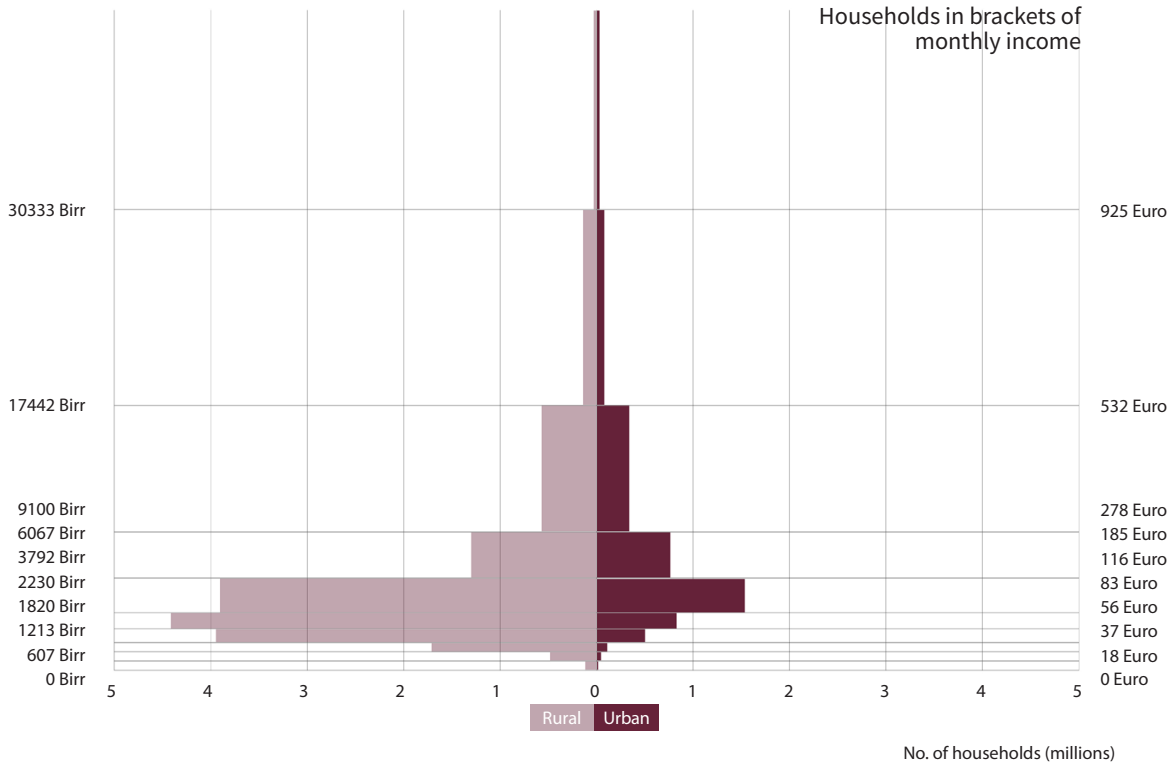



*(Barbero et al., 2020, p. 50-51)*

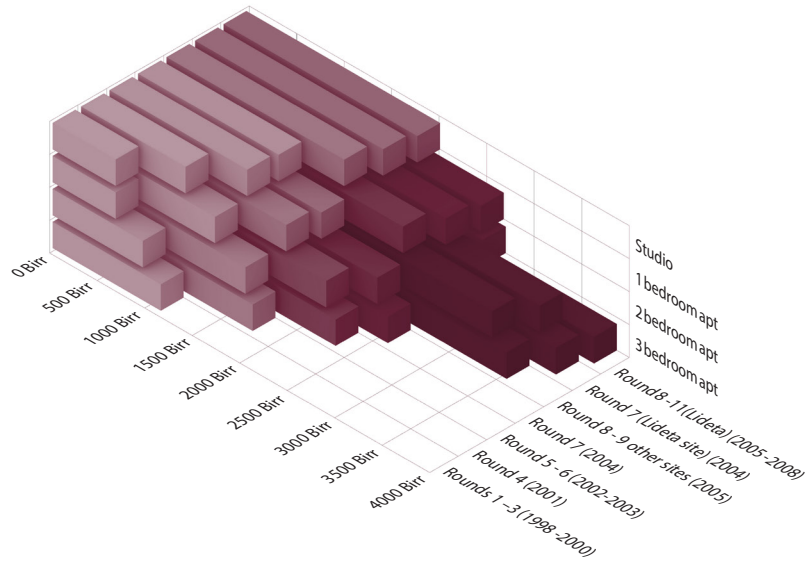
*The difference between rural and urban is strikingly clear in the percentages of formal and informal section. Due to lack of education, under-managed organisation and other reasons, informal sector remains a large form of employment in the rural area. As one might expect, in the urban area the percentage of formal employment increase significantly. What is striking though is the still very large presence of informal economy. Even in a decade's time, the informal section only declined by 3%, but given the growth of the economy of Addis Ababa, the absolute amount of informal employment might even have gone up. This indicate the resilience of informal sector and the amount of people that still relies on it.*

## *INCOME LEVEL*

*monthly income and affoardability of comdominium*




*(Barbero et al., 2020, p. 53)*




*(Barbero et al., 2020, p. 63)*

*The majority of Ethiopian households can be classified as low-income group, with a monthly income 83 euro. The rural area generally has more households in a lower income bracket. The income of the lowest bracket only ranged from 0 to 18 euro, while the highest brackets have a income of 925 euro or more. (Barbero et al., 2020, p. 52)*

*Shown in the seconnd graph, the rise of monthly mortgage payments for different types of condominium housings. In the Low-Cost Housing program (LCH), a predecessor of the Grand Housing program, condominium projects gradually increase the monthly mortgage unit prices. UN-Habitat explores the household monthly mortgage expenditure as a proportion of household income. 41.3% of the respondents spend more than 30% of their income on mortgage. Given the prevalence of low incomes and depressed wages in the context of developing countries, even spending 30% of income on housing, let alone a higher share, is not sustainable. (Barbero et al., 2020, p. 62)*

## *SOCIAL-ECONOMIC INSTRUMENTS*

*idir and ekub*



*For a long time in history, Ethiopians have lived in tribal clusters, concentrating a limited number of people (tens to hundreds) into villages, inhabiting a vast open field. The small number of people meant that the social ties are strong. The limited resources meant that collaboration in all works of life are essential to survive. This has led to the creation of different kinds of social-economic organisational instruments. To understand the Ethiopian ways of life it is important to also to understand these instruments and how they contribute to the interaction within communities.*

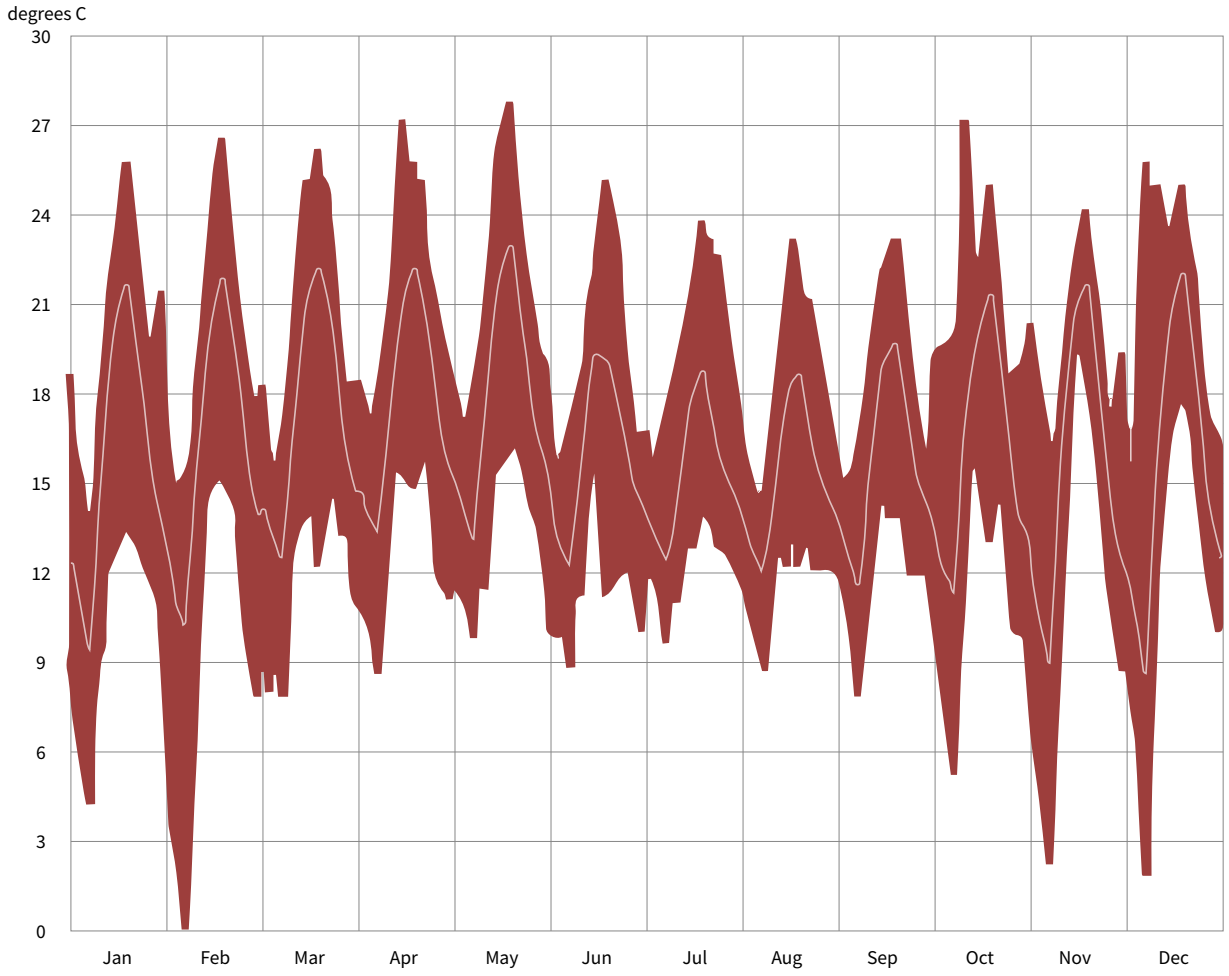
*An idir is a traditional social construct, in which a group of people within the same tribe, neighbourhood, company, etc. come together to organise and fund collectively, marriages, funerals, celebrations, etc. Idir can function as an organisational tool that binds together a collective of people from different households. On the financial side, idir can be characterize as a group life insurance. The difference with an actual group life insurance is that within a socially connected idir, members would even partake in organising the events rather than just funding it financially. To define more clearly, an idir is the combination of a group life insurance, funeral association, marriage and event organisation.*

*An ekub is an Ethiopian variety of a financial practice found throughout the world, in modern term a 'rotating credit association'. Ekub is the traditional financial instrument to collect a set amount of money in a pool and distributing it monthly (or any agreed time period) to one participant, until all participants have received what they have put in. The main purpose is to collect a large sum of money in a short amount of time, enabling a participant, particularly a poor one, to obtain the necessary funding for activities such as weddings, building a house, or starting a micro-business. The rotating fund is a means, particularly for poor people, to make investments that they would normally never consider making due to lack of money. Ekub is more flexible and accessible than banks and requires minimal paperwork. As a result, people without formal education are not discouraged to join. (Bekerie, 2003)*

*It's important to understand that these practices are informal and bottom-up, but its participation are not restricted by class or income level. These instruments are practiced as commonly in the kebele housing as between the board members of major corporations.*

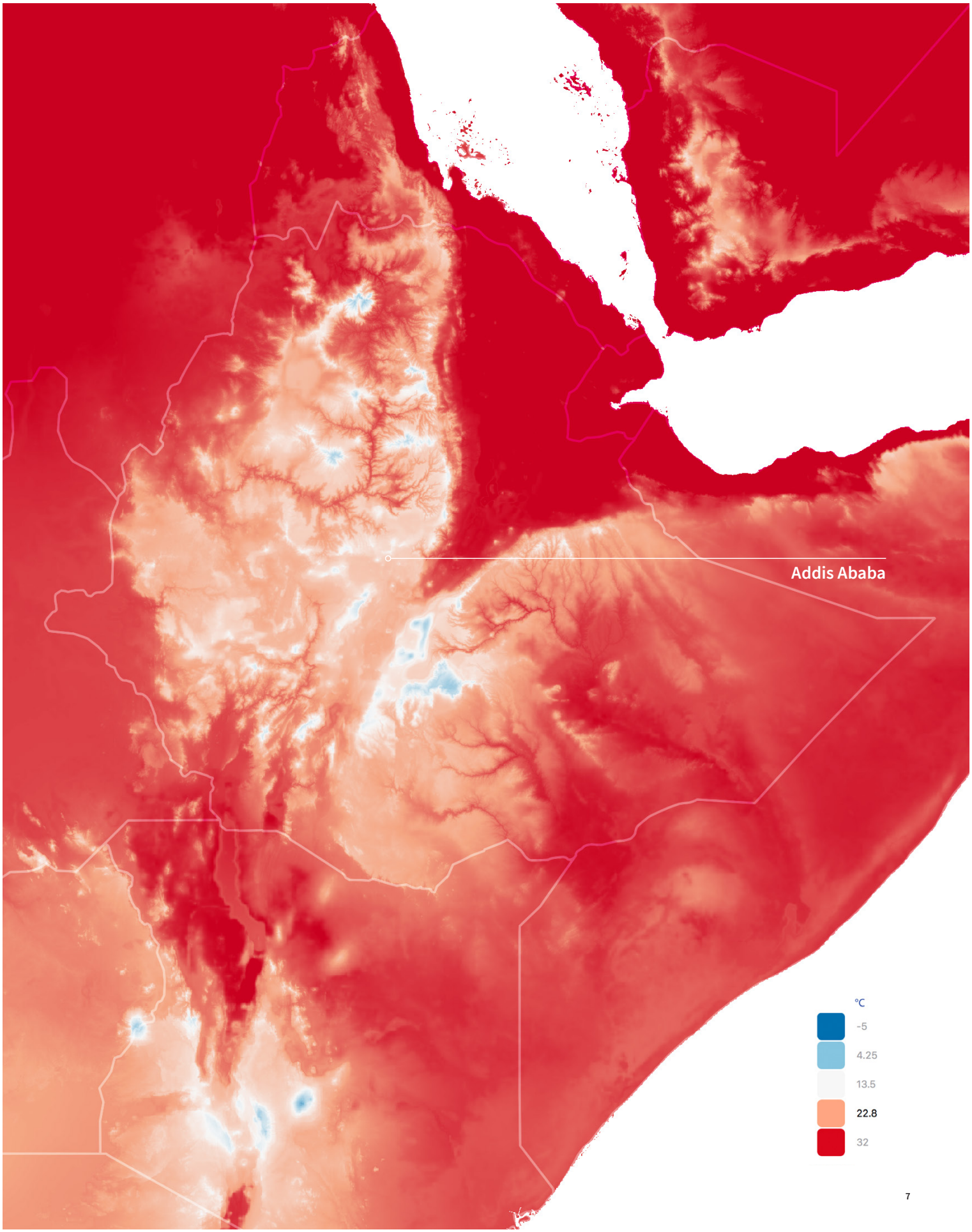
## *CLIMATE*

*subtropical highland climate*




*(Barbero et al., 2020, p. 6)*

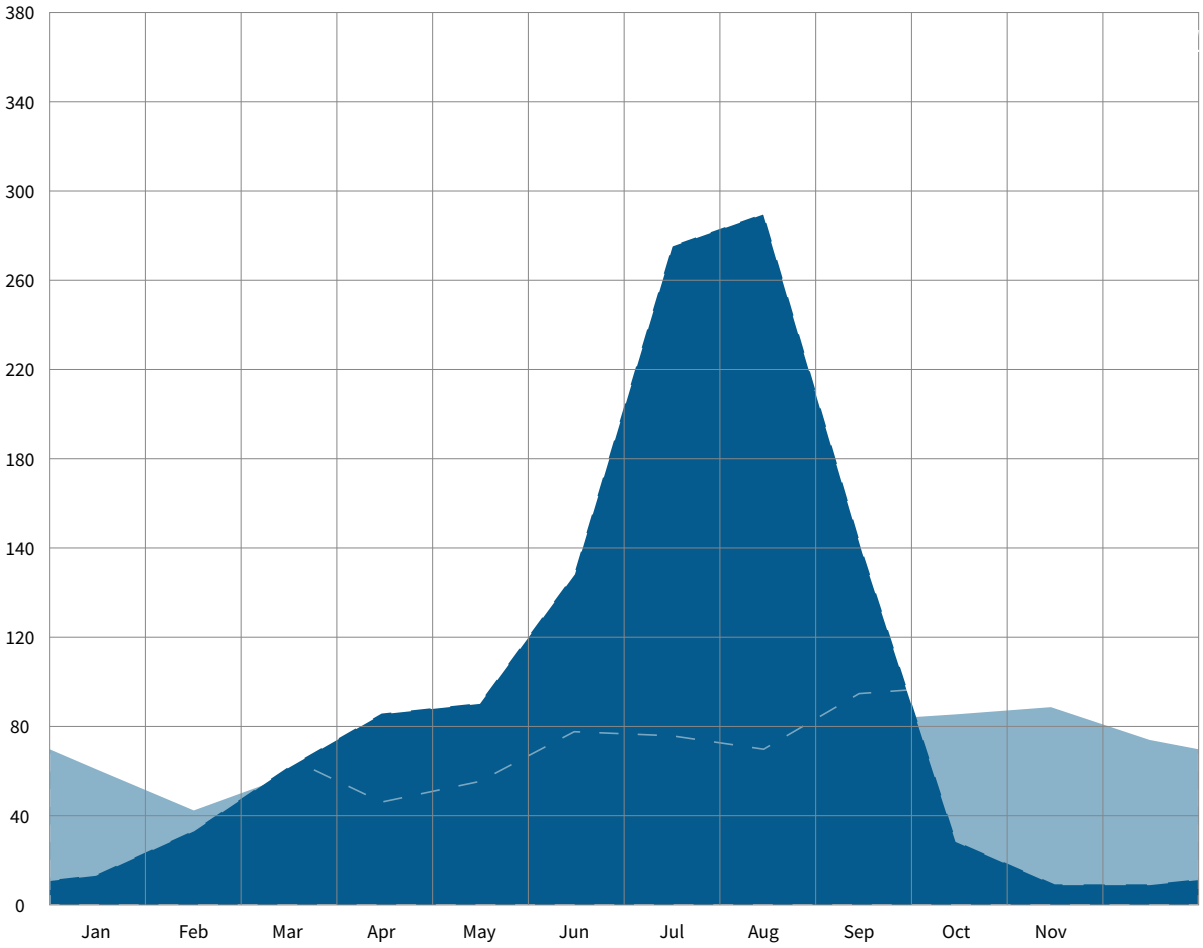
*There are multiple different climatic regions in Ethiopia, types ranging from equatorial desert to a humid subtropical climate. The altitude plays a major role in these differences in climate. Addis Ababa is situated at an elevation of around 2400 meters and has the climatic type of a subtropical highland climate. In the diagram the maximum and minimum temperature range of Addis Ababa. On the horizontal axis the months within a year are shown, and within every month an average 24-hour cycle is plotted. The average temperature of 16 degrees Celsius doesn't change so much during the year, though during the summer season there's a little drop. (Barbero et al., 2020, p. 6)*




7

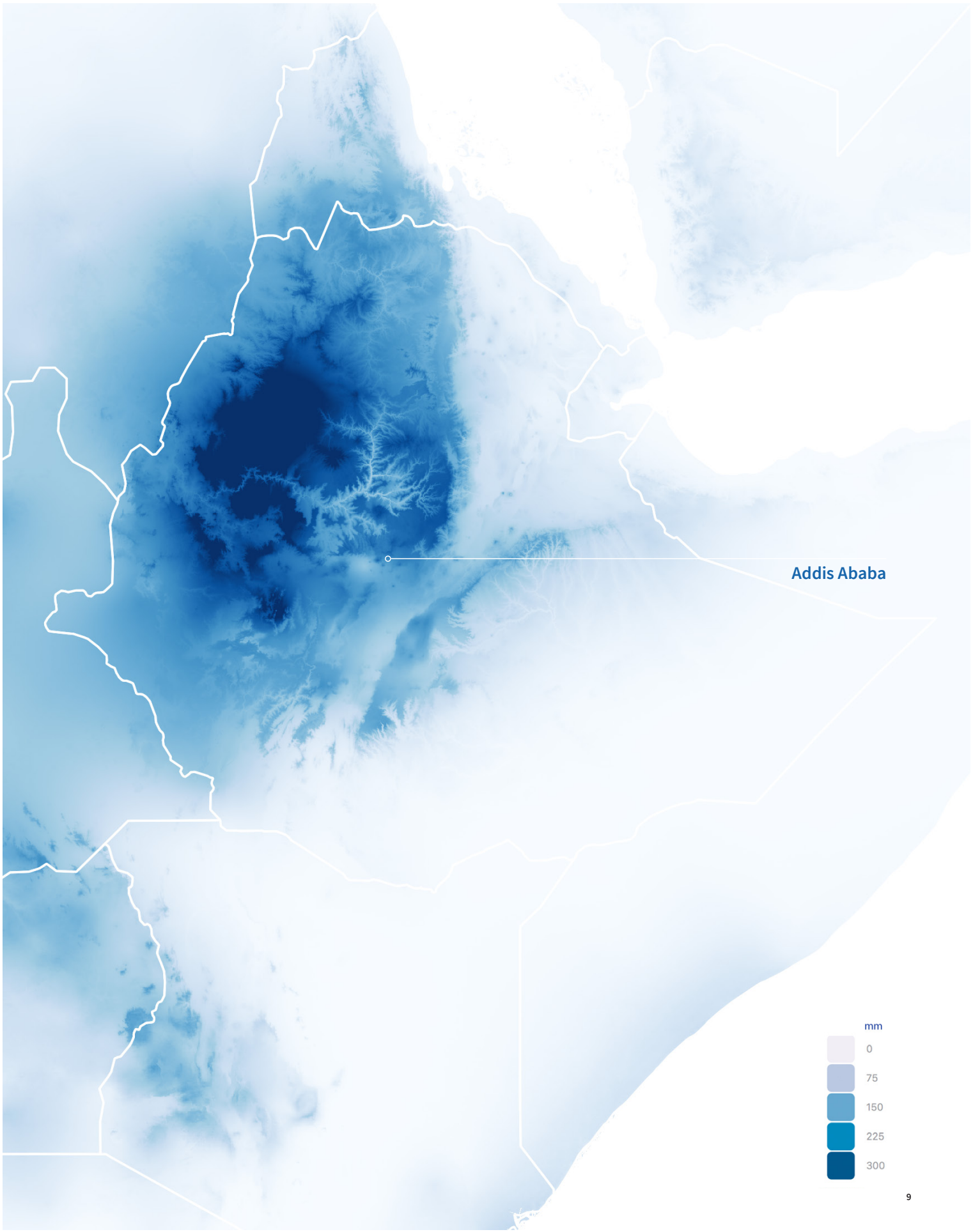
## *CLIMATE*

*wet summer, dry winter*

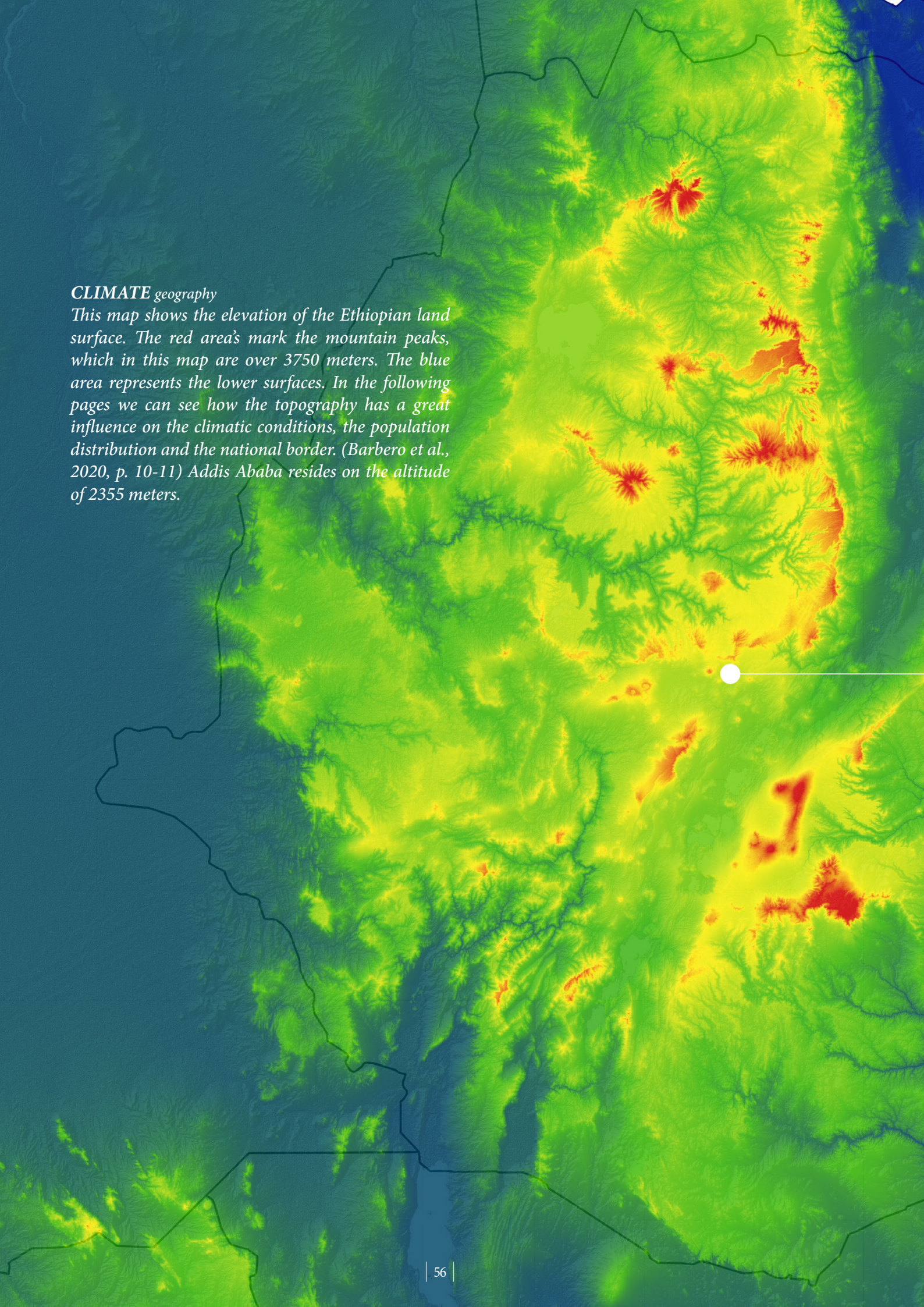



*(Barbero et al., 2020, p. 8)*

*Addis Ababa has two seasons: a wet summer and a dry winter. Above, the dark blue graph shows the monthly precipitation in Addis Ababa. In the months of July an August it can rain up to almost 300 mm per month. For a comparison a lighter blue precipitation graph on the background is plotted, which shows the monthly precipitation of Amsterdam. The map on the right shows the rainfall in the month of July. You can see the strong correlation between topography and precipitation. (Barbero et al., 2020, p. 8)*

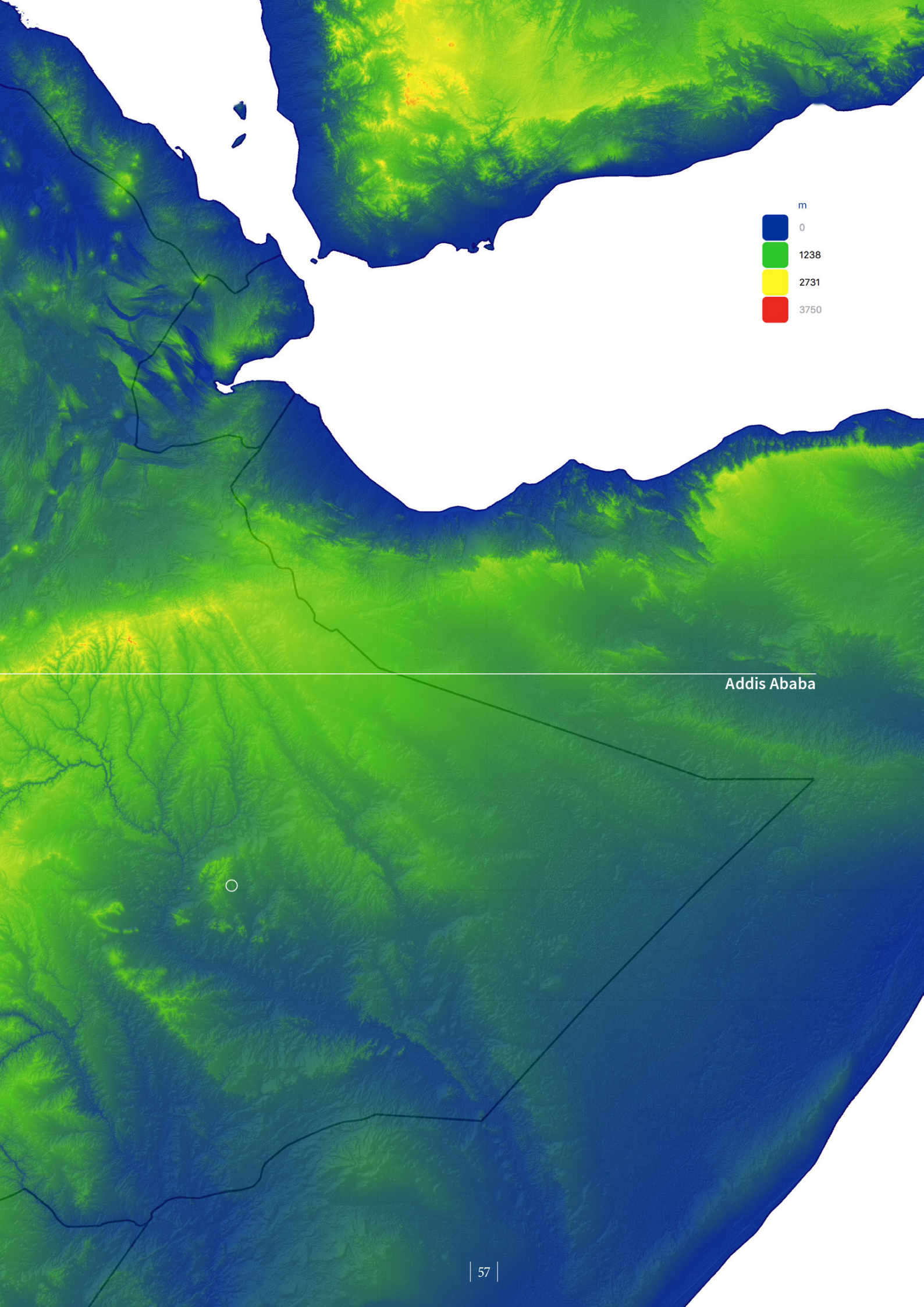


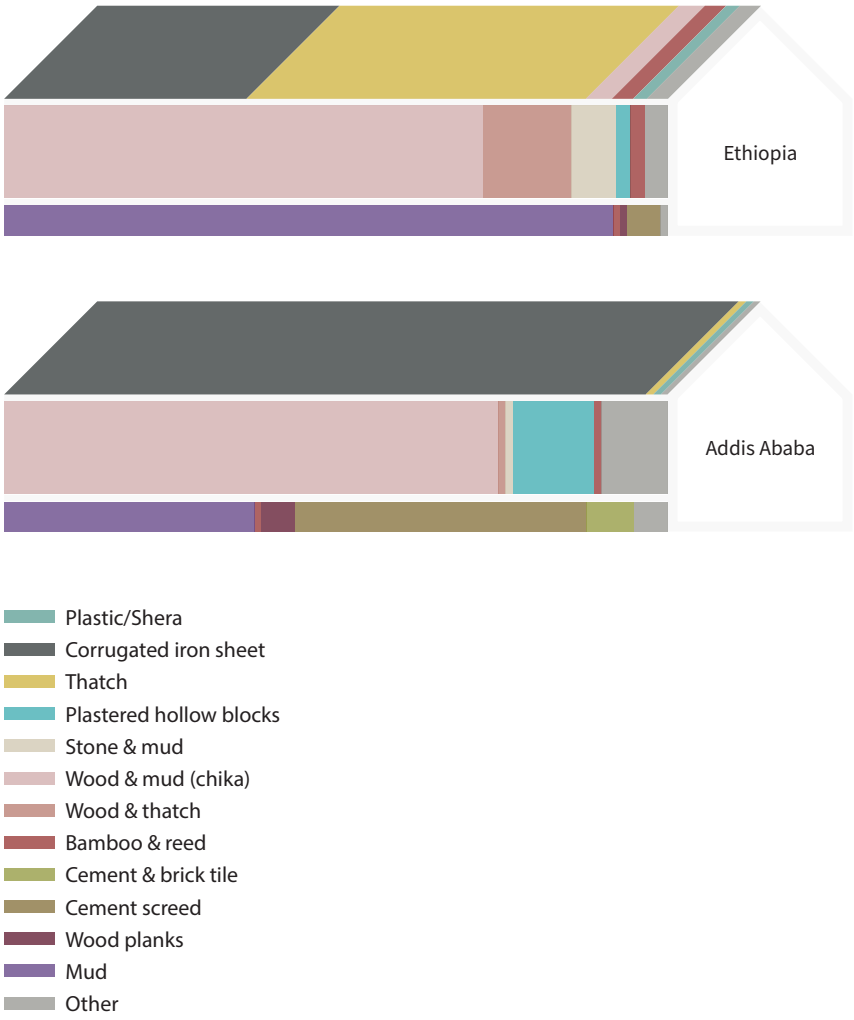

9



***CLIMATE** geography*

*This map shows the elevation of the Ethiopian land surface. The red area's mark the mountain peaks, which in this map are over 3750 meters. The blue area represents the lower surfaces. In the following pages we can see how the topography has a great influence on the climatic conditions, the population distribution and the national border. (Barbero et al., 2020, p. 10-11) Addis Ababa resides on the altitude of 2355 meters.*

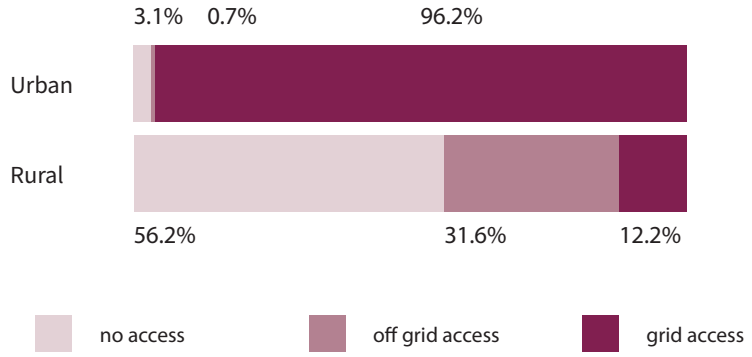

m
0
1238
2731
3750
Addis Ababa



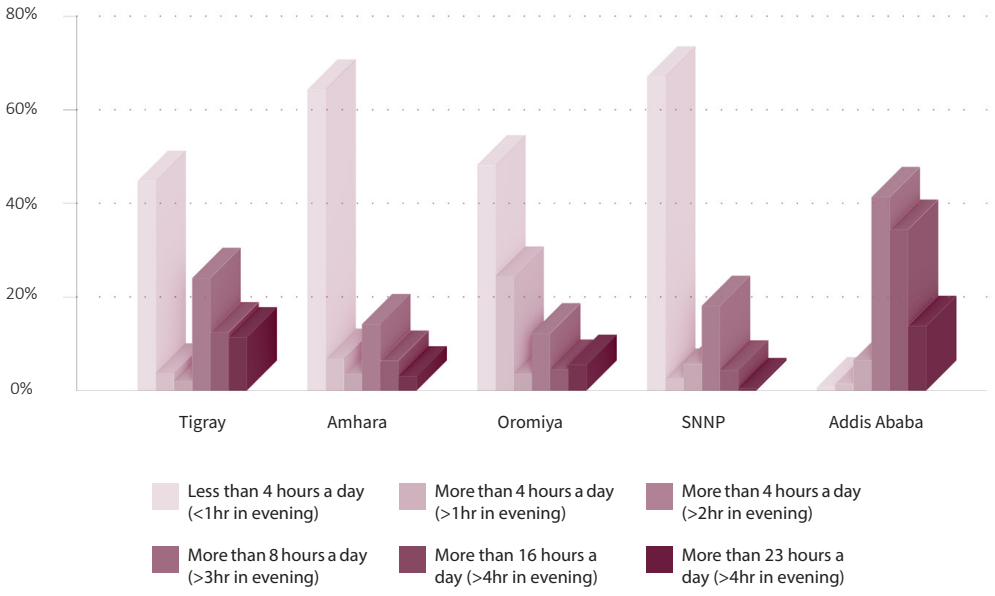

*(Barbero et al., 2020, p. 65)*

*The prevalence of construction materials in each region are based primarily on the accessibility in the direct surrounding and the climate in which the building is constructed. The primary roof construction material in Ethiopia, especially in rural area, are predominantly constructed in thatch. 37 % of all roofs in Ethiopia are constructed with corrugated iron sheets. Looking at Addis Ababa the share of corrugated iron sheets as roof spiked to around 98%. For wall constructions, the combination of eucalyptus wood and mud forming the traditional "chika" walls account for 73.6% of the building material of all the residential buildings in Ethiopia. Wood and mud wall construction is especially common in central- and western Ethiopian region like Addis Ababa, where the houses of more than 65 percent of the total regional population have walls constructed with these materials. Another material used in large part of Addis Ababa is the plastered hollow block construction in the condominium projects, accounting for 13% of the construction materials. Mud is the most prevalent as a floor material throughout Ethiopia, with a share of 92% of the total floor construction. Addis Ababa is one of the few places where a significant amount of cement floors (almost 40%) are used. (Barbero et al., 2020, p. 64)*

Accessibility of electricity ; differences in urban and rural




Accessibility of electricity in different Ethiopian regions, divided in tiers of access

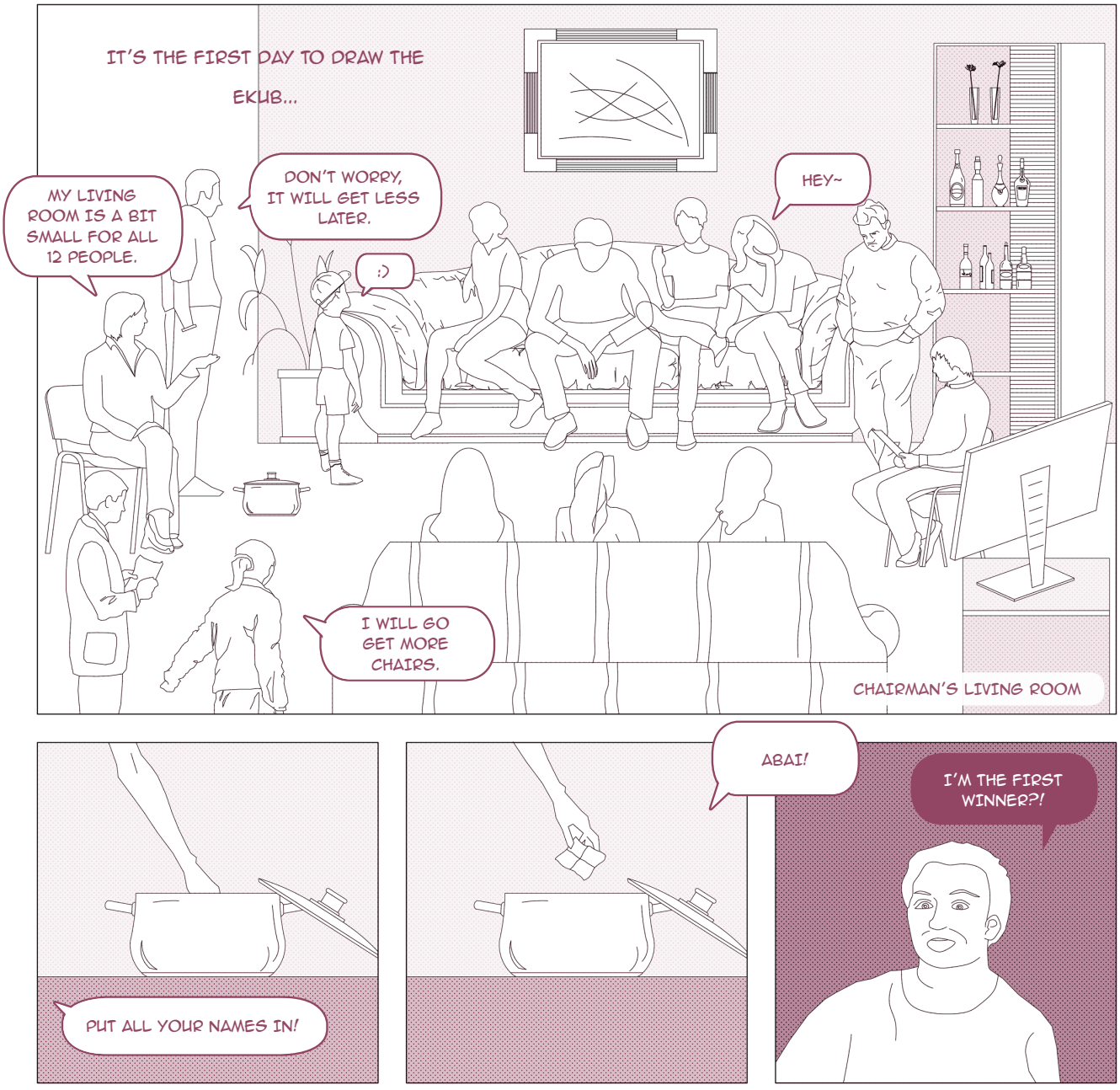


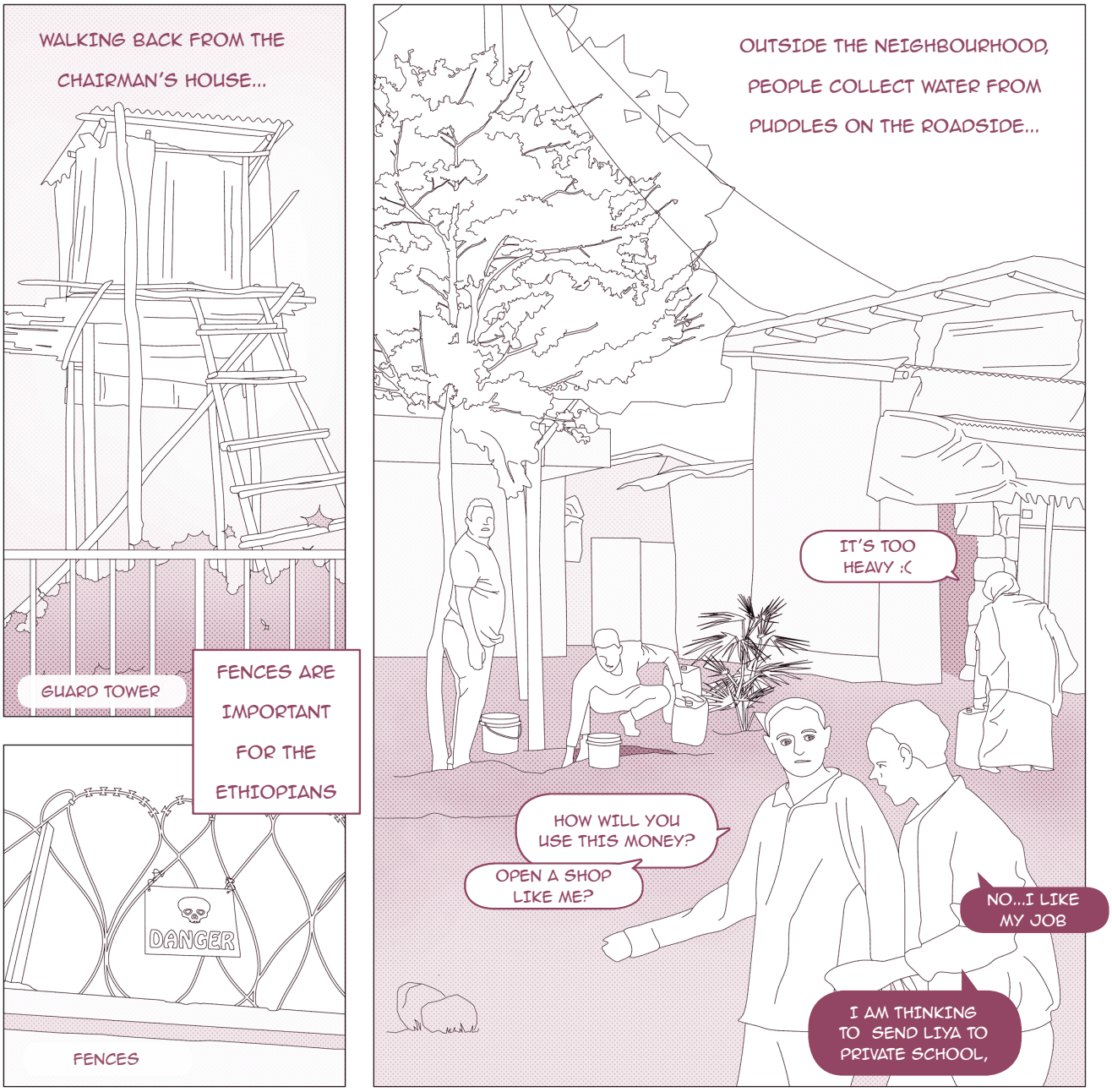

*(Barbero et al., 2020, p. 71)*

*In the electricity access there are huge differences to be found between the rural and urban context. In urban areas, more than 96% of the inhabitants have access to grid electricity, although it might not be a reliable access. In the rural area however, only 12 % have grid access. Almost a third of the population still relies on the informal ways of generating electricity like solar lantern, solar home system, solar lighting system, and to a less extend rechargeable batteries, mini-grid and generator. More than half of the rural population doesn't even have any access to electricity at all. Here we can conclude that access to electricity is mainly a rural problem, stemming from the fact that grid access is still unreachable for most of the rural inhabitants. When we divide the electricity access into different tiers, we can showcase the difference in each region. In Tigray, Amhara, Oromiya and SNNP, the biggest group have access to electricity for less than four hours a day and less than one in the evening. In Amhara and SNNP it's even the majority. In stark contrast to this is the accessibility in Addis Ababa. Majority of people have at least 8 hours a day access to electricity. (Barbero et al., 2020, p. 70)*

## *GRAPHIC NOVEL*

*As part of the research in trying to understand the relation between people and building, a series of interviews were conducted during the site visit in Addis Ababa. The findings were then processed, and the results were then transformed into a graphic novel. Linked to the praxeological study field, this graphic novel's aim is to present a fiction based on real life experiences. It will show three families and how their life developed after participating in an ekub and received a large sum of money. Their choices in how to use this money is directly related to their social-economic status. In the course of the story, the architectural environment will develop together with the families.*

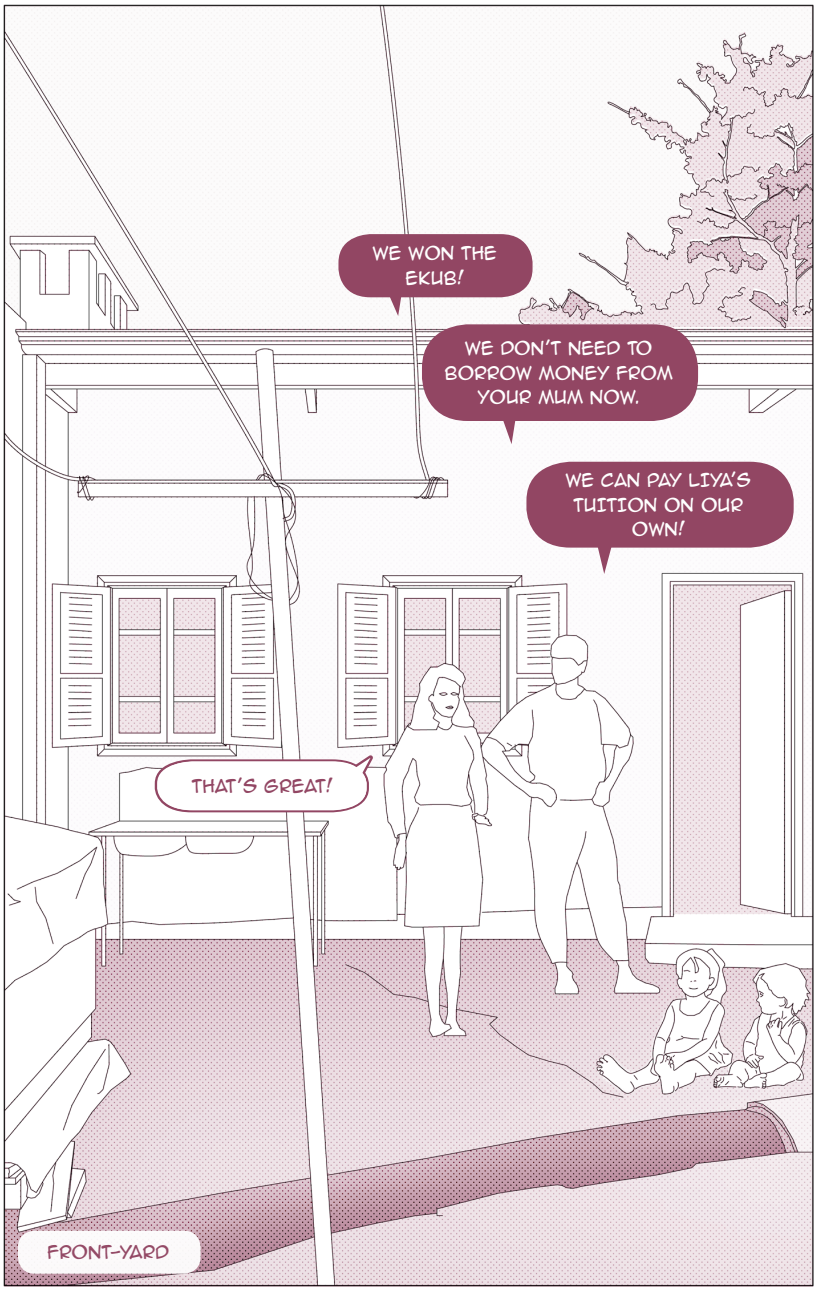

IT'S THE FIRST DAY TO DRAW THE EKUB...
MY LIVING ROOM IS A BIT SMALL FOR ALL 12 PEOPLE.
DON'T WORRY, IT WILL GET LESS LATER.
:)
HEY~
I WILL GO GET MORE CHAIRS.
CHAIRMAN'S LIVING ROOM
PUT ALL YOUR NAMES IN!
ABAI!
I'M THE FIRST WINNER?!


WALKING BACK FROM THE CHAIRMAN'S HOUSE...
GUARD TOWER
FENCES ARE IMPORTANT FOR THE ETHIOPIANS
DANGER
FENCES
OUTSIDE THE NEIGHBOURHOOD, PEOPLE COLLECT WATER FROM PUDDLES ON THE ROADSIDE...
IT'S TOO HEAVY :(
HOW WILL YOU USE THIS MONEY?
OPEN A SHOP LIKE ME?
NO...I LIKE MY JOB
I AM THINKING TO SEND LIYA TO PRIVATE SCHOOL,


COFFEE
I NEED SOME FRUITS.
COFFEE~~
MOST OF THE COMMERCIAL ACTIVITIES ARE ON THE BORDER ALONG THE MAIN ROAD.
GATES ARE SELF-CONSTRUCTED BY THE RESIDENTS OF THIS NEIGHBOURHOOD.
IT'S A NEW OFFICE BUILDING
SO TALL!

ABAI PASSED BY THE PARK WHERE HE USED TO PLAY AS A KID. JUST LIKE WHAT HIS DAUGHTERS ARE DOING NOW.

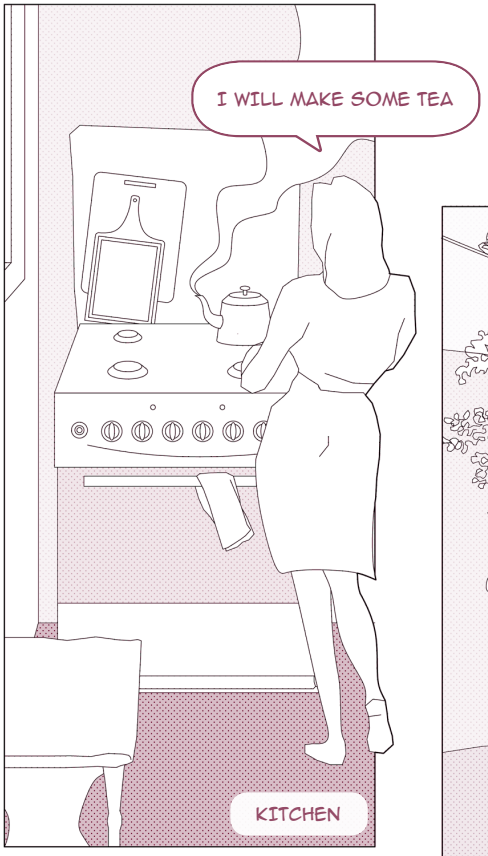





THE FRONT-YARD IS A PLACE FOR CHEREN, WHERE SHE DOES MOST OF THE HOUSEWORKS, LIKE WASHING AND HANGING CLOTHES.




LIKE MANY OTHER ETHIOPIAN FAMILIES, ABAI ALSO HAS AN OUTDOOR TOILET IN HIS COURTYARD, WHICH IS BUILT INFORMALLY BY HIMSELF.



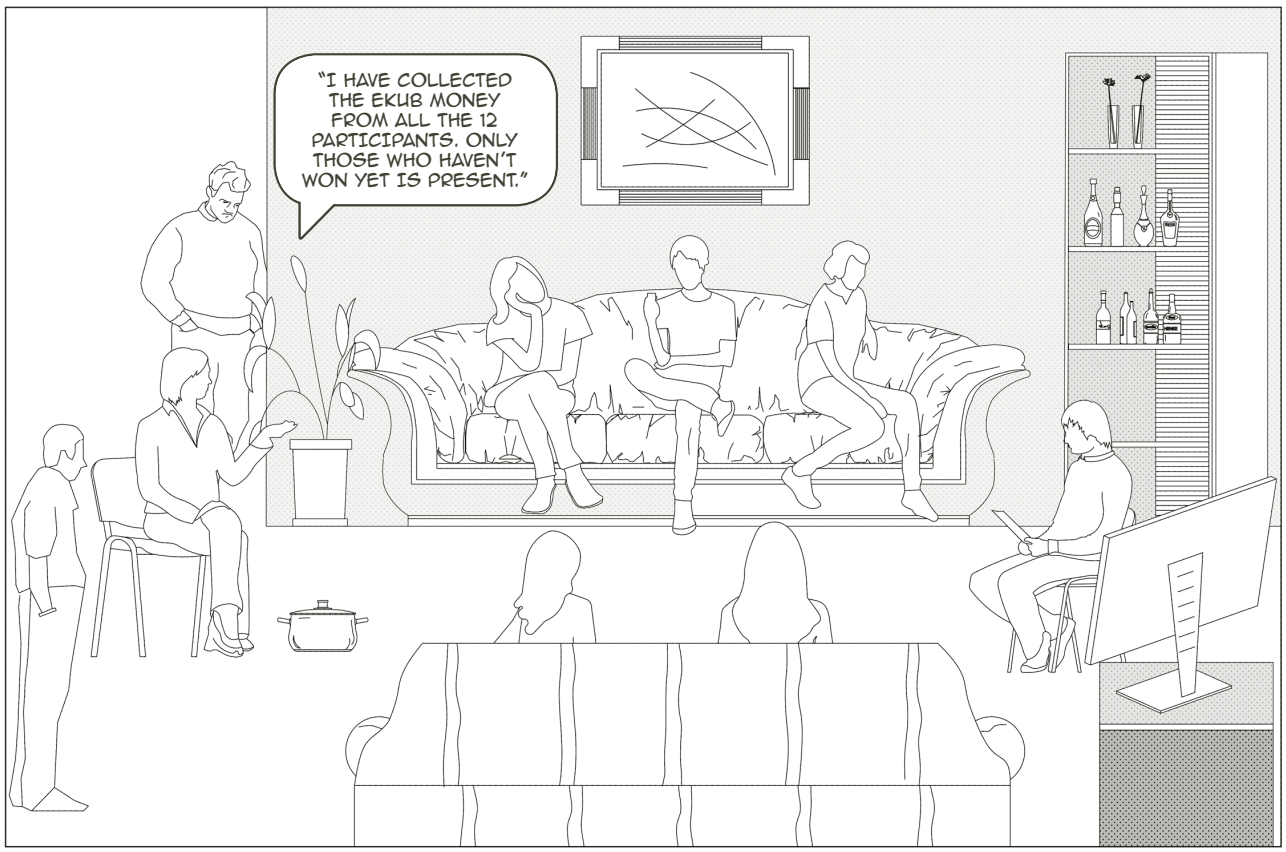




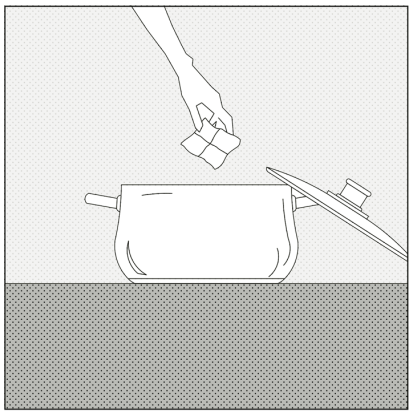
HOMEMADE GINGER TEA IS THE FAVORITE OF THIS FAMILY, AND THE THING THEY NORMALLY TREAT THEIR GUEST WITH.




THEIR LIFE IS GOING ON, TOWARDS A PROMISING FUTURE...


"I HAVE COLLECTED THE EKUB MONEY FROM ALL THE 12 PARTICIPANTS. ONLY THOSE WHO HAVEN'T WON YET IS PRESENT."

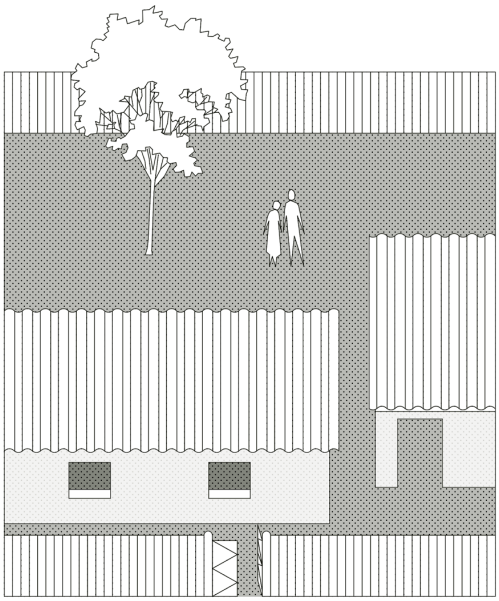

"NOW LET'S DRAW THIS MONTHS WINNER"



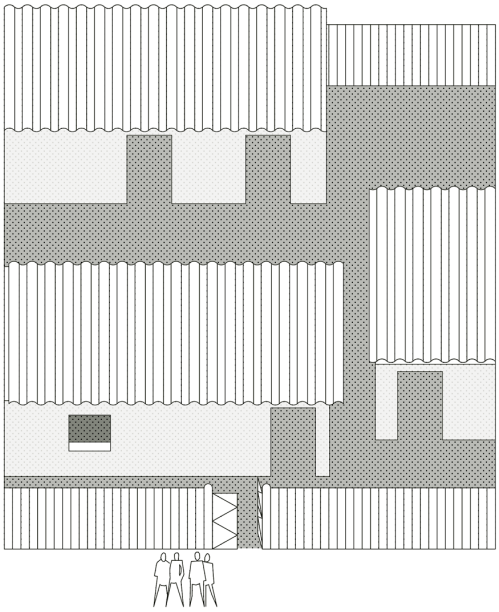

"ERMIAS!"

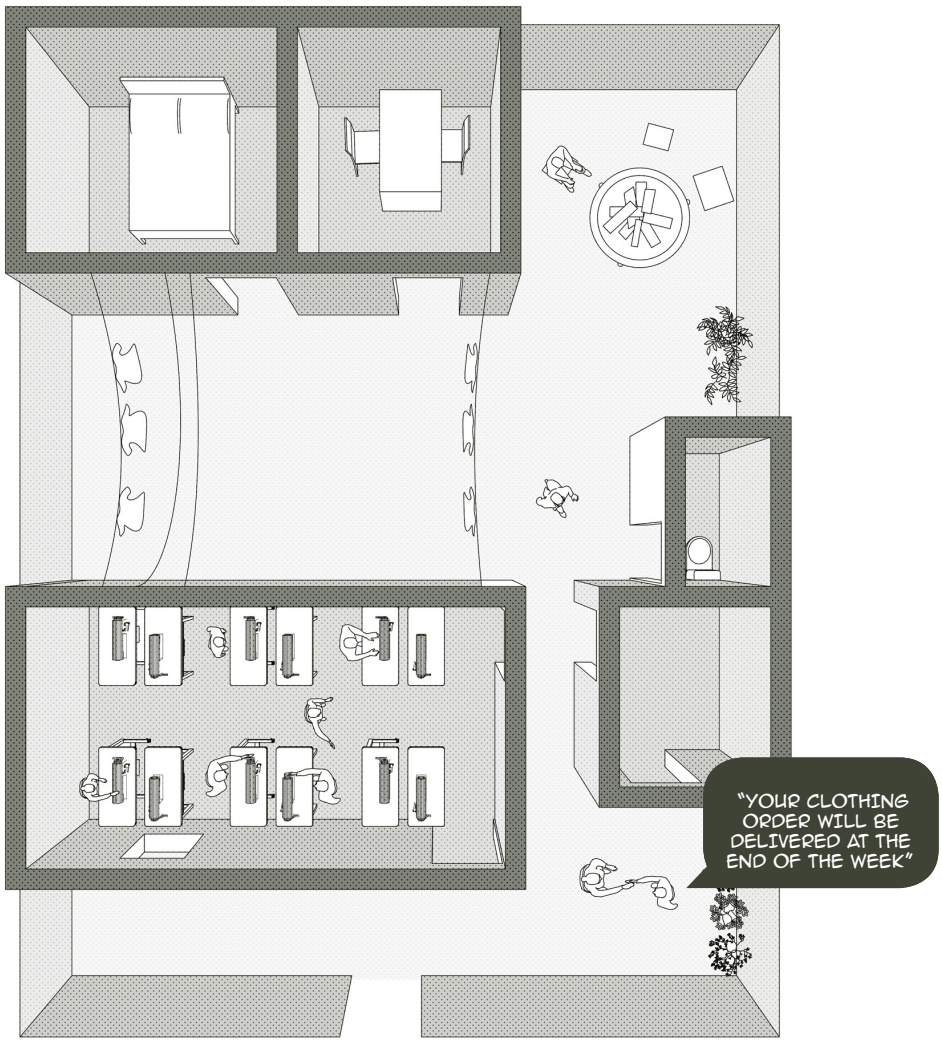

"WE HAVE WON! WE HAVE WON! TIGISTI, WE HAVE WON THIS MONTH!"
"THAT'S GREAT ERMIAS, WE CAN FINALLY START OUR OWN BUSINESS!"

AS AN URBAN MIGRANT FROM THE RURAL AREA. ERMIAS MARRIED WITH TIGISTI AND START LIVING TOGETHER IN TIGISTI'S OLD FAMILY HOME IN KOLFE. THIS FAMILY HOME HAVE A CORE UNIT WITH TOILET AND KITCHEN ON THE SIDE. THE BIG BACKYARD WAS USED BY TIGISTI TO EARN MONEY BY WASHING CLOTHES FOR OTHERS.

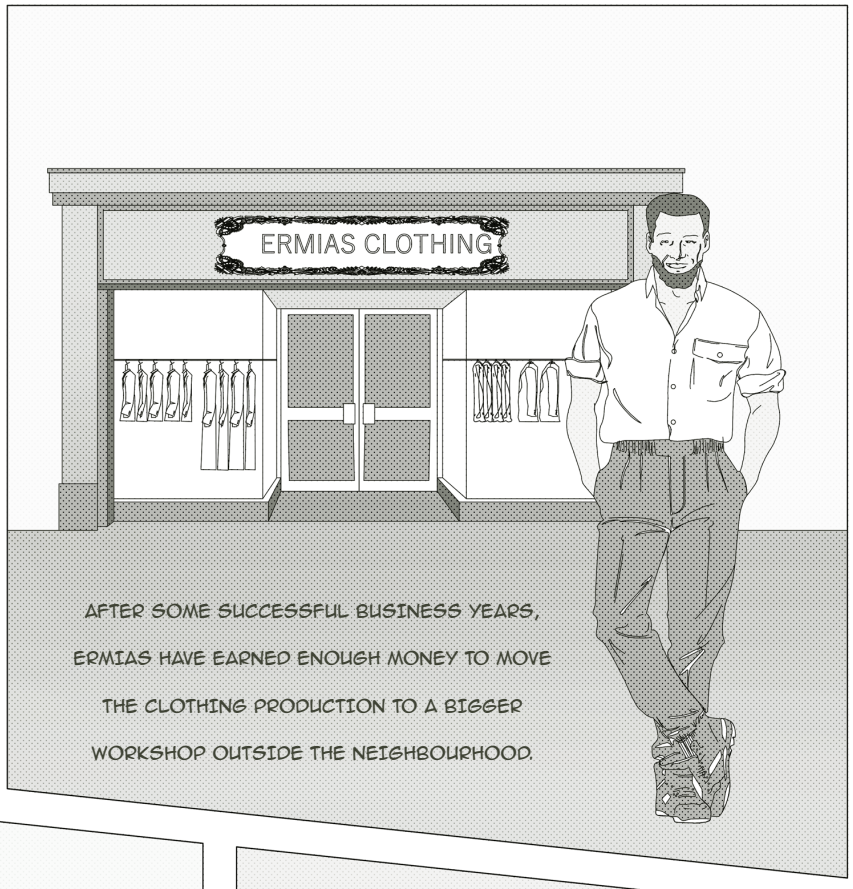


PLANNING ON MAKING MORE MONEY, ERMIAS WANTS TO ADD NEW BEDROOMS AT THE BACK, AND TRANSFORM THE CURRENT LIVING ROOM/BEDROOM INTO A SEWING WORKSHOP. HERE HE CAN MAKE TRADITIONAL CLOTHINGS TO SELL IN THE BIG MARKET MERCATO. THE MONEY FROM EKUB WAS THE LAST THING ERMIAS NEEDS TO BEGIN HIS PLAN.



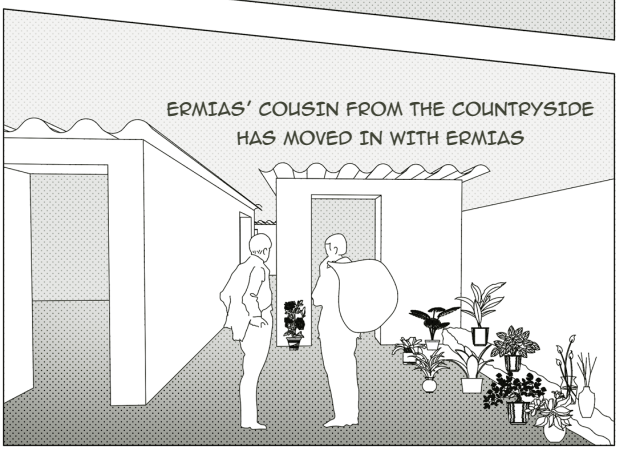

"YOUR CLOTHING ORDER WILL BE DELIVERED AT THE END OF THE WEEK"

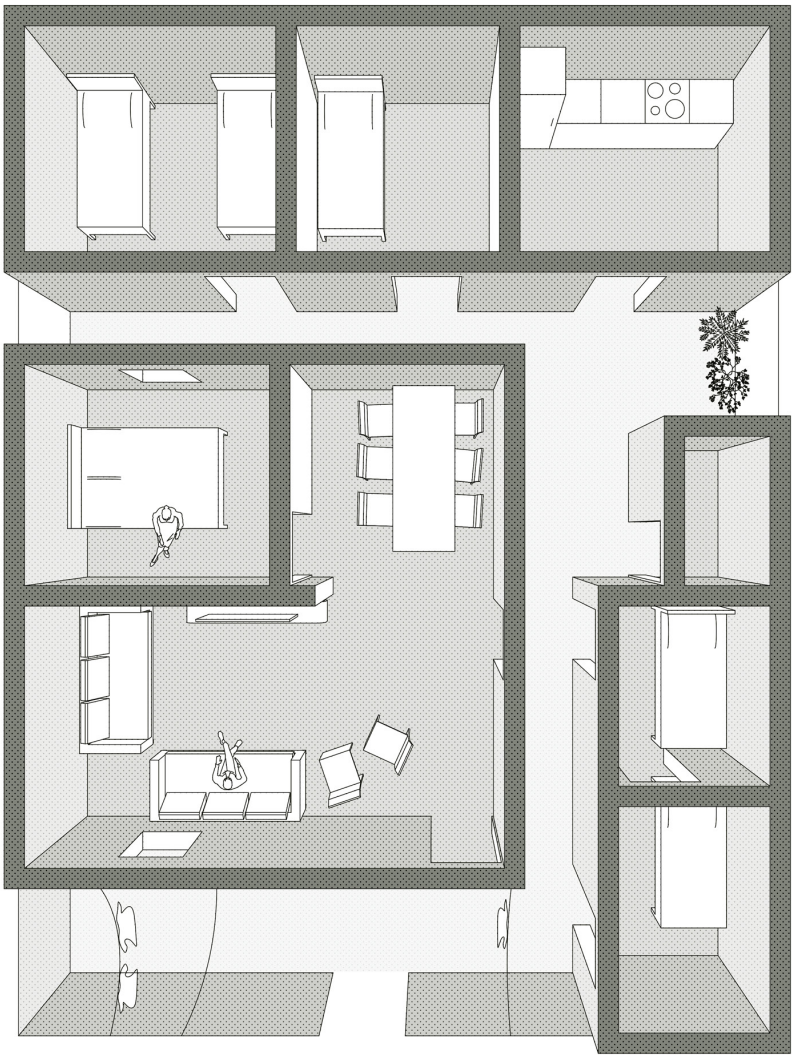
IN THE FOLLOWING YEARS, THERE HAVE BEEN SOME CHANGES IN THE LIFE OF ERMIAS.











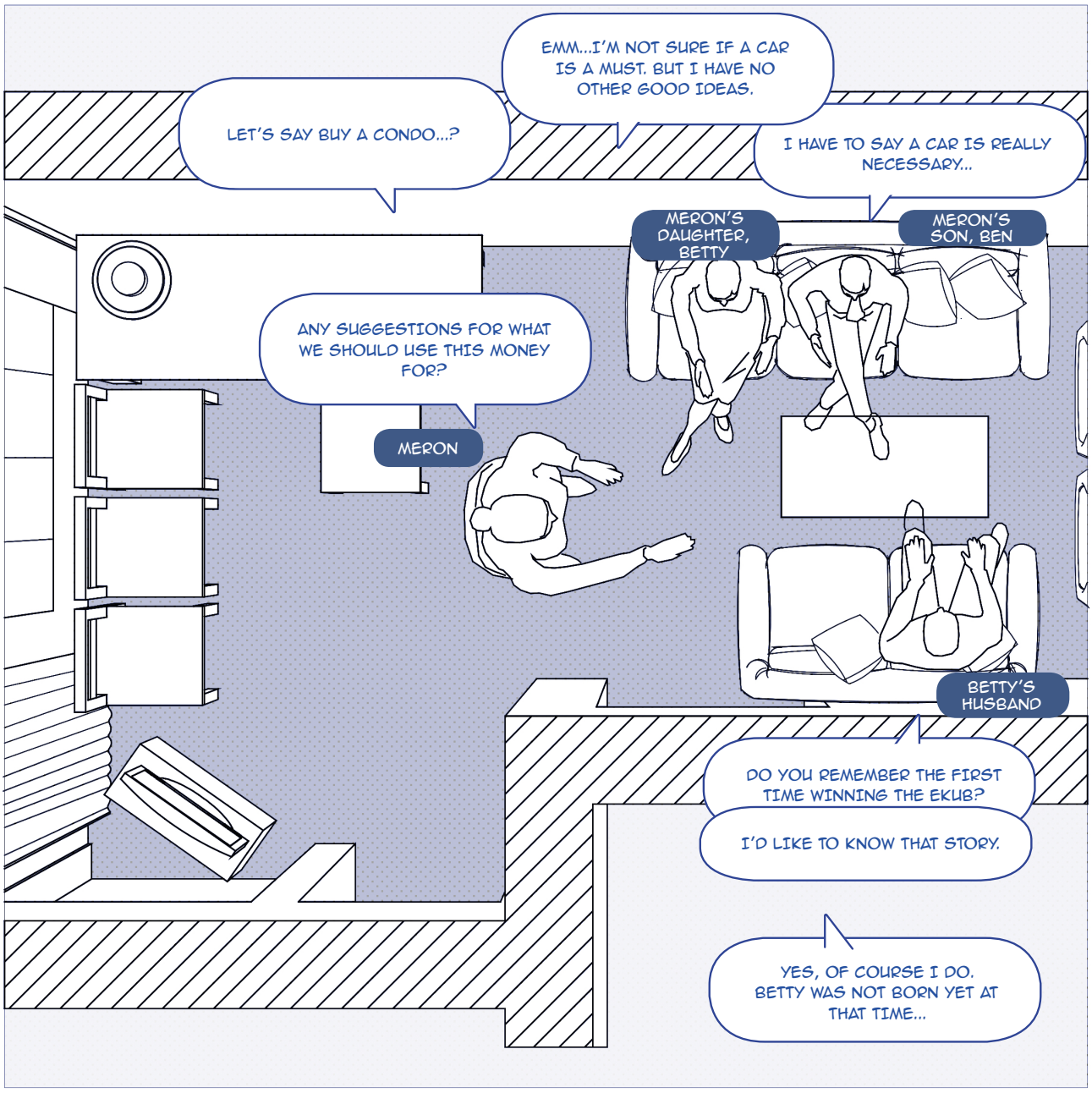
ERMIAS HAS CHANGED THE SEWING WORKSHOP BACK INTO A LIVING ROOM, AND ADDED IN A NEW MASTER BEDROOM AND DINING AREA.

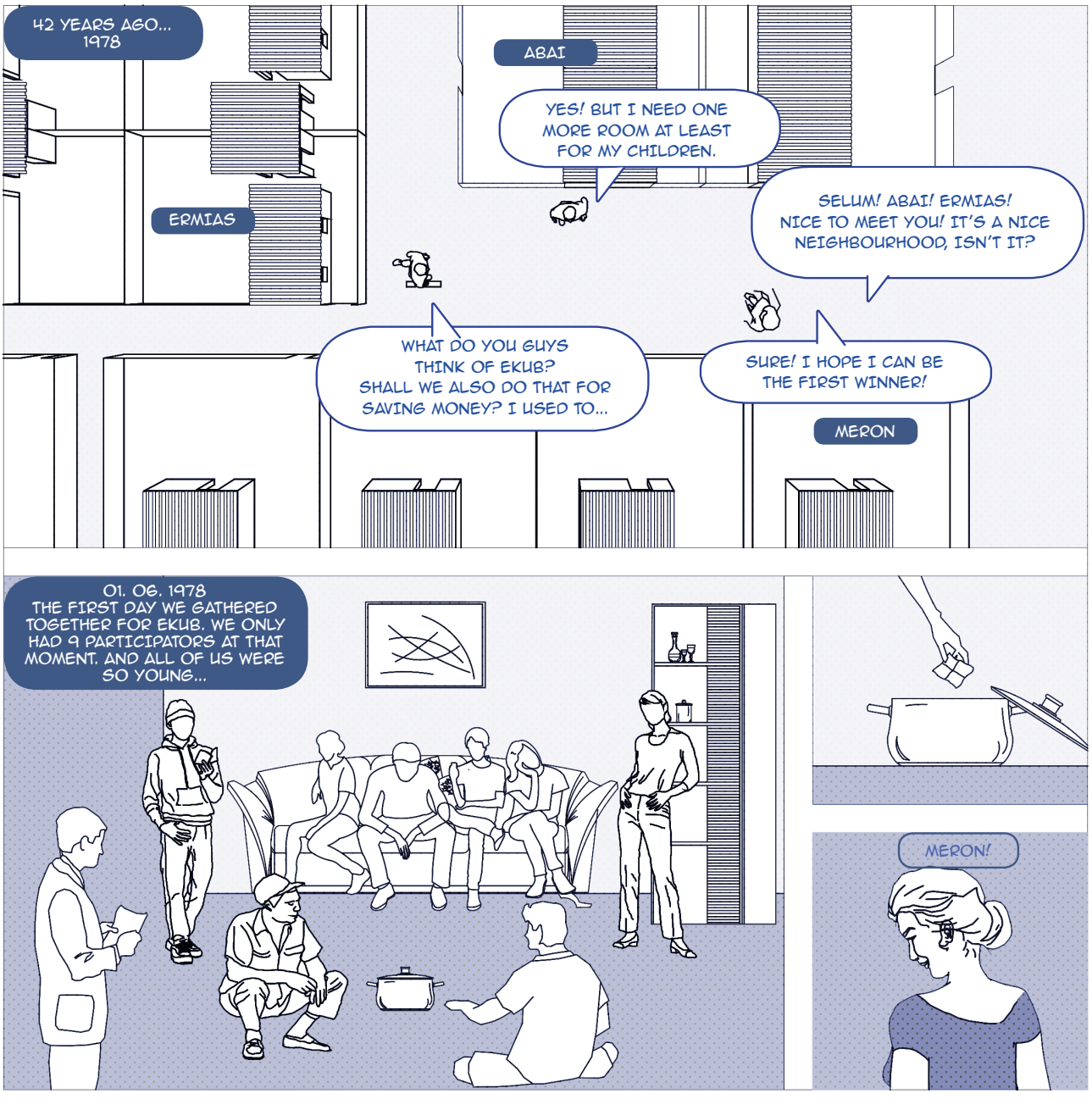
MORE SLEEP UNITS ARE ADDED FOR TIGISTI AND ERMIAS' CHILD AND ALSO OTHER DISTANT RELATIVES.

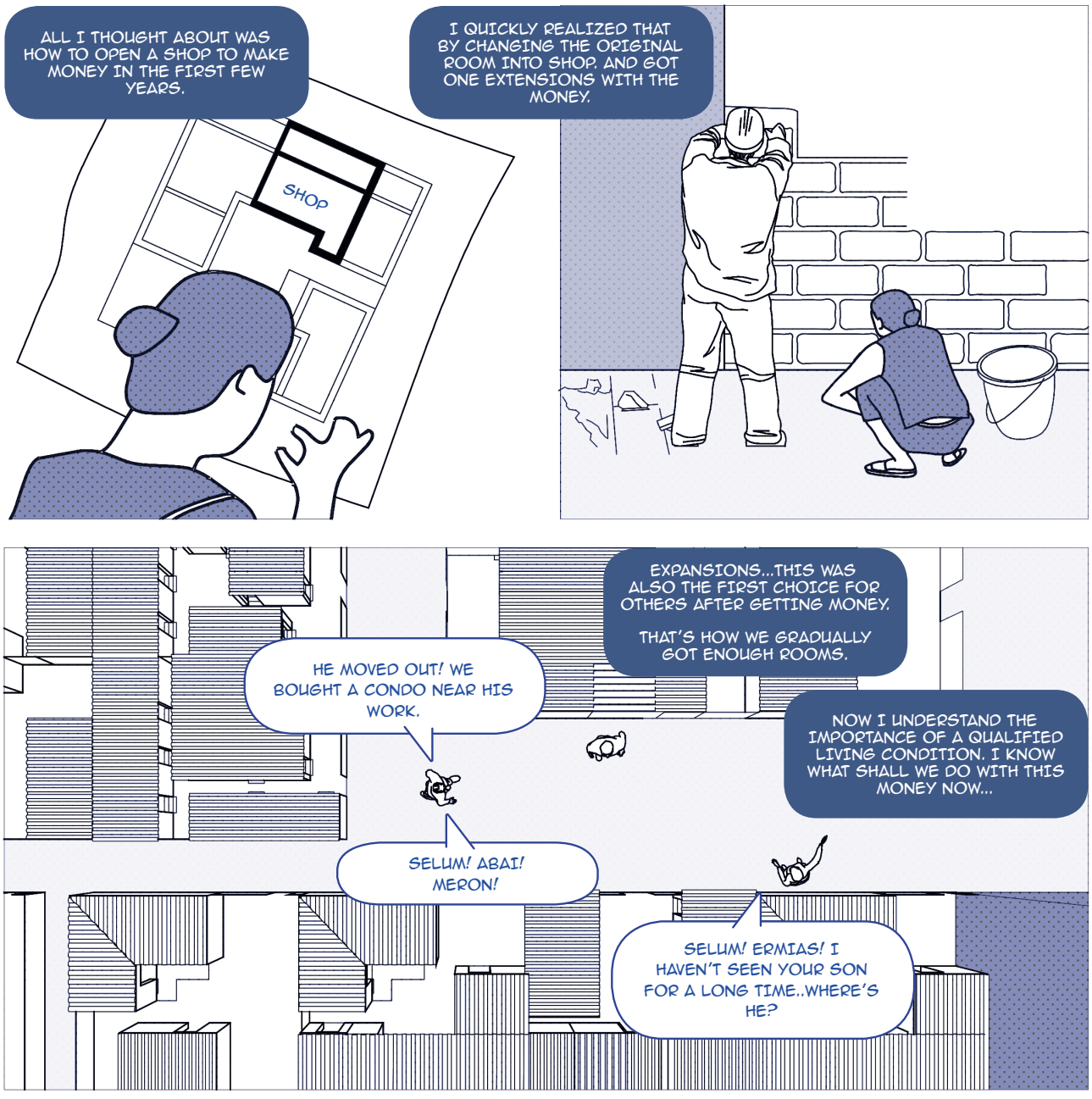
THE TRADITIONAL OUTDOOR KITCHEN IS REPLACED BY A MODERN ONE.

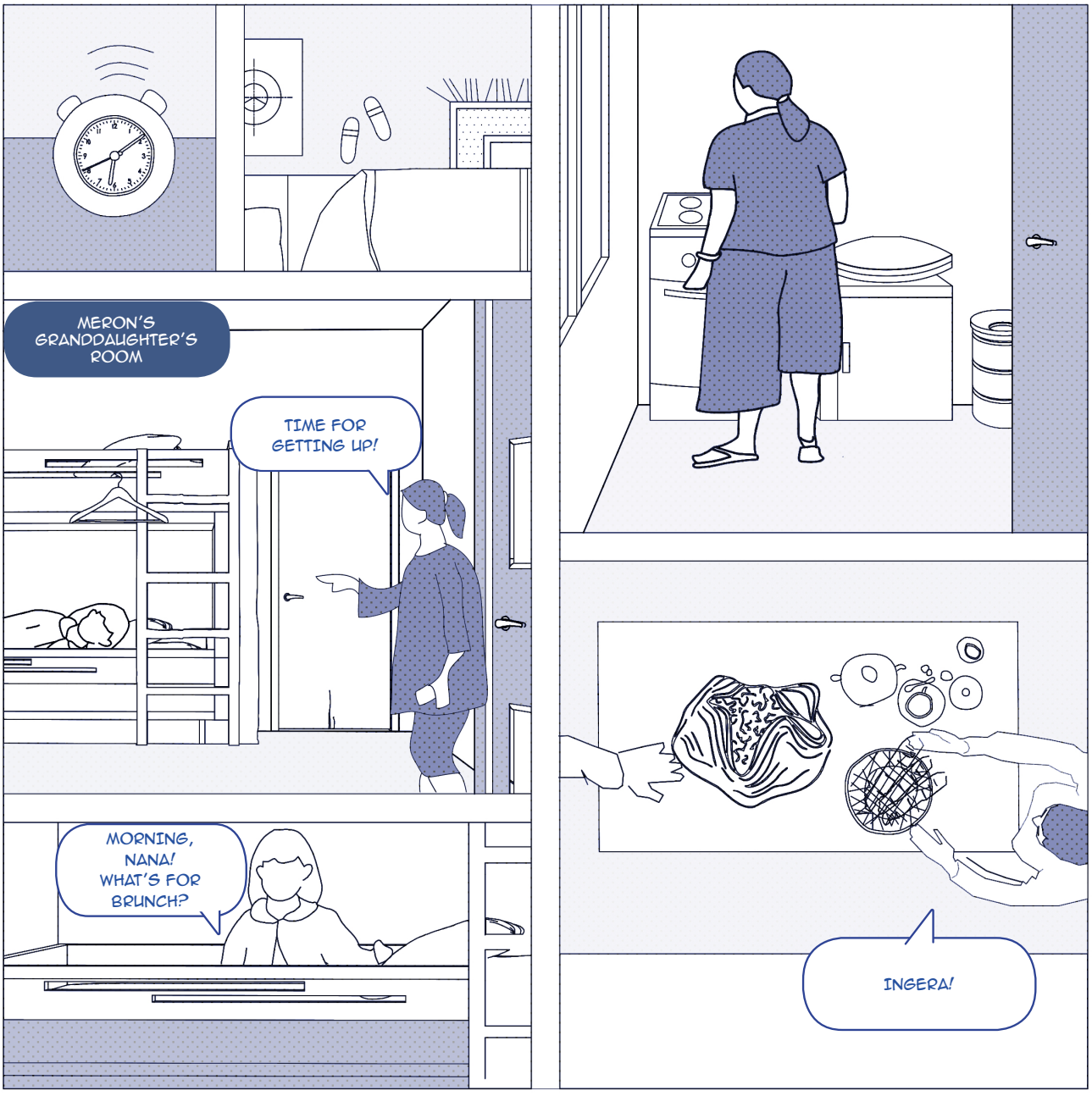
IT APPEAR THAT TIGISTI AND ERMIAS ARE IN A BETTER LIFE NOW. ONLY SOMETIMES TIGISTI STILL THINK ABOUT THE LARGE COURTYARD THAT THEY USE TO HAVE.


THANK YOU!
CONGRATULATIONS! MERON!
YOU'RE THE LAST ONE!
WILL YOU CELEBRATE TONIGHT?


EMM...I'M NOT SURE IF A CAR IS A MUST. BUT I HAVE NO OTHER GOOD IDEAS.
LET'S SAY BUY A CONDO...?
I HAVE TO SAY A CAR IS REALLY NECESSARY...
MERON'S DAUGHTER, BETTY
MERON'S SON, BEN
ANY SUGGESTIONS FOR WHAT WE SHOULD USE THIS MONEY FOR?
MERON
BETTY'S HUSBAND
DO YOU REMEMBER THE FIRST TIME WINNING THE EKUB?
I'D LIKE TO KNOW THAT STORY.
YES, OF COURSE I DO. BETTY WAS NOT BORN YET AT THAT TIME...


42 YEARS AGO...
1978
ABAI
YES! BUT I NEED ONE MORE ROOM AT LEAST FOR MY CHILDREN.
ERMIAS
SELUM! ABAI! ERMIAS! NICE TO MEET YOU! IT'S A NICE NEIGHBOURHOOD, ISN'T IT?
WHAT DO YOU GUYS THINK OF EKUB? SHALL WE ALSO DO THAT FOR SAVING MONEY? I USED TO...
SURE! I HOPE I CAN BE THE FIRST WINNER!
MERON
01. 06. 1978
THE FIRST DAY WE GATHERED TOGETHER FOR EKUB. WE ONLY HAD 9 PARTICIPATORS AT THAT MOMENT. AND ALL OF US WERE SO YOUNG...
MERON!


ALL I THOUGHT ABOUT WAS HOW TO OPEN A SHOP TO MAKE MONEY IN THE FIRST FEW YEARS.
SHOP
I QUICKLY REALIZED THAT BY CHANGING THE ORIGINAL ROOM INTO SHOP. AND GOT ONE EXTENSIONS WITH THE MONEY.
EXPANSIONS...THIS WAS ALSO THE FIRST CHOICE FOR OTHERS AFTER GETTING MONEY.
THAT'S HOW WE GRADUALLY GOT ENOUGH ROOMS.
HE MOVED OUT! WE BOUGHT A CONDO NEAR HIS WORK.
NOW I UNDERSTAND THE IMPORTANCE OF A QUALIFIED LIVING CONDITION. I KNOW WHAT SHALL WE DO WITH THIS MONEY NOW...
SELUM! ABAI! MERON!
SELUM! ERMIAS! I HAVEN'T SEEN YOUR SON FOR A LONG TIME..WHERE'S HE?


MERON'S GRANDDAUGHTER'S ROOM
TIME FOR GETTING UP!
MORNING, NANA! WHAT'S FOR BRUNCH?
INGERA!


BEN! I HAVE TO GO TO THE BANK THIS AFTERNOON! COULD YOU PLEASE LOOK AFTER THE SHOP?
SURE!
A.T.M
I WENT TO THE BANK TO SAVE MONEY FOR MY DAUGHTER. BTW, WHERE'S YOUR SON'S CONDO AGAIN?
SELUM! MERON! HOW'S YOUR DAY GOING?
I WON'T ATTEND EKUB ANY MORE. I DECIDED TO SAVE MONEY AT BANK EVERY MONTH FOR YOUR CONDO.



*The man who grew the fruit tree*

*He is an elder in the community, much respected by the people. He is part of the first generation who was relocated to this neighbourhood from the project site of the new Sheraton Hotel. His children are already living on their own. Being part of the community for such a long time, he knows everybody and likes to invite people to his living room to drink coffee. He has 7 rooms build in his courtyard, sublet to workers. In front of his house, he also plants fruit to sell in the market. Combined these incomes with his pension of 1000 Birr, he is still not satisfied, as he wants to make more money to build a bigger house and a large garden where he can plant a lot of fruit trees.*



*The woman with the best shop in the market*

*She is a mother of two living in a big compound close to the community market in the south. She rents out part of the compound to two other families. She also owns the little shop outside of the compound. Because the shop is next to the communal market, her business is doing quite good. Her daughter manages the shop while she watches over the baby in the compound. She is worried about one thing. The FHC who managed this area actually doesn't allow shops to be built here. She doesn't know if there is one day when she'll need to tear her own shop down*



## *The woman who can't afford a piece of eucalyptus wood*

*She grew up in this area and live with her mother and son. She shares the bedroom in the main unit with her mother, and her son sleeps in a standalone room in the courtyard. Her work consists of washing and drying clothes for people in the surrounding neighbourhoods. This work only barely maintains the cost of living of a 3 persons family. She says "I can't do other jobs because I didn't go to school. I also cannot build new rooms to rent out to make money. I can't even afford a piece of eucalyptus wood that is used to build walls."*



## *The man with the only car in the street*

*He lives in the medium size dwelling type of Kolfe, indicating a relatively good income level. As we walked by, we saw him washing his car with his two children. Its special because we barely saw any car in the neighbourhood. After the interview, we learned that this is actually his work car, leased from his job. He works at the municipality and today he took the car home. He is actually a migrant from the rural area. He came to Addis Ababa and married with his now wife who grew up in Kolfe. When we asked him what he thinks of the city comparing to the rural area he said "I miss the socializing. Back home I will get invited to coffee ceremonies in my neighbours' home. Here I barely know anybody because there is no chance to meet them. Everybody just stays inside their fenced home."*











## *PATTERNS OF INHABITATION*

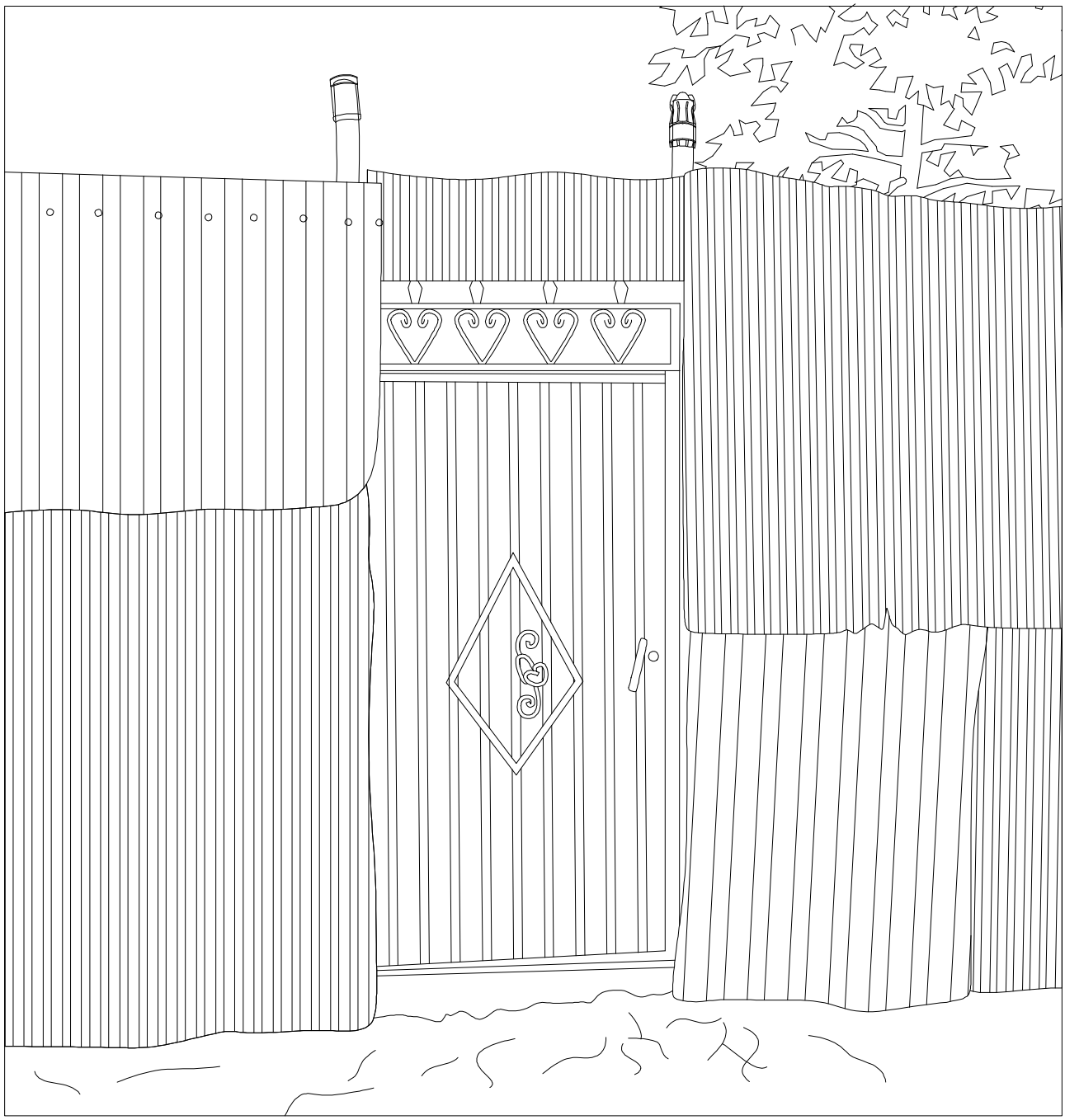
*The patterns of inhabitation display reoccurring patterns found in the interaction between people and the built environment. It aims at generating an essential understanding of the local culture and lifestyle by distilling the findings into a series of drawings in four categories: borders, building techniques, income generation, and social spaces. This way, a comparison can be made between the existing ways of living and the proposed ways of living in the new design.*

***border***
*corrugated iron sheets*



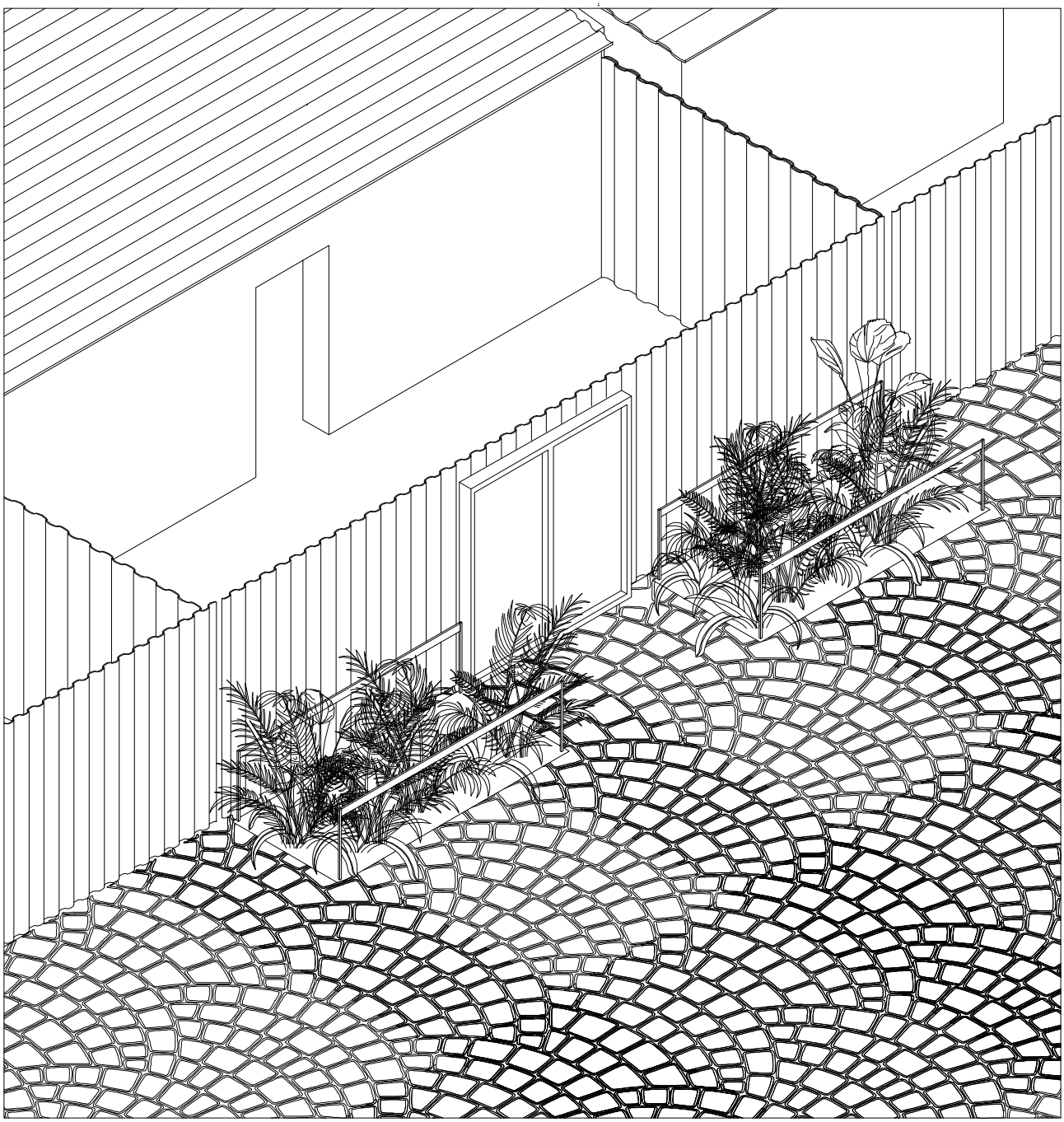
*As a cheap, abundant and easy to use material, corrugated iron sheets are seen throughout Addis Ababa. This material is mostly use as a hard separation between the public street and the private courtyard. The sheets are held up by a eucalyptus wood structure. Sometime the eucalyptus poles stick above the fences are covered by plastic bottles, as a way to prevent wood rot due to rainwater. From the entrance it is visible how people, even with the limited resources, are eager to personalise the entrance by decorated metal work on the door.*

***border***
*corrugated iron sheets*





*The corrugated sheet fences are often pushed to the outer property line to maximize the extent of the private space. However, some of the inhabitants will even choose to claim part of the public space as an additional space for greenery. This shows the desire of the inhabitants to decorate the public space, as well a more informal idea of public ownership.*

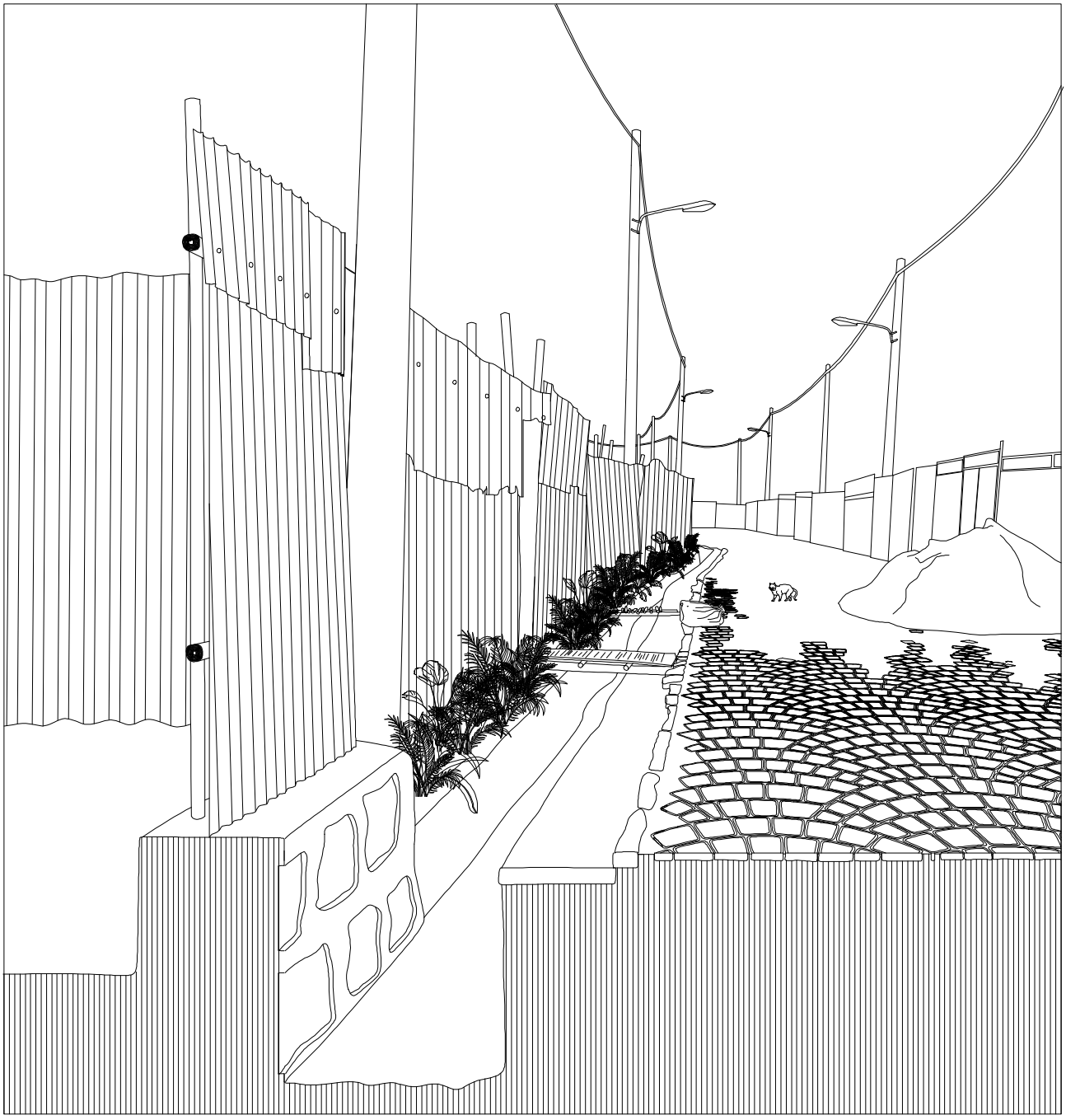


***border***
*open sewer*



*To maximize the privately owned floor space, the corrugated fences are pushed towards the street to the point that it incorporated the electricity poles into the private domain. Some inhabitants constructed a concrete slab on the border of the compound as a barrier against rainwater flooding the streets. Later on, the FHC refurbished the streets and laid down a network of open sewers, mitigating the flooding problem. This addition to the border is bridged by the inhabitants through self-made eucalyptus platforms.*

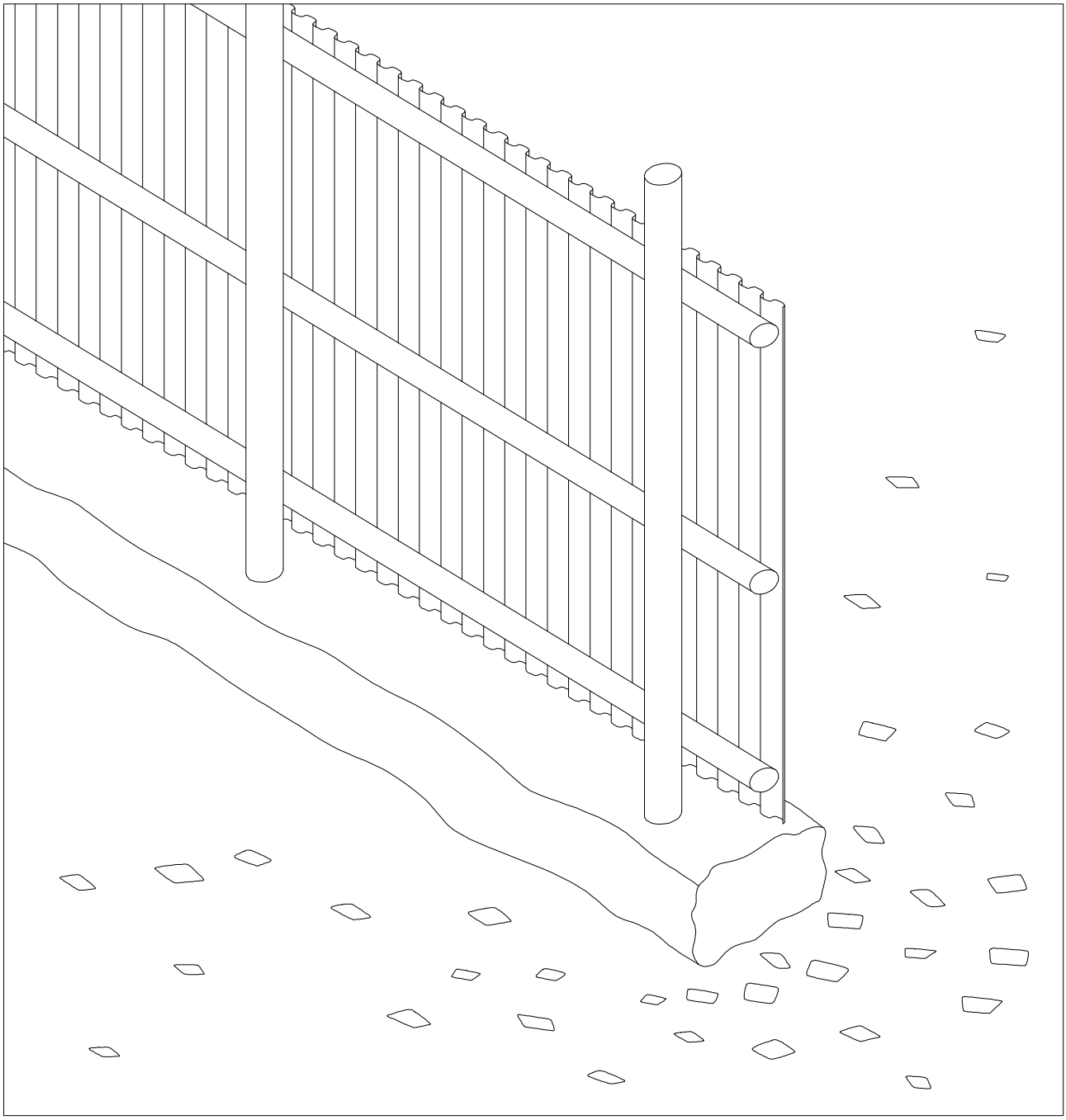
***border***
*open sewer*



***building techniques***
*eucalyptus structure with corrugated iron sheet*



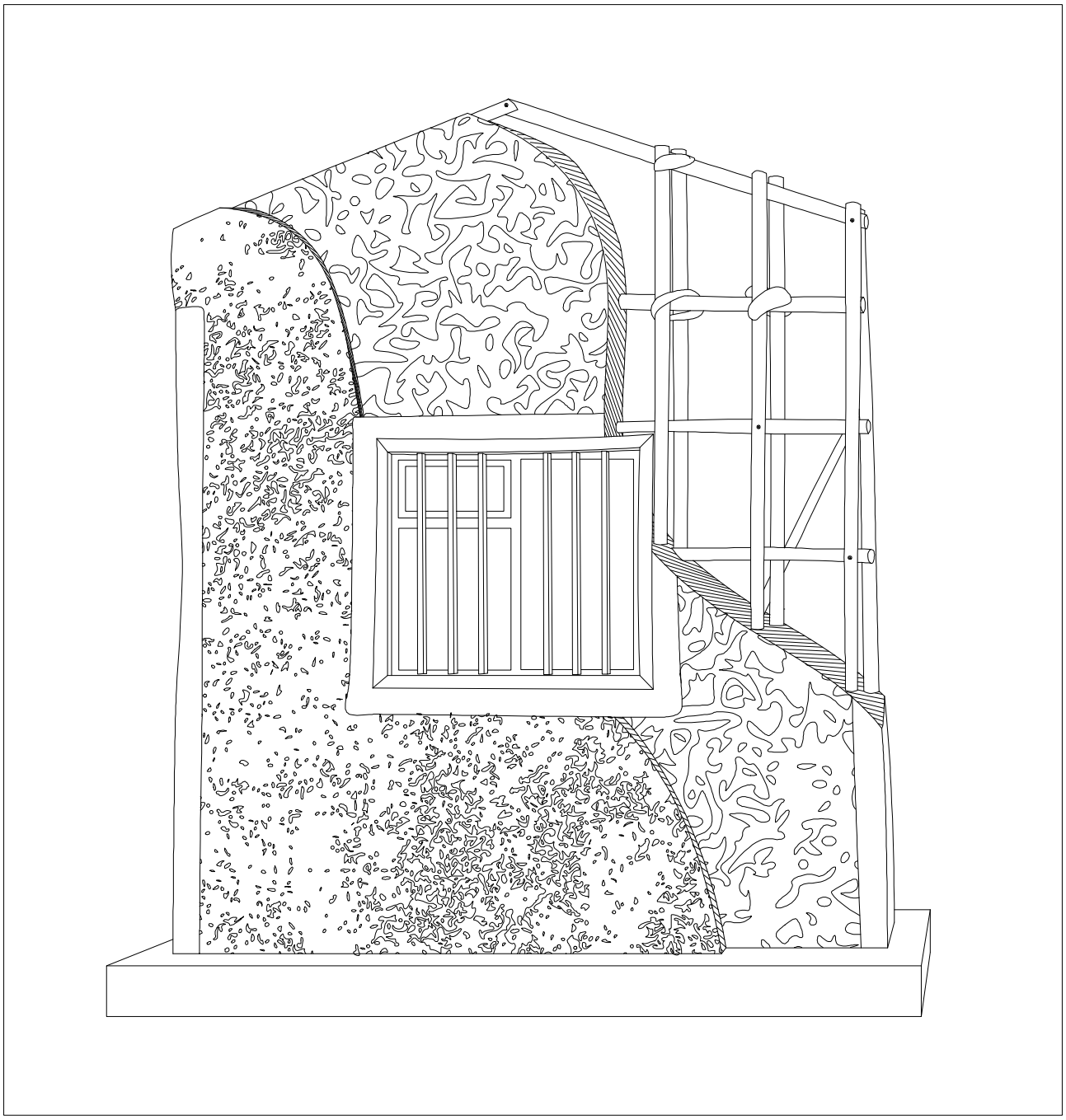
*Due to lack of financial resources, most inhabitants are left with the choice of the relatively cheap eucalyptus woods and corrugated iron sheets as construction materials. The combination of these two materials are mostly used as fences, but also as roofs and walls of the dwelling. This building technique is representative of the self-built culture in Ethiopia, as well as the need of low cost, low tech construction methods for low income people.*



***building techniques***
*chika wall with cement on outside*

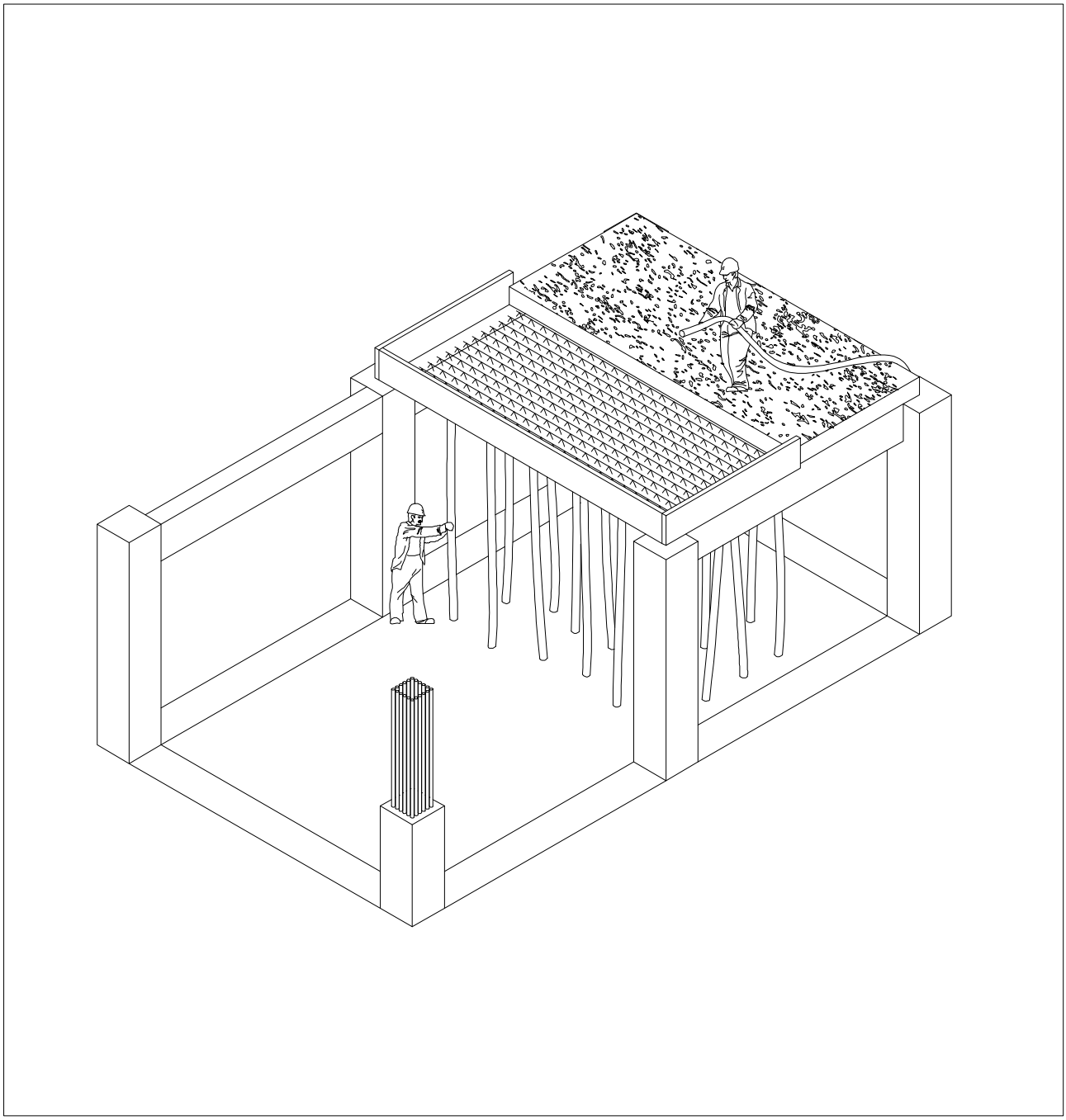


*A traditional way of wall construction used throughout Ethiopia is Chika: a load-bearing wall with eucalyptus wood as frame structure and mud as infill. Some people opt to also add a layer of cement plaster on the mud surface as a water barrier. This construction method utilises local materials and is part of the vernacular architecture lineage. The downside is that this method cannot sustain more than 2 floors and is susceptible to erosion.*



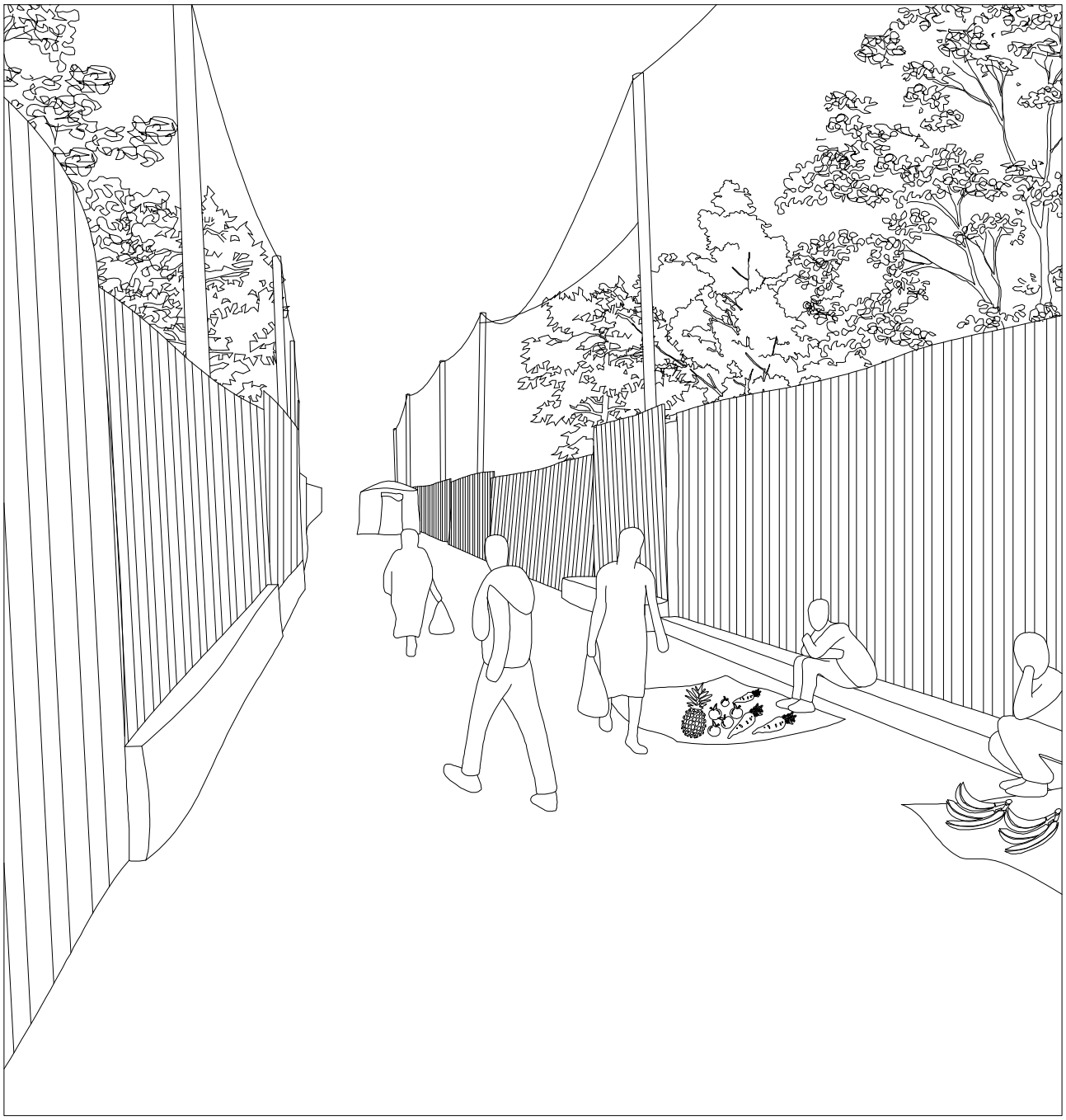



*Modernisation of Ethiopia means that housing construction also happens with foreign materials such as cement and steel reinforcement with limited local production capacity. A distinguishing feature is the use of eucalyptus wood as form work support. Also due to lack of finances and cheap labour cost, only few machineries are involved in the building construction. None load bearing infills are often made up of hollow concrete blocks. Most of the work are still done by manual labour.*





*As a form of income generation with a low bar of entry, especially for those with low level of education, street vendor is often a crucial way of earning daily income. Products that are made at home will be sold somewhere nearby. Customers are mostly people from the neighbourhoods close by.*

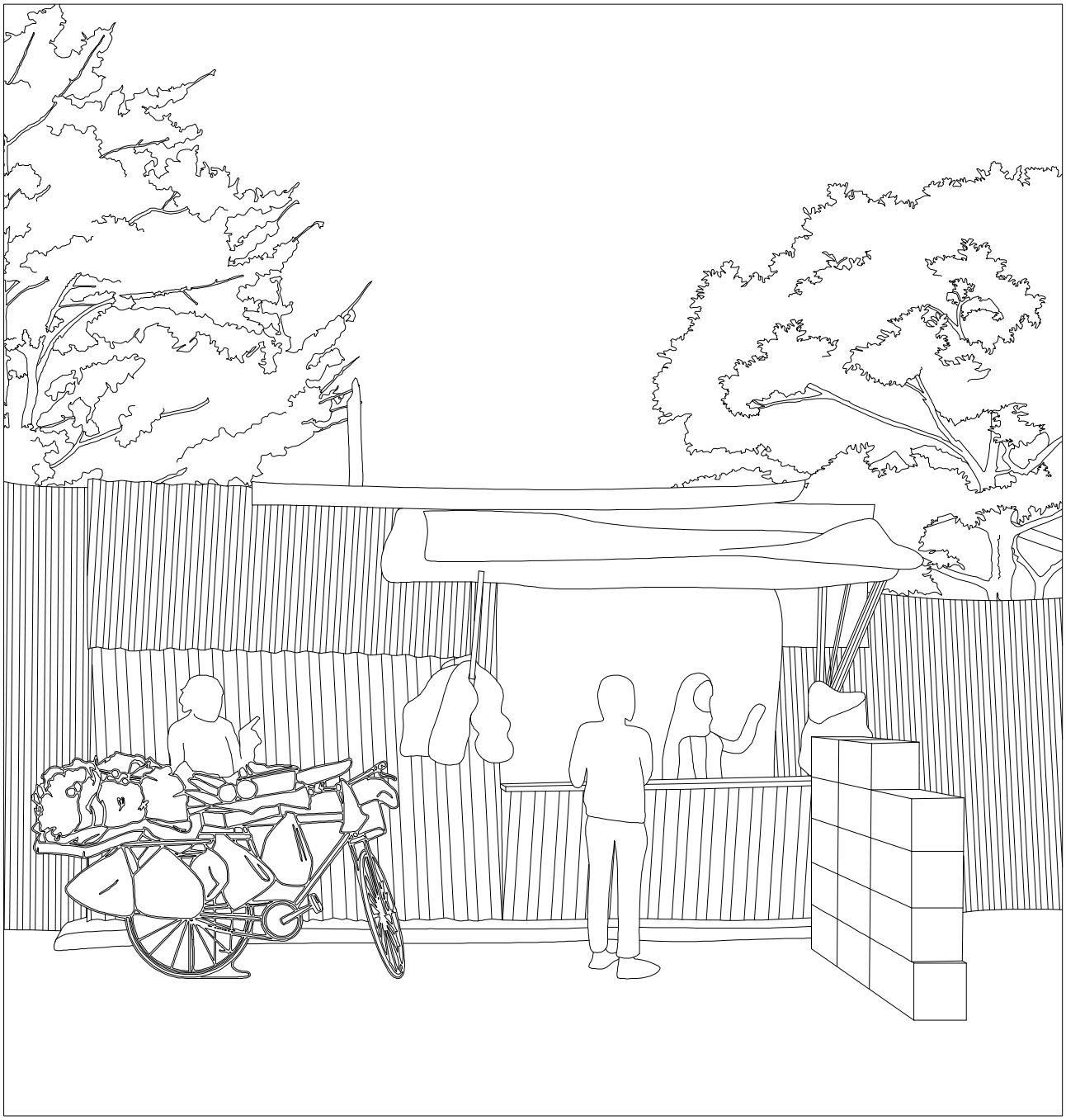


***income generation***
*home extension shop front*




*Occasionally, an opening in the continuous corrugated fenced streets will present itself in the form of a small kiosk. The inhabitant operates the shop from within the compound. The inner courtyard is filled with products, as there is no other space to store. This kind of enterprise is an evolved form of the street vendor as it is also operating in close proximity of the compound but required a larger initial investment.*

***income generation***
*home extension shop front*



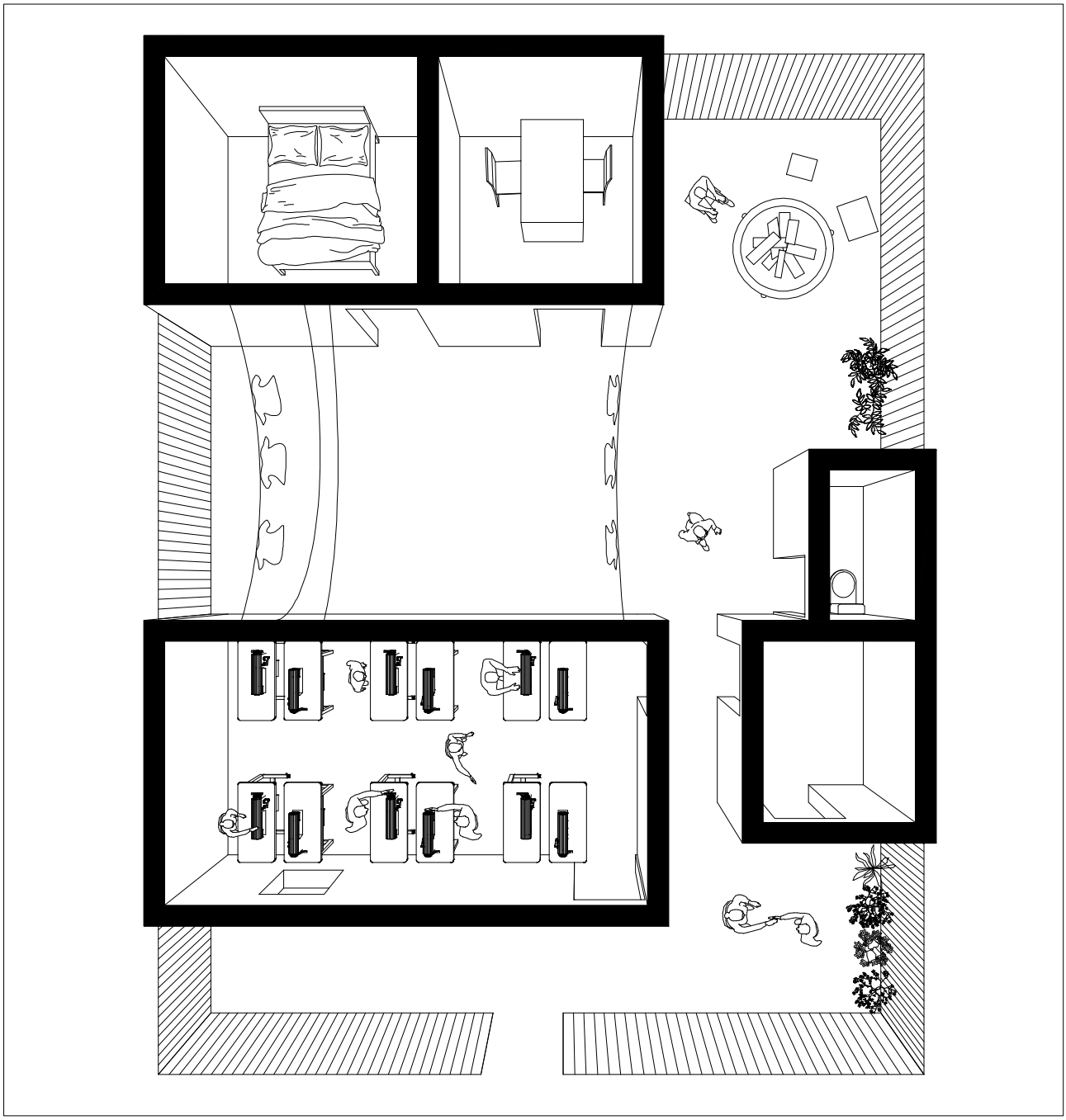


*Informal markets serve as a crucial link in the informal economy. Products and services that are done in the private household can be exchanged in the public markets. A wide variety of products will fulfil all the needs of daily lives. These markets are often informally built and organised and thus, an eyesore for government officials.*





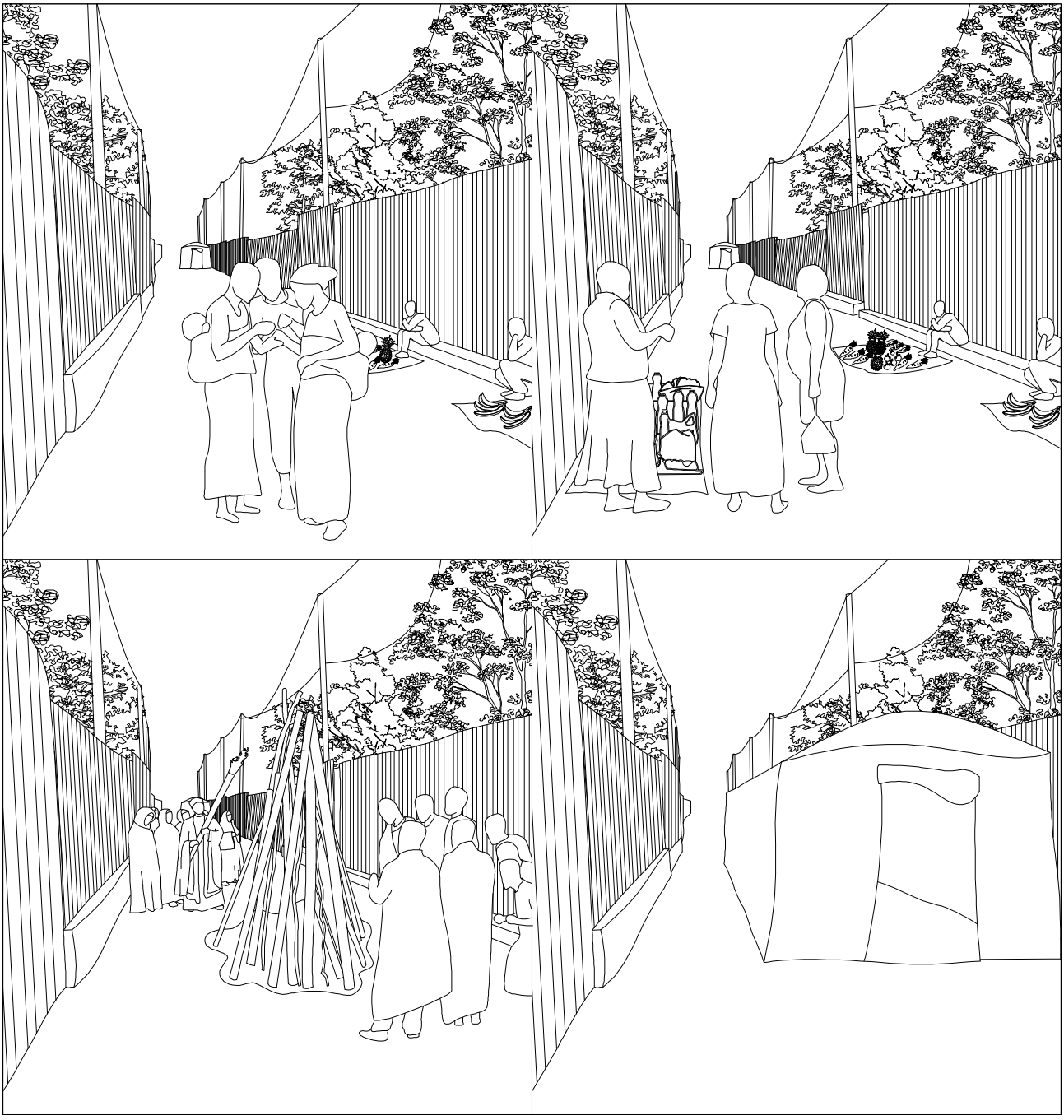
*For those with no financial resources or a high level of education, to generate income means to appropriate any resources available. Among those resources is the dwelling space that people live in. An inhabitant can turn part of the compound into a sewing workshop or rent it out to make money. In the Ethiopian context, dwelling space is very much interchangeable with workspace.*



***social space***
*multi-purpose street*

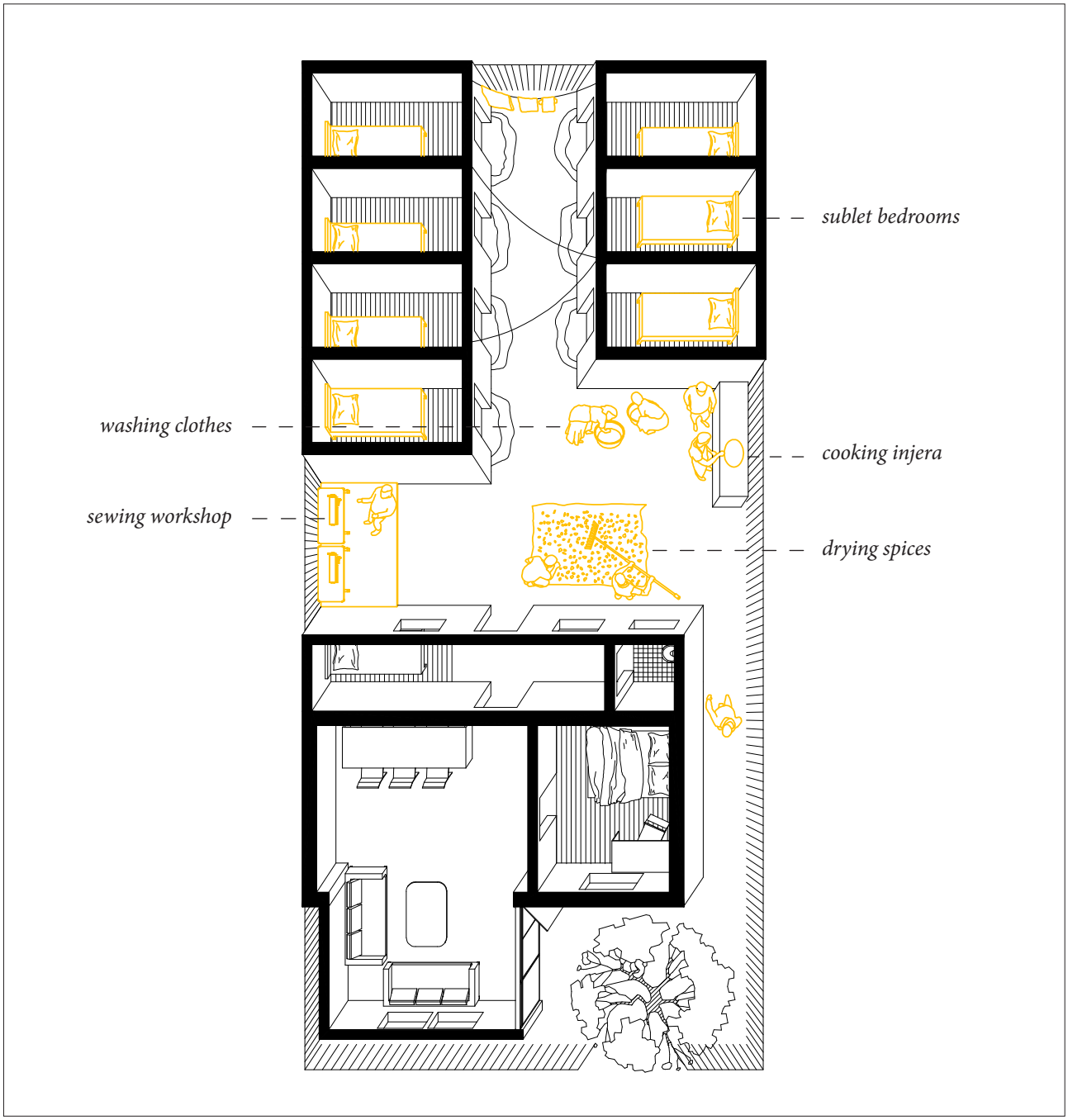


*A street fenced by high corrugated sheets does not proves to be any less social. The lack of other public spaces has turned the streets into a multi-functional space. People from different households mingle when they stumble upon acquaintances. The street vendors also create moment of social interaction as both the seller and the customer are also neighbours. The streets are also used for traditional celebrations, such as the Meskel. Families from the same street would gather and organise the fire pile celebration as a small community. Furthermore, neighbours will also gather financial resources to rent tents for funerals that happens on the street.*





*In a single compound defined by the corrugated fences, the number of families can vary. Often, there will be the owner of the compound who is also the main inhabitant. With the possibility of self-adaptation of the house, the owner can decide to expand the house or construct new units on the compound ground to sublet to renters. This has created the situation of multiple households sharing a private compound. The private courtyard has turned into a collective outdoor space with a social function.*


sublet bedrooms
washing clothes
cooking injera
sewing workshop
drying spices

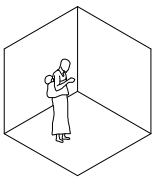
## *NEW WAYS OF WORK*

*approach on integrating income generation in the new design*

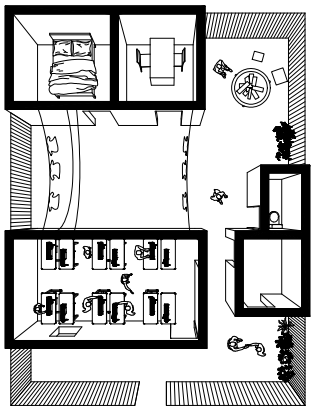
*As the existing income generation activities are analyzed, it can serve as the tool in making clear a direction in how the income generation activities can be shaped in the new design. In the private domain, income generation is an essential part of the dwelling. Through altering parts of the dwelling, a various array of income generation activities can be practiced, like subletting or manufacturing.*

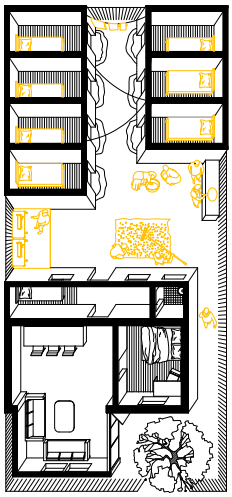
*In the scale from private to public space, it is the level of the collective that lacks any form of income generation. The private space requires few resources to be altered in order to be used for income generation. On the other hand, income generation in the public space still requires more resources to even participate in it. Collective spaces that can be scaled up from the private level, while still doesn't requires more resources as working in the public space. The collective is therefore not only a spatial transition between public and private, but also as an intermediate stage of income generation activities in which people gather their resources to participate in the income generation in the public space.*

*In the public domain, the existing patterns of market space and small shops should find its place in the new design. Street vendor is also an essential way of generating income for the low-low income group. Though there is a need to organise these street vendor activities in a more concentrated manner in order to not disrupt the public quality of the street.*

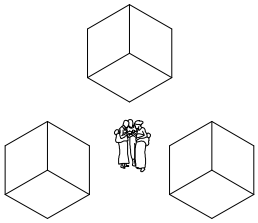


*Private*

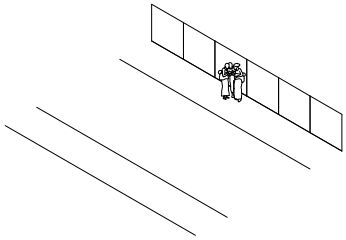




*Keep the possibility of interchanging the function of the private space between living and working, having the ability to adapt the private space for a variety of work activities, as well as subletting part of the dwelling.*



*Collective*

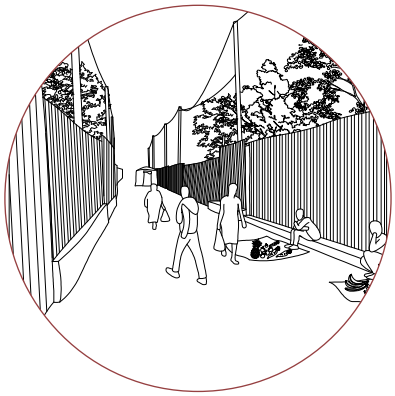


*Public*

?







*Lack of collective income generation activities. Introduce a new ways of collective income generation activities as a part of the strategy*

*Public income generation are mainly part of the informal economy. To enhance this form of income generation. There is a need to do the following: mixture of high and low income; formal framework to control the informal activities.*

## *LIVING BORDER*

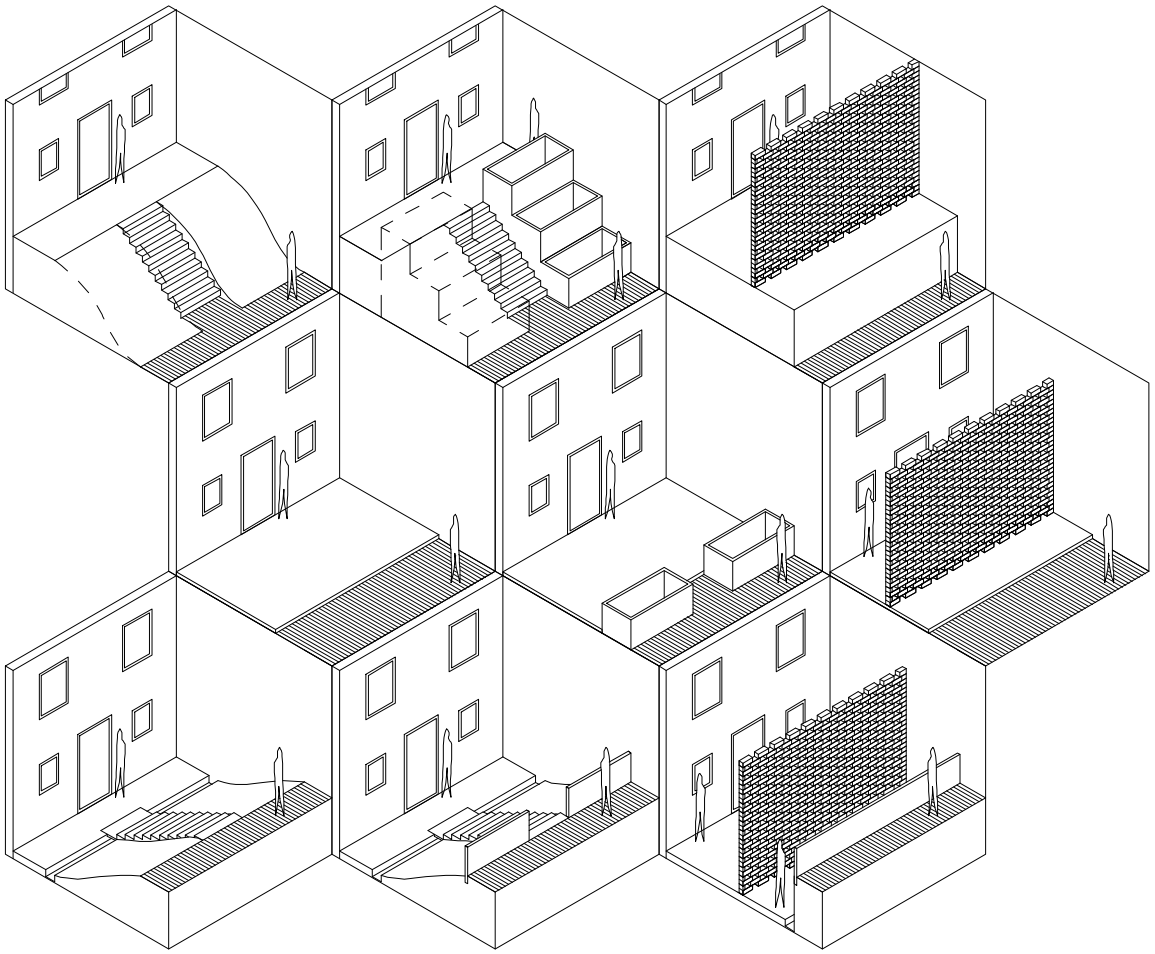
*defining the private, while not shutting off the collective*

*open* *semi-open* *closed*

*high to low*

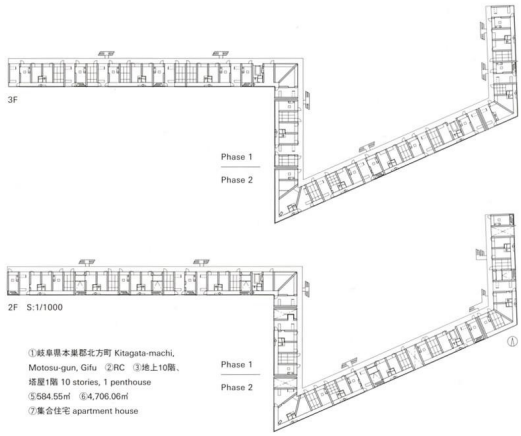
*even heights*

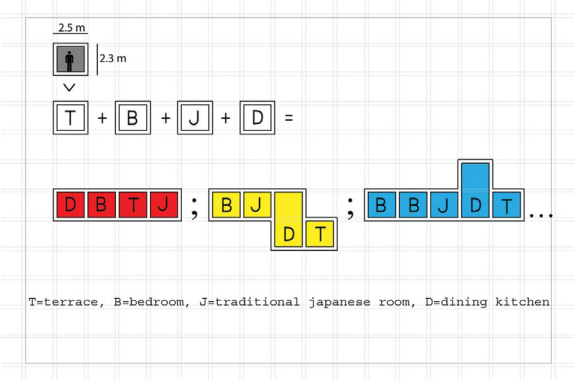
*low to high*

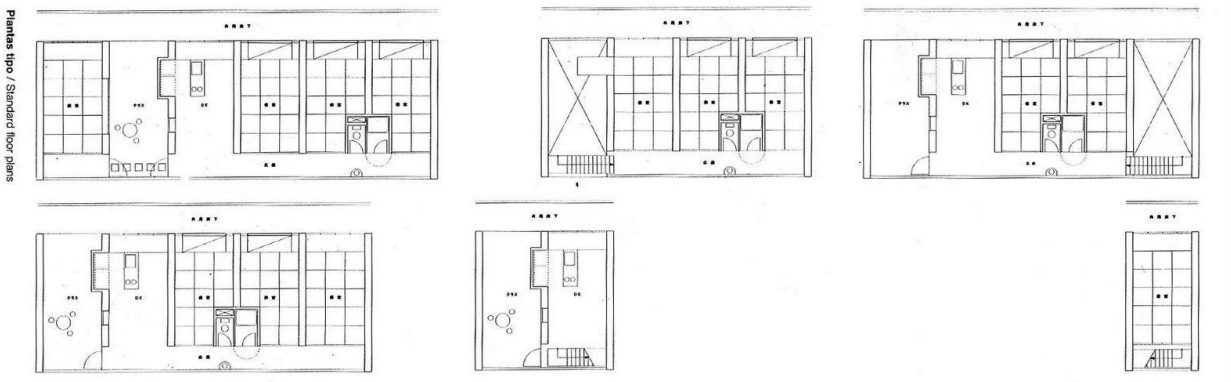


*From the patterns of inhabitation, it is clear that there is a strong desire for ownership. The key word is hereby ownership, instead of privacy. By placing a hard boundary between public and private domain, we can indeed suggest that the inhabitants want to protect their privacy strongly. However, after we learn that more often than not, multiple families live in the same compound, where the notion of privacy is much more fluid. As all inhabitants possess a clear understanding of the ownership within the compound, we see that there are no fences raised between the families inside the compound. There for we can conclude that border is mainly a tool to indicate ownership. While privacy, though not unappreciated, is often blurred within a socially connected community. The usage of differences in height is therefore a valuable tool to define ownership within the collective domain*





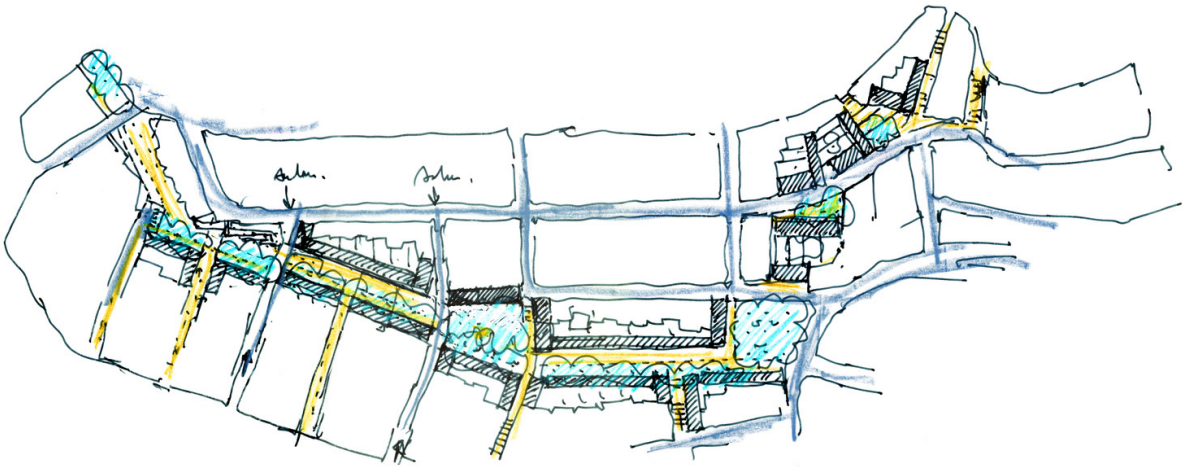




*This housing project in Kitagata, Japan shows the possibilities in morphology of dwelling in a standardize grid. The use of a room as a modular design element is easy to understand in terms of standardization of design typologies. This basic principle minimizes construction waste at the design level, while providing a great variety in dwelling types. This minimisation of the spatial form of a dwelling to the level of a mere 'framework', means that those who inhabit this frame will need to fill in its substance on their own. That could be advantage, or a disadvantage based how common owners-initiated transformations are in the local context.*

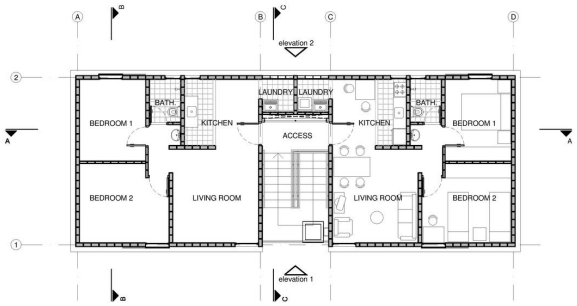
## *TYPOLOGICAL REFERENCES*

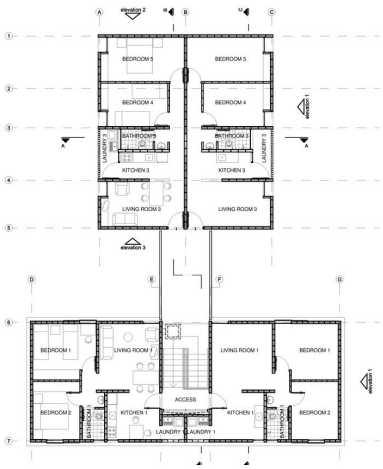
*Jardim Vicentina Urbanization / Viglecca & Associados*



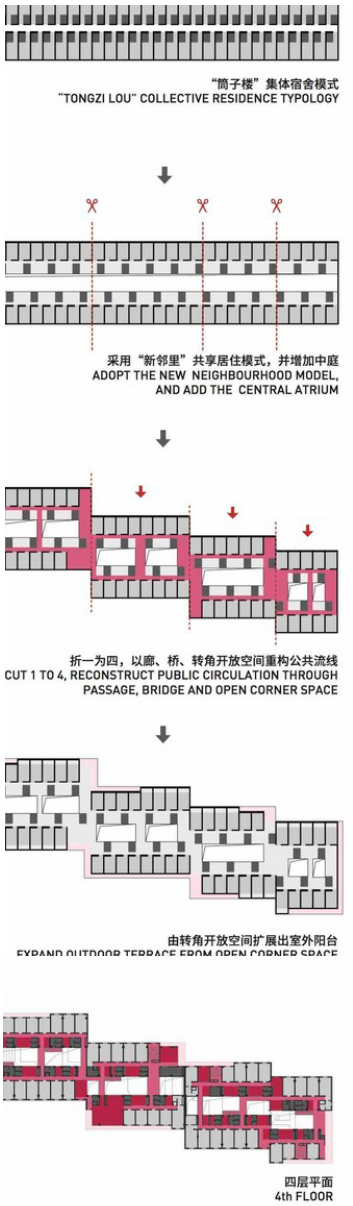







*Social housing project at Jardim Vicentina, on the outskirts of the city of Osasco, greater São Paulo. This is an urban slum upgrade project aiming to transform the slum area along the river to a new social housing neighbourhood. The design is built up of three typologies, responsive to the urban fronts and the existing river. between the buildings are social spaces and playground for children. Construction was made possible using affordable materials and results in a low maintenance building.*

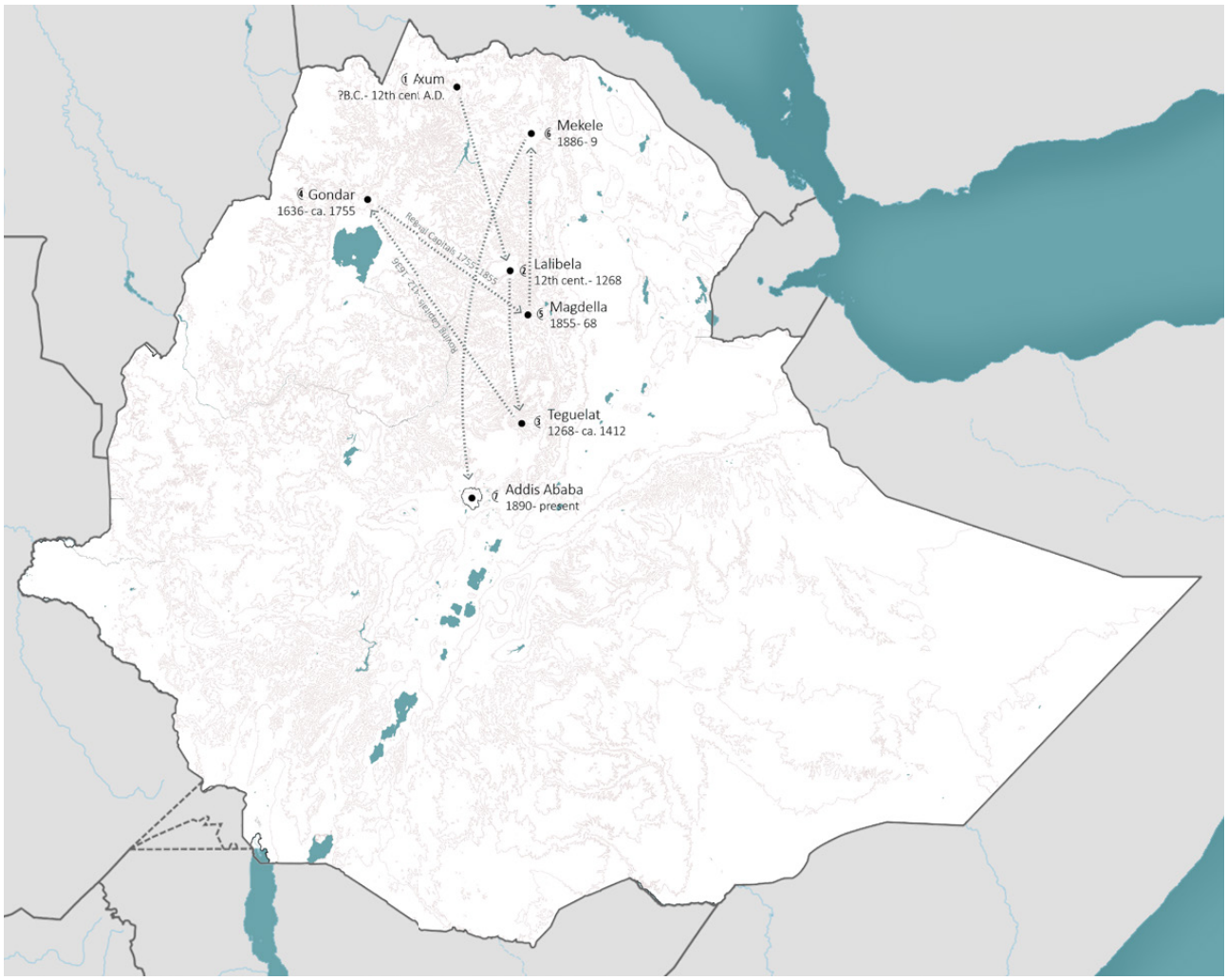






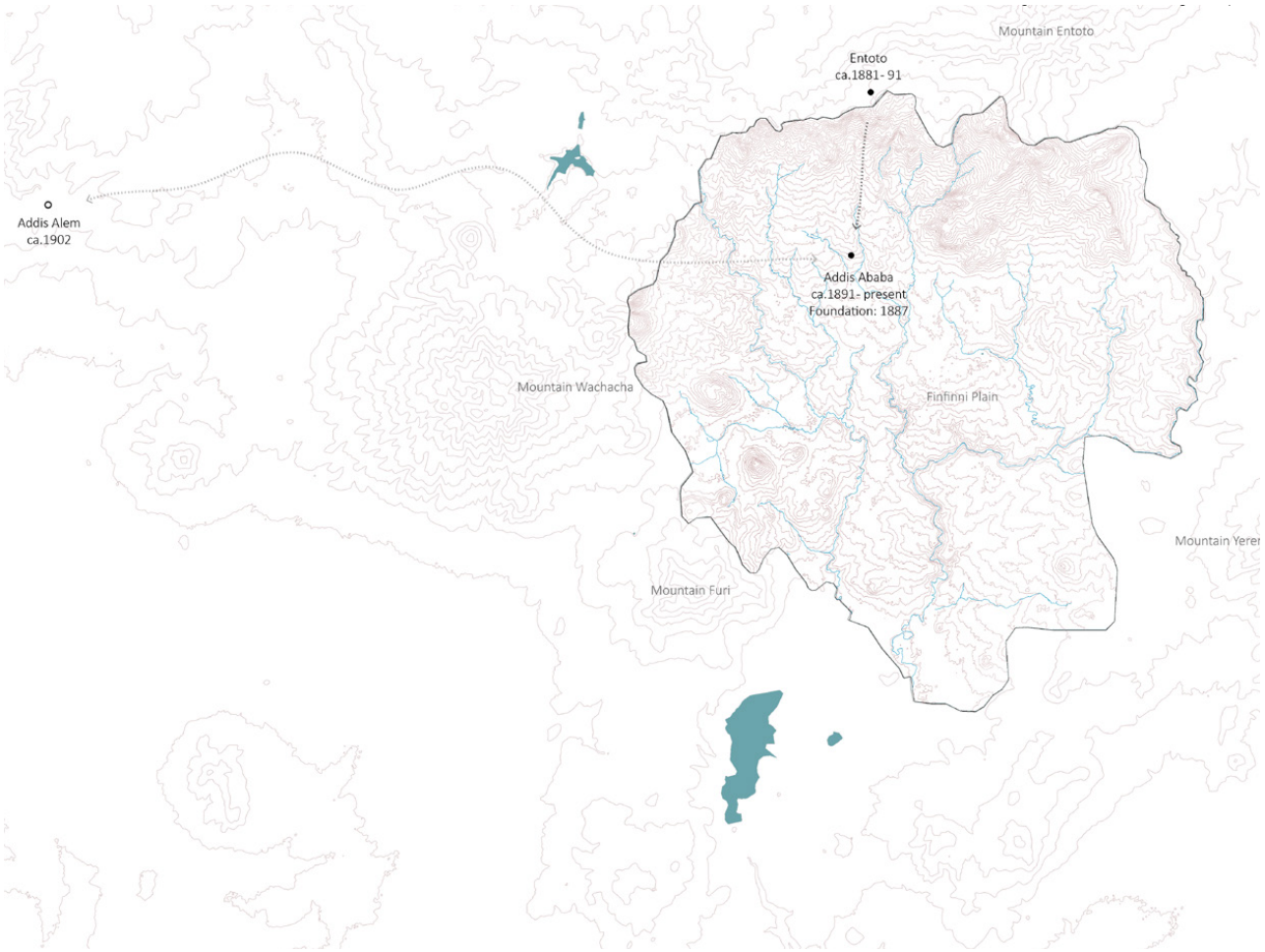


*In this project, the architect presents a form of shared living in which students and youngsters live together in groups with shared amenities as well as social spaces. This model presents a new possibility in housing especially for those that are not anymore part of the traditionally defined combined families or even the modern nuclear families. This share-living principle is applicable to those who are moved/migrated to a new environment and are limited in not only the financial resources but also the social resources. Through this form of living, urban migrants who are just like students with no resources, can acquire a place to live in the city, while also establish new relationships that transcends familial bonds.*




*(Míková et al., 2020, p. 8-9)*

*In the history of Ethiopia, the capitals were highly mobile. The moving of capitals is closely related to two factors: military considerations and exhaustion of resources (represented by food and wood). Their relations with the hinterlands are believed to be exploitative. After the current hinterlands had been impoverished, the capital would move to the next location with supplies. This exploitative nature could also be perceived in the way of consuming wood. One suspects that many individual moves were motivated by the exhaustion of wood resources. For the example of Addis Ababa, no measures of conserving woods were taken before the decision was made to remain Addis as the capital for the future. (Míková et al., 2020, p. 8)*




*(Míková et al., 2020, p. 10-11)*

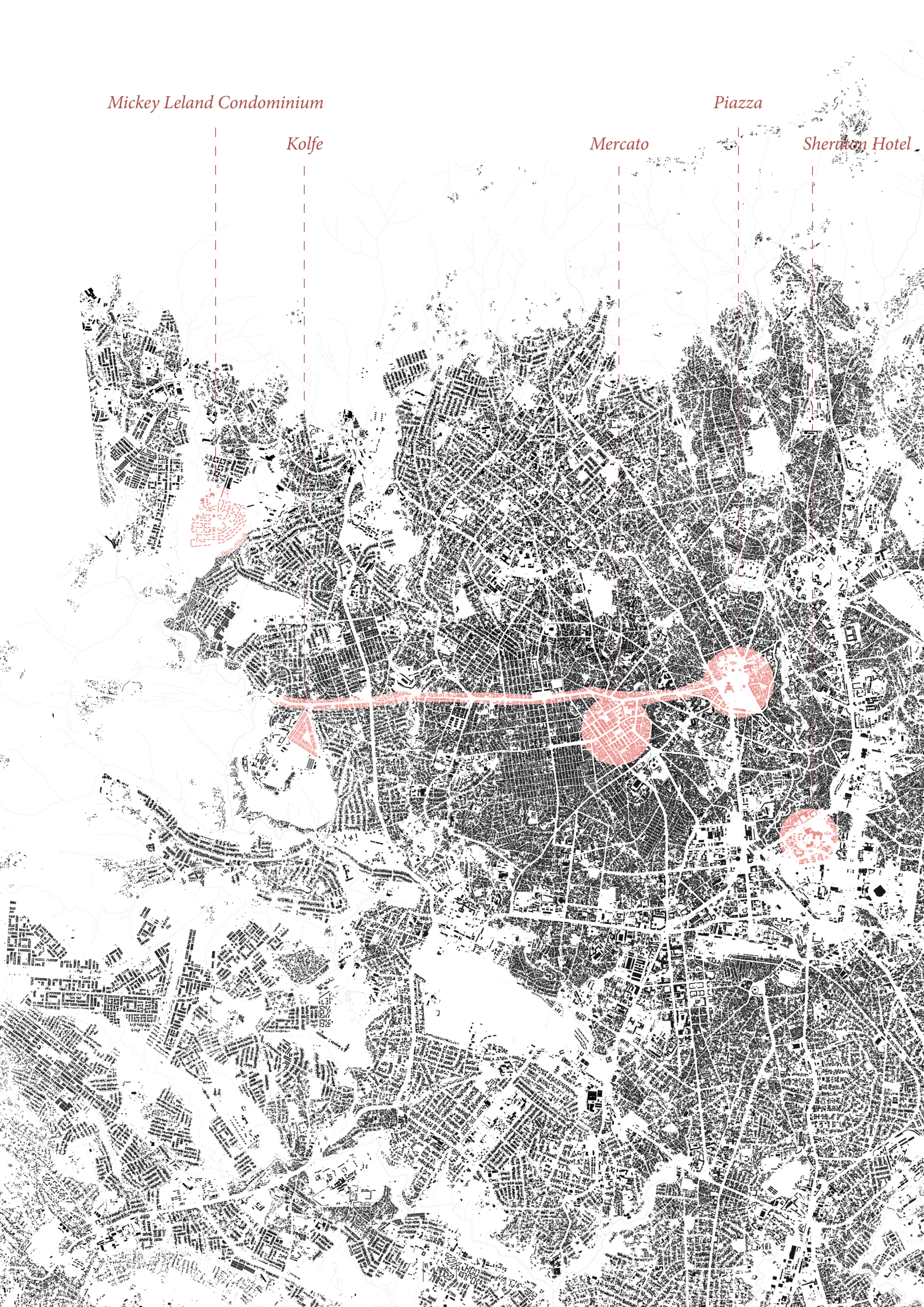
*Addis Ababa became the capital of Ethiopia since 1891, which makes it the last stop for the journey of wandering capitals. There was a major population growth by the mid-1890s, which results in a shortage of wood as major construction materials. Like previous times when resources were depleted in other capitals, an attempt to move the capital to Addis Alem, 40km to the west of Addis Ababa with more wood resources was considered. However, the wood shortage was ultimately eased by the import of eucalyptus tree from Australia and the measure of afforestation, so that Addis Ababa could consolidate its position as the capital. (Míková et al., 2020, p. 10)*



***URBAN CONTEXT*** *Addis Ababa*

*The city is showing an immense pressure to expand and densify in order to accommodate the increasing urban migrant flow. Being a chartered city surrounded by regions, tension rises with ethnic groups in other regions whenever the capital city try to expand into the territory of the neighbour regions. Addis Ababa only have limited capacity to expand horizontally and thus sees the need to further densify in height.*



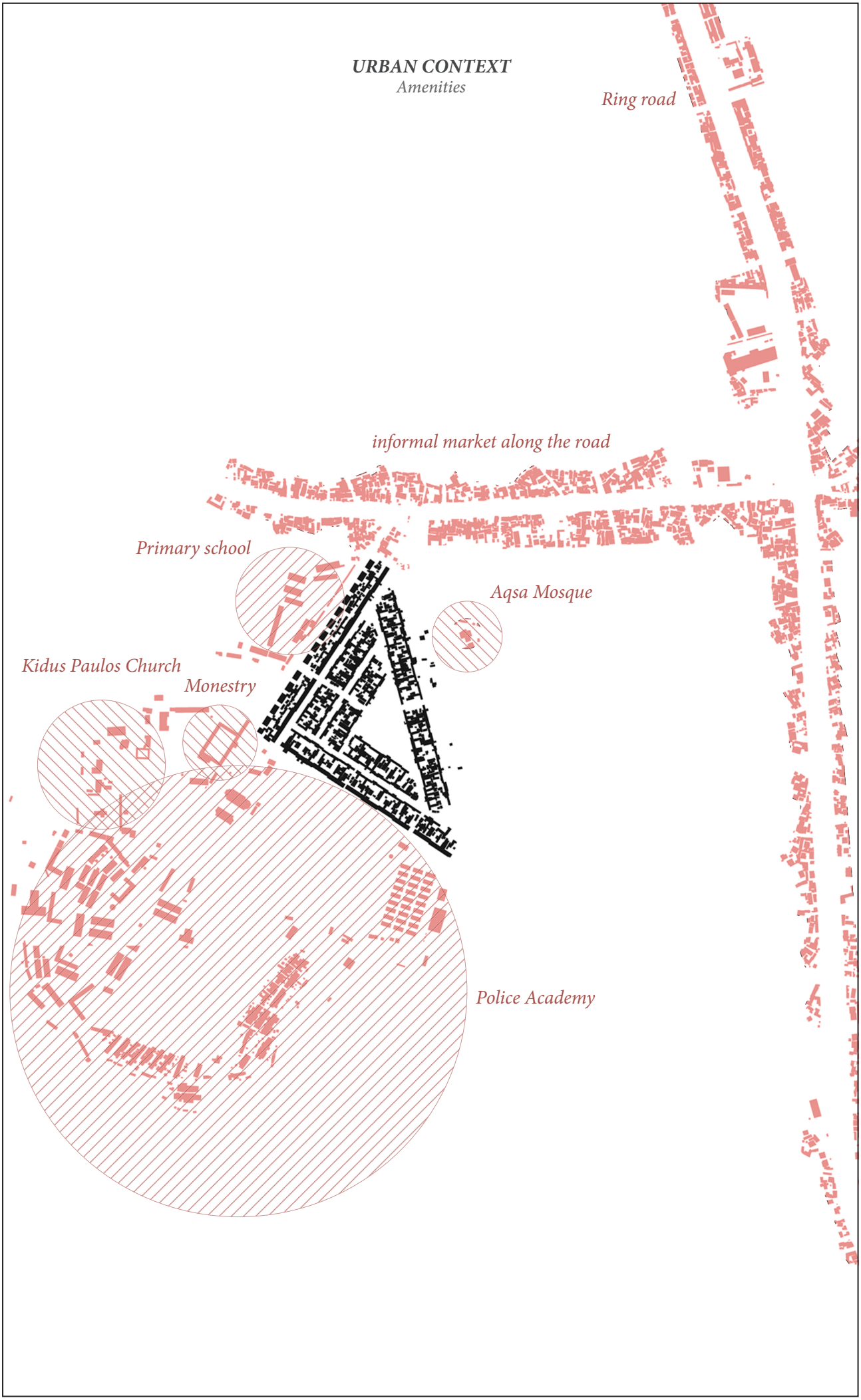

Mickey Leland Condominium
Kolfe
Mercato
Piazza
Sheraton Hotel




***URBAN CONTEXT*** *Important sites*

*The project site, Kolfe, is situated in Kolfe-Keranio, one of ten sub-cities of Addis Ababa. Kolfe-Keranio sub-city is located west of the city, directly bordering the Oromo region. The peripheral location of the project site is similar to the Mickey Leland Condominium project. However, the project site is directly linked with Mercato, the largest market in Africa, and Piazza, the city centre of Addis Ababa. South of the Piazza is the Sheraton Hotel, the location from which all of the current inhabitants of Kolfe were relocated from.*


URBAN CONTEXT
Amenities


URBAN CONTEXT
Amenities
Ring road
informal market along the road
Primary school
Aqsa Mosque
Kidus Paulos Church
Monestry
Police Academy



*Kidus Paulos Church*



*public street*



*primary school*



*riverside*




*Aqsa Mosque*



*sport field*

## *KOLFE ZOOM IN*

*basic information*

*Official address*
*Kolfe Keranio Sub city, Woreda 24, Kebele 09*

*Development period*
*late 1980's*

*Developer*
*Federal Housing Corporation*

*Ownership*
*rent from the FHC; sublease*

*Gross site area*
*8,5 Ha*

*Gross built area*
*~ 4 Ha*

*GSI*
*0,47*

*FSI*
*0,47*

*Number of plots/unit*
*357 (est.)*

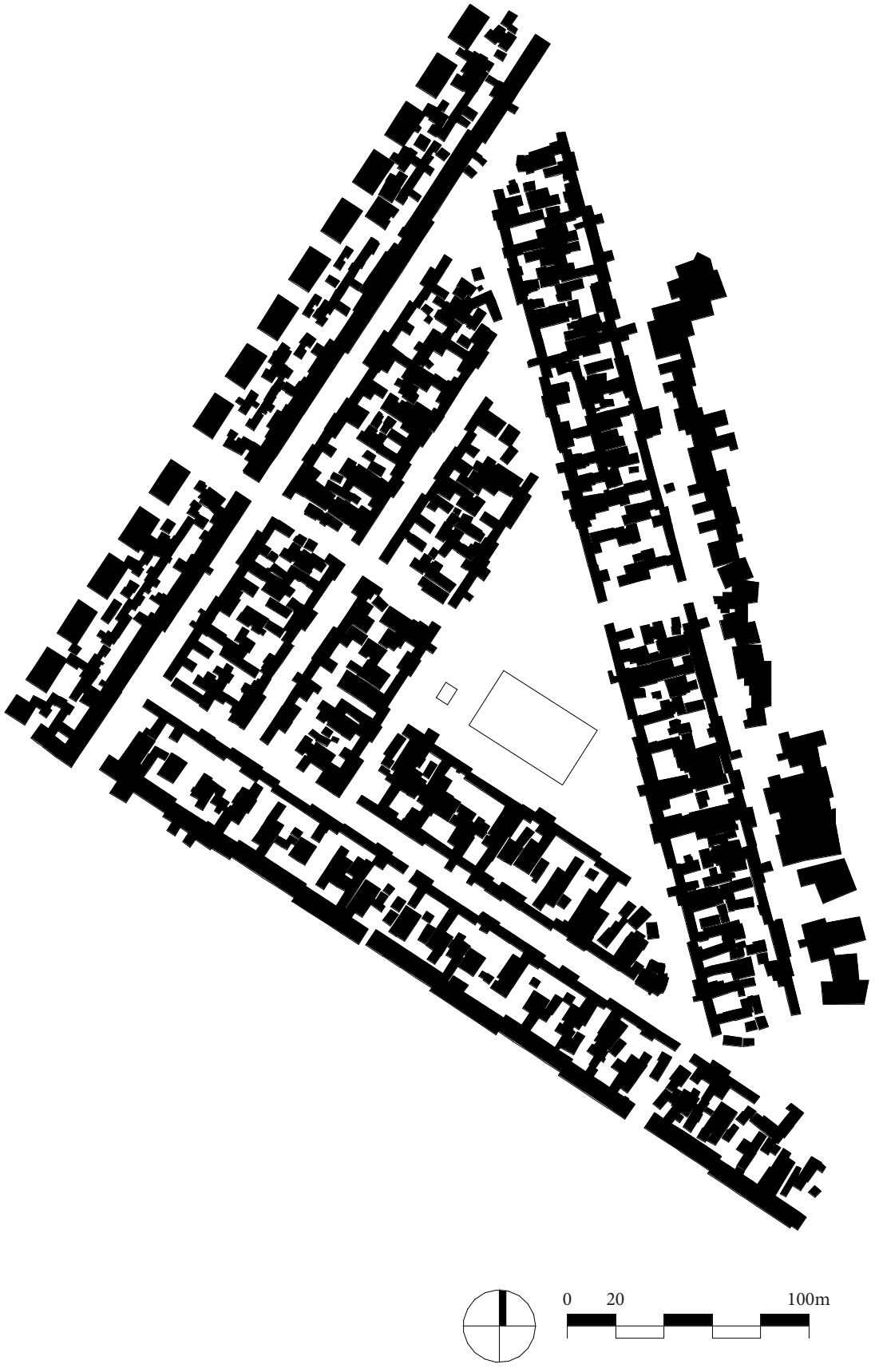
*Units/ha*
*42*

*Typologies*
*3*

*Population*
*2 540 (assume ave. 7/household)*

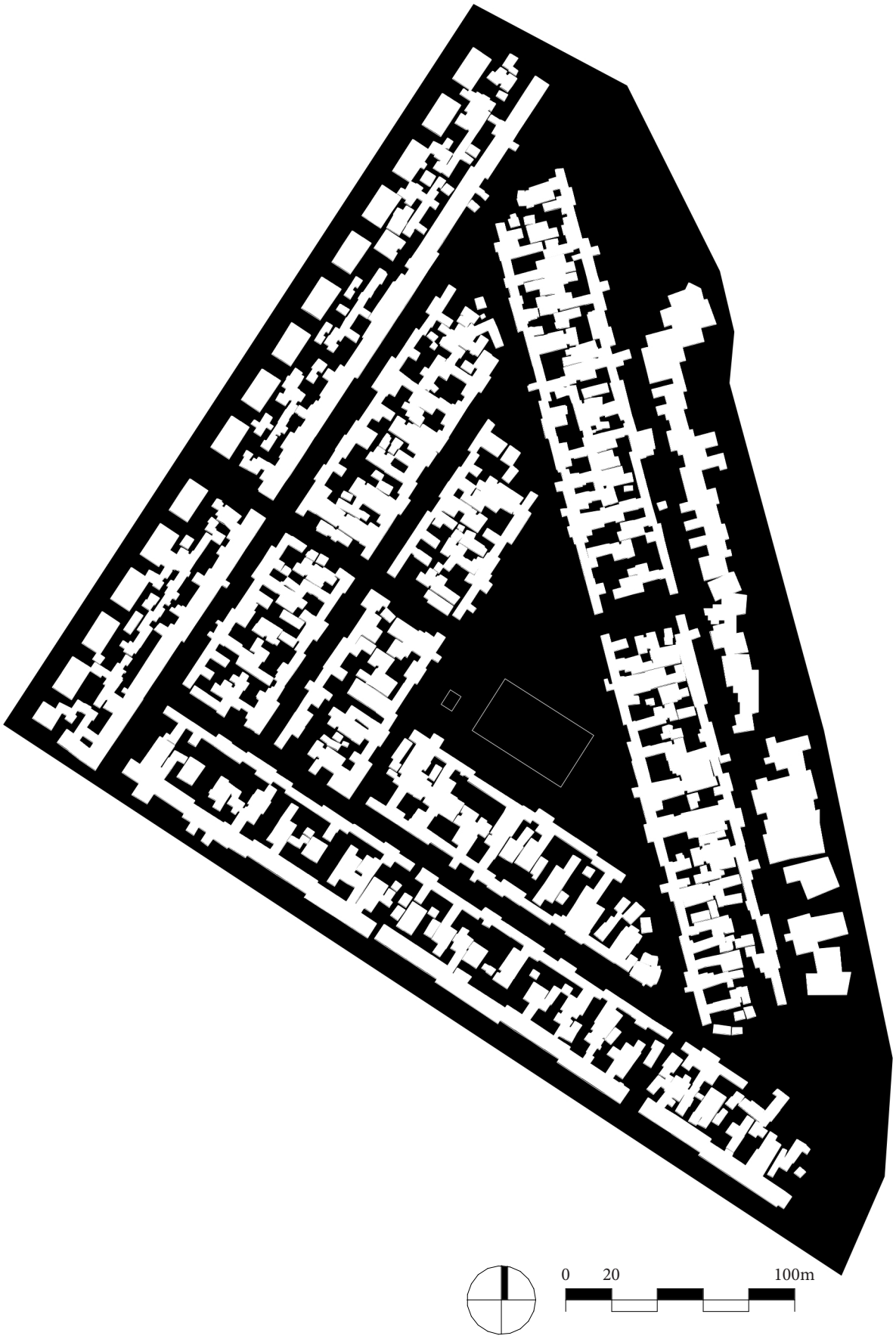
*Population/ha*
*299 (assume ave. 7/household)*

***KOLFE ZOOM IN***
*figure ground*

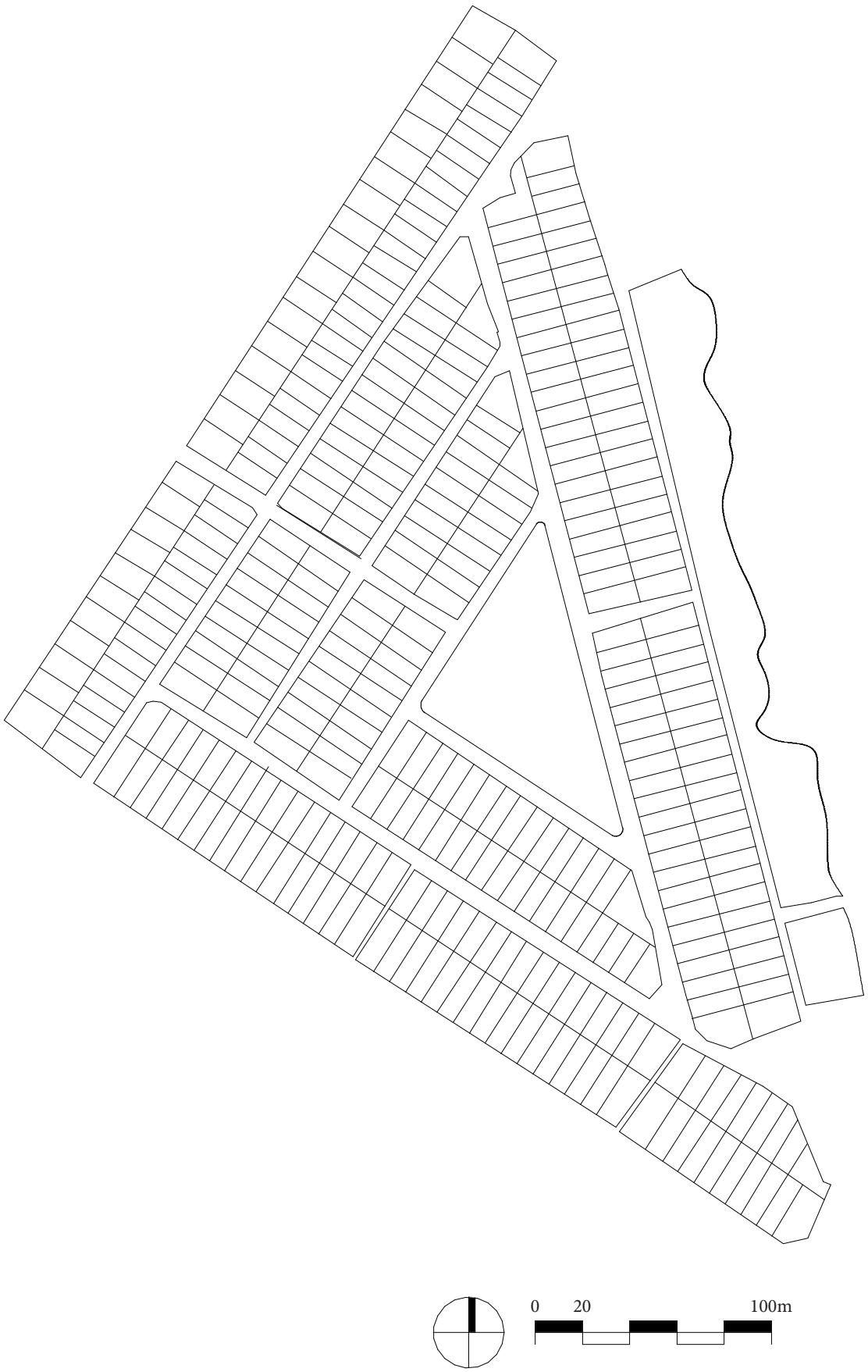


***KOLFE ZOOM IN***

*open space*



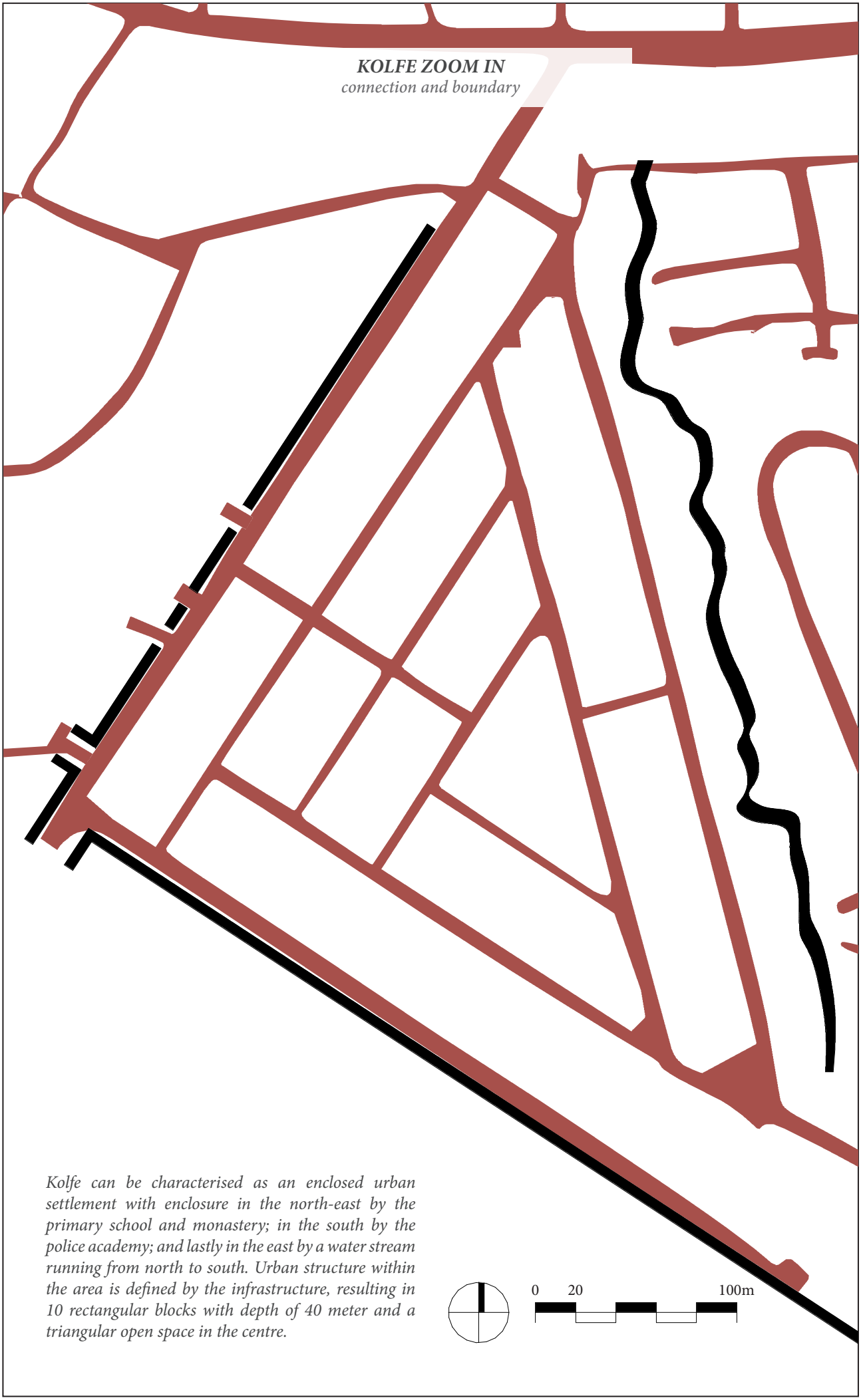
***KOLFE ZOOM IN***
*plots arrangement*



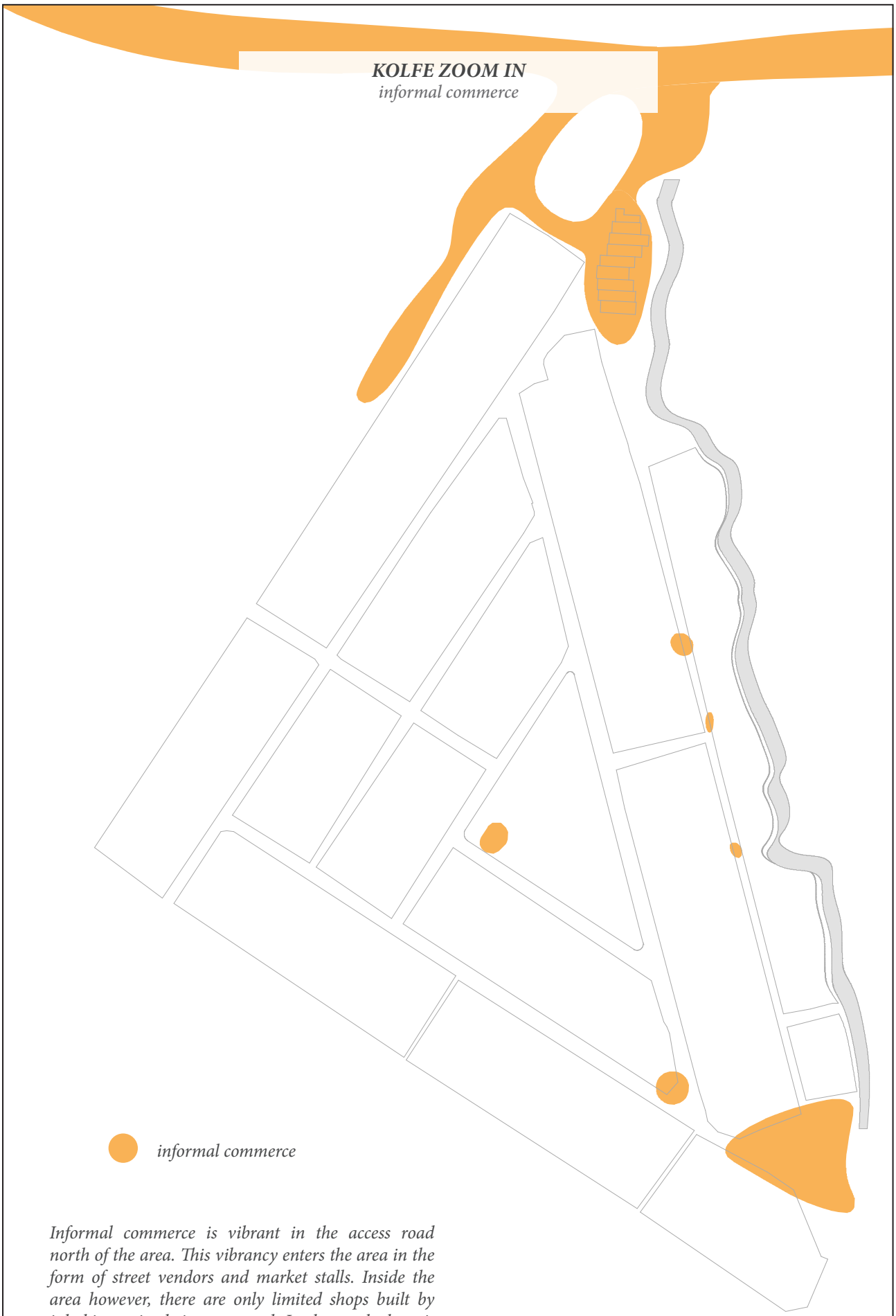
***KOLFE ZOOM IN***

*dwelling types*

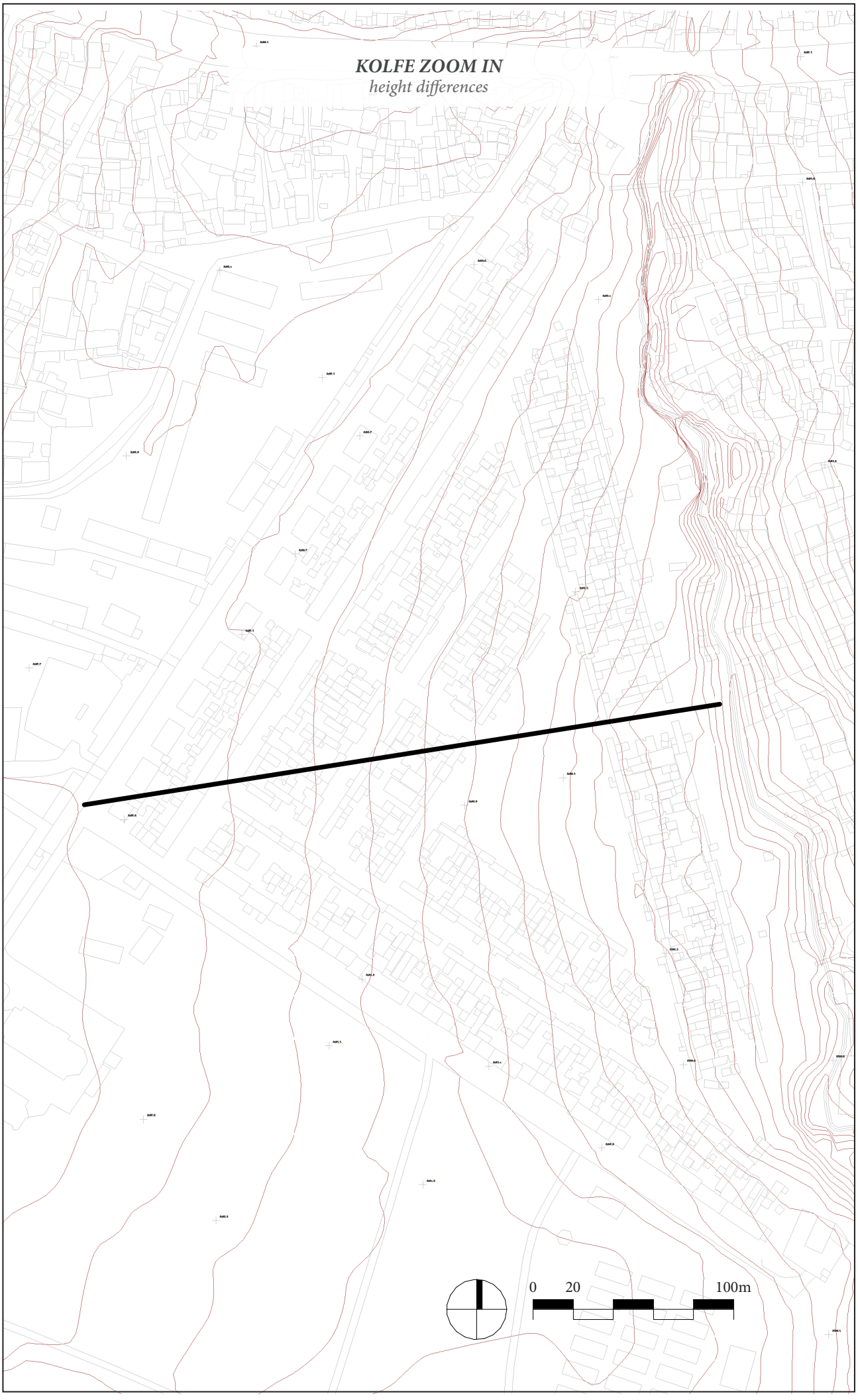




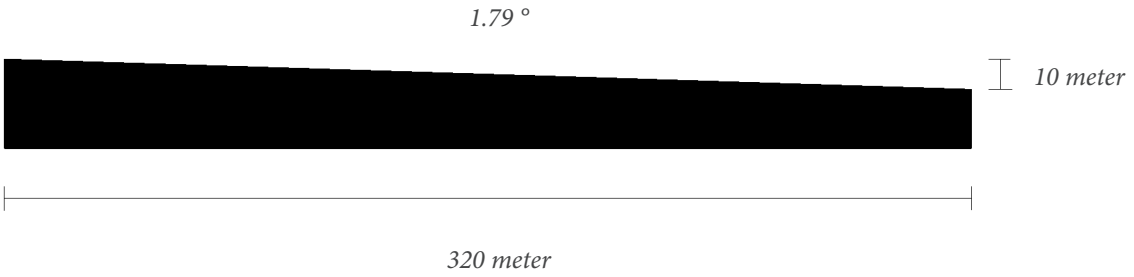

*Kolfe can be characterised as an enclosed urban settlement with enclosure in the north-east by the primary school and monastery; in the south by the police academy; and lastly in the east by a water stream running from north to south. Urban structure within the area is defined by the infrastructure, resulting in 10 rectangular blocks with depth of 40 meter and a triangular open space in the centre.*




*Informal commerce is vibrant in the access road north of the area. This vibrancy enters the area in the form of street vendors and market stalls. Inside the area however, there are only limited shops built by inhabitants in their compound. In the south there is also an informal market run by elderly woman in the neighbourhood.*

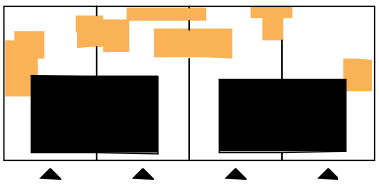

KOLFE ZOOM IN
height differences
0
20
100m

***KOLFE ZOOM IN***
*height differences*




*Similar to other places in Addis Ababa, Kolfe also have height differences in the area. However, this geographical relief is much less striking. In an area section of the site, a distance of 320 meters only have 10 difference in height. In other words, every meter that you travel horizontally, there will be a drop in height of 3,2 centimetre.*

## *Type A*



*Rooms (add. not incl.)*
*living room;*
*3 bedrooms;*
*outdoor kitchen and pit latrine*

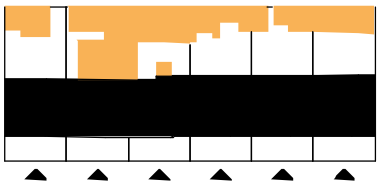
*Plot size*
*12 x 20 = 240 m²*

*Core size*
*8 x 9,5 = 76 m²*

*Ave. extension*
*~ 36 m²*

*Ave. built area incl. extension*
*~ 113 m²*

## *Type B*



*Rooms (add. not incl.)*
*living room;*
*2 bedrooms;*
*outdoor kitchen and pit latrine*

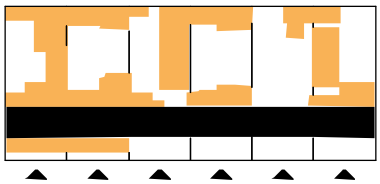
*Plot size*
*8 x 20 = 160 m²*

*Core size*
*8 x 7,8 = 62 m²*

*Ave. extension*
*~ 36 m²*

*Ave. built area incl. extension*
*~ 98 m²*

## *Type C*



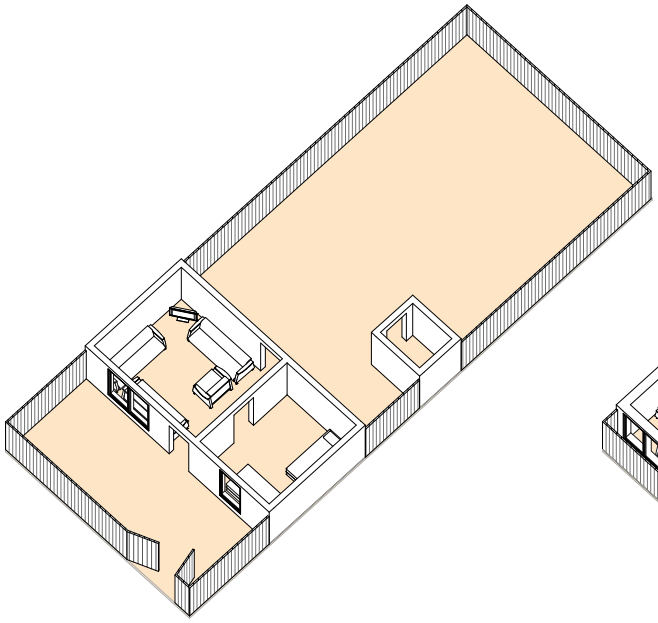
*Rooms (add. not incl.)*
*living room;*
*1 bedroom;*
*outdoor kitchen and pit latrine*

*Plot size*
*8 x 20 = 160 m²*

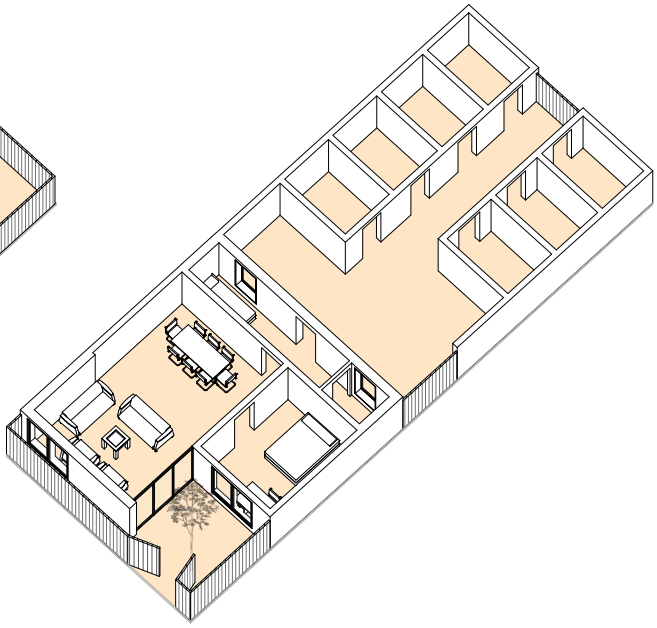
*Core size*
*8 x 4 = 32 m2*

*Ave. extension*
*~ 51 m²*

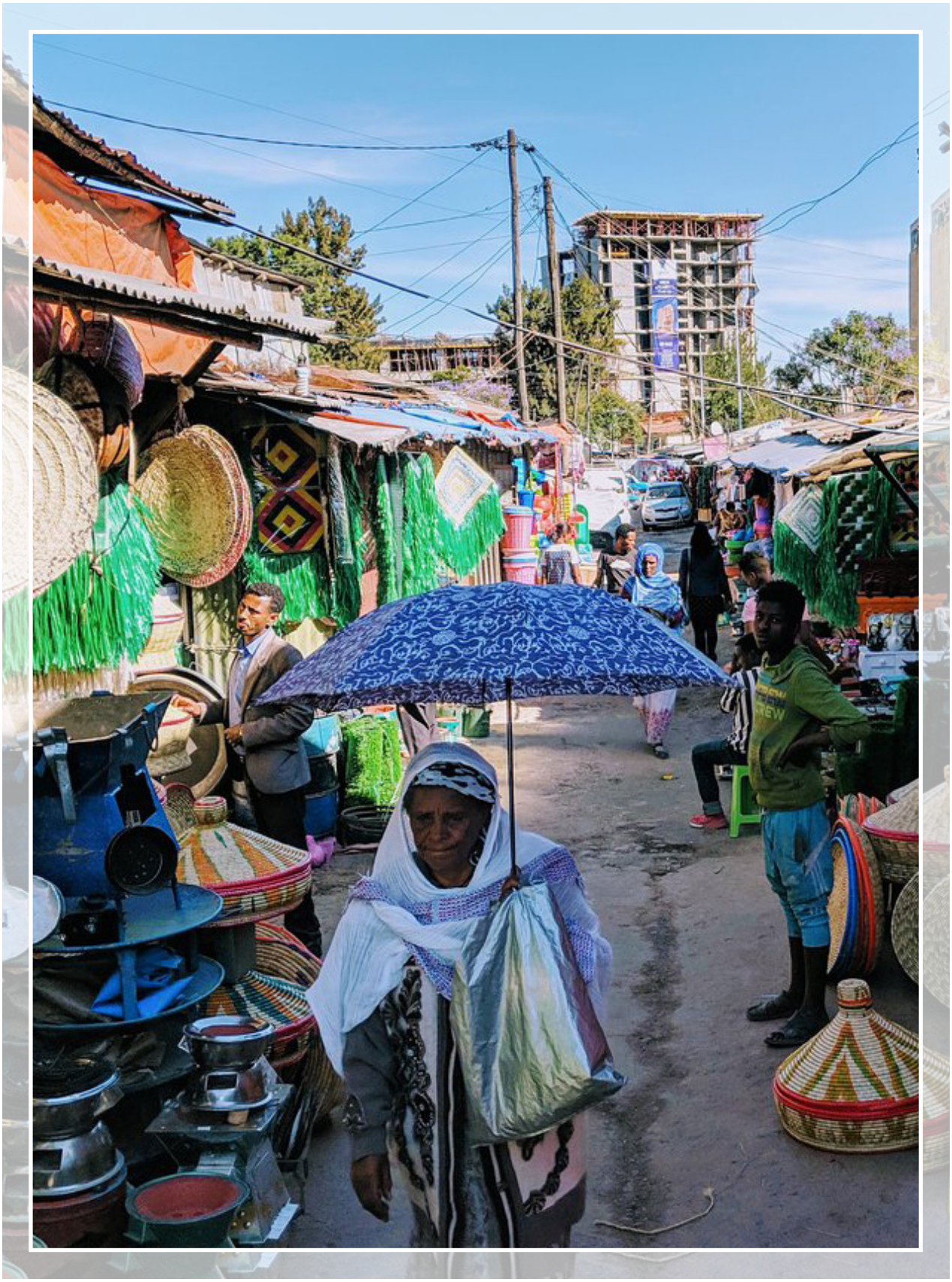
*Ave. built area incl. extension*
*~ 83 m²*



type C - original



type C - possible extensions



*Chapter III*

# DESIGN

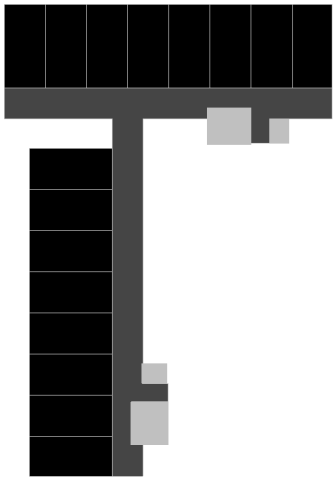
## *URBAN STRATEGY*

*Aim of the design*

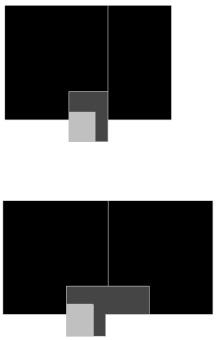
*The aim of the design is to create communal living between different income groups/ social classes, while offering the low-income group chances to make their living in various forms. Thus, two main themes can be derived from this goal: community and income generation.*

*To form community mean offering space of interaction. That could happen in various scale, from the largest town square, were people from the whole neighbourhood will gather for celebrations, to the smallest scale, of having a place to chat with your neighbours. While creating points of interactions, there must also be caution in creating to much of it. Different social/ income groups have different attitudes towards collectively. Due to the very nature of the low-income group to have limited resources, people from this group will be more inclined to have collective spaces where help and needs can be exchanged to each other. This is contrary to the middle- and high-income group, where social interaction mostly happens with people from the same group, even outside of the neighbourhood. But towards people from lower income groups, there is a more protective attitude. This does not mean that there will be zero interactions between the low-income group and the middle-income group. As the middle-income groups would also need goods and services from the low-income groups, this act of exchange in goods and services will not only be socially beneficial to both, but also financially beneficial to the latter.*

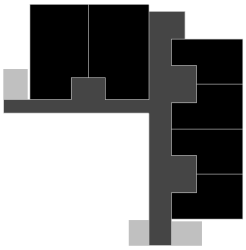
*Now we come to the second theme: income generation. As the middle-income groups will have sufficient opportunities outside the neighbourhood, the main benefit of living in an area with mixed income groups is the lower prices for goods and services. For the low-income group, it means a stable income source from this trade with the middle income group. However, this means that the low-income group would also need space for income generation. Examples are spaces to make goods to sell, spaces to dry the spices for the restaurants, spaces to wash the clothes collected from the middle-income group. Another way to make money is to sublet a part of the dwelling to renters. These income generation practices all need a certain flexibility from the space. Flexibility to adapt the dwelling to be able to sublet it while not sacrificing privacy. Flexibility to share the outdoor space to do various tasks. This design will make possible to live in an environment where the greatest potential in income generation can be achieved, while not sacrificing the living quality.*



*Type 1*
*ADAPTIVE MODULAR GALLERY*



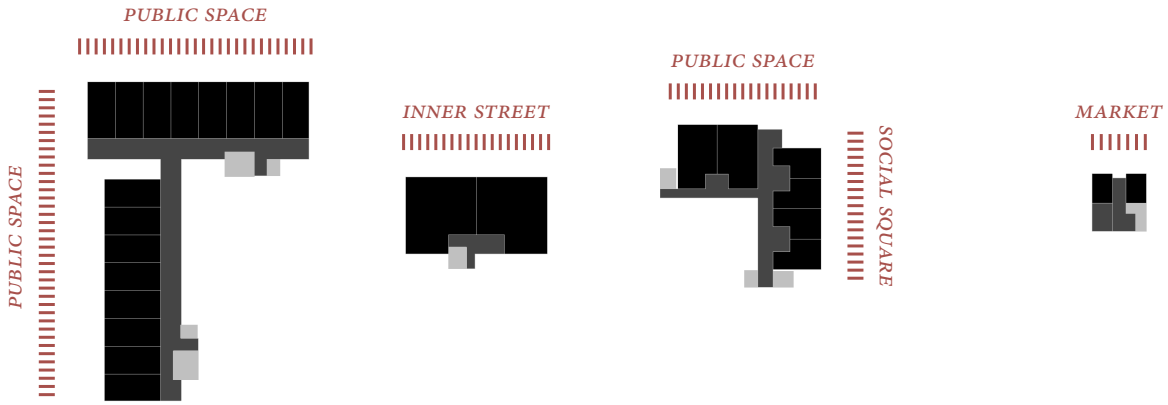
*Type 2*
*MIDDLE INCOME PORTICO*



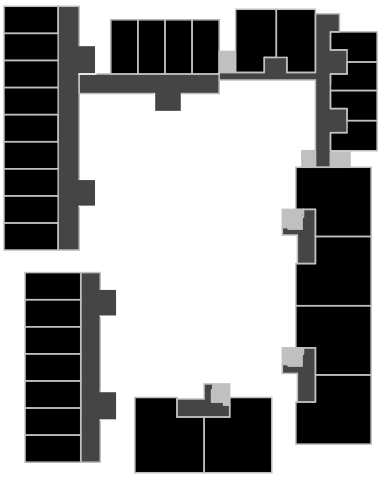
*Type 3*
*URBAN CORNER*



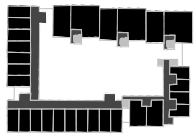
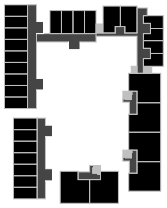
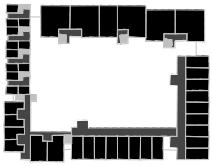
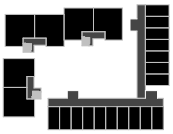
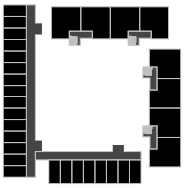
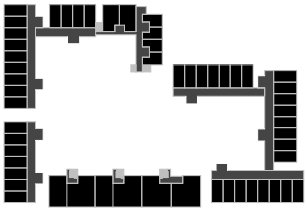
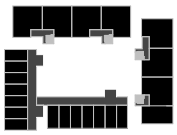
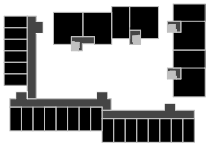
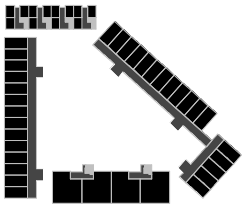
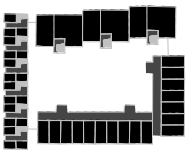
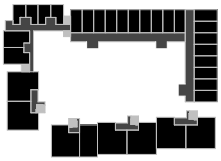
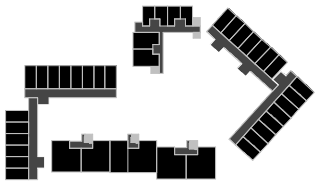
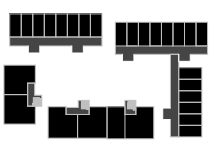
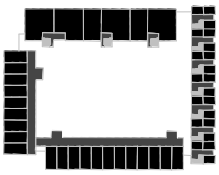
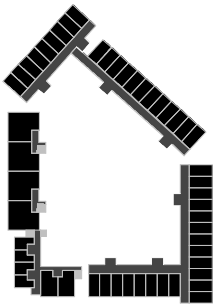
*Type 4*
*WORKERS CO-HOUSING*



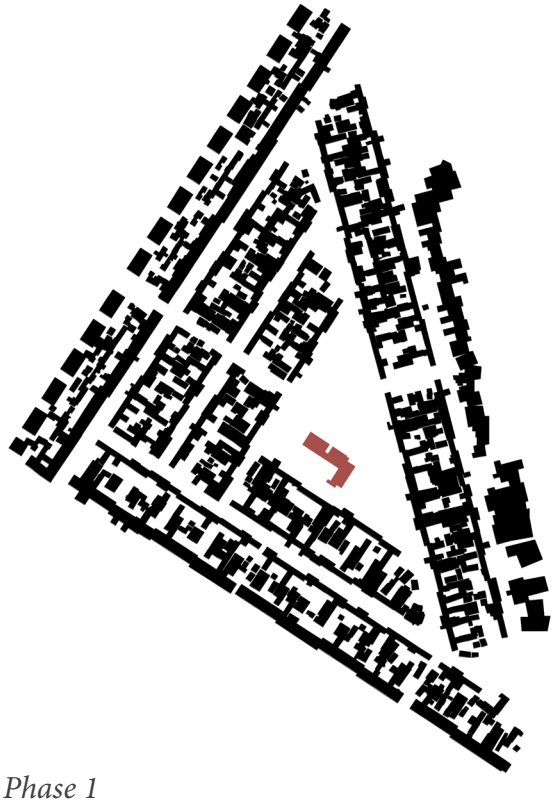

*placement of building type based on their urban surrounding*



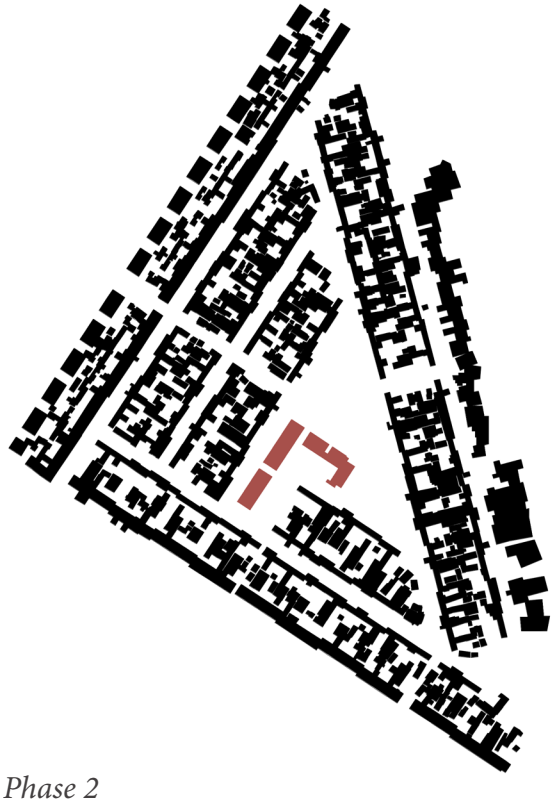
*cluster into courtyard block*





*Phase 1*



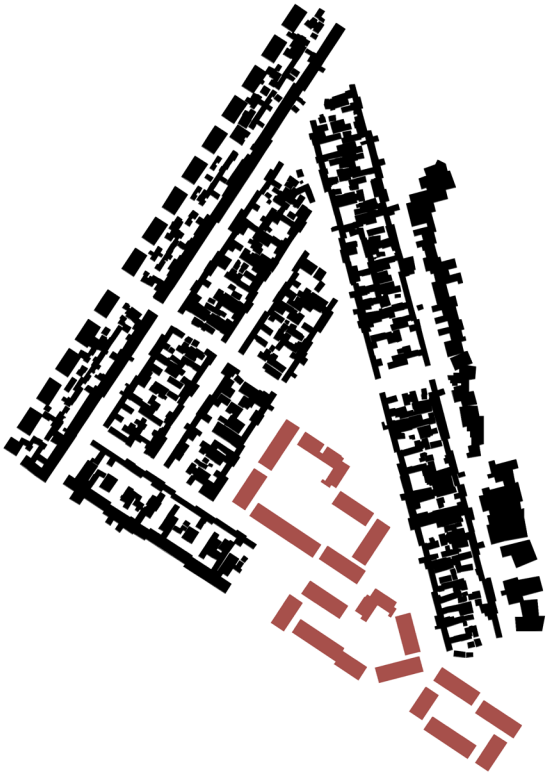
*Phase 2*



*Phase 3*



*Phase 4*



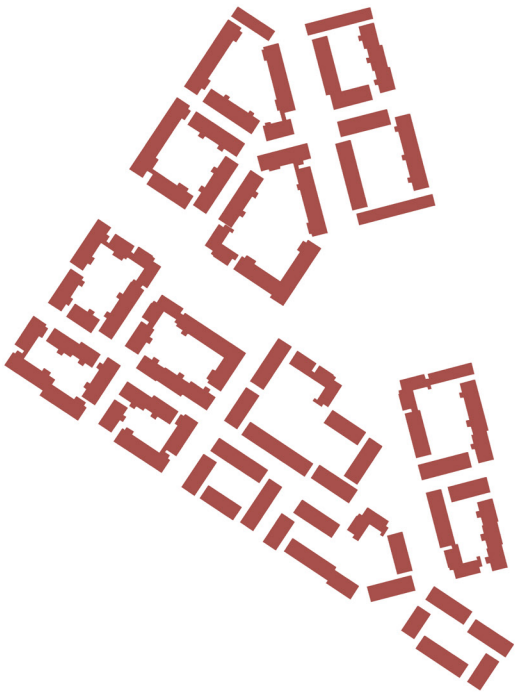
*Phase 5*



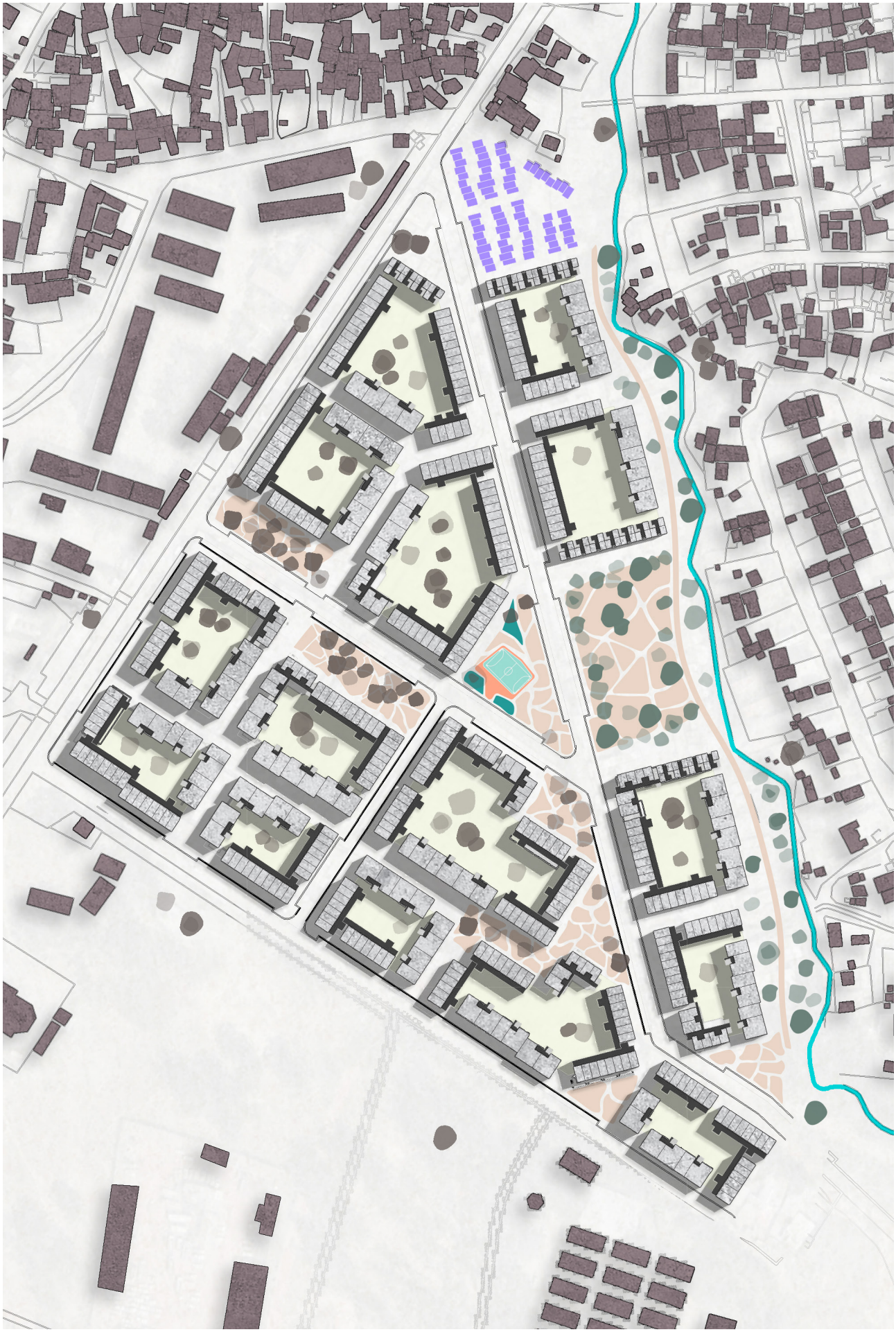
*Phase 6*



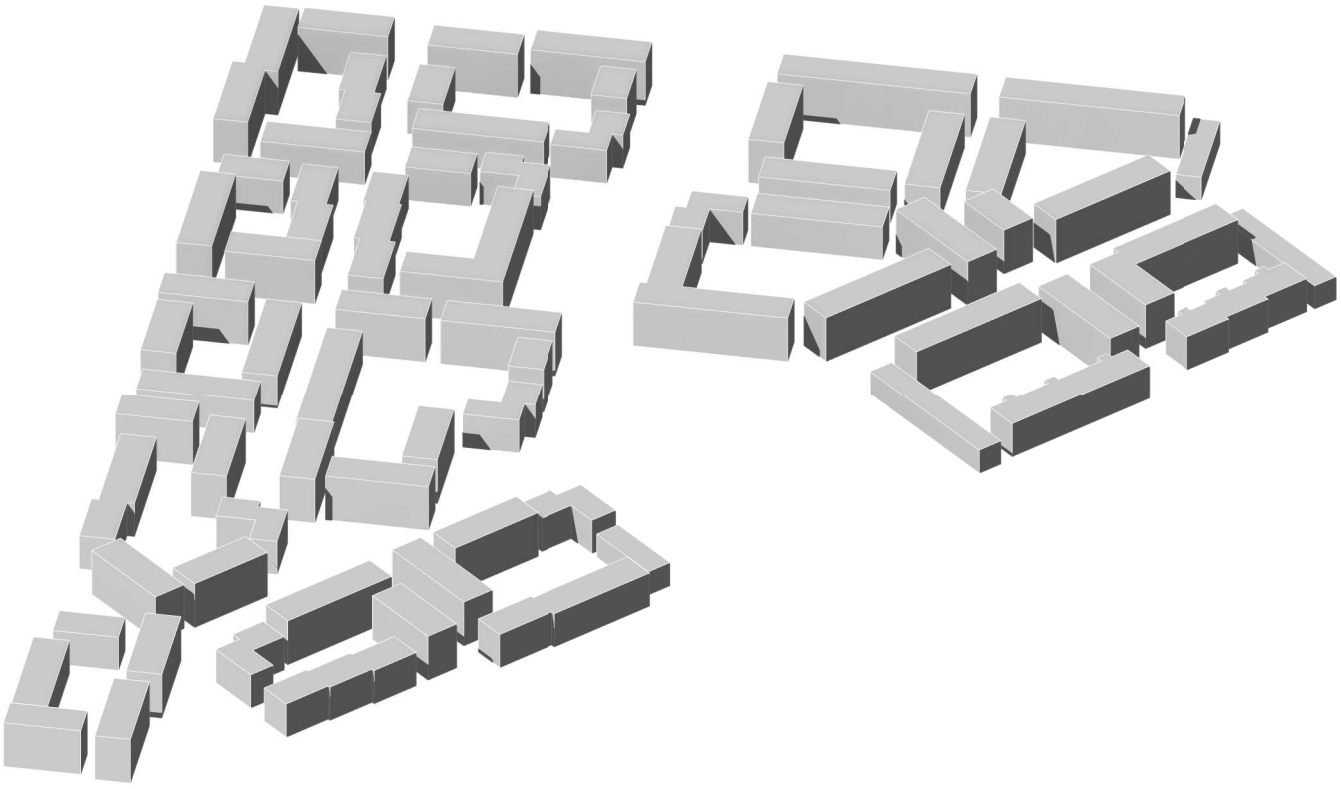
*Phase 7*



*Phase 8*



***URBAN STRATEGY***
*isometric view*



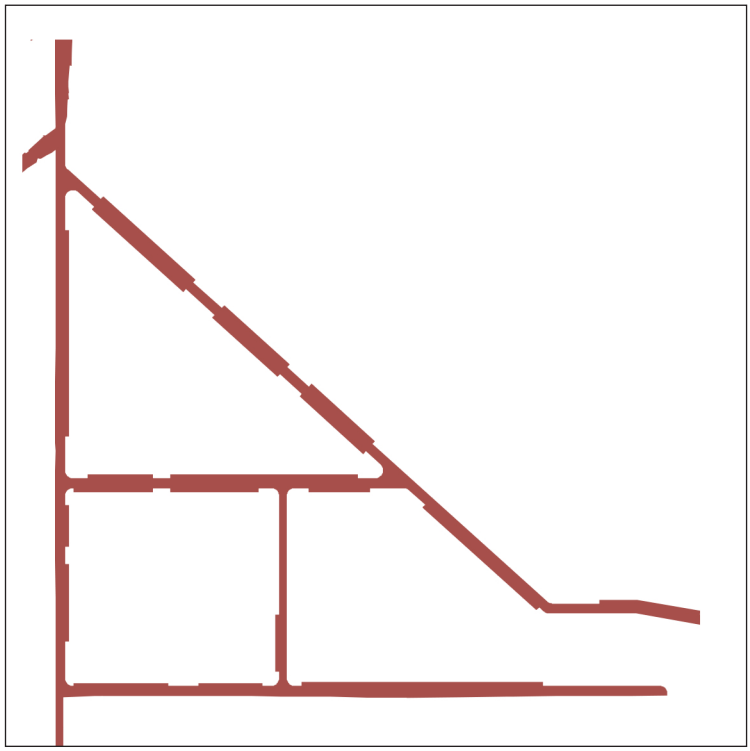


*In the current context of Kolfe, the site is confined by its surroundings. The main access to the site is by the access road at the north, where informal businesses are vibrant, and the road in the south, connecting to the other neighbourhood. In the eastern corner is the entrance to the police academy. In the north-western side of the triangular area are the primary schools and access to the monastery and church located.*

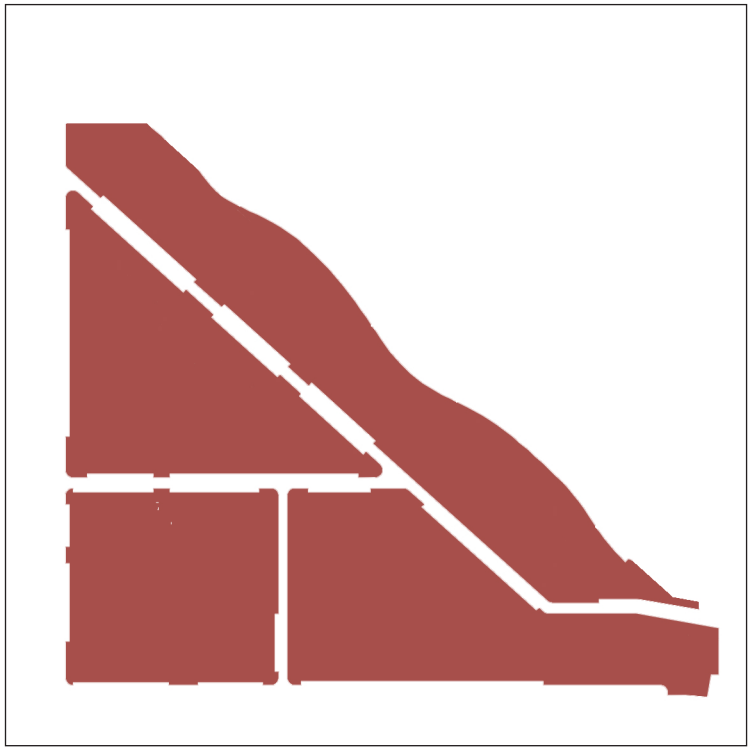
## *URBAN STRATEGY*

*dissection - connection and division*

*To connect the main access points in the north and south, car roads are placed parallel to the site's borderlines. Inside the area are also car roads that will connect the parallel roads. The road parallel to the police academy's border will remain a dead end, just like the existing situation.*



*Divided by the road are the urban divisions. Four areas that have limited car access. These four areas form their own neighbourhoods*



## *URBAN STRATEGY*

*dissection - internal streets and promenade*

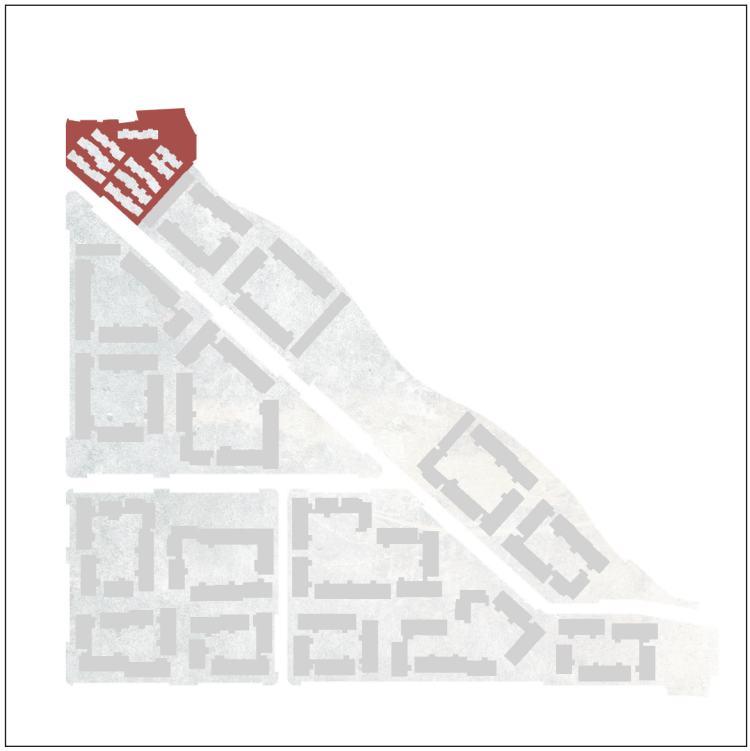


*Within the neighbourhood, voids between the urban blocks will create inner streets. These inner streets will be a connection network for the pedestrians, while cars are limited to access.*

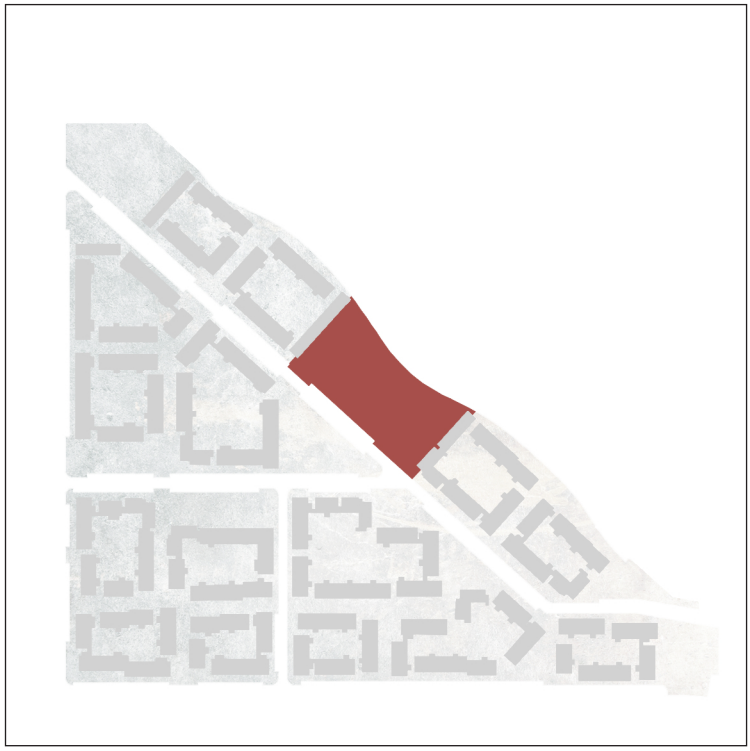


*A new promenade along the river will activate the area with a new form of social space. This promenade gives the river back to the whole neighbourhood instead of just the people with live directly adjacent to it.*

*In the north of the project site a new market space will be create as an expanded variant of the existing one. This way more people will be able to trade their goods and services. The placing and expansion of this marketplace will also concentrate the street vendors into one place, giving the other public spaces in the area back to a social function.*

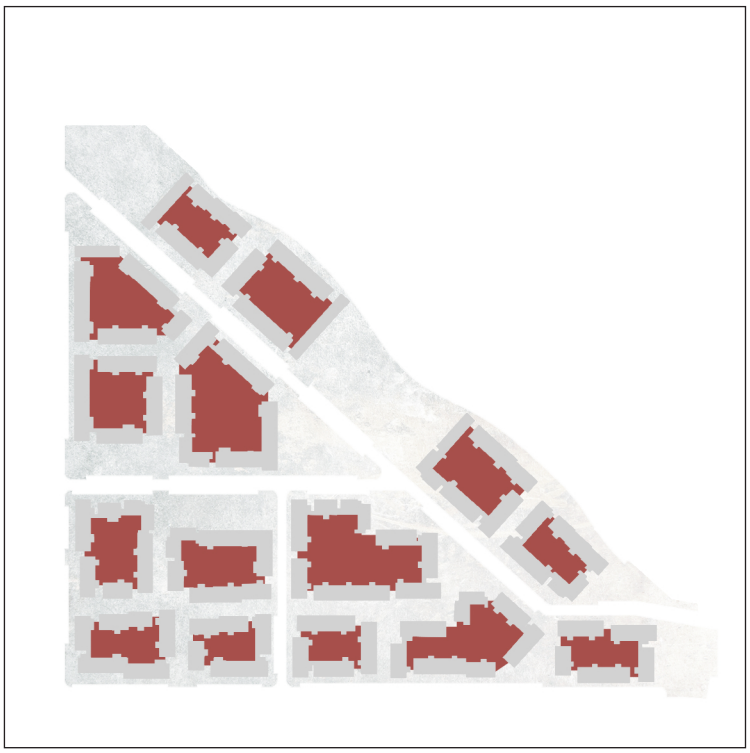


*The public plaza is located in the centre of the area. The main difference between this open space and the marker square is the program. This public plaza is more oriented to the social program for the inhabitants in this area, while the market is for commercial activities that connect Kolfe's inhabitants to the informal road north, outside of the neighbourhood. That is why the public plaza is placed in a more enclosed location This public plaza is also the largest link in a network of social spaces in the neighbourhood. The placement of the public plaza also makes it possible to open up the river towards the neighbourhood.*





*Social squares are the main meeting space for people from different courtyard blocks. It connects the people from the same social network. The placement of the social squares in the middle of the area makes it possible that each square has its own spatial integrity but is also well connected to the other squares. This network of social squares is placed along the car roads and there for also connected to the public plaza.*



*The main urban typology is the courtyard block. It defines a clear collective space shared by inhabitants from the different building types surrounding the courtyard. The courtyards spaces can be differentiated from each other by the variance in size and form, as well as the buildings that are setting up the courtyards.*

## *URBAN STRATEGY*

*dissection - plinth program and building heights*

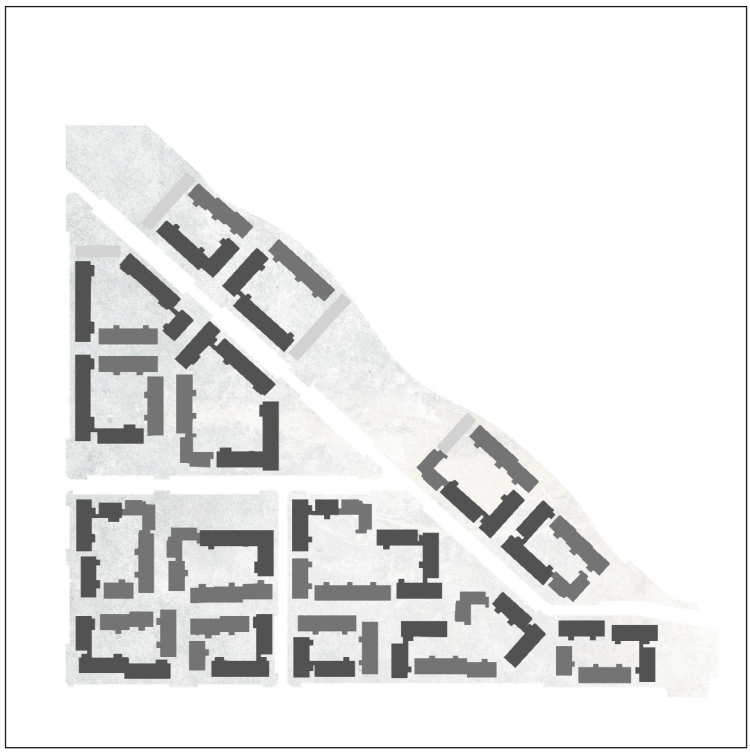
*The main idea of the urban strategy is to have building types that are responsive to its urban context. The commercial programs are placed adjacent to the market space ant the public plaza, for its large pedestrian flow. mix-use, adaptable plinths are adjacent to the car roads. In this group, the inhabitants can decide if the want to keep the plinth as dwelling or adapt it to a shop front. Public programs are placed next to the social squares. On the inner streets and along the promenade are residential plinths only.*



*commercial* *mix-use/adaptable*

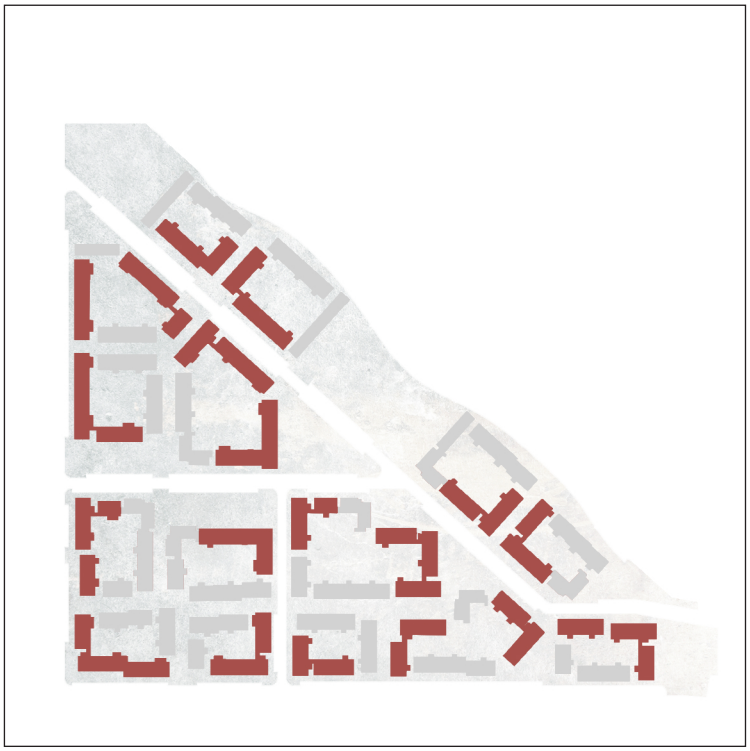
*residential* *public*

*The amount of floors (and thus the building height) is also a factor as response to the urban context. The highest floor counts is six, of which the lowest two levels are maisonettes. These are predominantly placed along the car roads. This is in contrast to the three floors buildings adjacent to the market and the plaza. The three floors building height will bring back the public spaces to a more human scale.*



*three floors* *six floors*

*four floors*



*The first typology is the adaptive modular gallery. In this type, the plinth level is made up of maisonette units with an adaptable program. It is imaginable that inhabitants who are living closer to the public spaces are also more inclined to change their plinth to a commercial program.*

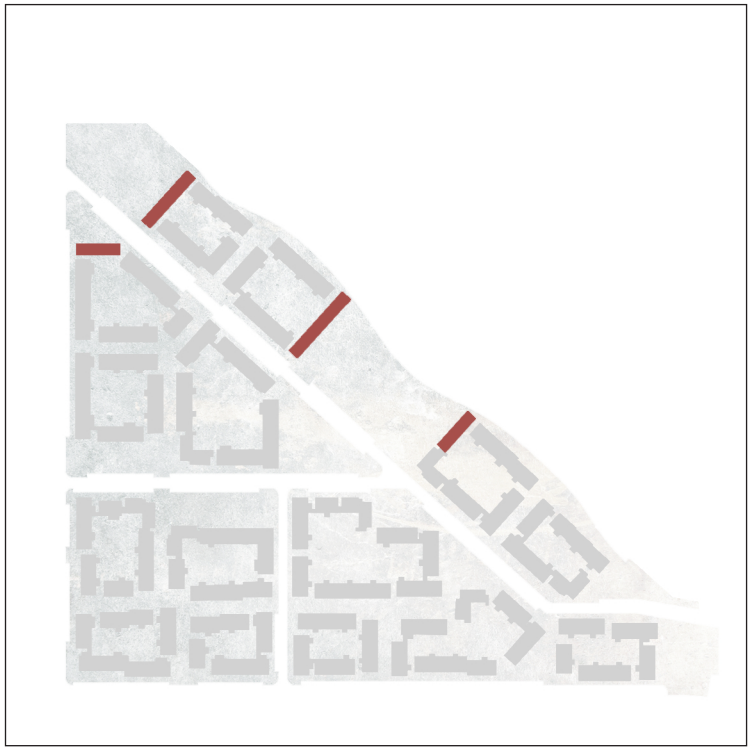


*The second type is the middle-income portico apartment. This type is oriented to middle income families and thus are the building placed on the quiet inner streets and along the promenade. the inhabitants enter via the courtyard and facing the inner street and the promenade would be the spacious balconies.*

*Third type is the urban corners. It is named for its L-shape and its placement on the corner of the courtyard block. Its placement in the urban plan make it logical to have a public program in the plinth. This public indoor space can serve as the space where inhabitants in the surrounding blocks to organise their ekub and idirs. The target group of the dwelling units are couples in the low- and middle-income segment.*



*The fourth type is the workers co-housing. As urban migrants come to the city with little resources and a need for a place to stay, this typology offers a solution to this need. This co-housing type can house four different household of one to two people. The inhabitants will share amenities like kitchen and washing space. Because the entrance is also via the courtyard, these urban migrants are explicitly a part of the community of the courtyard block. On the plinth is the large shops facing the public space.*



## *STAKEHOLDERS ANALYSIS*

*aspirations and offers*

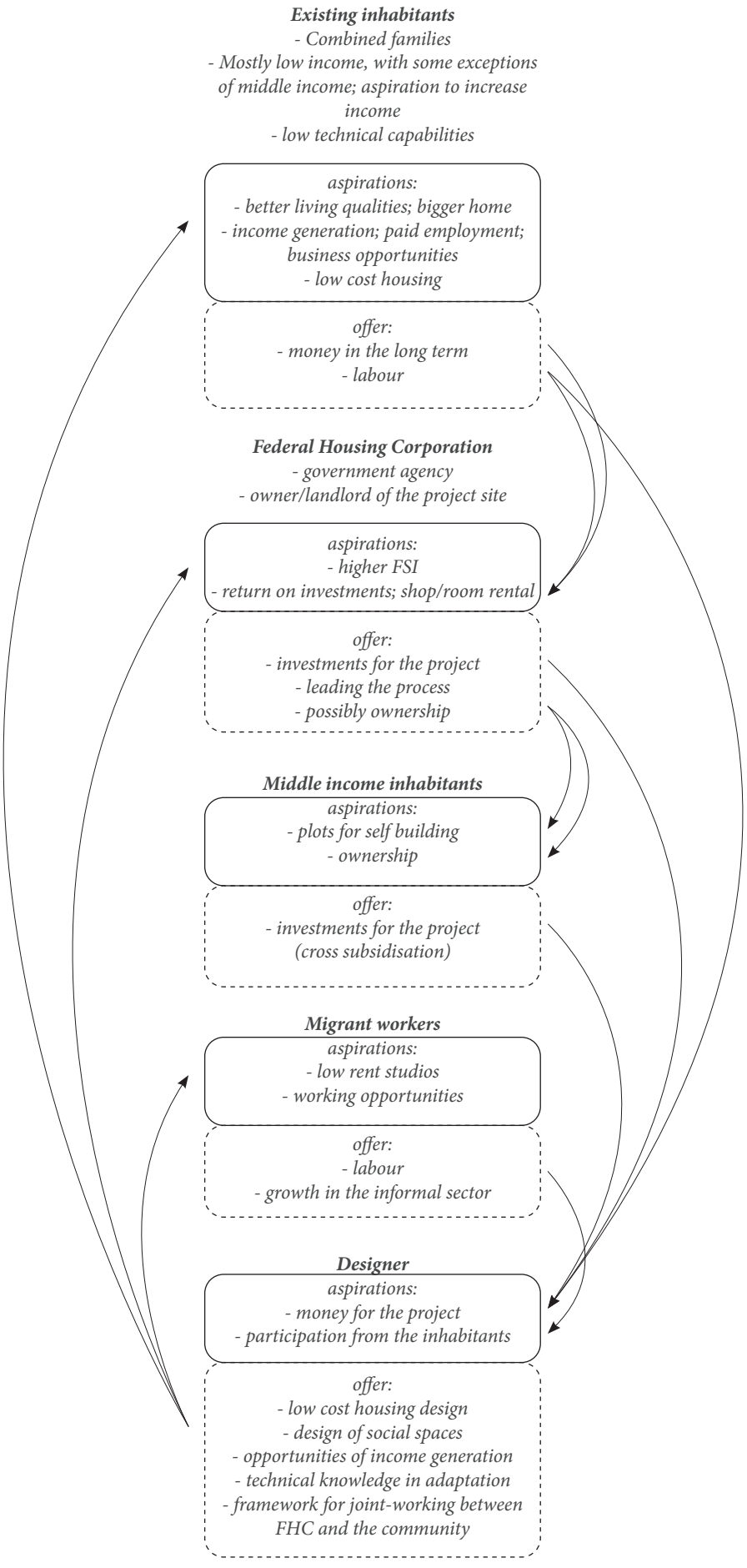
***Who wants what, and who gives it?***

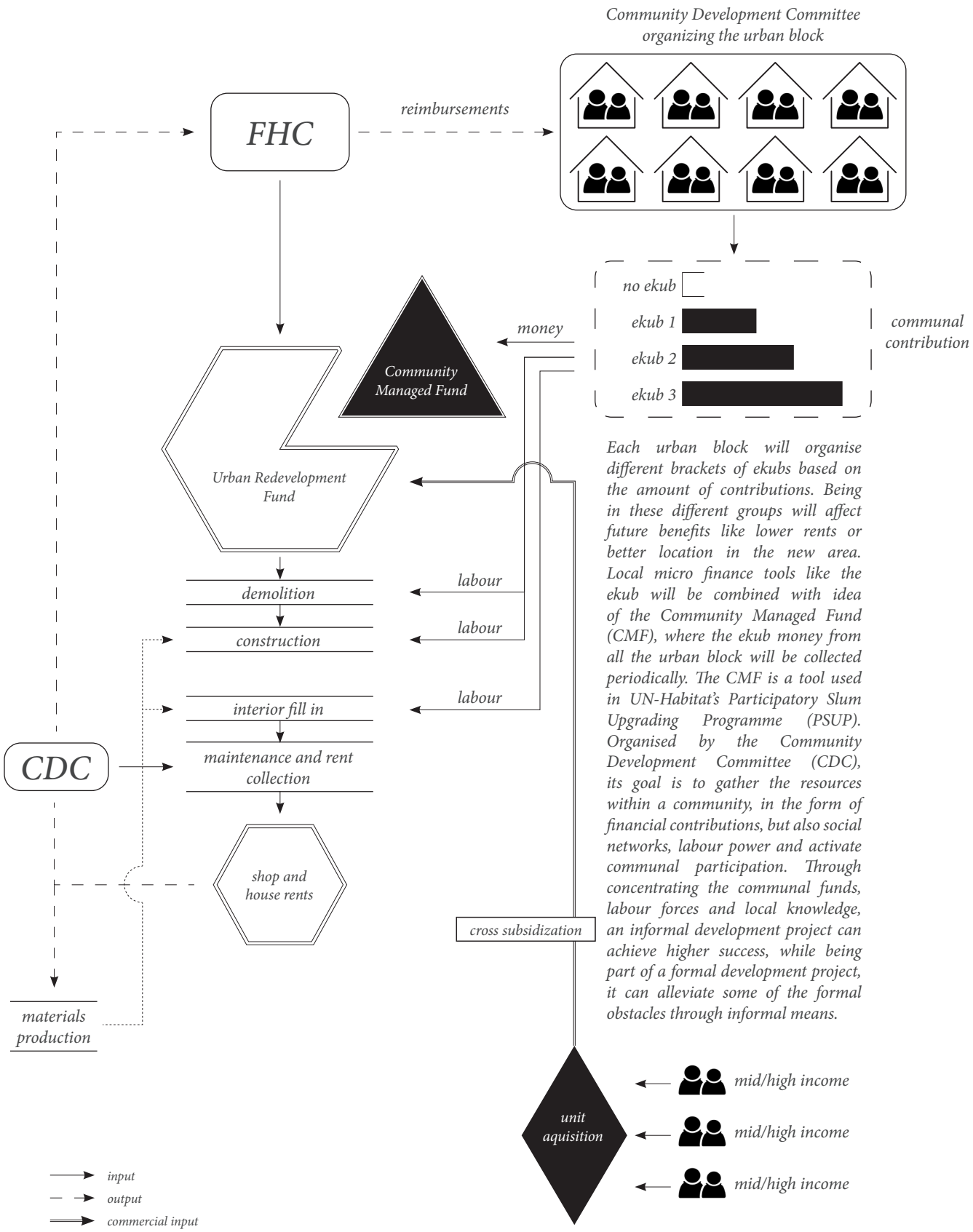
*Inhabitants wants better living qualities in the form of income generation possibilities, and bigger homes. Good amenities and social/green spaces are also desired. In return they can offer sufficient money in the long run, and perhaps even more with better working opportunities.*

*The FHC wants a denser urban area (higher fsi) and return on investments. It can serve as the leader in the redevelopment process and also the main financier.*

*The architect provides low-tech solutions for inhabitants to expand and alter their home without the need of outer investments like from the fhc.*

*New inhabitants are divided based on income. The FHC can decide to open up the acquisition of a number of units. Middle income families can buy the units and there for own the units instead of renting it. This cross-subsidisation would generate a higher initial income for the urban redevelopment fund. FHC would hereby trade the ownership of a number of for investment.*






*Each urban block will organise different brackets of ekubs based on the amount of contributions. Being in these different groups will affect future benefits like lower rents or better location in the new area. Local micro finance tools like the ekub will be combined with idea of the Community Managed Fund (CMF), where the ekub money from all the urban block will be collected periodically. The CMF is a tool used in UN-Habitat's Participatory Slum Upgrading Programme (PSUP). Organised by the Community Development Committee (CDC), its goal is to gather the resources within a community, in the form of financial contributions, but also social networks, labour power and activate communal participation. Through concentrating the communal funds, labour forces and local knowledge, an informal development project can achieve higher success, while being part of a formal development project, it can alleviate some of the formal obstacles through informal means.*

## *URBAN STRATEGY*
*basic information*

*Gross site area*
*8,5 Ha*

*Gross built ground area*
*4 Ha > 2,7 Ha*

*Ground Space Index*
*0,47 > 0,32*

*Floor Space Index*
*0,47 > 1,59*

*Number of plots/unit*
*357 (est.) > 1296 to 2396**

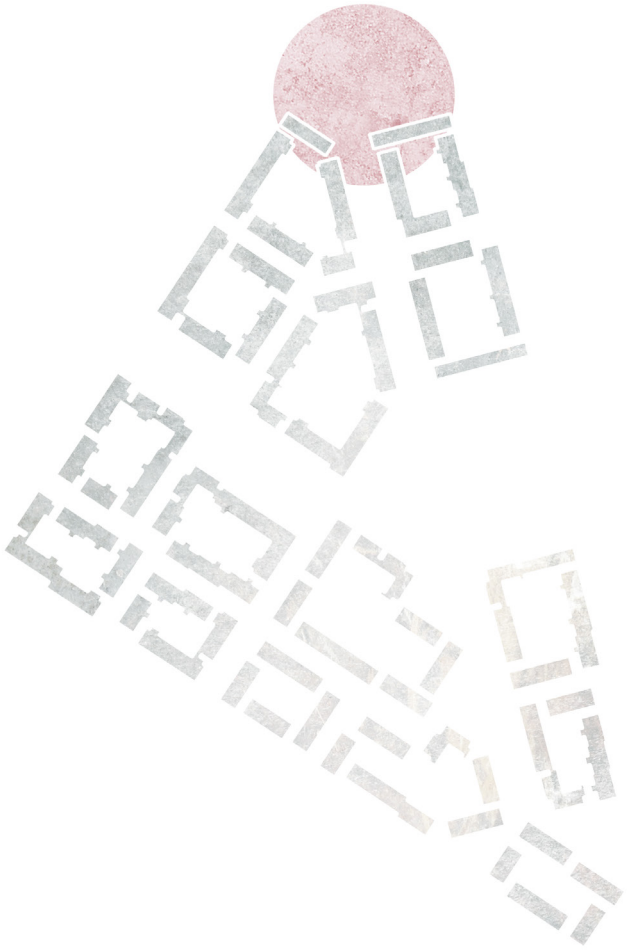
*Units/ha*
*42 > 153 to 282**

*Delling types*
*3 > 14*

*Population*
*2 540 (est.) > 3318 to 5084***

*Population/ha*
*299 > 390 to 598***

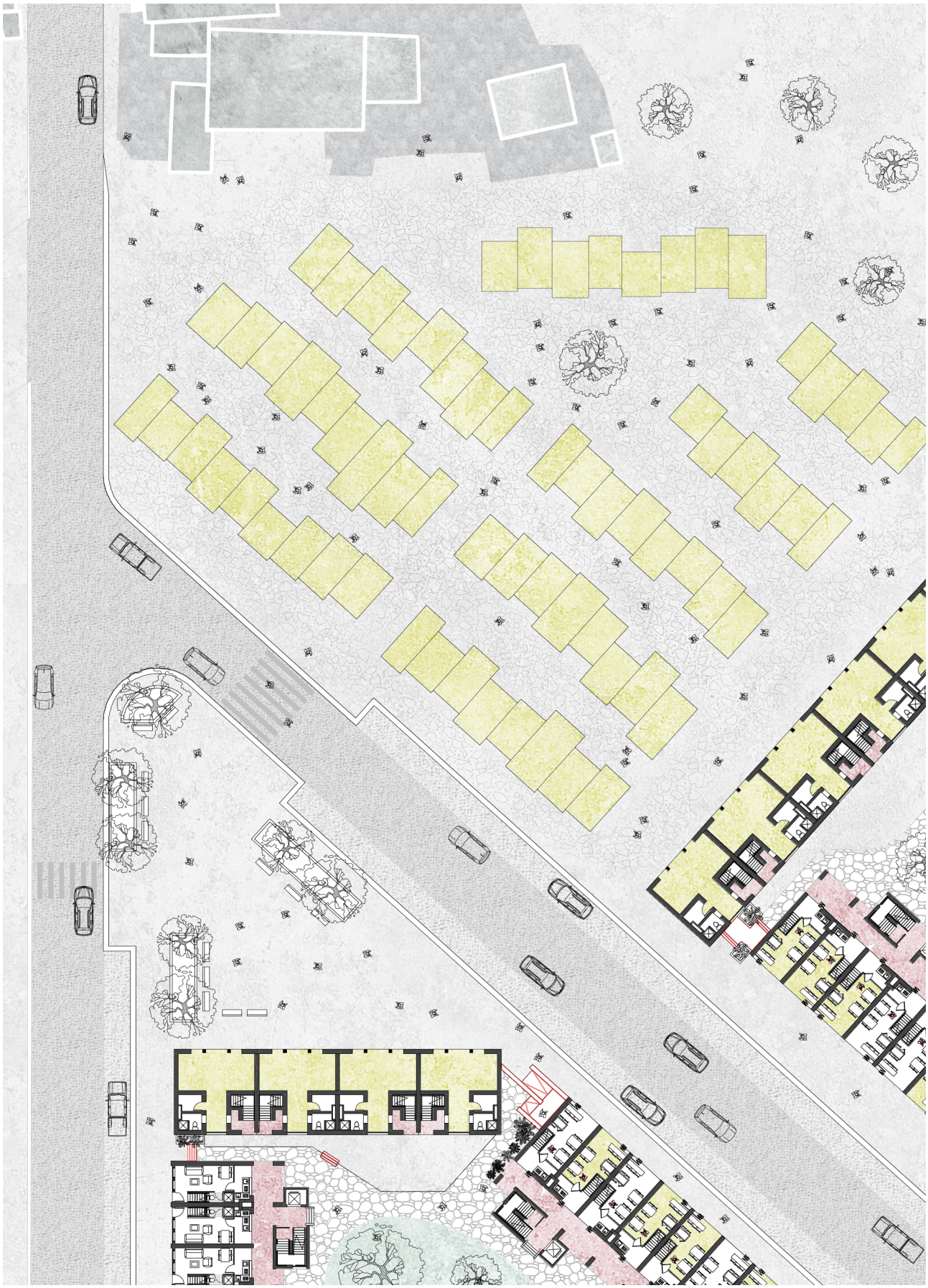
* *Large range because of the adaptable unit variation of Type 1*
** *Range based on low occupancy, 1 person on 2-person-bed, to full occupancy*



*In the north of the project site, an open space will be the location of an expanded informal markets. This market is closely linked to the existing commercial road. By creating an open space here for the informal shops, as well as placing housing typology with a commercial plinth adjacent to the market, will concentrate the main commercial activities of the area in this location. This allows for a concentrated flow of street vendors rather than having them scattered in the whole neighbourhood. Opposite to the informal market, on the other side of the street is the social square. This standalone urban public space is enclosed by tree rows and create an environment for socializing between the people of the community. Walking towards the south, courtyard entrances between the building will present itself in the form of slopes and stairs. This marks a clear distinction, while not completely closing off, between the public and collective.*

## *URBAN SPACES*

*informal market space and social square*



*1:500*

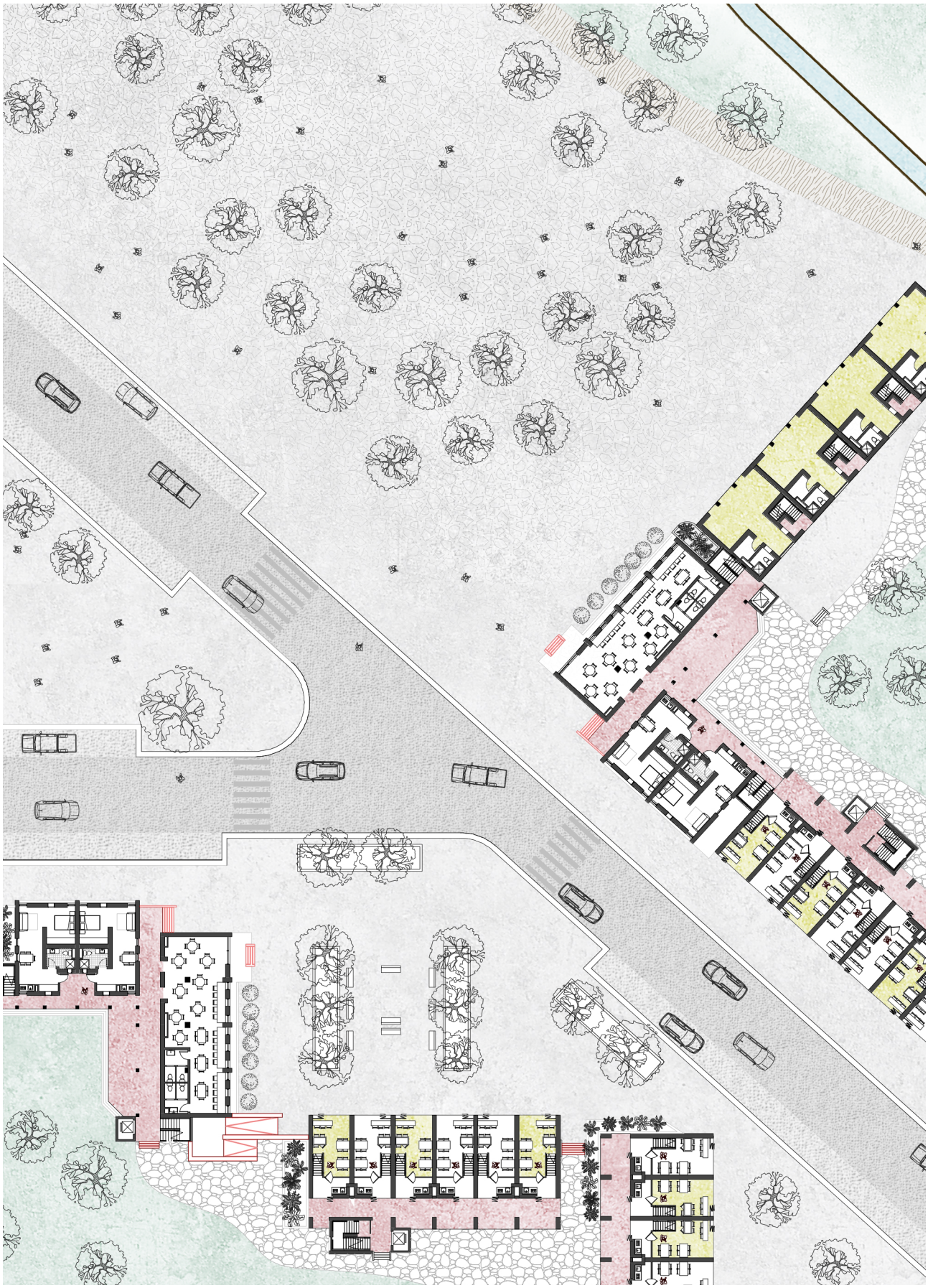
0 4 20m


ROMEL



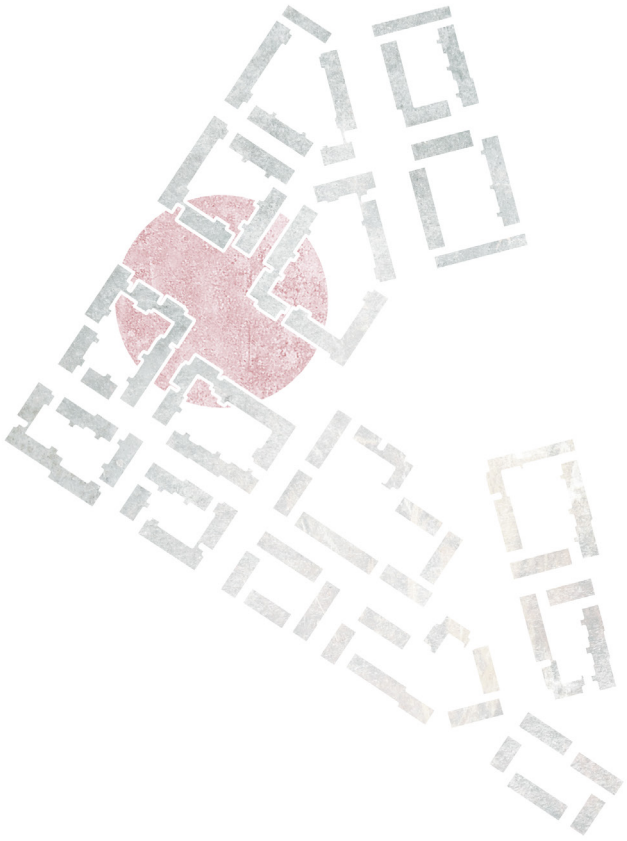
*The public plaza is located in the centre of the area. The main difference between this open space and the marker square is the program. This public plaza is more oriented to the social program for the inhabitants in this area, while the market is for commercial activities that connect Kolfe's inhabitants to the informal road north, outside of the neighbourhood. That is why the public plaza is placed in a more enclosed location This public plaza is also the largest link in a network of social spaces in the neighbourhood. The placement of the public plaza also makes it possible to open up the river towards the neighbourhood. Adjacent to the public spaces are building plinths of either a mix-use program or a purely commercial program. Also adjacent to the social spaces are the public program of community spaces in the plinth of the corner typology.*





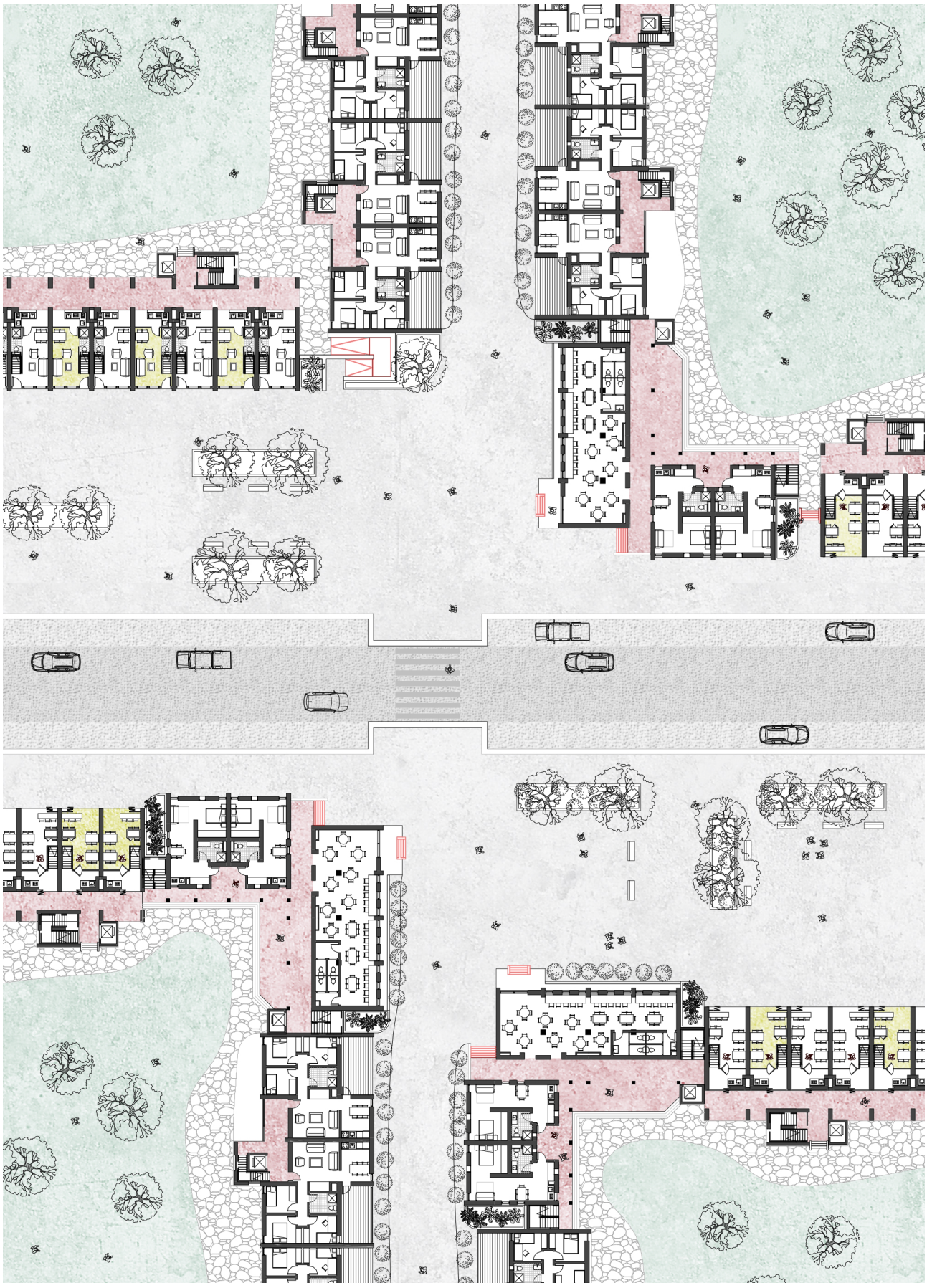
*1:500*

0 4 20m



*Here are two social squares in connection. Despite of both having the same program, these two squares are separated by the car road. Reason is that each social square serves primarily the inhabitants in the surrounding courtyards blocks. By creating a closely linked network of social spaces, people from different urban blocks will also have an increase in the chance of interaction. On these squares are social spaces enclosed by tree rows. From these social squares, people can either enter the courtyard of their urban block directly or walk into the inner streets to the neighbourhood.*





*1:500*

0 4 20m

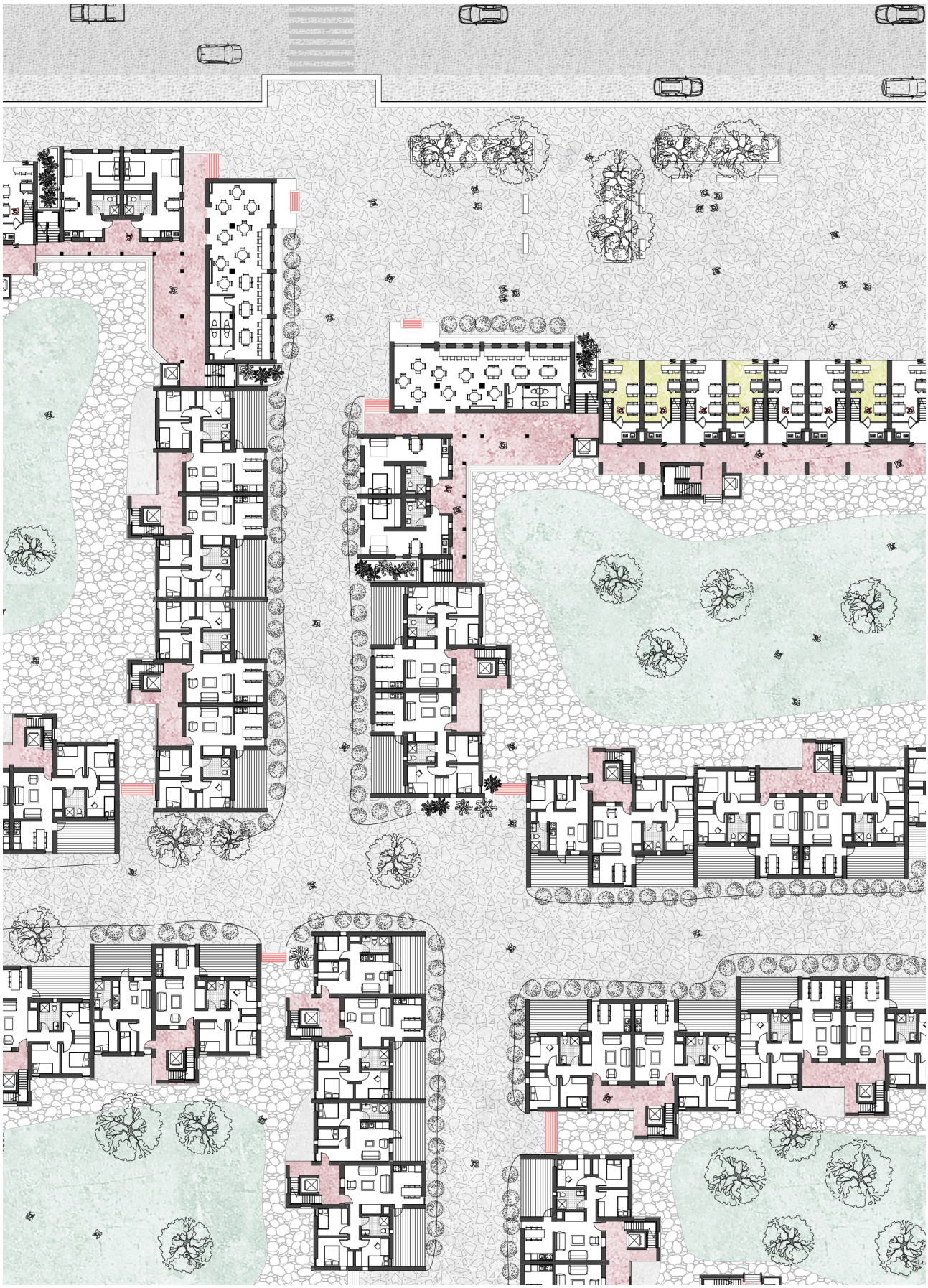


*As the most enclosed public space in the plan, the inner streets offer qualities entirely different from the other public spaces. The inhabitants can enter their courtyard block from these inner streets. Along this linear space, people will find it quieter than the public plaza and the market space. Greenery fills the sides of the streets, adding a layer of border between the street and the dwellings along it. There is also a height difference between the street level and the ground floor of the dwellings. The dwelling type placed on these inner streets is the portico apartments for middle income group. As their spacious outdoor spaces are all oriented towards the inner street, this will also add to the social dimension of the street.*



## *URBAN SPACES*

*social squares to the inner streets*



*1:500*

0 4 20m

## *INFORMAL IN THE FORMAL*

*transcribing patterns of inhabitation in the new design*

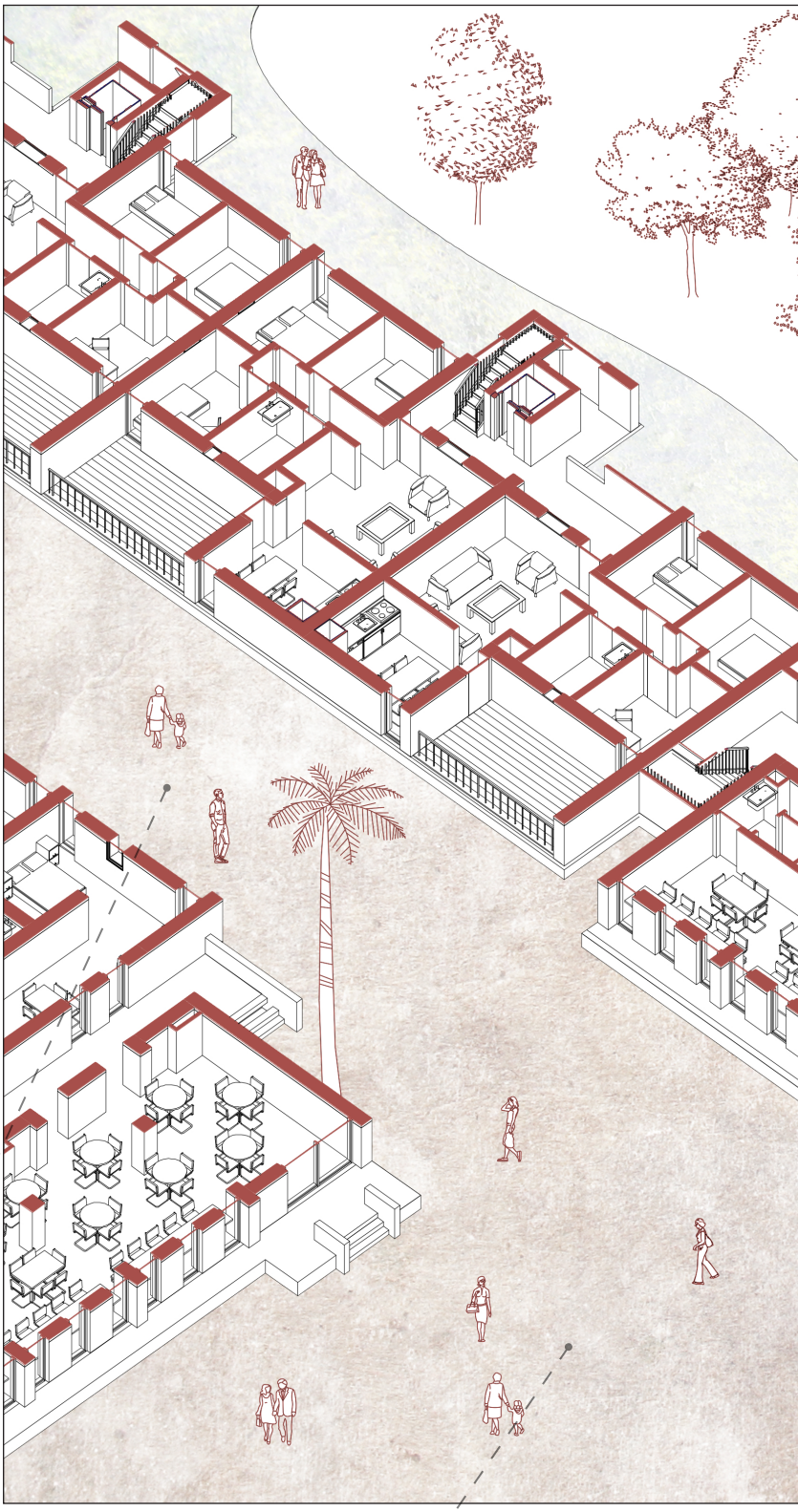
*Existing patterns of inhabitation are integrated in the new design of urban and dwelling spaces in various ways. Each pattern takes its place in the new design differently.*

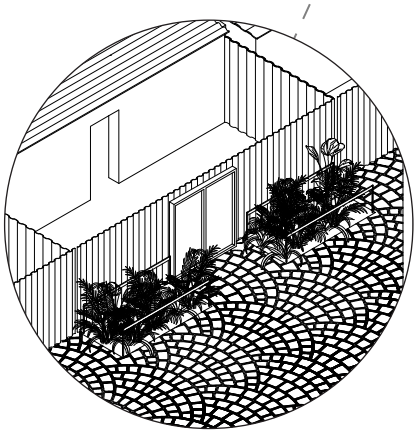
*The public greeneries that inhabitants are informally growing is now part of the inner streets visage. Along the paths are small vegetations maintained by the inhabitants*

*Street vendors are not longer scattered through out the area. In the new design, street vendors are concentrated near the social squares, public plaza and the market space.*

*For social gatherings like the ekub, and idir that currently take place in the houses of the participants, now it can also be held in the social spaces at the ground floor of the urban corner type.*

*Illegal shop fronts now take the form of plinth shops under the adaptive gallery type. These plinth shops are part of the ground floor maisonette dwelling type. It can be interchanged between a residential and commercial program.*





*public greenery*



*street vendors*



*social gatherings*



*shop fronts*

## *INFORMAL IN THE FORMAL*

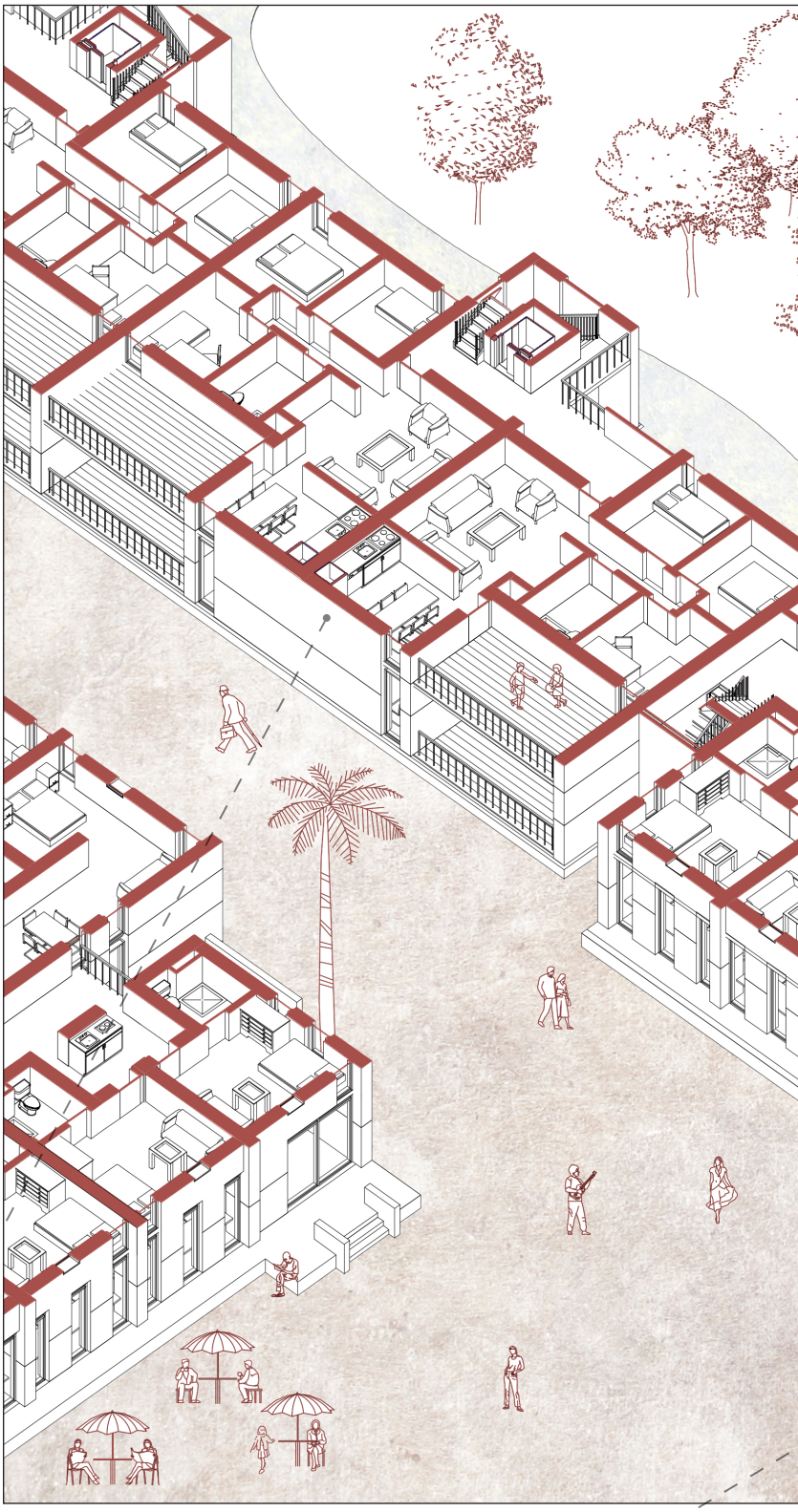
*transcribing patterns of inhabitation in the new design*

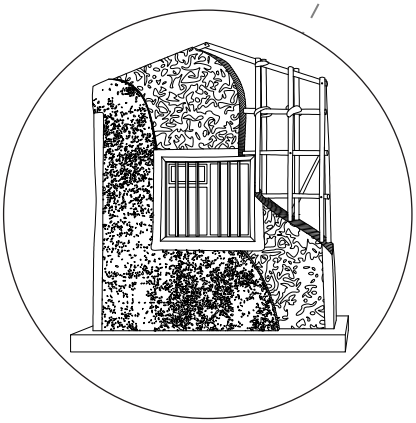
*The pattern of chika walls, representing the usage of vernacular materials, is transcribed in the construction method of rammed earth. This is similar to the old pattern as both are locally sourced, easy to build and earth based constructions.*

*The border pattern of the corrugated iron sheets reflects a need of a clear indication of where the public space ends and the private starts. In the new design, the transition from public to private is not anymore a severe boundary of iron sheets, but multiple layer of boundaries in the form of stairs and slopes, filtering out the unwanted guests.*

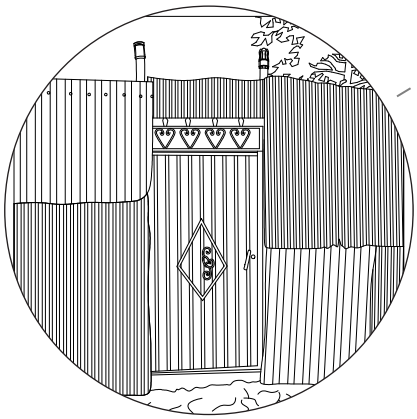
*in the new design, chats between neighbours won't have to take place in the streets anymore. Secluded corners on the galleries give space for the neighbours to have private talks.*

*Yearly celebrations like the Meskel can happen both in the courtyards of the urban blocks, as well as in the social squares. This way, celebrations of different sizes can be organized.*





*vernacular materials*



*border*



*neighbours chat*



*celebrations*

## *INFORMAL IN THE FORMAL*

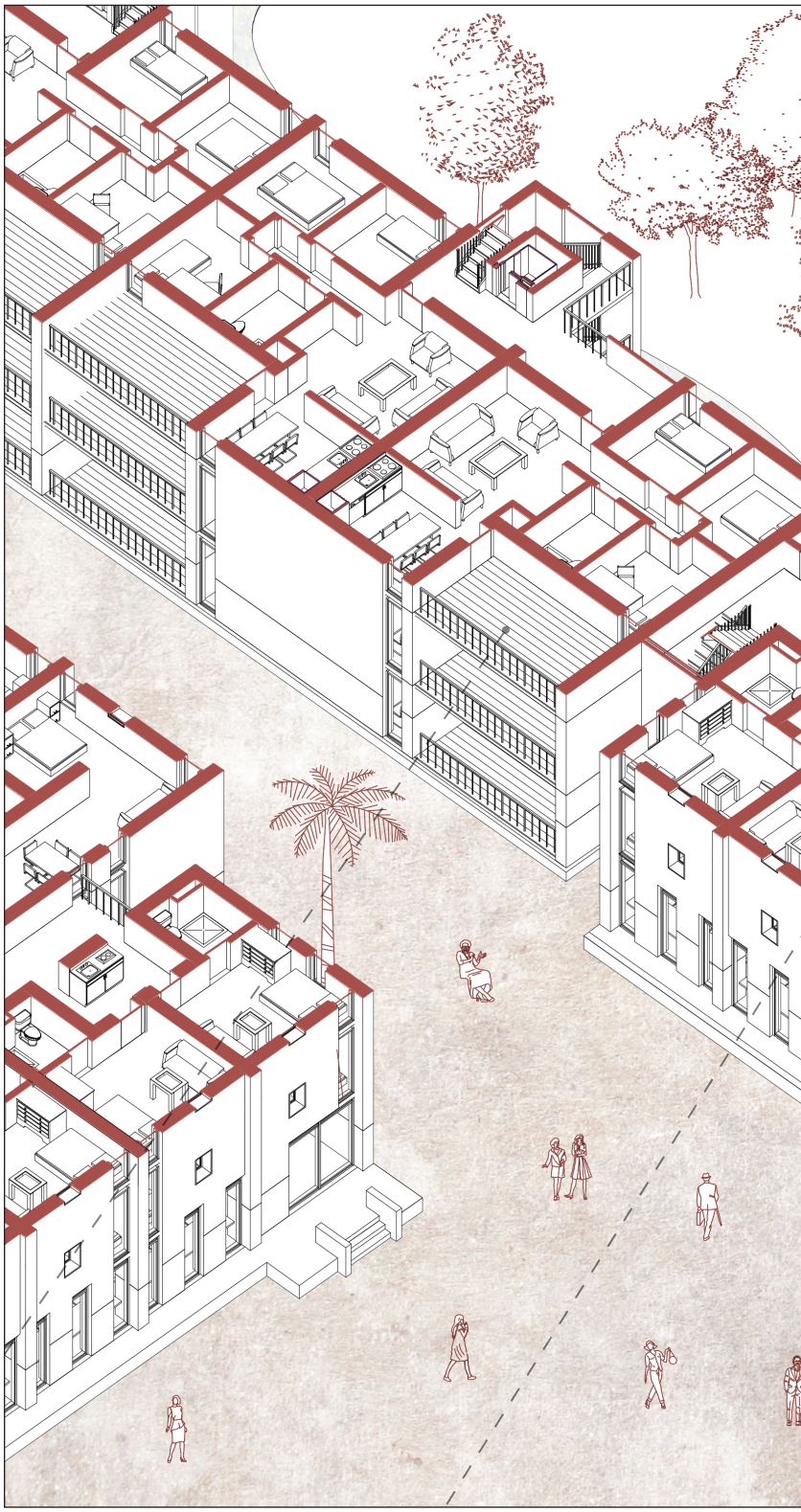
*transcribing patterns of inhabitation in the new design*

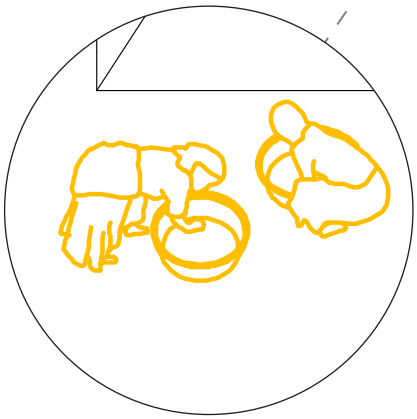
*Washing clothes is both a weekly routing and a way to generate income. Some low income households will gather clothes from the neighbours and wash them in order to make extra income. This is especially beneficial in the new design as middle income and low income households are mixed in the same urban block. This make it easier for the low income people to earn more money for washing clothes of the middle income. Sufficient space are reserved on the galleries for both washing and drying of the laundry.*

*Drying spices is another household activity that can be used for income generation. In Ethiopian cuisine various spices are used. These are mostly grown in the outskirts farmland of the city. They are then informally dried and processed by low income households. These spices are sold to other households or restaurants. In the courtyards there are sufficient space for this activity.*

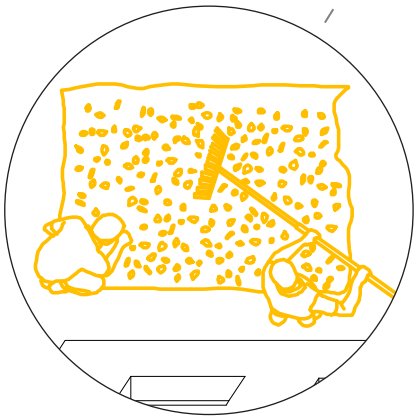
*Subletting part of the dwelling is a common way of people to make money. In the adaptive gallery type de dwelling can be split and merged freely. This means that part of the dwelling can be split to be sublet, while the remaining part of the dwelling still have all the quality of a dwelling space.*

*Collective space on the galleries can be used as space for inhabitants to work in. Neighbours can come together to make products together and sell them in the markets.*



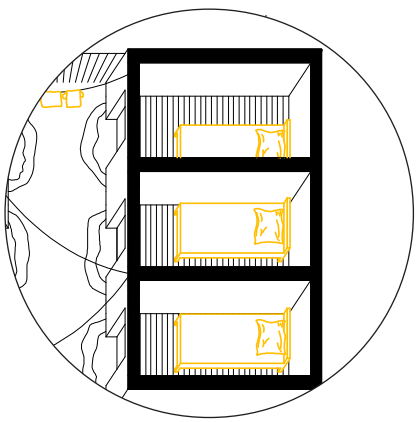


*washing clothes*

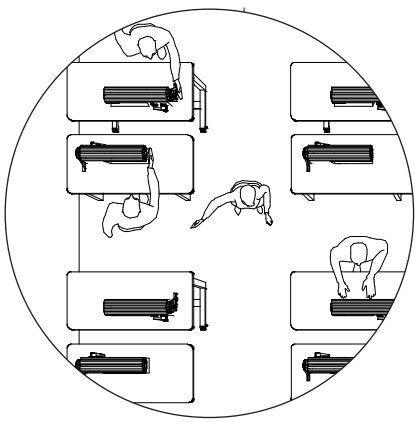


*drying spices*





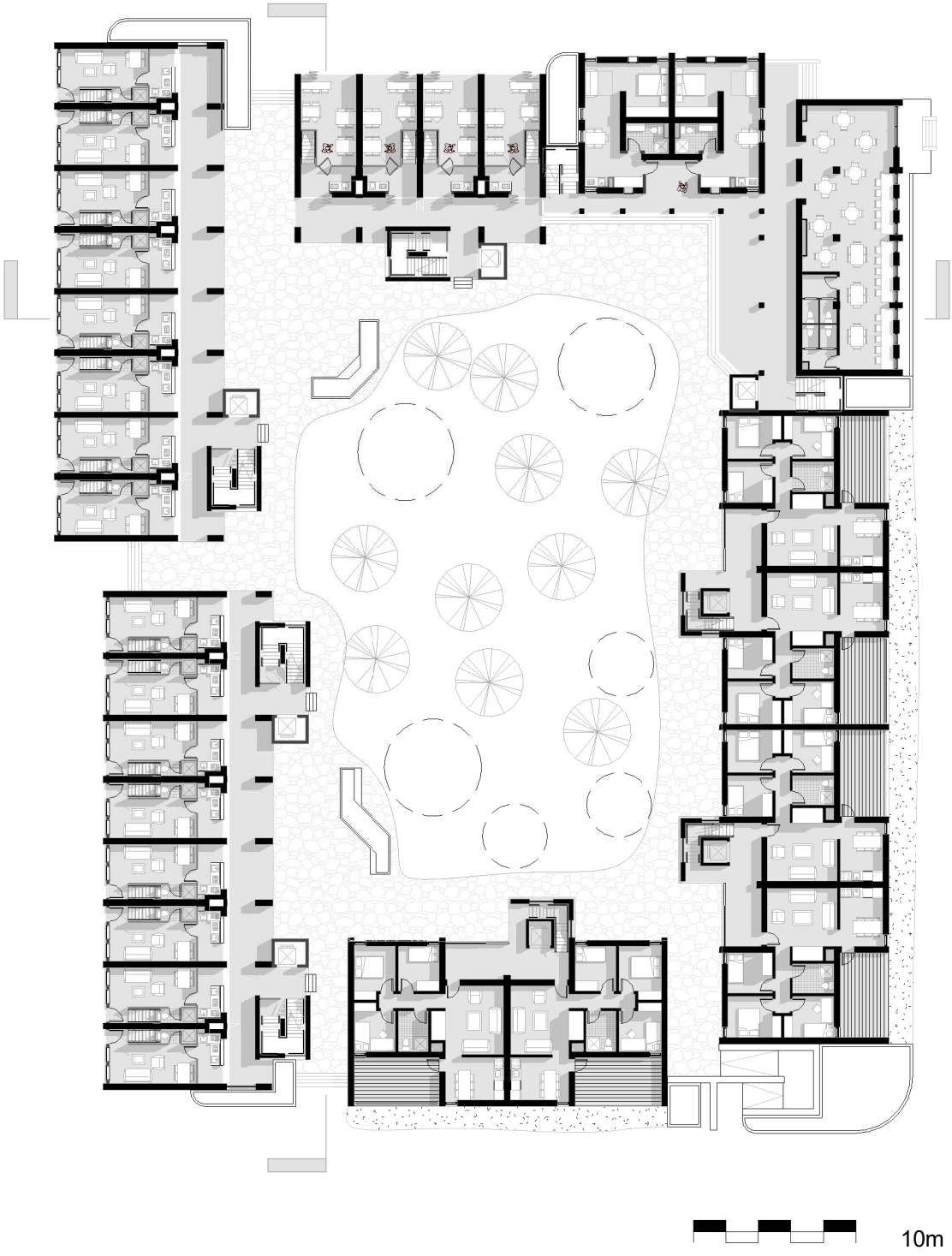
*subletting*



*collective (work) spaces*

## *URBAN CLUSTER*

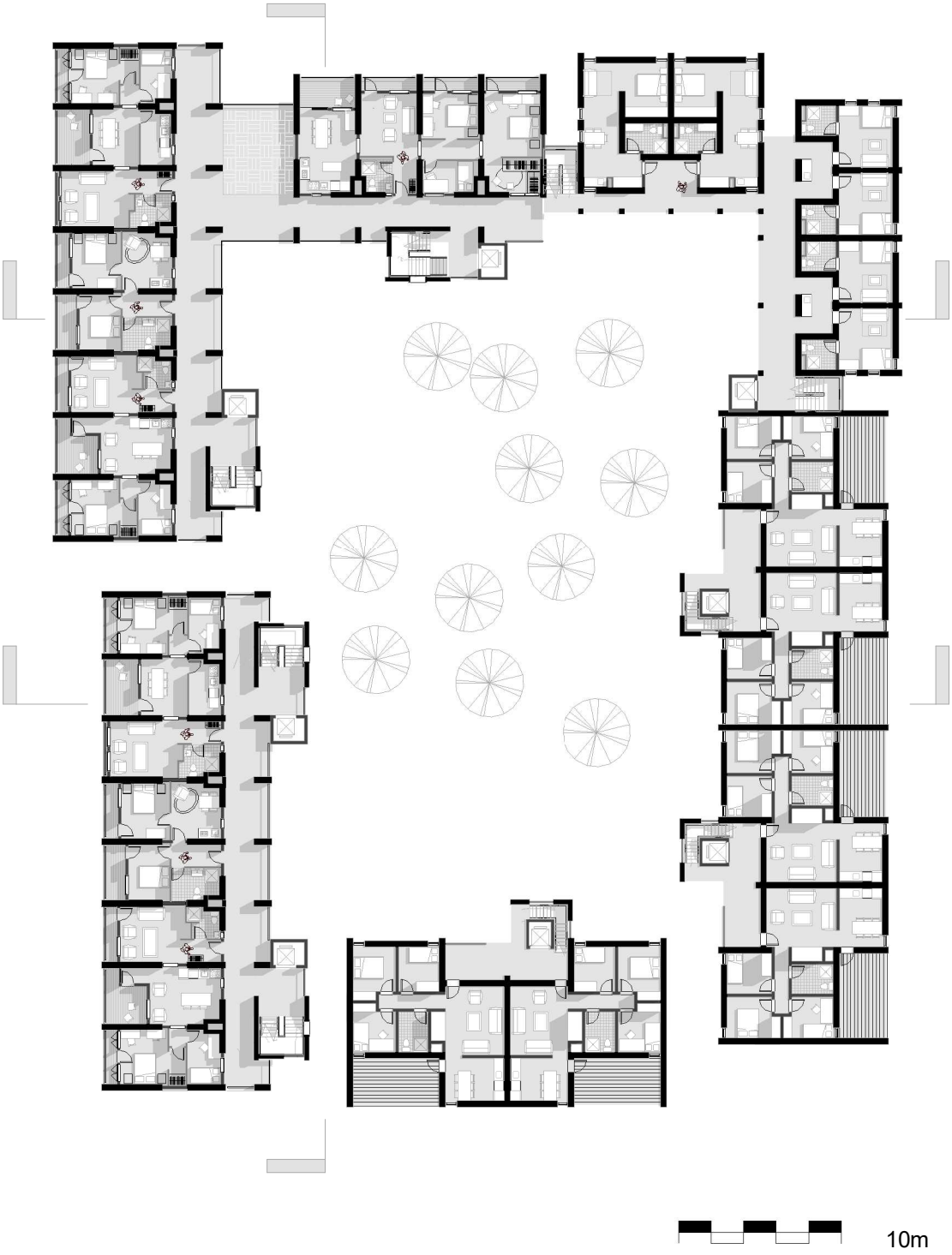
*courtyard block - ground floor*




*The design is to ensue both security and collectively for the inhabitants of the courtyard block. Passage connecting the inside of the courtyard and the outer urban spaces can be found on multiple sides of the block. Border of height differences instead of gates adds a dimension of ambiguity to what is collective and what is public. All plinths of the block are connected to the urban spaces so no dead urban space will be created. The courtyard path along the buildings will be the main interaction point between people from different building types, as well as the place to do outdoor tasks like laundry. The centre of the courtyard will be multi-purpose, from the place for drying spices to the place of celebration.*

## *URBAN CLUSTER*

*courtyard block - typical upper floor*




*On the upper floors it is visible that the different building types are no longer connected. This is to ensure the integral relationship between the building and its target inhabitants. For example, the galleries of the adaptive modular type won't be connected to the middle-income portico or the urban corner type, to retain its own collectively. The elevators of the adaptive gallery type and the urban corner type are placed in such a way that it won't have to be build at the beginning of the construction. This way the construction cost can be kept low while still there is the possibility to add elevators later in time.*

***URBAN CLUSTER***
*entrance to the courtyard*





## *URBAN CLUSTER*

*collective space on the gallery*

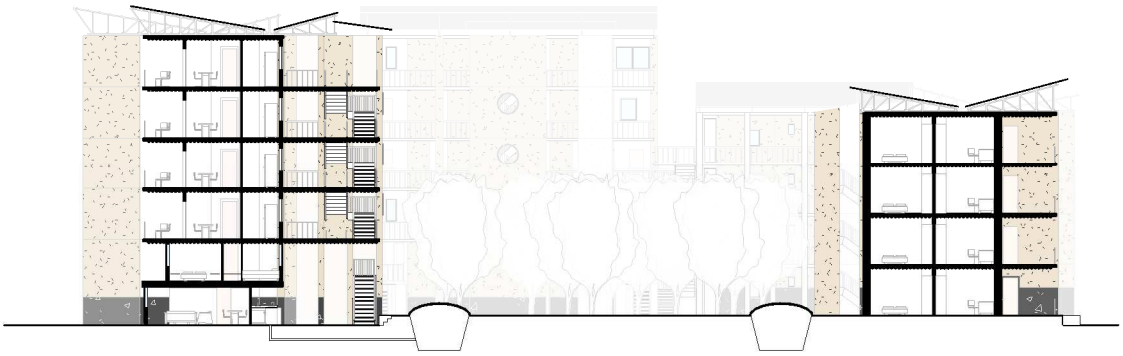


***URBAN CLUSTER***
*relation ground floor and courtyard*

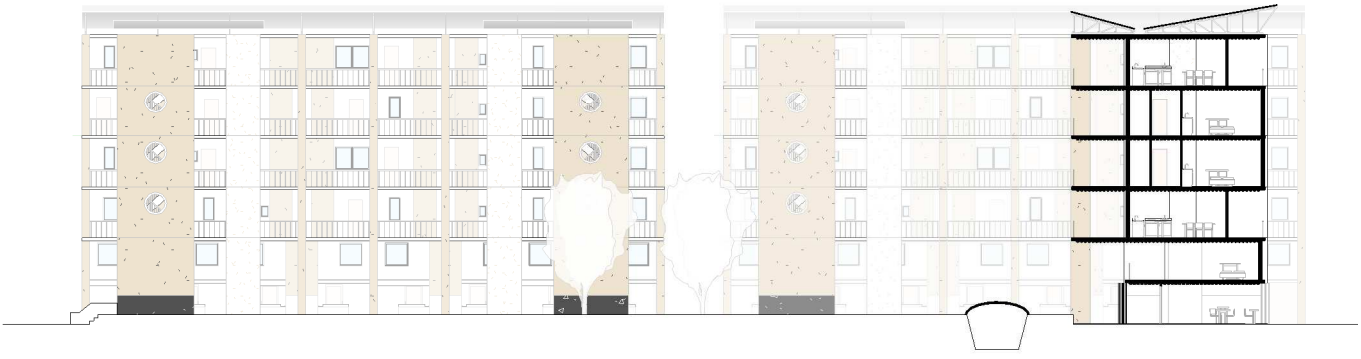


## *URBAN CLUSTER*

*courtyard block - sections*



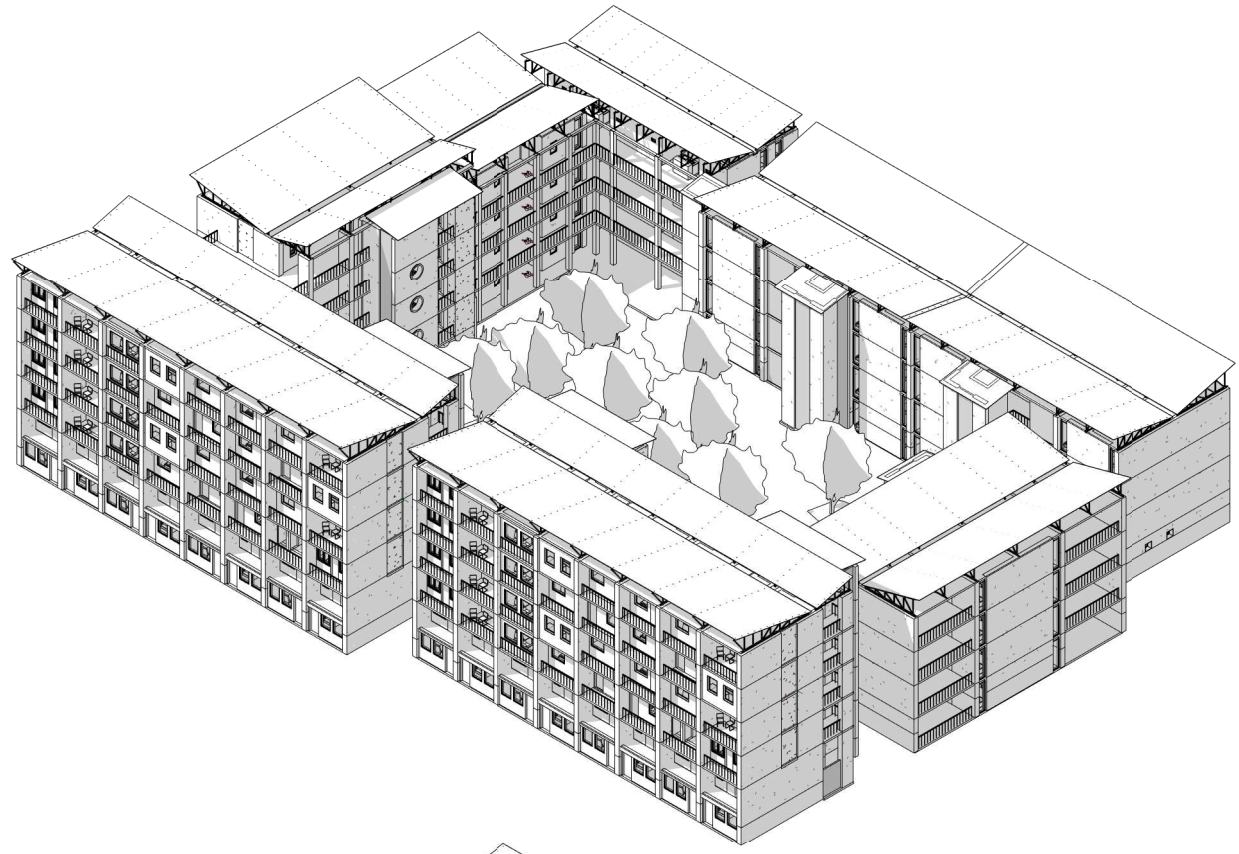


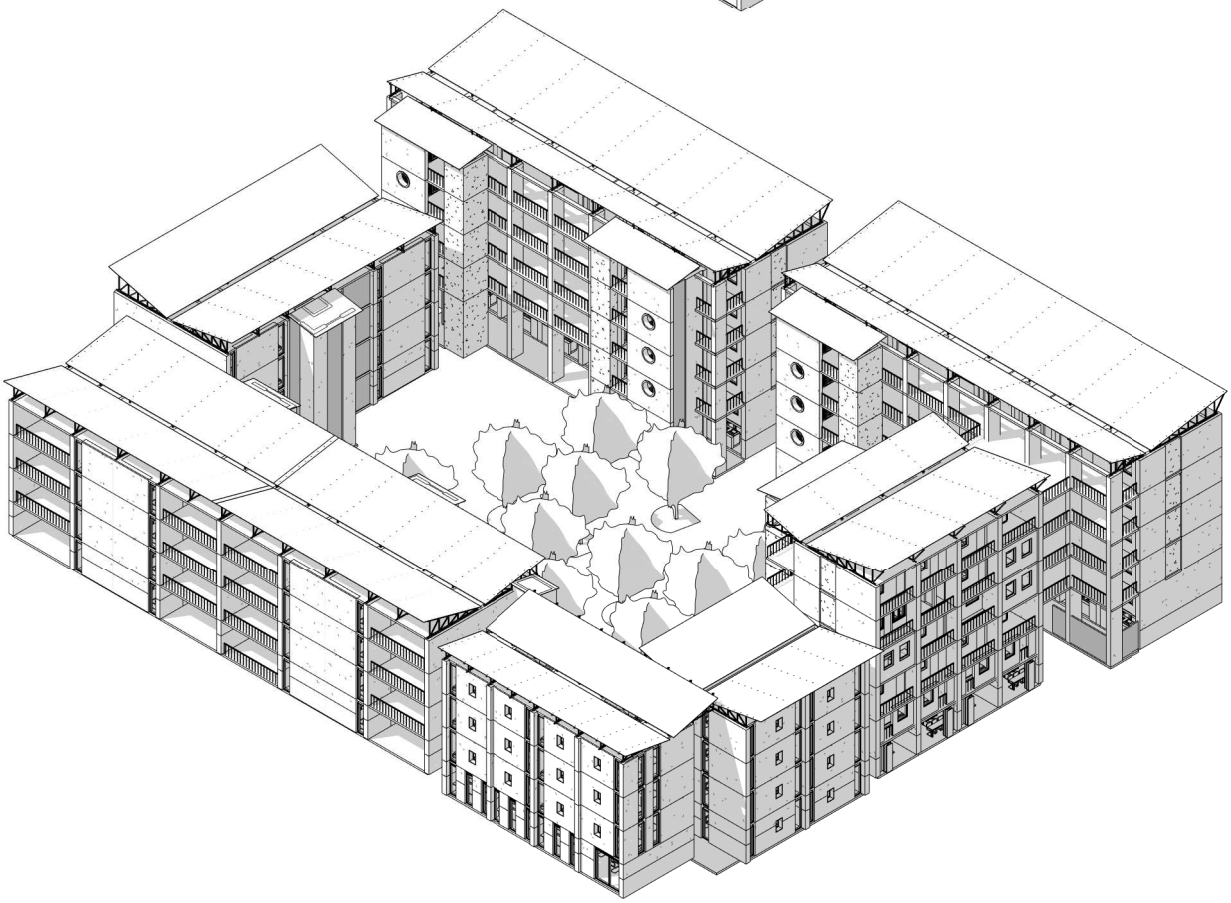


10m

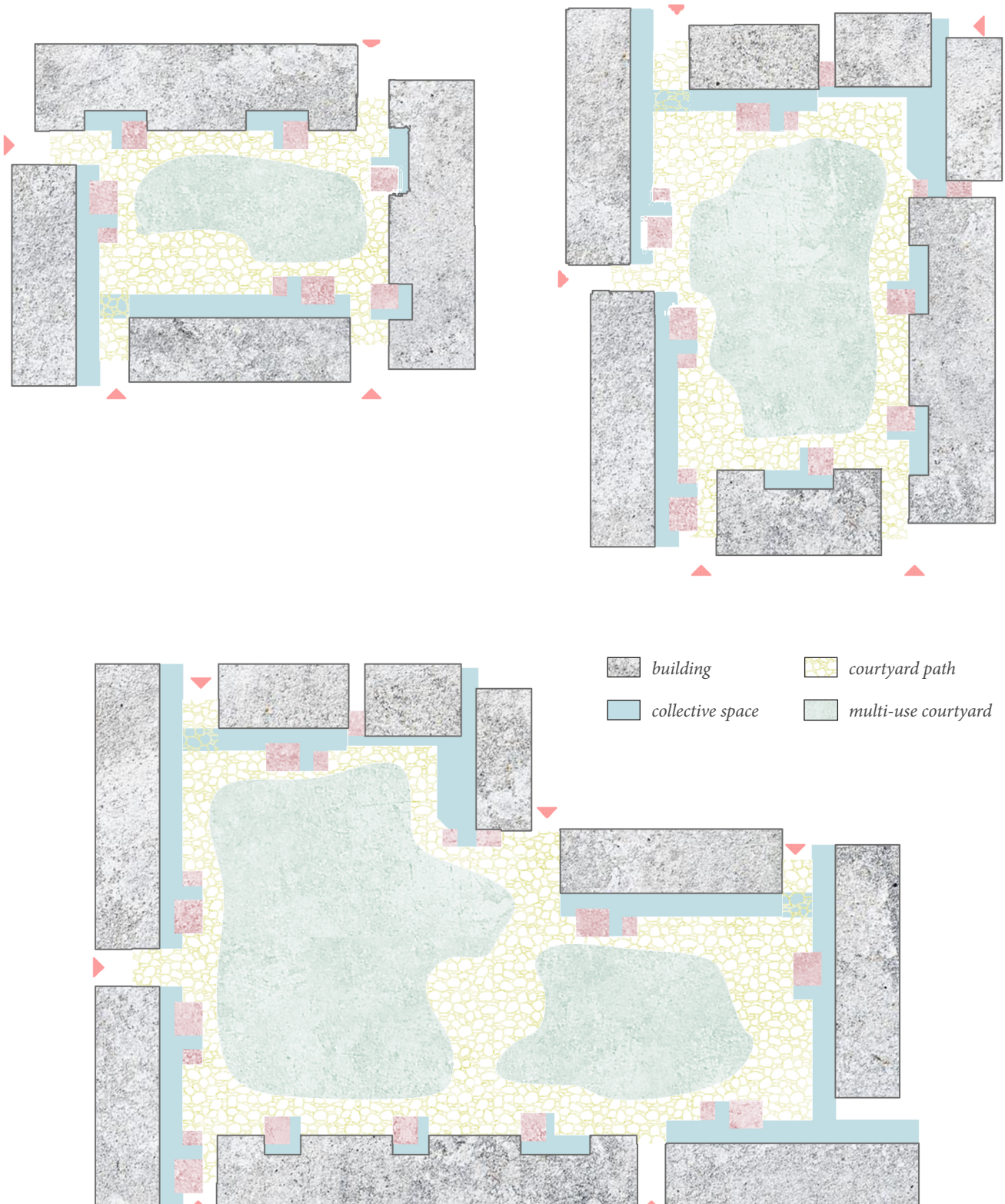
## *URBAN CLUSTER*

*courtyard block - isometric view*



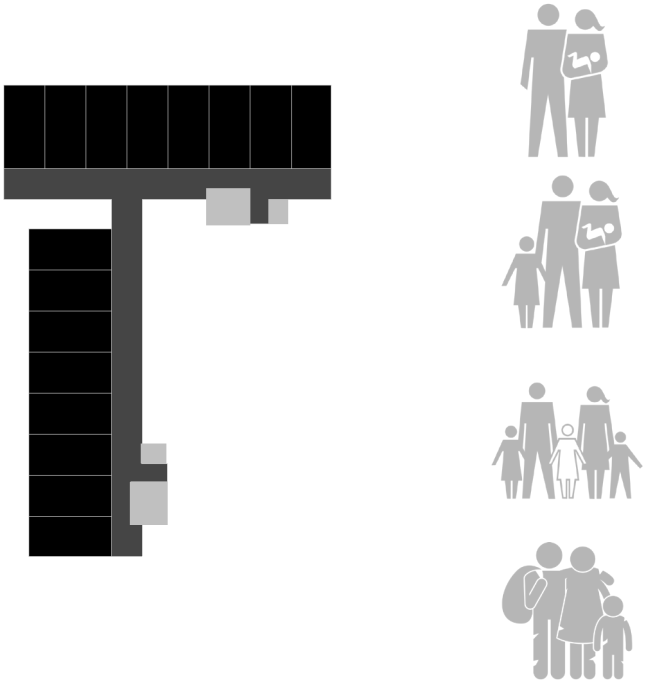


## *URBAN CLUSTER*
*courtyard morphology*



## *TYPE 1: ADAPTIVE MODULAR*

*intro*



*The adaptive quality of this building's design is to open up the possibility of the dwelling space as a resource to make income. The modular system allows for the spiting and merging of units into bigger or smaller units. This way part of the dwelling can be transformed into workspace or sublet to renter without sacrificing the privacy of the main inhabitant. The target group is low income to middle income families of various sizes. As sublet is also part of the design, urban migrants can also be part of the inhabitants' group.*

## *TYPE 1: ADAPTIVE MODULAR*

*plan - ground floor*




*Inhabitants can enter the courtyard between the buildings. Passing the stairs, on the side you can find the lowered veranda of the ground floor maisonette type. Along this lowered veranda are the cooking place for the inhabitants of these dwelling units. This way the cooking activities become a social interaction point, similar to the rural lifestyle.*

*1:200*

## *TYPE 1: ADAPTIVE MODULAR*

*plan - typical upper floor*

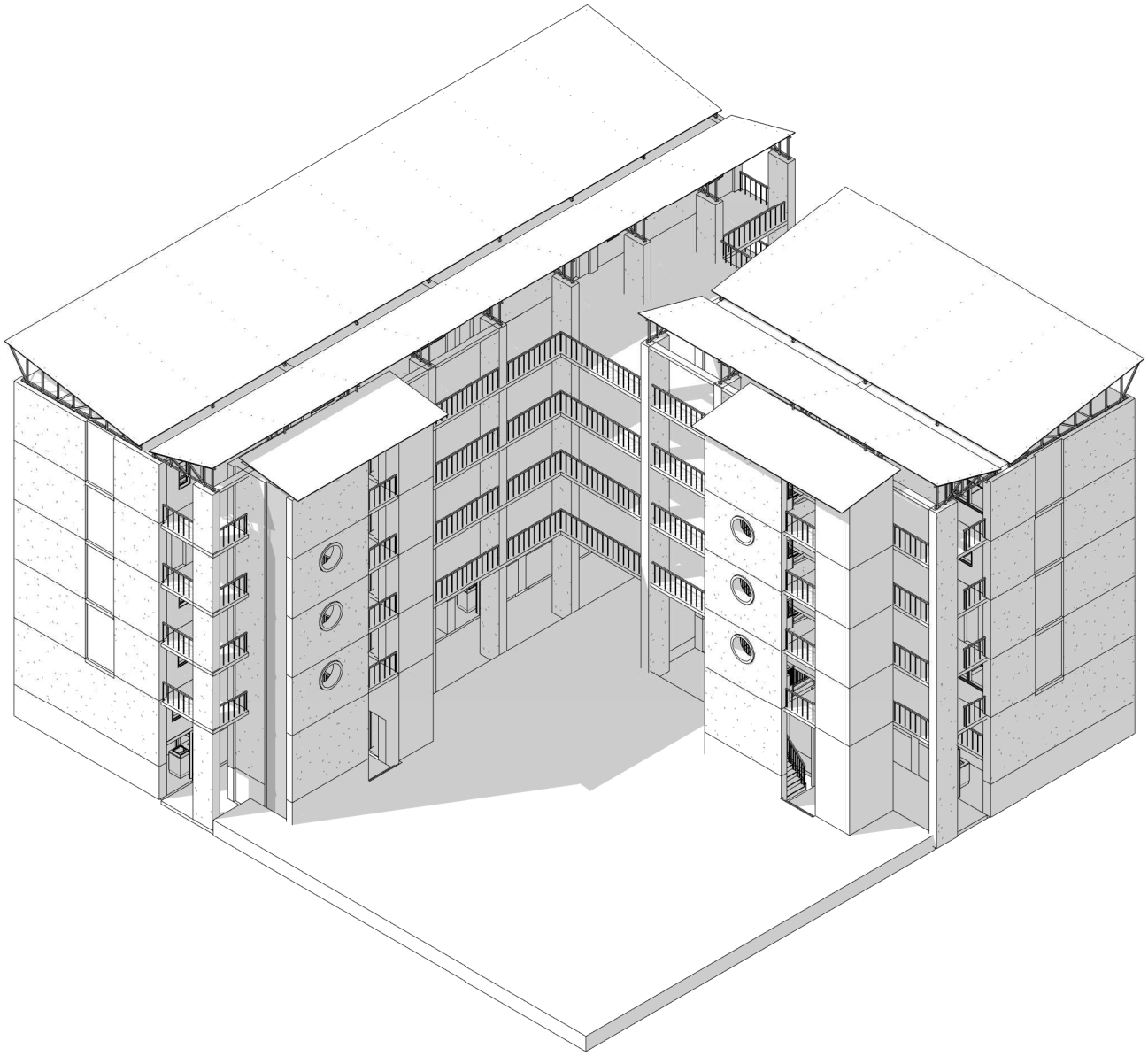



*On the upper floors are the modular adapted units. As adaptation are owner initiated, this will create various inhabitant's make-up each floor. On the corner is the place for collective activities on the floor scale. Here inhabitants can meet up and produce goods together to sell. The gallery itself is also widened to give space for drying clothes and other outdoor activities. This is needed when the inhabitants to leave no private outdoor space inside the dwelling.*

*1:200*

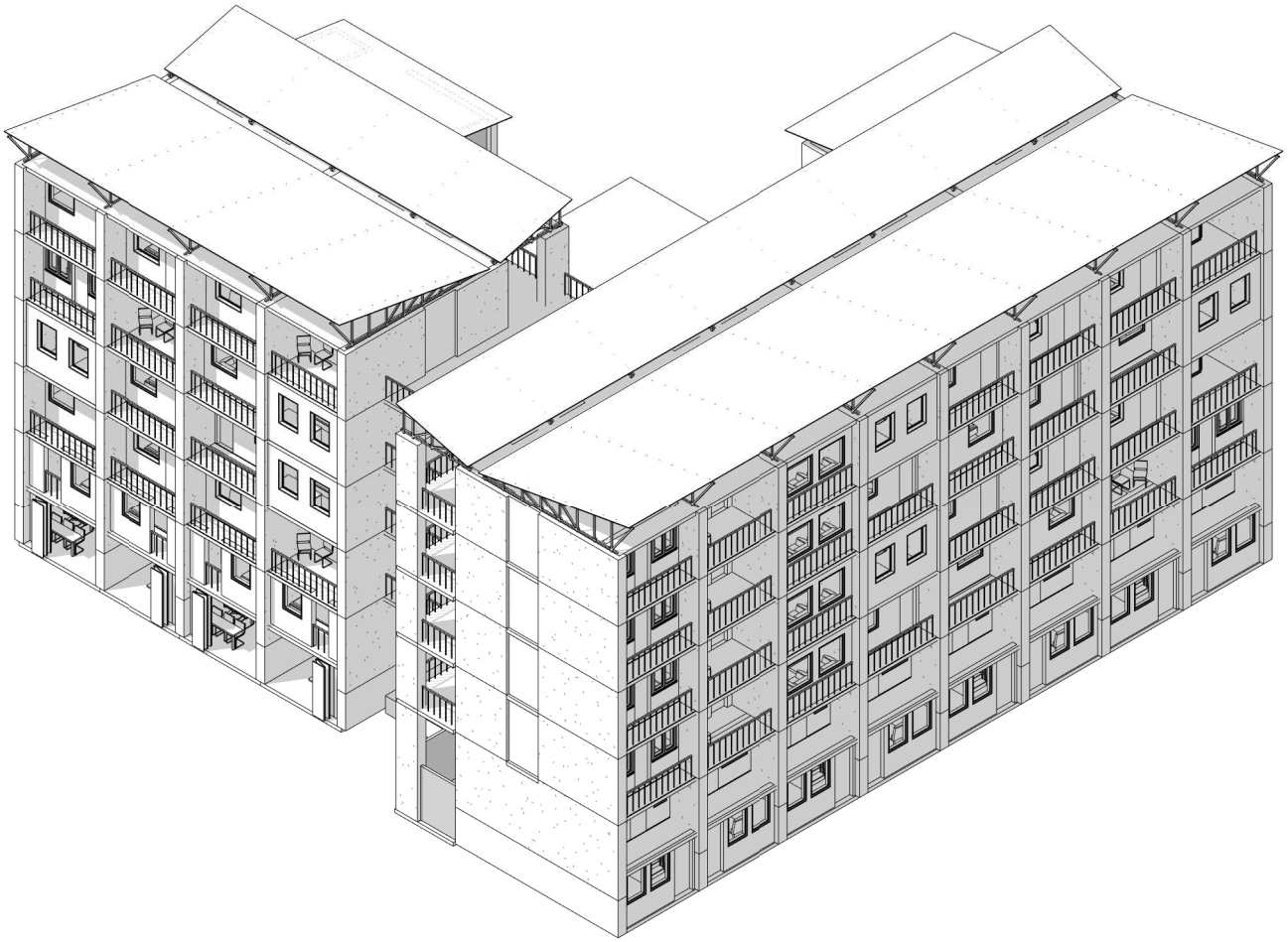
## *TYPE 1: ADAPTIVE MODULAR*

*units - ground floor maisonette*



## *TYPE 1: ADAPTIVE MODULAR*

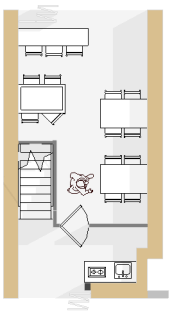
*units - upper floor adaptation possibilities*



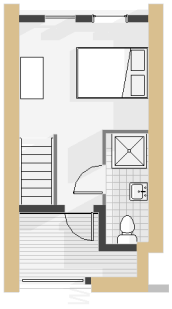
## *TYPE 1: ADAPTIVE MODULAR*

*units - ground floor maisonette*

*SHOP ADAPTATION*

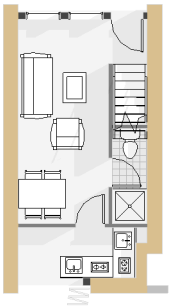


*0F*
*29 m²*

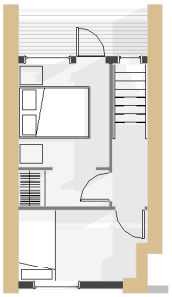


*1F*
*29 m²*

*RESIDENTIAL ADAPTATION*



*0F*
*29 m²*



*1F*
*29 m²*

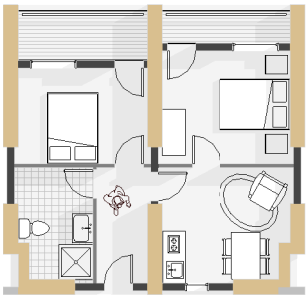
*1:200*

## *TYPE 1: ADAPTIVE MODULAR*

*units - upper floor adaptation possibilities*



*29 m²*



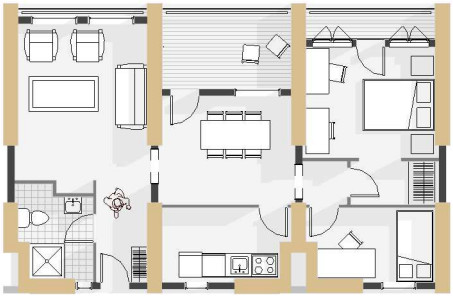
*58 m²*



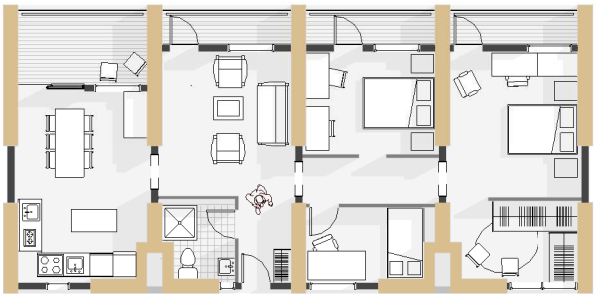
*58 m²*



*87 m²*



*87 m²*



*116 m²*



*116 m²*

*1:200*

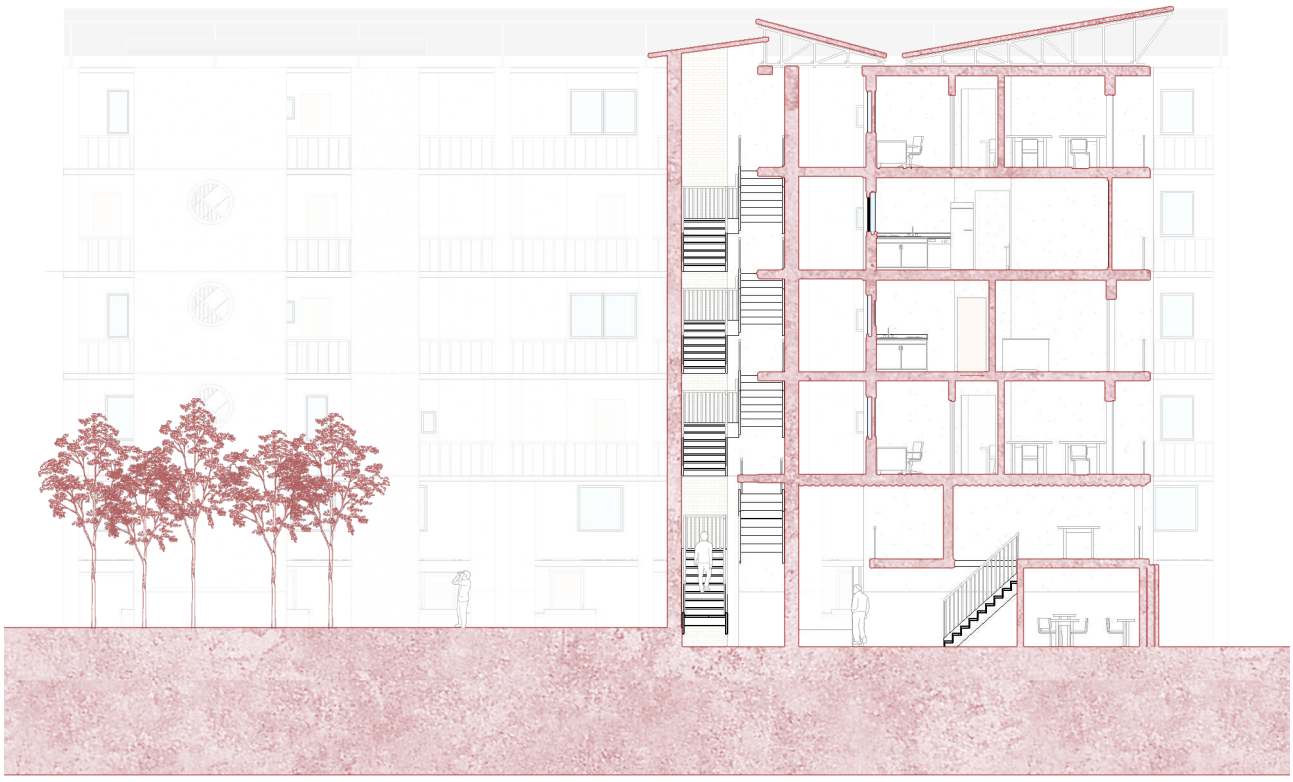
## *TYPE 1: ADAPTIVE MODULAR*

*Elevation*



## *TYPE 1: ADAPTIVE MODULAR*

*Section*





*1:200*

## *TYPE 1: ADAPTIVE MODULAR*

*Adaptability*



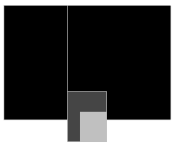
This typology is designed with ease on adaptability in mind. A family can rent/buy a unit with four modules and alter it in such a way that it become 2 different units. This way, the dwelling can accommodate the different needs of the inhabitants. For example, the owner can sublet part of their dwelling and live in the remaining part, while still keeping the possibility of expanding the unit into the former size when needed.

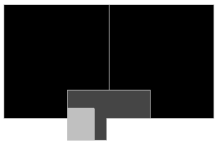
## *TYPE 2: MIDDLE INCOME PORTICO*

*intro*





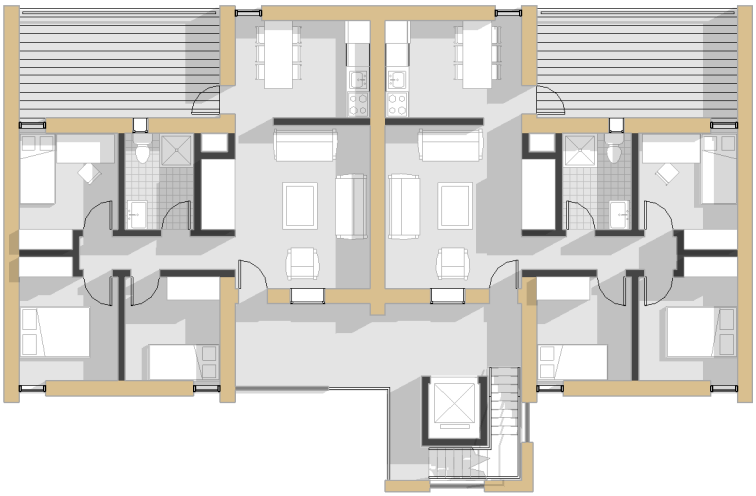




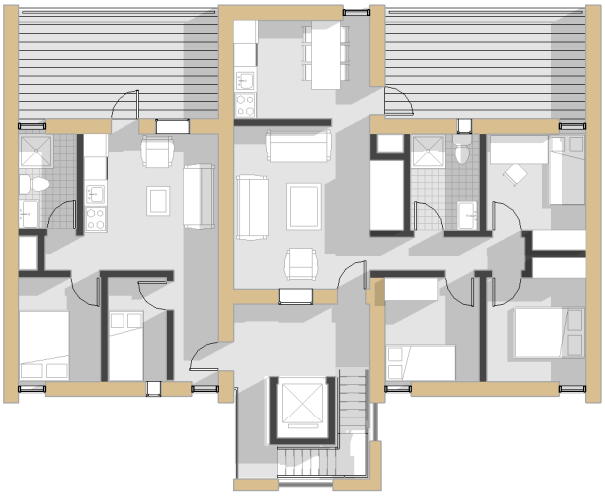
*The middle-income portico is an apartment building aimed at the 2-3 and 4-5-person middle income households. As part of the goal to attract middle income inhabitants, a portico type with large outdoor space have been designed. Each floor there will be two families. Two building variations can be found in the plan, a combination of two Type A units or the combination of Type A and Type B. As the target group is middle income, no informal expansion of the dwelling unit is expected to occur here. In both dwelling types, you enter into the living room, from which then you can access the outdoor balcony or the bedrooms. In both unit types, the kitchen is adjacent to the outdoor space. This is to allow the modern indoor cooking activity and traditional outdoor cooking to be close to each other*

## *TYPE 2: MIDDLE INCOME PORTICO*

*plan*



*Type AA*

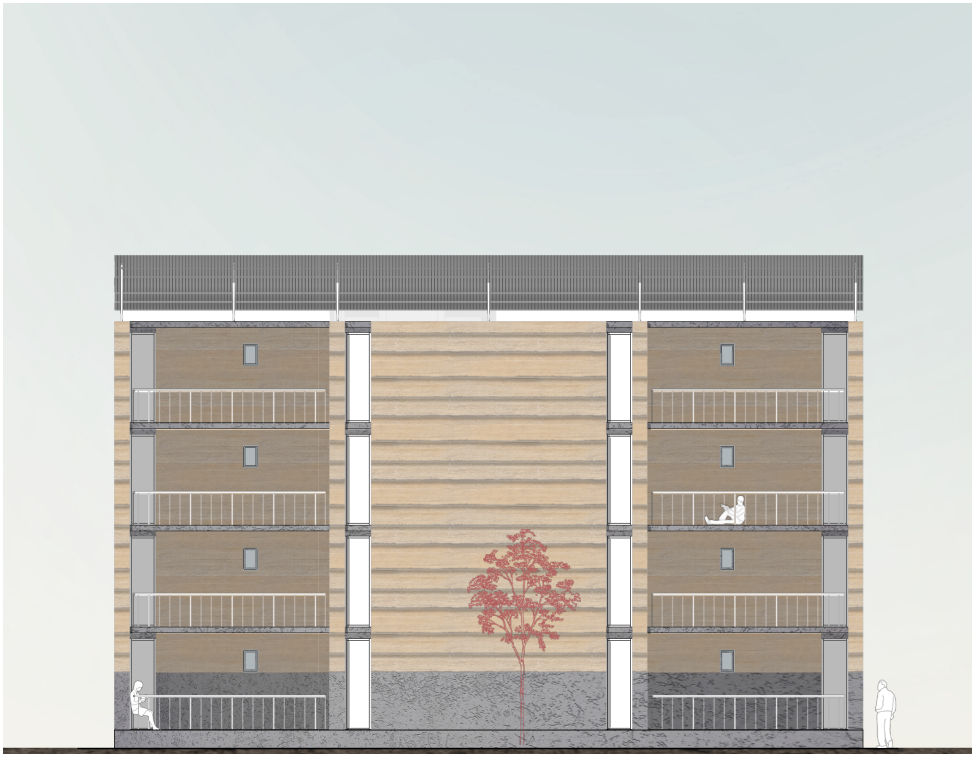


*Type AB*

*1:200*

## *TYPE 2: MIDDLE INCOME PORTICO*

*elevation*





## *TYPE 2: MIDDLE INCOME PORTICO*

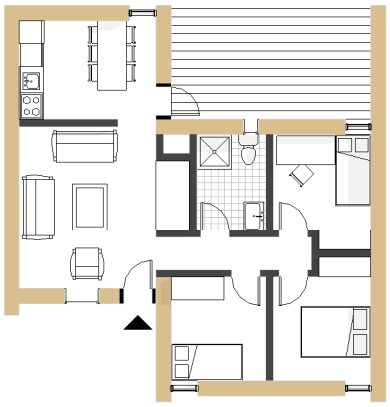
*section*



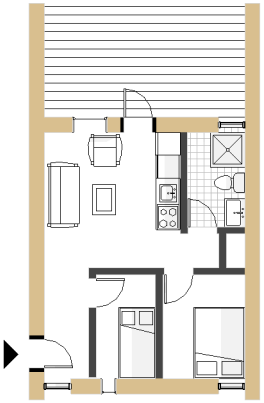
*1:100*

## *TYPE 2: MIDDLE INCOME PORTICO*

*unit plan*



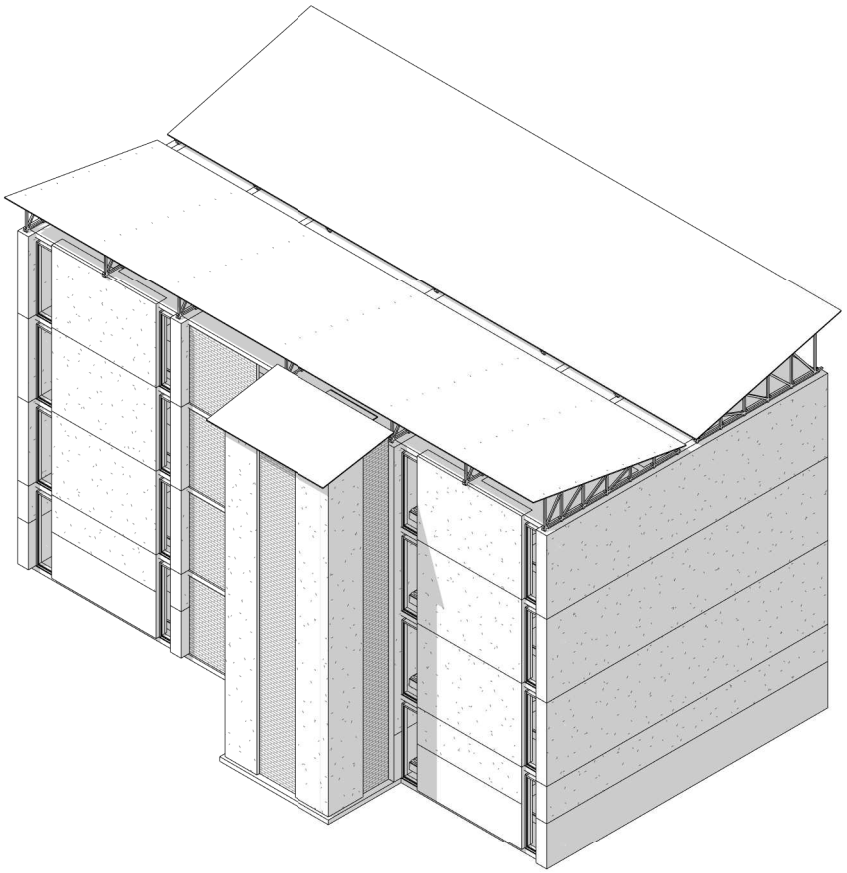
*Unit type A*
*90 m²*

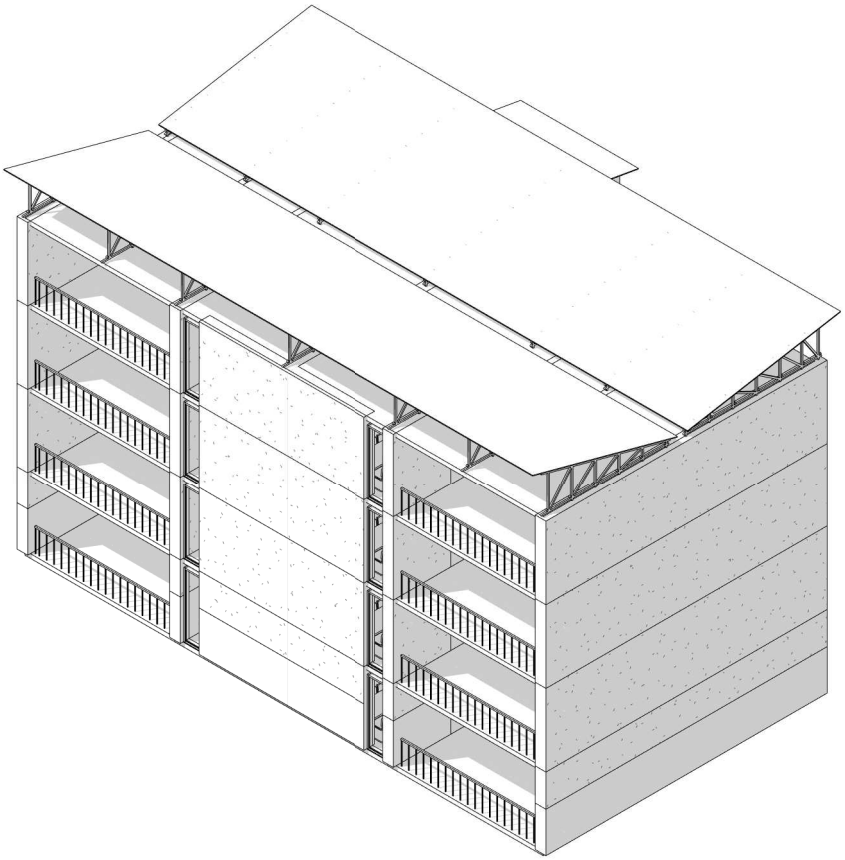


*Unit type B*
*58 m²*

## *TYPE 2: MIDDLE INCOME PORTICO*

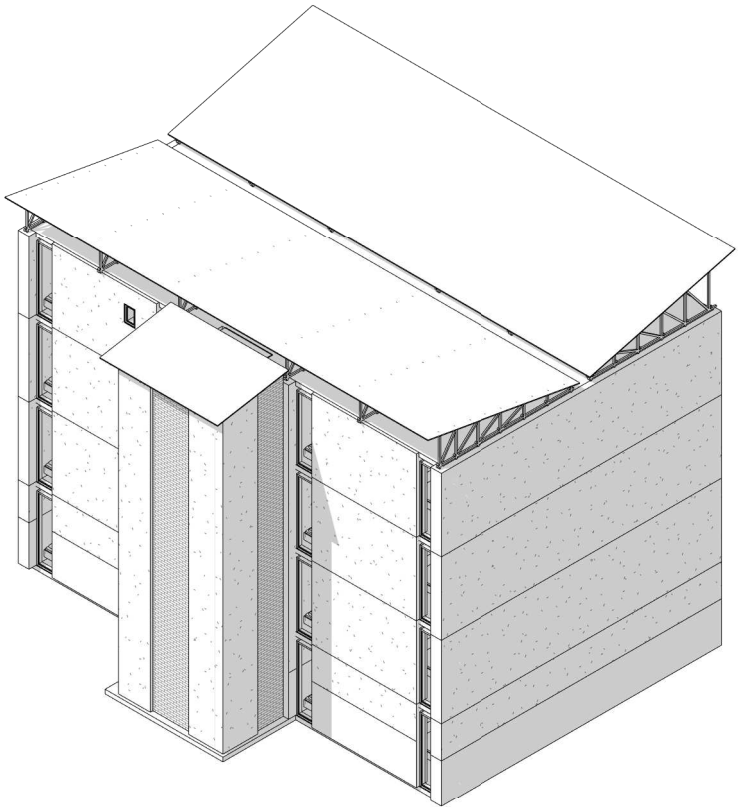
*isometric Type AA*

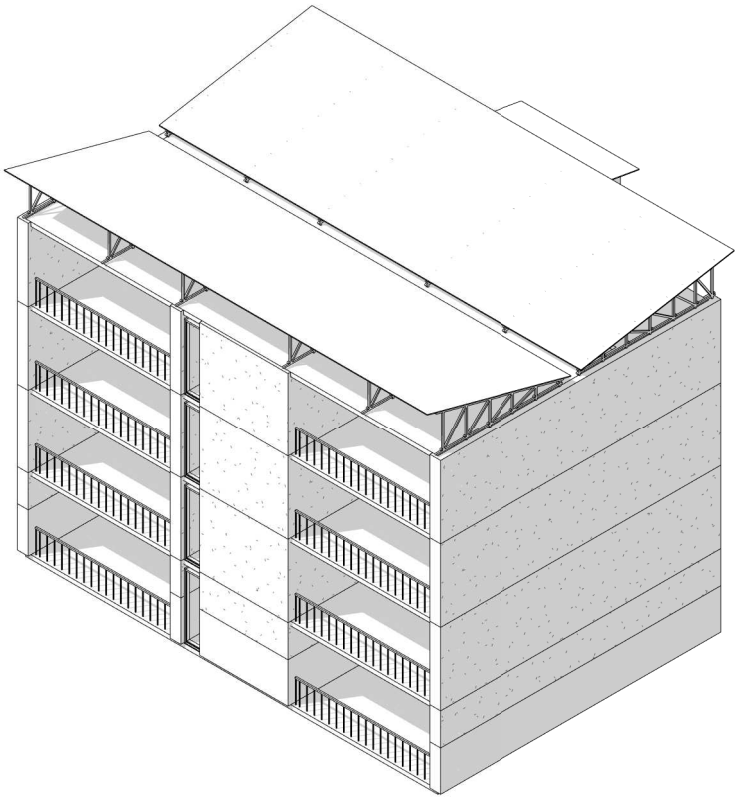




## *TYPE 2: MIDDLE INCOME PORTICO*

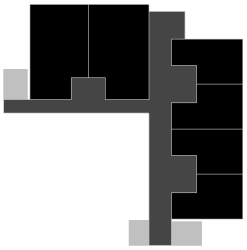
*isometric Type AB*





## *TYPE 3: URBAN CORNER*

*intro*

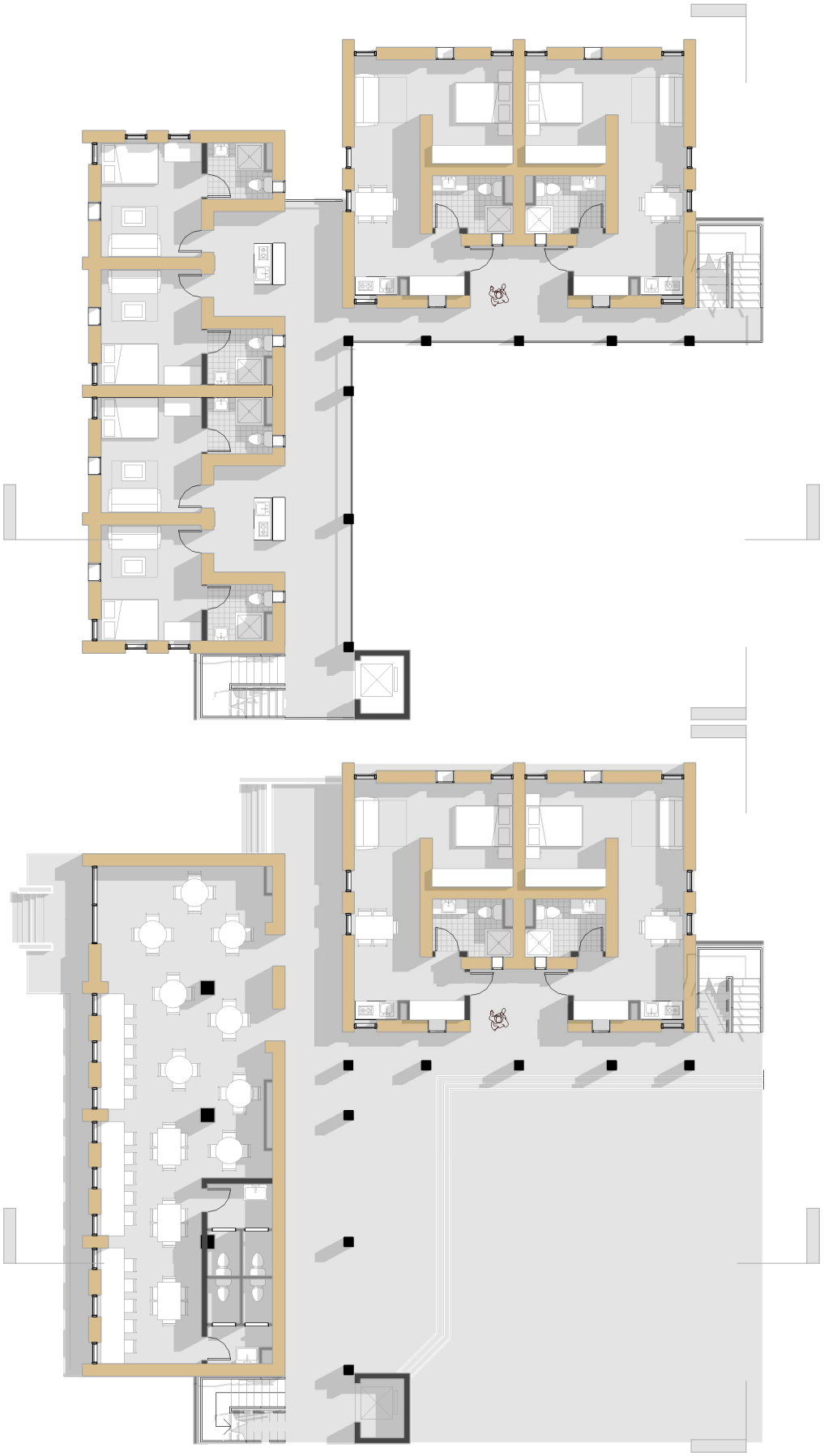




*The urban corner is named for its form as well as its public program at the plinth facing the urban social squares. The community centre on the plinth is accessible to people in the surrounding courtyard blocks. Here people can come together to socialize or the discuss about ekub and idir. Two different unit types can be found in this building design. One is the studio apartment aimed at the low-income couples. The cooking element is in this unit type shared with the mirrored type. This way, the cooking activities is an interaction moment between the two units, as well as a way to bring down the cost. On the other side of the building is the 1-bedroom apartment for middle income couples. This unit type has its own cooking element inside the unit, but the outdoor space on the gallery is still shared.*

## *TYPE 3: URBAN CORNER*

*ground floor and typical upper floor*



*1:200*

## *TYPE 3: URBAN CORNER*

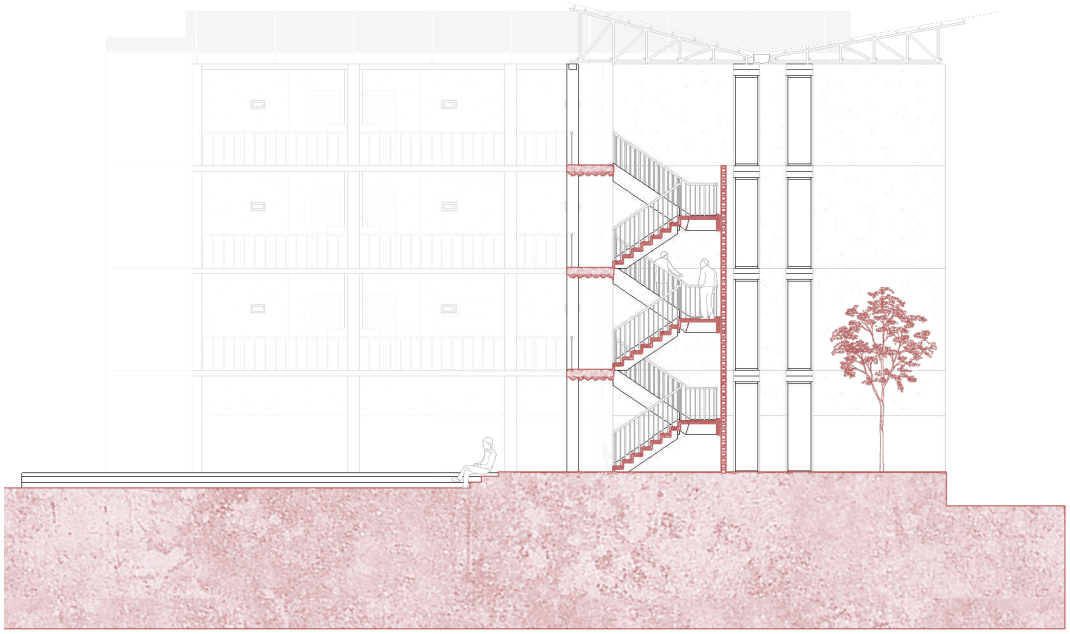
*elevation*



## *TYPE 3: URBAN CORNER*

*section*

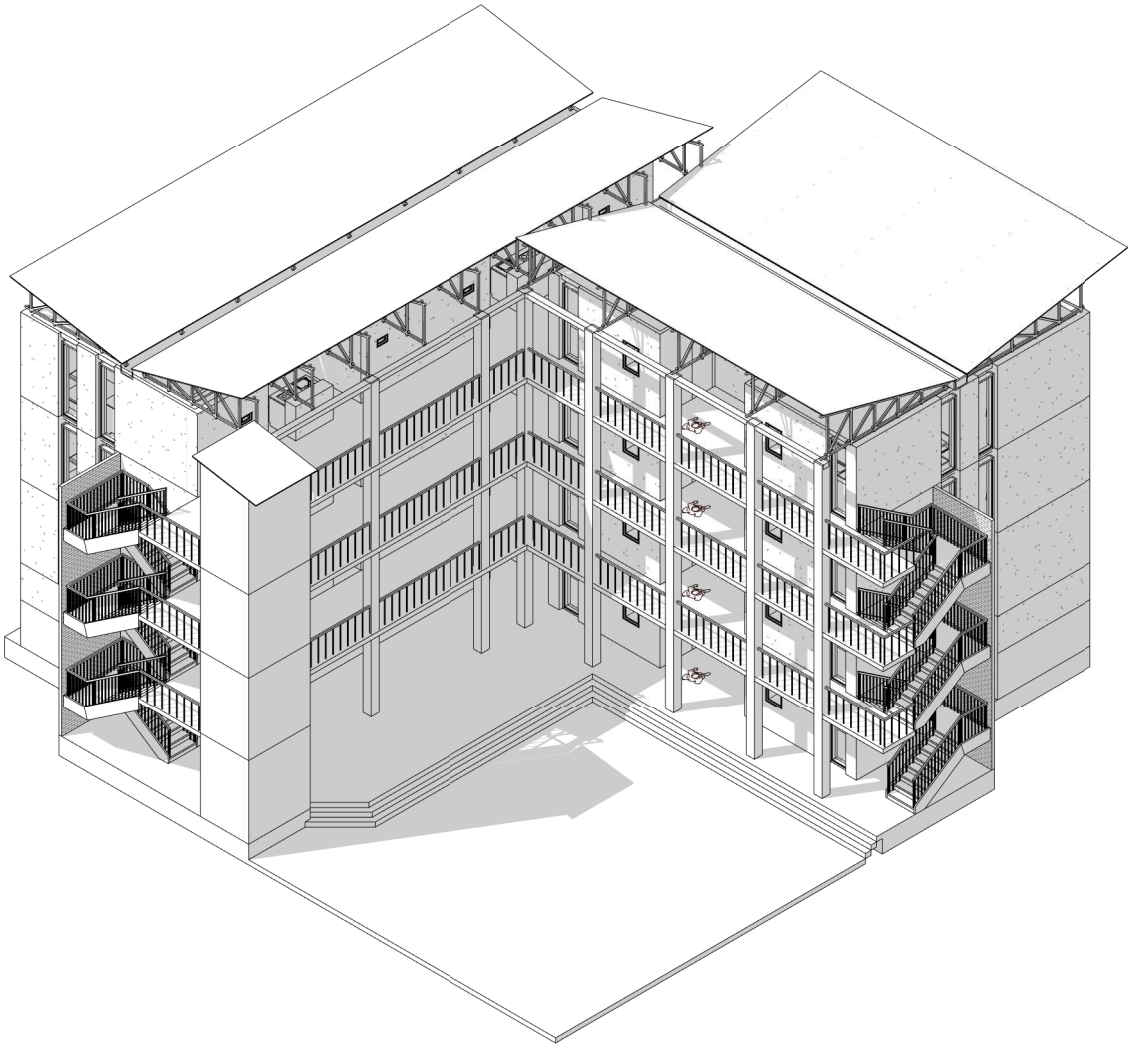




*1:200*

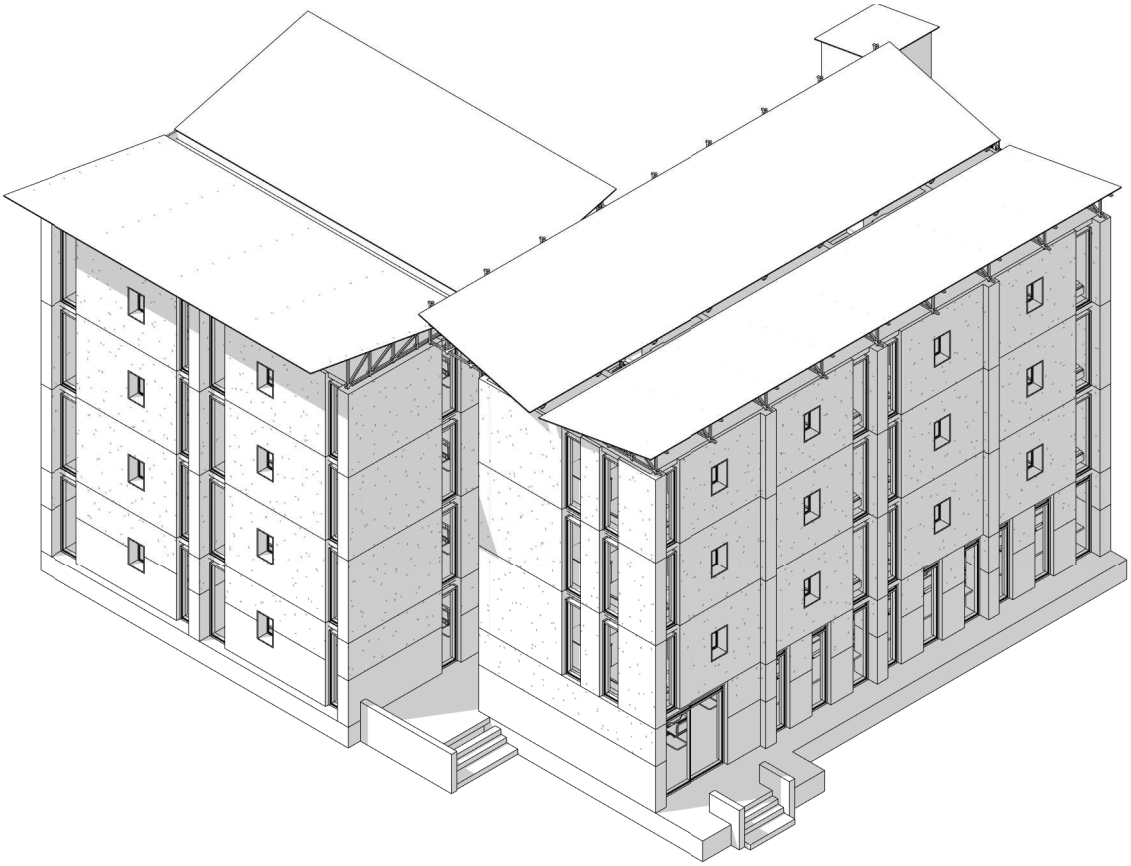
## *TYPE 3: URBAN CORNER*

*plan*



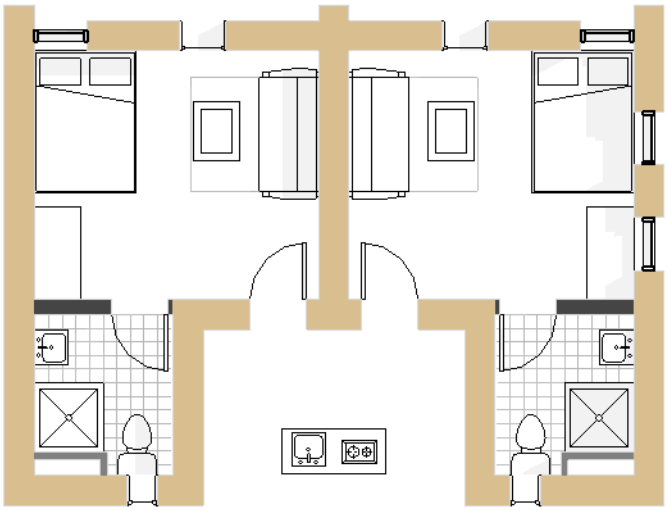
## *TYPE 3: URBAN CORNER*

*plan*

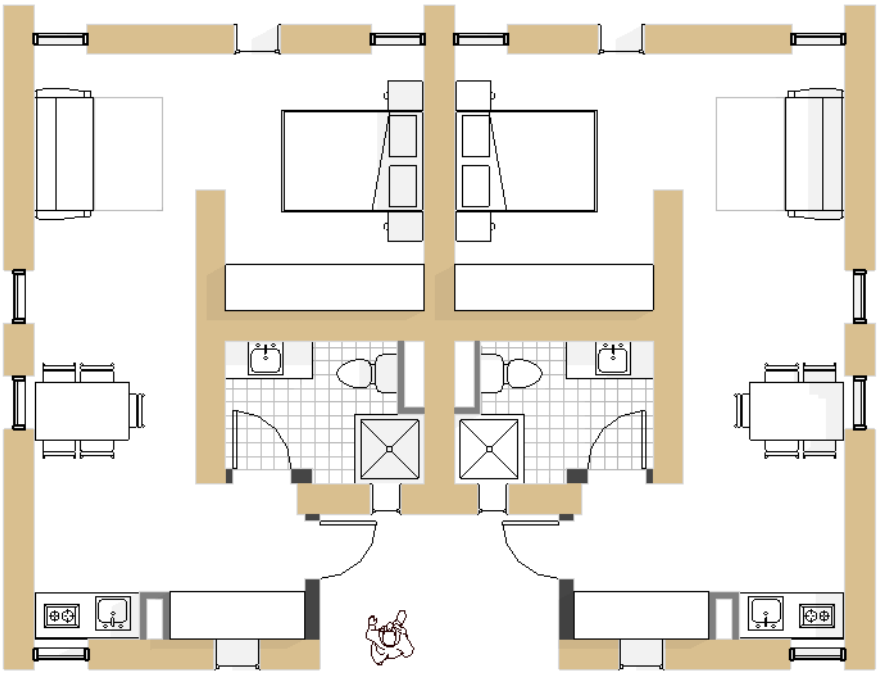


## *TYPE 3: URBAN CORNER*

*unit*



*22 m²*



*43 m²*

*1:100*

## *TYPE 4: WORKERS CO-HOUSING*

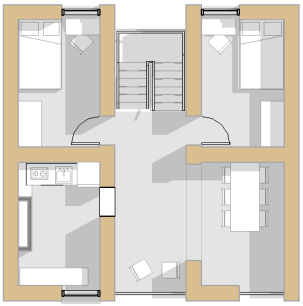
*intro*





*As the urban population boom is partly due to the influx of poor urban migrants, this workers co-housing design will try to solve that. On the ground floor is the commercial space facing the market square. On the other side, facing the courtyard is the stair entrance to the dwelling units on the upper floors. On the first floor you can find two-bedroom units for 1-2 people. On the courtyard side is the shared toilet/ washing space located. Going to the second floor is another two-bedroom units and the kitchen with a shared dining space facing the courtyard.*

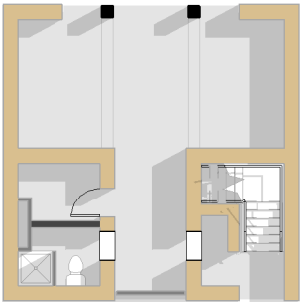
## *TYPE 4: WORKERS CO-HOUSING*
*plan*



*2F*



*1F*



*0F*

*bedroom unit*
*10 m²*

*shared kitchen*
*9,5 m²*

*shared dining space*
*17,8 m²*

*shared wash room*
*9,5 m²*

*shop plinth*
*46 m²*

*1:100*

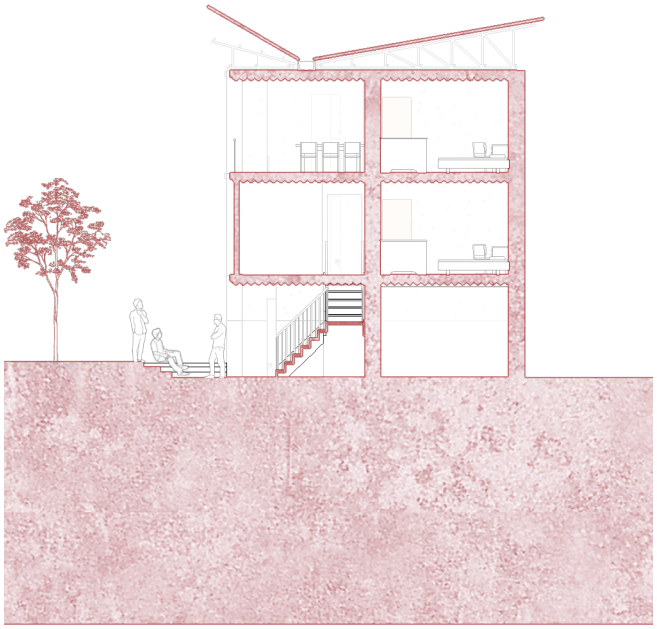
## *TYPE 4: WORKERS CO-HOUSING*

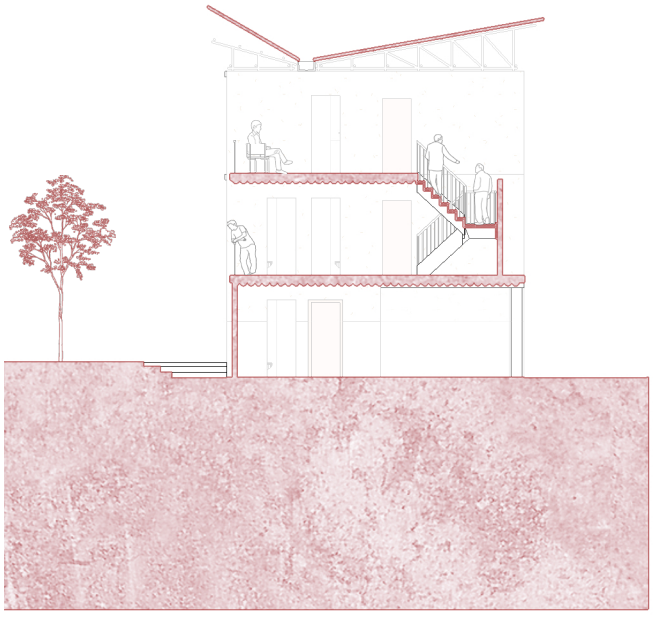
*elevation*



## *TYPE 4: WORKERS CO-HOUSING*

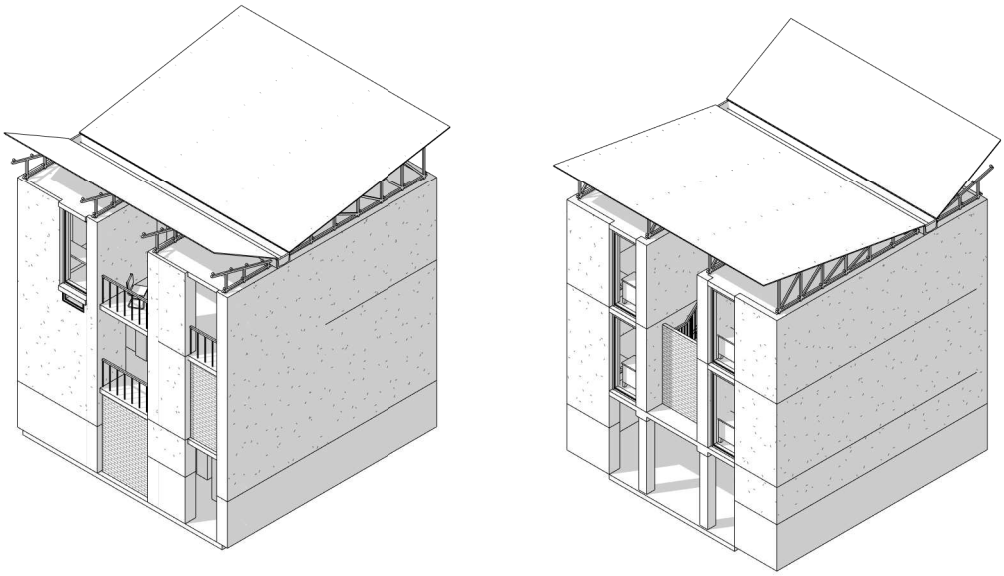
*section*





## *TYPE 4: WORKERS CO-HOUSING*

*section*



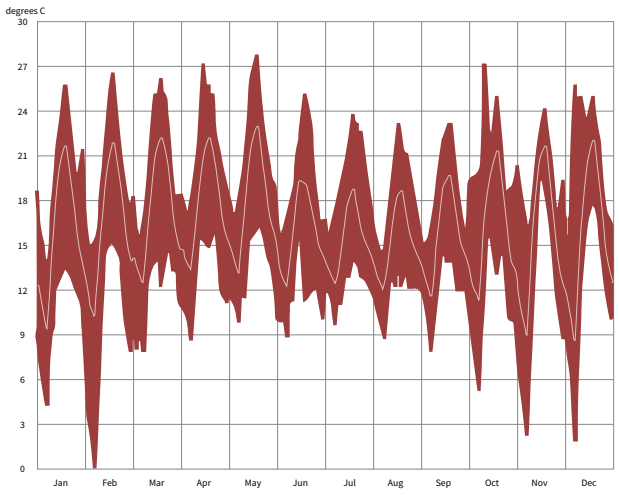
# *BUILDING TECHNOLOGY*

*building today for the climate of tomorrow*

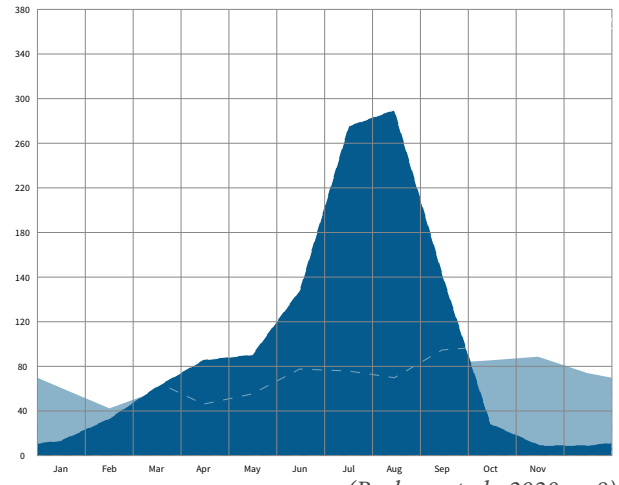
*In the wake of climate change, buildings in the future are destined to become climate neutral. In order to improve in economic power, the developed world have already walked the path of industrialisation, with excessive energy usage and pollution as result. We must be aware that current developing countries, while not denying their opportunities to improve as well, also won't cause the same problems as the developed countries already have. One way to do that in the field of architecture is to design passive buildings, with little embodied energy within the building process. As the greenhouse gas emission in developing countries like Ethiopia are still far lower than developed ones, it would mean that there must also be vernacular building practices that would have less of an environmental impact. One of which is the usage of local material. As the distance between the source location of the building materials and the building site get close, so will the energy usage become less. Also, more often than not, is that local materials mostly require less energy in processing the raw materials into building elements. Other ways to lower the embodied energy is to use more human labour rather than machines. The building design should here for also be possible to be manually constructed as well. The usage of traditional vernacular building practices combined with the goal for a better environmental future can be established as a new path, upon which the urban densification can be accommodated and thus the economy improved, while still not compromising on the living quality.*

*There are multiple different climatic regions in Ethiopia, types ranging from equatorial desert to a humid subtropical climate. The altitude plays a major role in these differences in climate. Addis Ababa is situated at an elevation of around 2400 meters and has the climatic type of a subtropical highland climate. In the diagram the maximum and minimum temperature range of Addis Ababa. In the diagram right, on the horizontal axis the months within a year are shown, and within every month an average 24-hour cycle is plotted. The average temperature of 16 degrees Celsius doesn't change so much during the year. (Barbero et al., 2020, p. 6) The fairly stable climate through the year means that the greatest challenge does not lie in the seasonal temperature difference, but rather the daily temperature difference. The biggest temperature difference is in November, when the average day temperature is at 22 °C, and the average night temperature at 9 °C.*

*Another challenge is the precipitation in Addis Ababa. Rather than seasons with temperature differences, Addis Ababa has two seasons with precipitation differences: a wet summer and a dry winter. The dark blue graph shows the monthly precipitation in Addis Ababa. In the monsoon season it can rain up to almost 300 mm per month. Outside of the monsoon season however, the precipitation level will fall drastically. The challenge thus is to alleviate the stark seasonal difference of the precipitation: storing water during the monsoon season, and effectively guiding away the excess water, and during dry periods, providing water to the households despite drought.*




*(Barbero et al., 2020, p. 6)*




*(Barbero et al., 2020, p. 8)*



*(ethiopiaglocal, 2020)*




*alleviating day/night temperature differences*



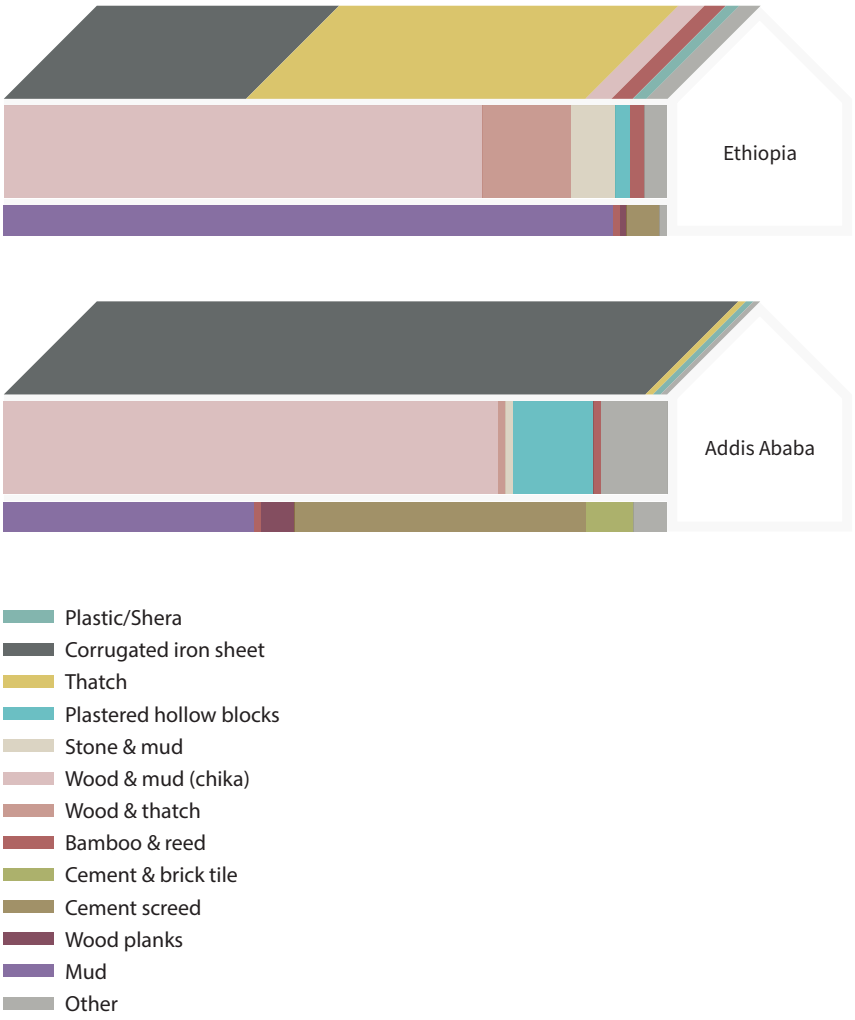
*utilise the monsoon season as solution for drought*



*Adapting your own home to cater to your own lifestyle is an innate nature of human. For people in the low-income bracket, adapting your home means improving it with the limited resources available, and maximize the usability of the dwelling space. The usability is in this sense not only being able to accommodate as much people as possible inside the dwelling space, but also having the possibility to use the dwelling space as a workspace or even as a commercial shop front. Adaptability for the low-income group is maximizing the potential of the limited resources the inhabitant possesses. A dwelling is not anymore just a space to sleep, to eat or to dwell. It has become a way to generate extra income by using the living room as a place to make products to sell in the big market; or the kitchen to make injera and coffee to sell as breakfast for the middle income groups on their way to work; or the courtyard as a place to dry clothes that are washed for the people in the neighbourhood. Dwelling space itself can also be a source of income as rooms can be sublet to people in dire need of housing.*

*By being able to adapt the dwelling space, low income people will see an increase in their ability to generate income. The dwelling space is there for used in its maximum potential as a dwelling space, and also for its great variety in responding to the different needs of each households.*

*Important in the adaptability of the dwelling space is that inhabitants are familiar with the possibilities of adaptation and how to do so. A key aspect in advocating adaptability for the low-income group is the '3L' strategy. '3L' stands for local technology, local materials, and local labour. Being able to recognise the technology and materials used, means that the inhabitant will be able to better imagine the adapted results. Using local labour will also be beneficial to the local economy. Most importantly, the usage of local technology, materials and labour will significantly bring down cost and environment impact.*




*(Barbero et al., 2020, p. 65)*

*In the available building materials in Addis Ababa, a comparison will be made amongst materials of roof, wall, and reinforcement. This comparison will lead to a material choice for the design. Shown n the graph above, is the usage share of materials in the three building elements in Ethiopia and Addis Ababa.*



*Corrugated Iron Sheets*
*roof structure; finishing; temporary structure; reinforcement*



*Thatch*
*roof structure; wall finishing*



*Bamboo*
*roof structure; finishing; temporary structure; reinforcement*



*Chika*
*wall; scaffolding*



*Concrete Hollow Blocks*
*wall*



*Concrete, cast in situ*
*foundation; wall; floor; roof; column; lintel*



*Rammed Earth*
*foundations; wall; floor*



*Compressed Earth Block*
*foundations; wall; floor*



*Steel*
*reinforcement*

## *BUILDING TECHNOLOGY*

*material comparison - roof*

| | *corrugated iron sheet* | *thatch* | *bamboo* |
|---|---|---|---|
| *density* | *2.25 - 9.25 kg/m²** | *34 kg/m²* | ** |
| *fire resistance* | - | -- | -- |
| *carbon footprint**** | -- | ++ | +++ |
| *material cost**** | + | - | + |
| *ease of construction* | ++ | - | + |
| *time of construction* | ++ | - | + |

* *Depending on the coating and thickness*
** *Mostly combined with other materials*
*** *Plus indicate low carbon foot print/material cost*

*Corrugated iron sheet is by far the most common roof material in Addis Ababa. The ease to manufacture and construct with this material means that even the lowest income group can work with this material. Its carbon footprint is its worst factor, as it takes factory level of manufacturing and requires great deal of energy. The other two materials are more environmentally friendly. Thatch is comparing to bamboo less common in Addis Ababa. Combining with the fact that it is far more labour intensive than bamboo makes it less good of a choice. The quality of bamboo depends mostly on its application. Applied a raw material, it can already build up entire houses. Process bamboo can create factory standard building elements like cross-laminated bamboo.*

## *BUILDING TECHNOLOGY*

*material comparison - wall*

| | *chika wood and mud* | *concrete hollow block* | *cast in situ concrete wall* | *stabilised rammed earth* | *compressed earth block* | *dried mud brick* |
|---|---|---|---|---|---|---|
| *density* | *1800 kg/m³ ** | *1100 - 2150 kg/m³* | *2,400 kg/m³* | *2000 kg/m³* | *1500 - 2000 kg/m³* | *1840 kg/m³* |
| *compressive strength* | - | *7,5 N/mm²* | *5-70 N/mm² *** | *1-15 N/mm² **** | *4 N/mm²* | - |
| *porosity* | ++ | - | -- | +++ | ++ | ++ |
| *thermal conductivity* | *0,2-0,3 W/mK* | - | *1,4 W/mK* | *1,51 W/mK* | *1,1 W/mK* | *0,9 W/mK* |
| *fire resistance* | + | +++ | +++ | +++ | ++ | + |
| *carbon footprint ***** | +++ | - | -- | ++ | +++ | +++ |
| *material cost ***** | +++ | -- | -- | ++ | +++ | +++ |
| *manual/ mechanical construction* | *manual* | *manual/ mechanical* | *mechanical* | *manual/ mechanical* | *manual* | *manual* |
| *ease of construction ****** | +++ | + | + | + | ++ | ++ |
| *time of construction ***** | +++ | ++ | - | - | ++ | ++ |

* *Can vary based on share of mud and wood*
** *Depend on the grade of concrete, though in Addis Ababa a lower grade is expected*
*** *Depend on the mixture and construction technique*
**** *Plus indicate low carbon foot print/material cost/construction time*
***** *Define as how easy can a low skill worker participate*

*Chika wall as a vernacular building method is easy to build and affordable to most. Other common choice for load bearing construction is concrete in situ and concrete hollow block. However, his kind of construction relies heavily on the foreign import of materials, with limited local supply. Other more climate friendly solution could be alternative for the foreign materials. First is stabilised rammed earth, using cement mix with local sand and clay soil, it can reduce the usage of foreign materials while not losing much of the load bearing capacity.*

## *BUILDING TECHNOLOGY*

*material comparison - roof*

| | *steel reinforement* | *bamboo* |
|---|---|---|
| *density* | *1800 kg/m³ ** | *731 kg/m³* |
| *E modulus* | *210000 MPa* | *45475 MPa* |
| *carbon footprint ** | --- | +++ |
| *material cost ** | --- | +++ |
| *ease of construction *** | ++ | ++ |
| *local small scale production* | *no* | *yes* |

* *Plus indicate low carbon foot print/material cost/construction time*

** *Define as how easy can a low skill worker participate*

*Steel reinforcement is an imported building material in Addis Ababa. This result in an added cost both financially and environmentally. To be able to further densify the city while benefiting the local building industry, there must be either an increase in local capacity to manufacture steel reinforcement or find local alternatives to it. One of the possible alternatives is bamboo reinforcement. As bamboo is already native to Ethiopia, it is available in abundance. As bamboo has a lesser E-modulus than steel (Unnikrishnan, 2017), other studies still suggest that "bamboo can substitute steel satisfactorily" (Ghavami, 2005).*

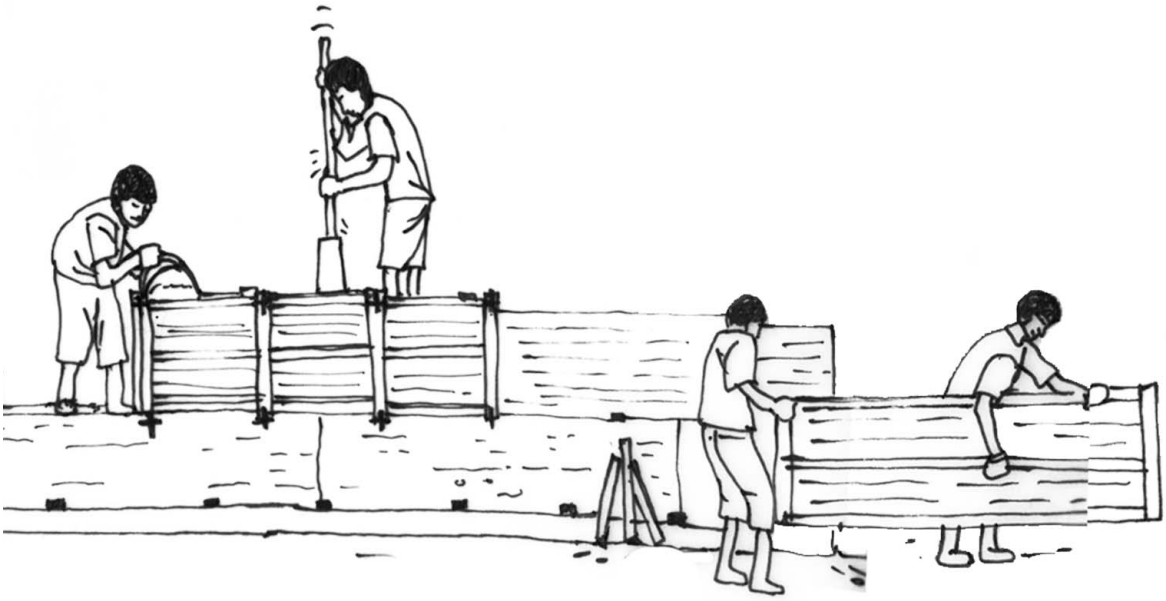


*mining the soil* *mixing with cement* *transport to location*

*The choice of stabilised rammed earth as load bearing wall is evident from the material comparison. To summarize its main beneficial attributes: 1) It absorb the humidity inside the house and maintain an almost constant air humidity of 50% for an entire year. 2) It has a high thermal mass, storing the heat captured during the day and release it in the house during the night. 3) It is environmentally friendly, for example, stabilized earth's embodied energy is of 0.7 Mj/kg and cement's embodied energy is of 5.6 Mj/kg. 4) It is natural, economical, available for everyone who has a land and it is ideal for a do-it-yourself construction. 5) It is very good fire resistant. (Ciurileanu & Horvath, 2012)*

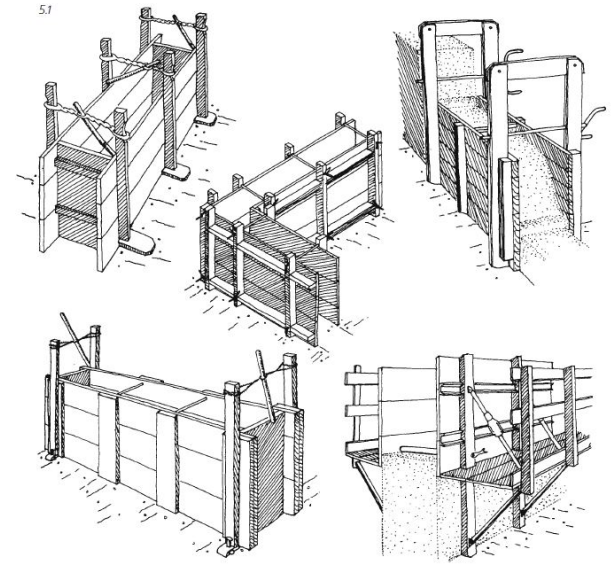
*Stabilised rammed earth uses soil 50 cm below the vegetation layer. This way, the soil won't contain unwanted roots and insects and the topsoil for agriculture won't be used. The mining site is usually close to the building site so there won't be any long-distance transport needed. The mined soil is mixed with cement. Water will be added if the soil is too dry. The finished mixture will then be transported to the building site. On site, the mixture will be poured into the wooden form work. Builders will then start ramming the wall layer by layer. When the top of the form work is reached, it will be demounted and placed on the next section of the wall.*

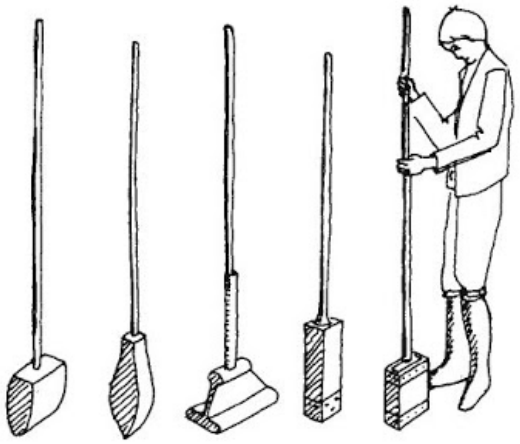
*This process can happen manually, especially well-suited for Addis Ababa, where the labour force is young, abundant and affordable. However, the same building process can happen entirely mechanical. As mining can be done by mechanical diggers, transport through truck and pouring of the mixture similar to pouring of concrete. the ramming can also be done through mechanical rams.*

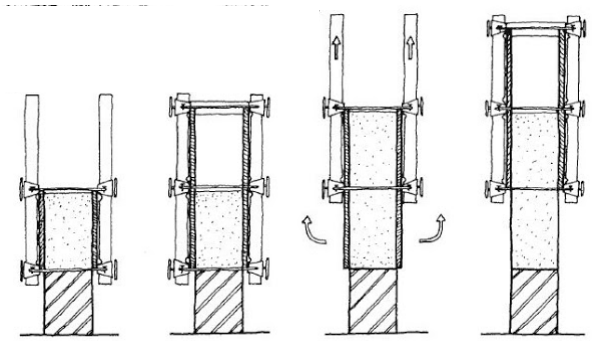


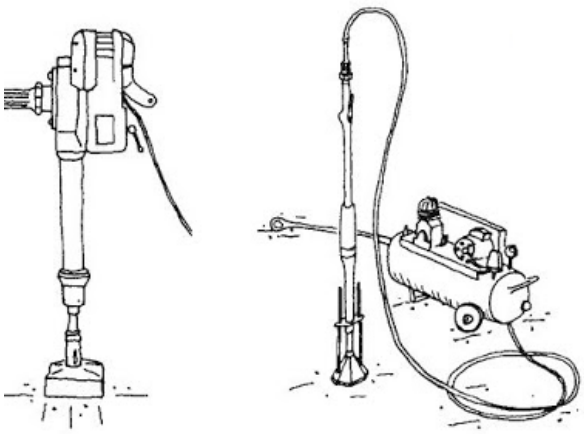
*pouring into the form work and start ramming*

*take away the form work after completion*

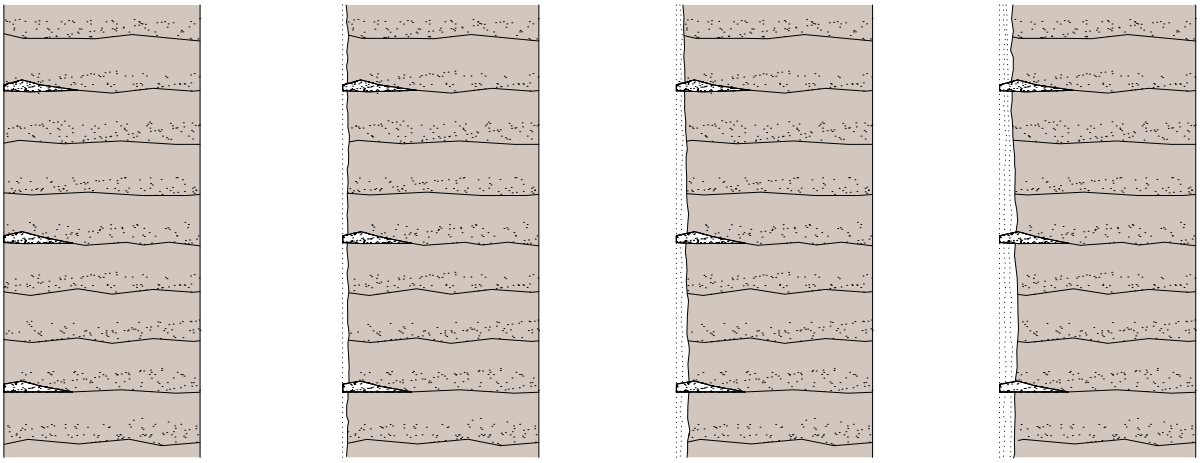








*Tools of rammed earth construction(Minke, 2000)*



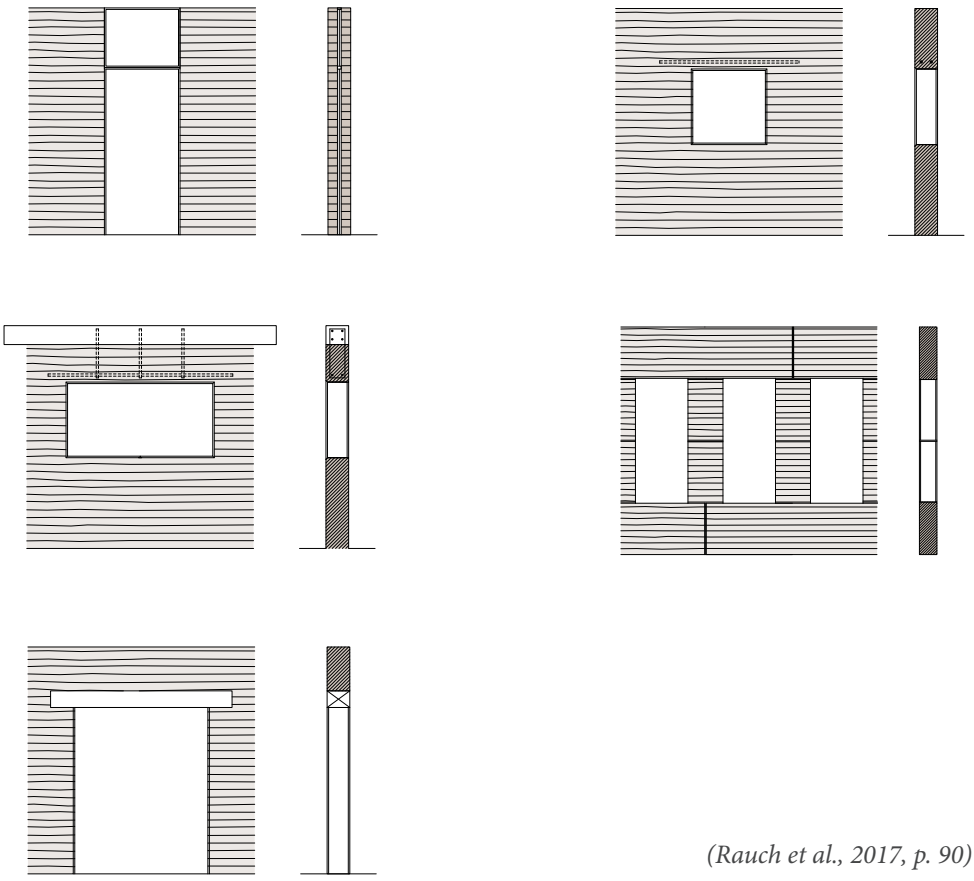
*(Rauch et al., 2017, p. 72)*

*Rammed earth as a material also has its weakness. As an earth material, it is prone to erosion by rainwater. Direct hit of rainwater on the wall won't have much effect on the structural integrity of the wall. Rather the slow sliding of water along the entire vertical distance of the wall will slowly erode the surface layer. There are different ways to combat this erosion. One way is to not do anything special against rainwater within the structure. The erosion will happen slowly so it is a common practice that the surface of the rammed earth wall will be re-plastered periodically with the same mixture of soil clay and sand. This way the erosion will only go so far until the next new layer is applied. This requires long lasting need of maintenance on the building. Another way is to apply a mixture with high clay content to the surface during the construction process. As rammed earth is a mixture made up of different percentages of sand, gravel, clay (and also cement in stabilised rammed earth), the differences in the share of the materials will also affect the structural and climatic characteristic of the wall. In a rammed earth construction, sand is the main load bearing element in the mixture. A higher sand percentage would also mean a higher compressive strength. The drawback is that high share of sand content and low shared of clay content will make the wall prone to cracks. On the contrary, a wall will high clay percentage will be more suitable to withstand water, but then the result is a structural weaker wall. There for, combining the two kind of mixture, one with high sand content as structural element and one with high clay content as plaster on the outer wall will also combine the strength of both kinds of mixtures. Lastly, it is also possible to add erosion checks into the wall. These erosion check can be made of any robust, water resistant material. Examples are brick plate, natural stone or recycled plastic. As water slides down the wall, erosion checks will guide the droplets away. This way, the erosion will stop at a certain depth of the wall and it will also compartmentalise the erosion.*

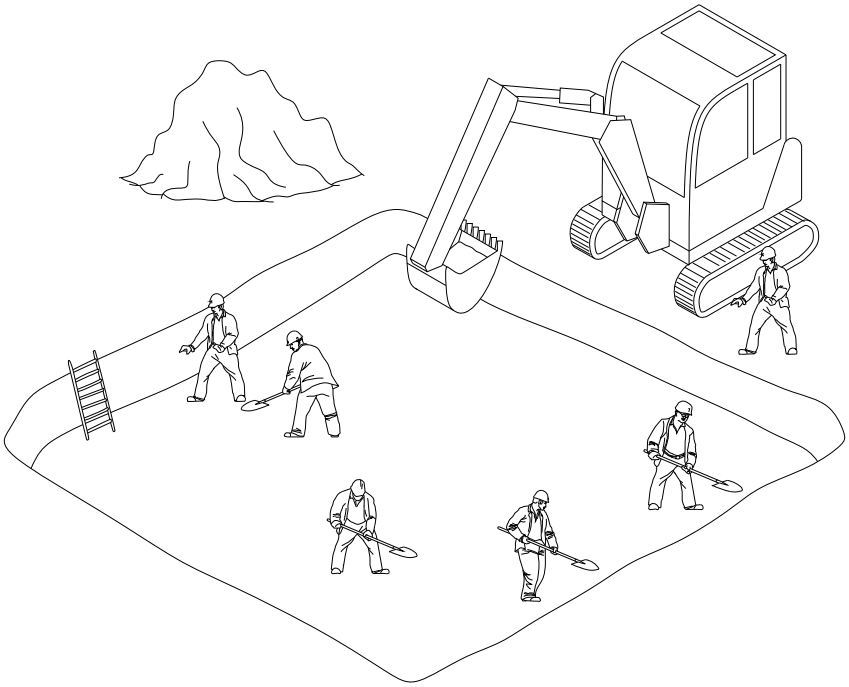
*There are different possibilities in make opening in a rammed earth wall. The first is to open the entire height of the opening, meaning that there will be no rammed earth materials above the opening that need to be supported. Second is a suspended lintel, in which a smaller lintel above the opening will be hanged onto a larger lintel above. This requires a material with high tensile strength to be able to bear the load of the rammed earth wall. Third way is to have a single lintel of another material distributing the load the sides. This kind of lintel can be exposed or concealed. Fourth way is to have an integrated lintel, in which reinforcement are integrated in the rammed earth wall itself. The downside is that the strength of this technique is limited comparing to others. Lastly is the technique of stacked prefab rammed earth elements. This technique requires prefab rammed earth elements which can be suspended and assembled, similar to prefab concrete elements.*



*Manhattan of the dessert - Shibam Hadramawt , Yemen (MacLeod, 2019)*

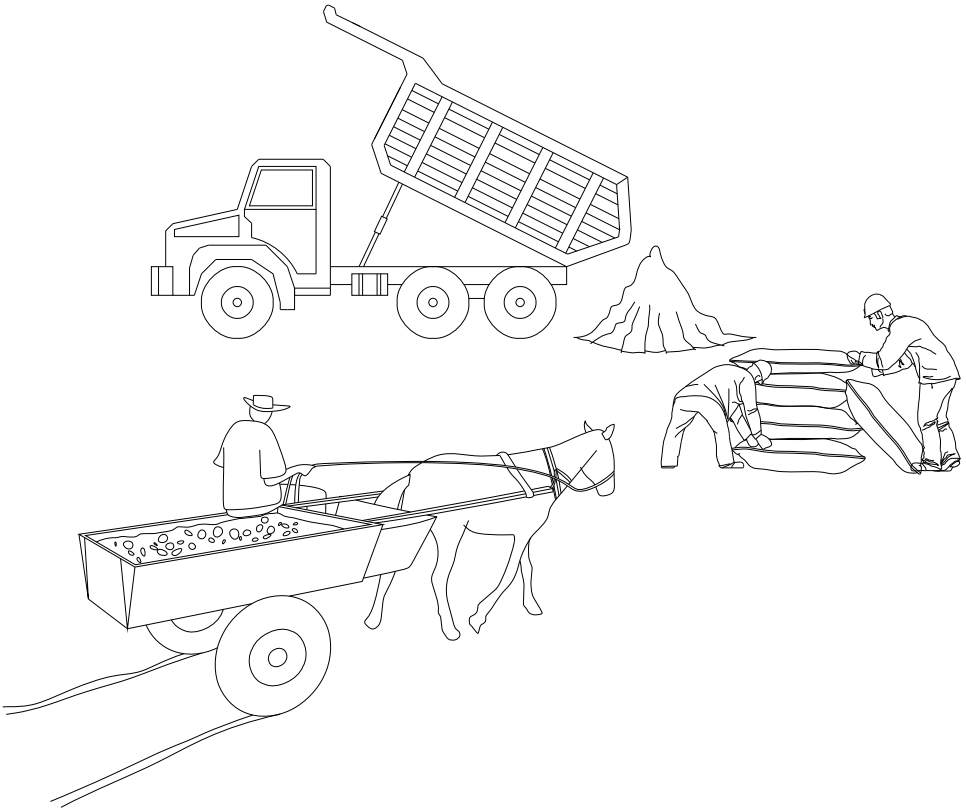


*(Rauch et al., 2017, p. 90)*



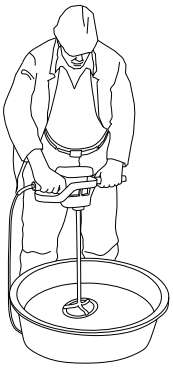
*STEP 1 - MINING SAND*

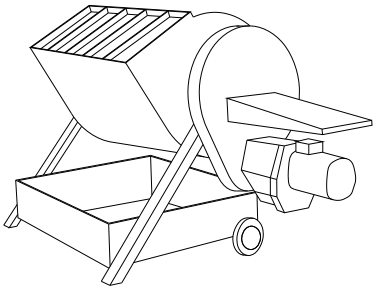
*At the construction site, sand will be excavated from the subsoil layer 1,5 meter under the surface. This excavation can happen along with the construction of the underground infrastruction system (i.e. sewage system). after the excavation the ground will be made ready for the construction of the building.*

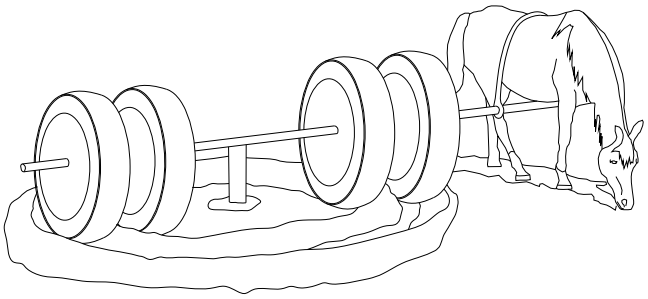


*STEP 2 - TRANSPORTING MATERIALS*

*Beside sand there are also gravel, clay and cement needed for the mixture of stabilised rammed earth. These materials can either be transport in large quantity by trucks, or in the informal ways like carriage bringing in small quantities.*

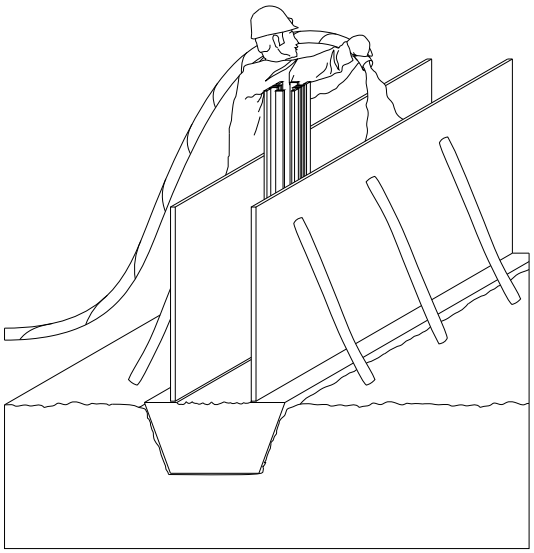






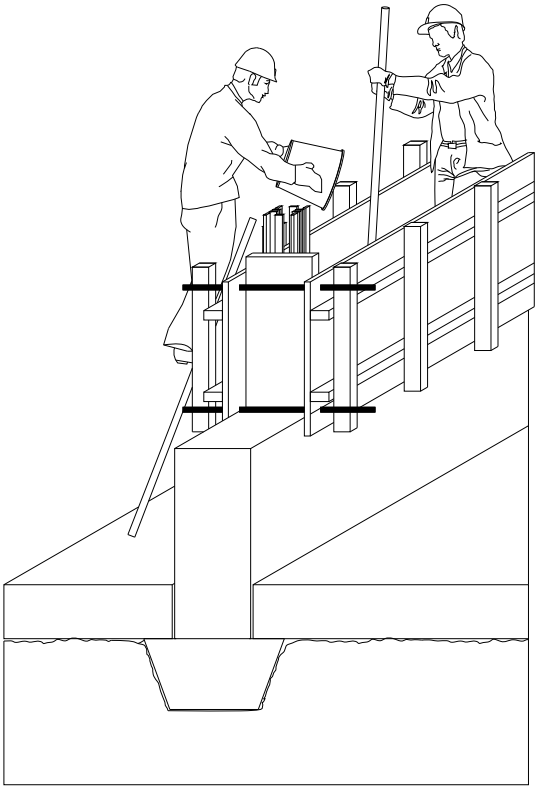
*STEP 3 - MIXING*

*Water will be added to the materials and then it will be mixed until all materials are distributed equally. The mixing can happen mechanically of through animals.*



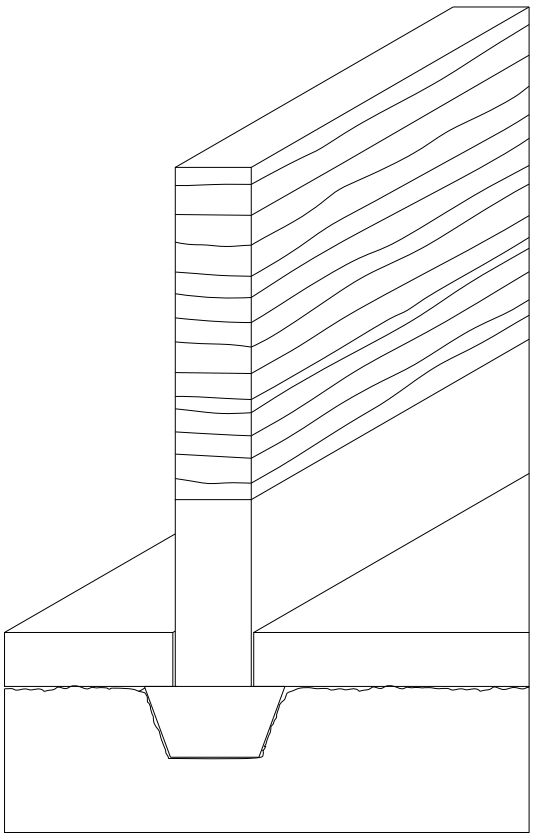
*STEP 4 - CONCRETE BASE WALL*

*Rammed earth is susceptible to water damage from the ground. This means that rammed earth cannot be in direct contact with the ground. To alleviate this problem, a concrete base wall of 1,5 meter will be constructed first.*



*STEP 5 - RAMMING*

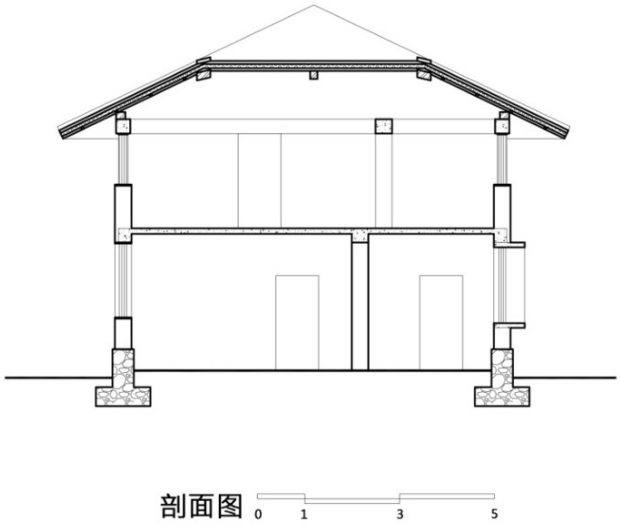
*A wooden form work will be constructed above the concrete base wall. The mixture of clay, sand, gravel and cement will be poured into this form work. Every time less than 10 centimetre of materials should be added in the form work to ensure that each layer is sufficiently rammed. The process can happen manually or mechanically.*



*STEP 6 - DRYING*

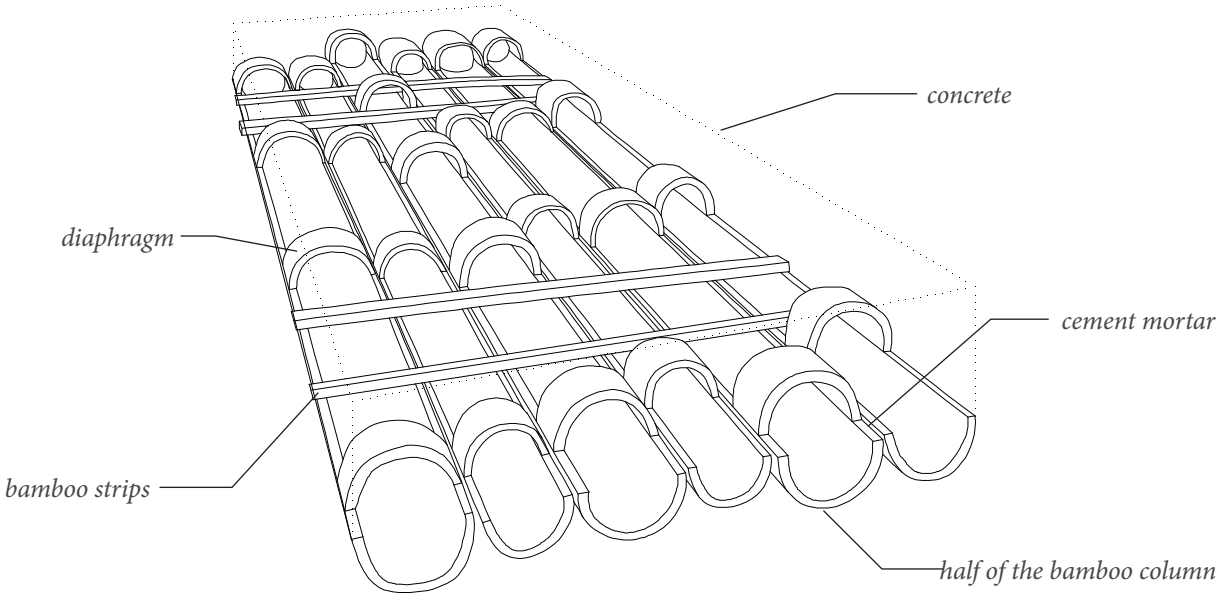
*After removing the form work, the wall segment should be left to dry and stabilise. Thick walls will dry out from 50 % of the original moisture content approximately in 2.25 days. The same walls will dry out from 85 % of original moisture content approximately 18.6 days. (Otcovská et al, 2018)*






*Post-Earthquake Reconstruction (Archdaily, 2017)*






*In this project, the material of bamboo will have two kinds of application. First as the lost fore work of the cast in situ concrete floor, and second as the reinforcement within the walls. Each application is to utilise the tensile strength of bamboo to replace the expensive and environmental unfriendly steel reinforcements.*

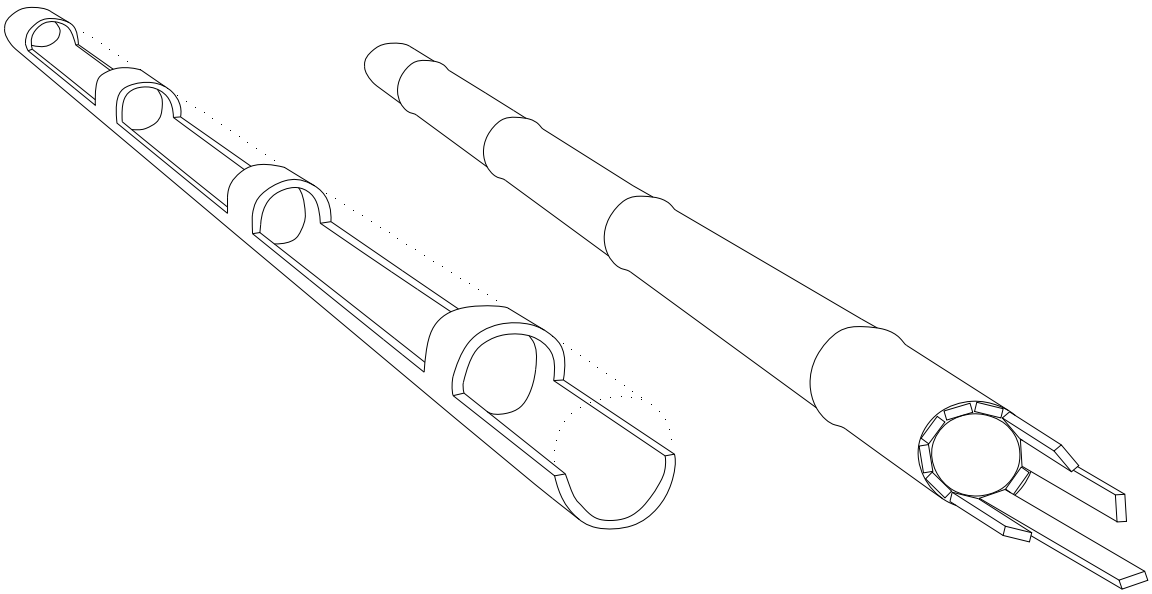
*The application of bamboo as lost form work is shown above. The idea is to cut bamboo in half on certain section of the pole. Only on places of the diaphragm are the half not cut. These cut bamboo poles are then fixed by bamboo strips in the perpendicular direction into a plate. As the seam between the bamboo poles won't be perfect, it is needed to close the openings between the bamboo with cement mortar. Once fixed, the lightweight bamboo form work can be placed on the load-bearing walls. By adding a couple of side form work, concrete can be poured onto the form work. As the bamboo is strong enough in tensile strength, no additional reinforcements are needed in the floor. (Ghavami, 2005)*





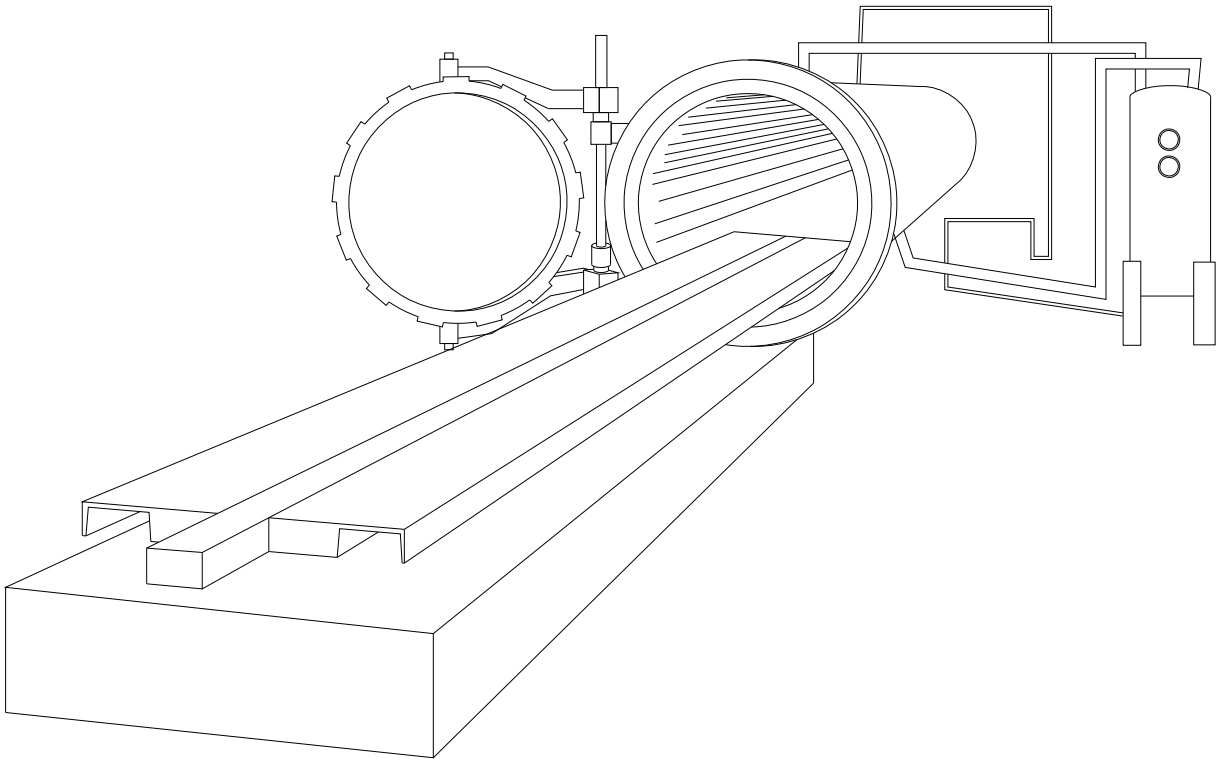


*(Ghavami, 2005)*



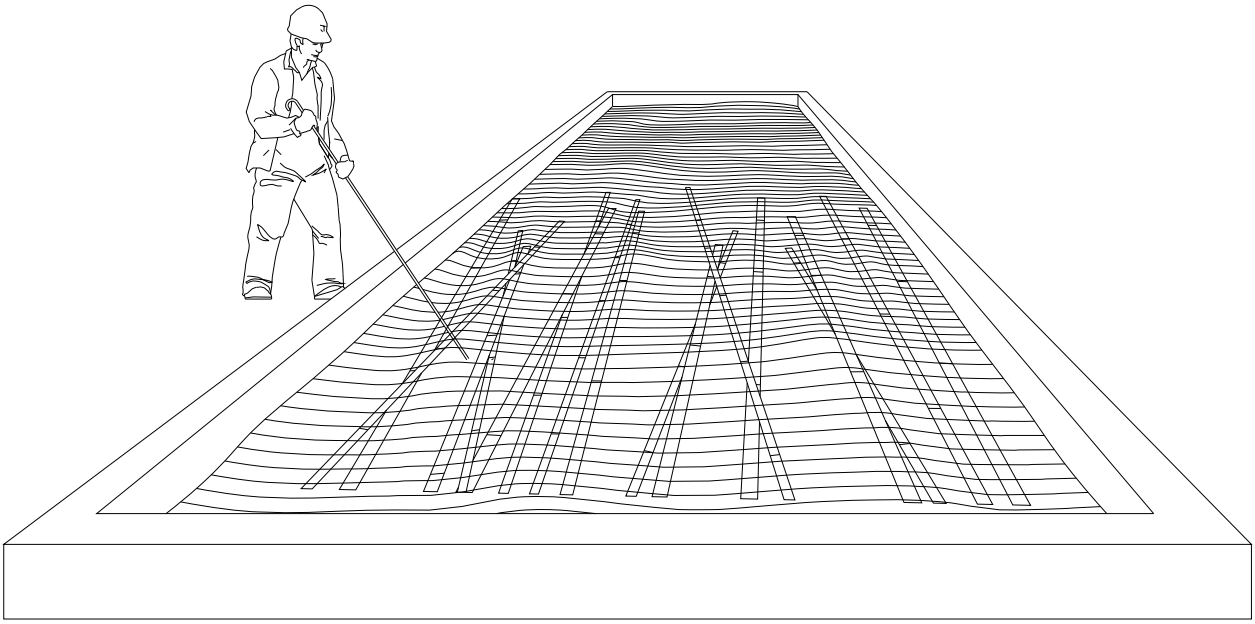
*STEP 1 - CUTTING*

*Two different application of the bamboo material requires two different cutting method. For the lost form work, a bamboo pole is cut in half on certain sections of the pole. Only on places of the diaphragm wont the half be cut. This diaphragm node can increase the grip between the form work and the concrete. The second cutting method is to cut the bamboo into strips of the same sizes.*



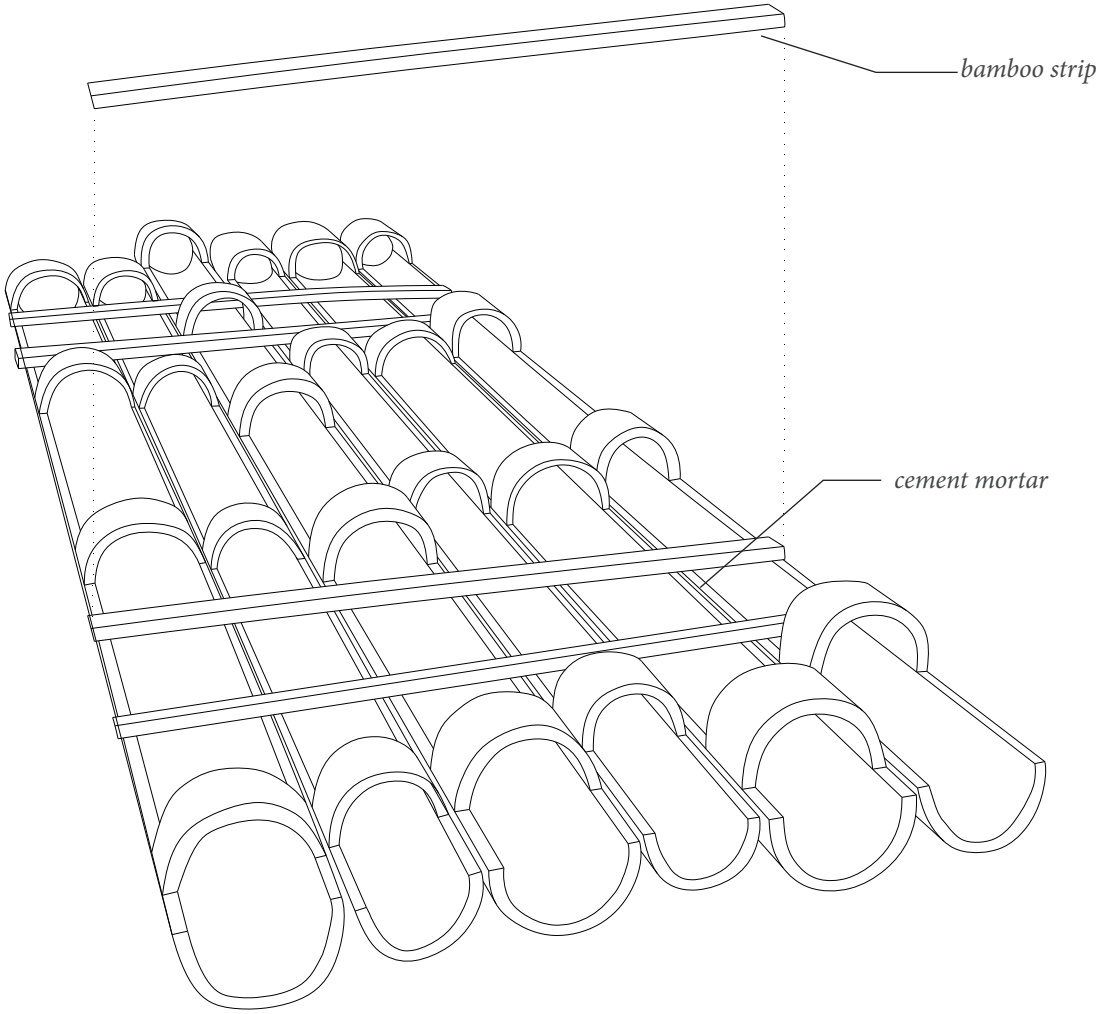
*STEP 2 - PRESSURE TANK*

*Bamboo is rich of natural starches that attract insects. To prevent insect eating the bamboo, the starches need to be released by processing the bamboo in a heat and pressure tank. This way the water content of the bamboo will also be lowered.*



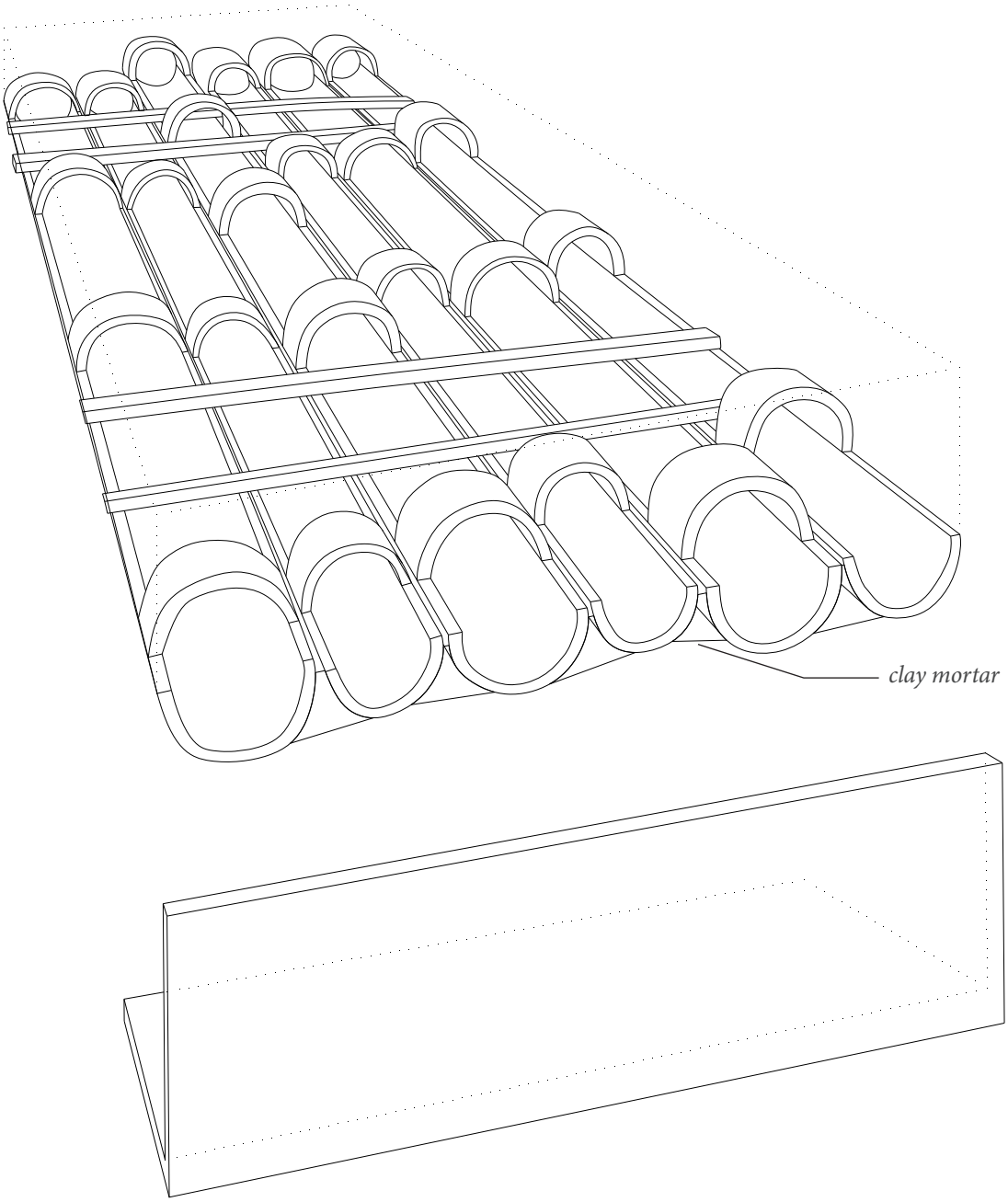
*STEP 3 - TAR COATING*

*Bamboo as a natural material have two main problem when it is used as a building material. One is that it can burn. Second is that bamboo can absorb and release moisture. When doing so, the bamboo will expand and contract. This is especially unfavourable when the bamboo is used in the concrete, which will lead to internal cracks. To increase the fire resistance as well as making it watertight, the bamboo will need to be coated in a tar bath.*



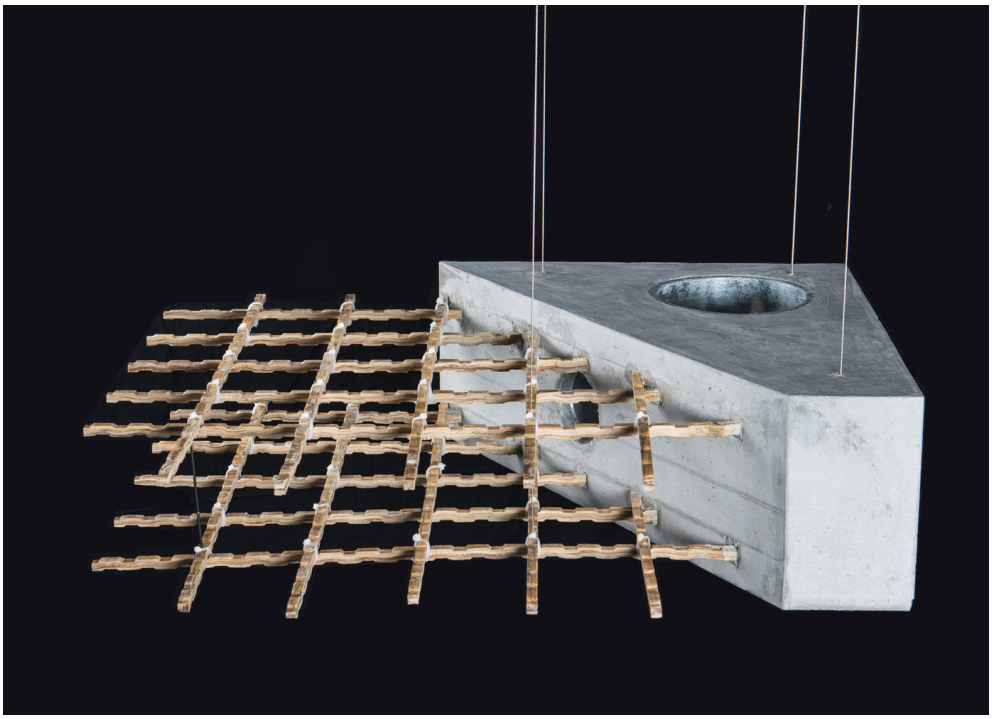

*STEP 4 - ASSEMBLING THE FORM WORK*

*The processed bamboo will be placed in rows. In the perpendicular direction bamboo strips are used to fixed the form work. As the seams between the bamboos wont closed off perfectly, concrete will leak through during pouring. There for the seams need to be closed with a cement mortar.*

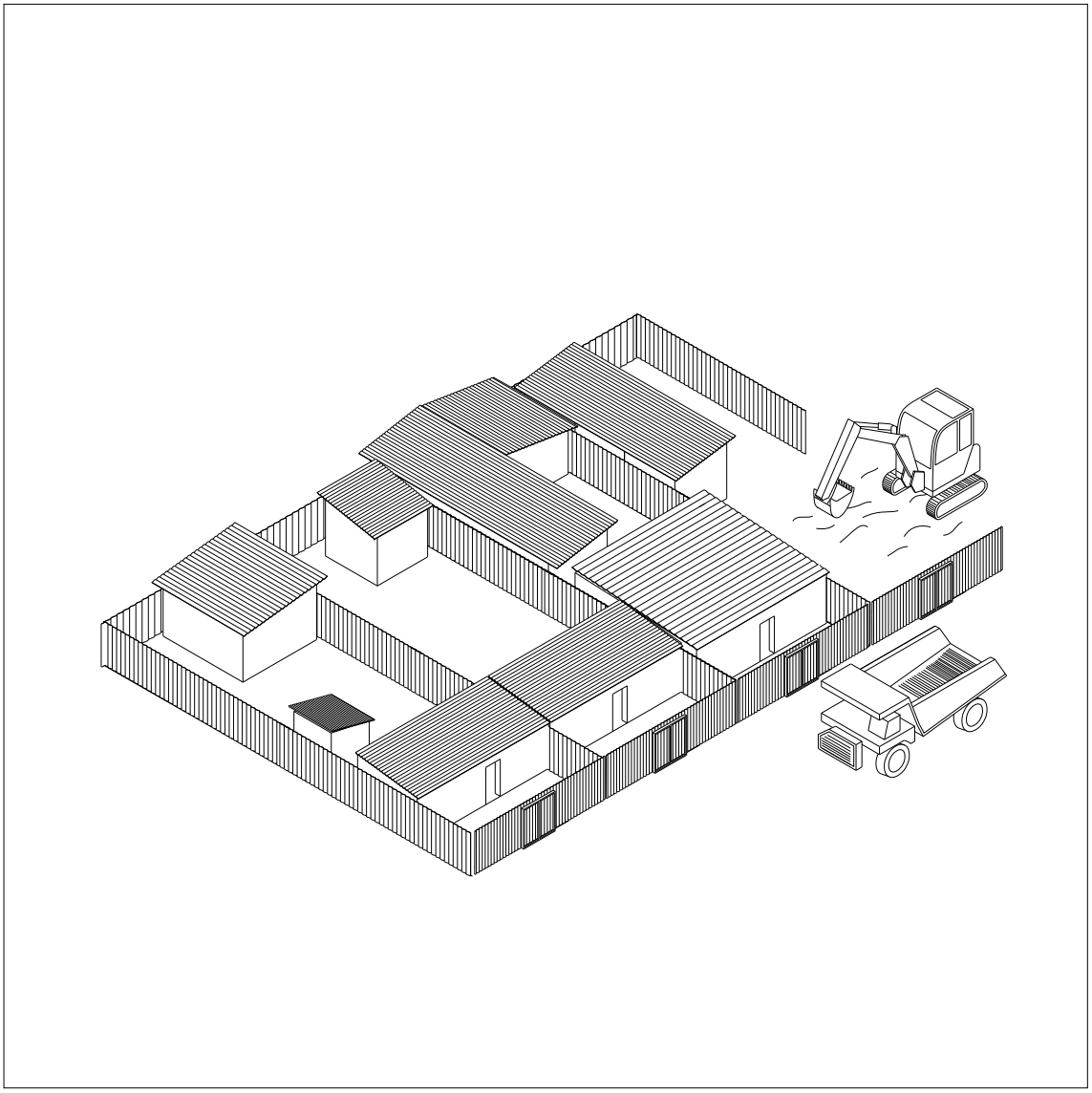



*STEP 5 - CLOSING THE GAPS*

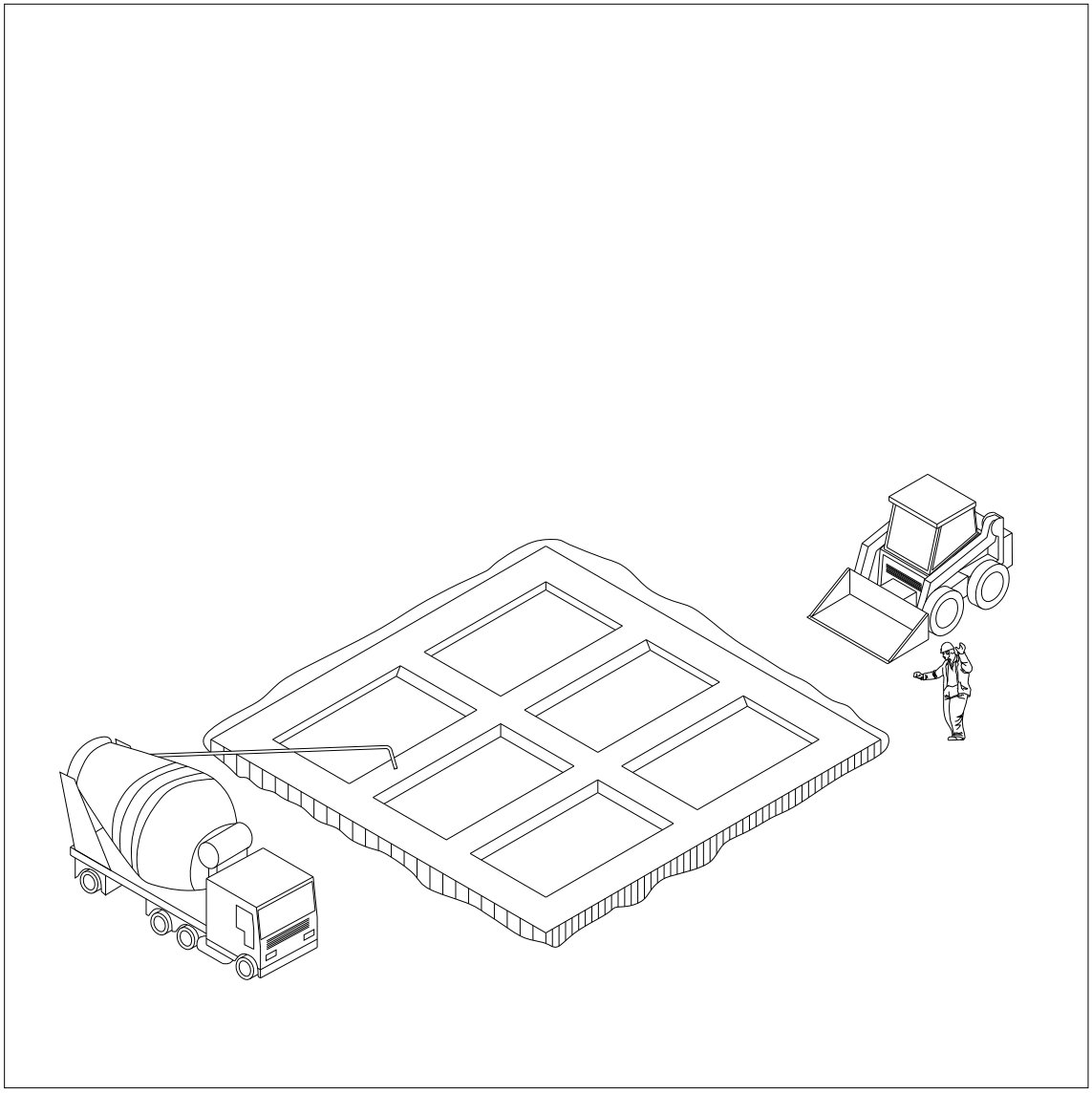
*When the bamboo form work is ready, it can be placed on the L shape prefabricated concrete bond beam on top of the load bearing wall. The voids between the form work and the bond beam need to be closed with a clay mortar. This mortar is not structural but it is only to make sure that the concrete poured onto the form work wont leak.*



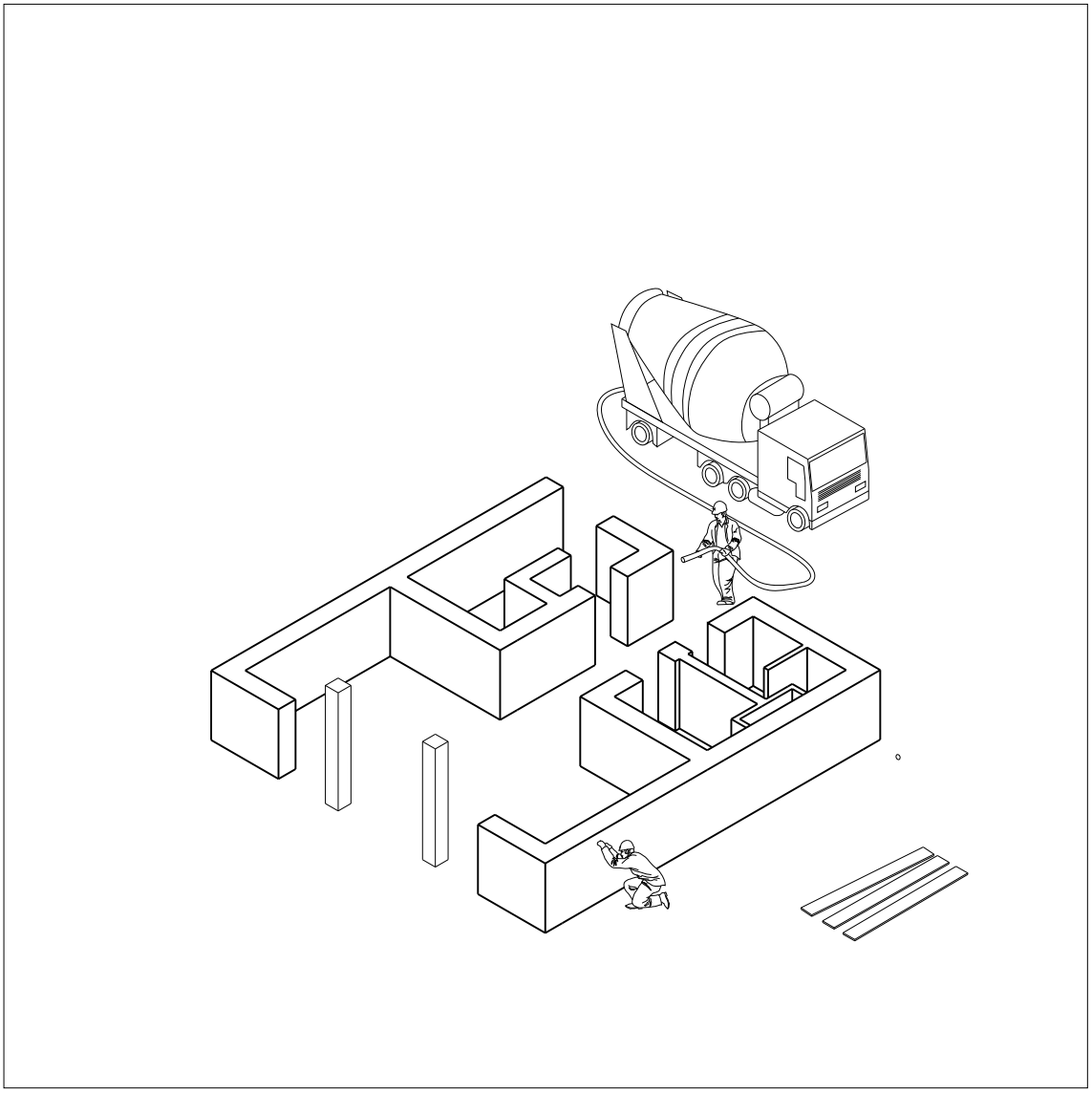
*The second application is using bamboo as a direct replacement of steel reinforcement. In this application, the bamboo needs to be split into strips. To protect bamboo from future insects' attacks or fungi, the bamboo strips are carbonized in a high-pressure tank for several hours. The combination of heat and pressure releases natural starch in bamboo strips which gives it a typical brown caramel colour. The slats are hereby also lowered in the water content. (Schröder, 2020) During the casting and curing of concrete, reinforcing bamboo absorbs water and expands. This swelling pushes the concrete out. At the end of the curing period, the bamboo loses the moisture and shrinks back almost to its original dimensions leaving voids around itself. This may cause the concrete to crack. To prevent this bamboo must also be treated to gain water-repelling properties. One effective treatment is the application of a thin layer of epoxy to the bamboo surface followed by a coating of fine sand. However, this is an expensive treatment in many countries. Materials such as asphalt paints, tar-based paints and specific bituminous materials satisfy all the impermeability requirements. According to Ghavami (2005), "results of the investigations show that bamboo can substitute steel satisfactorily". The bamboo slats are there for, as shown in the research applicable in the same fashion as steel reinforcement in concrete.*



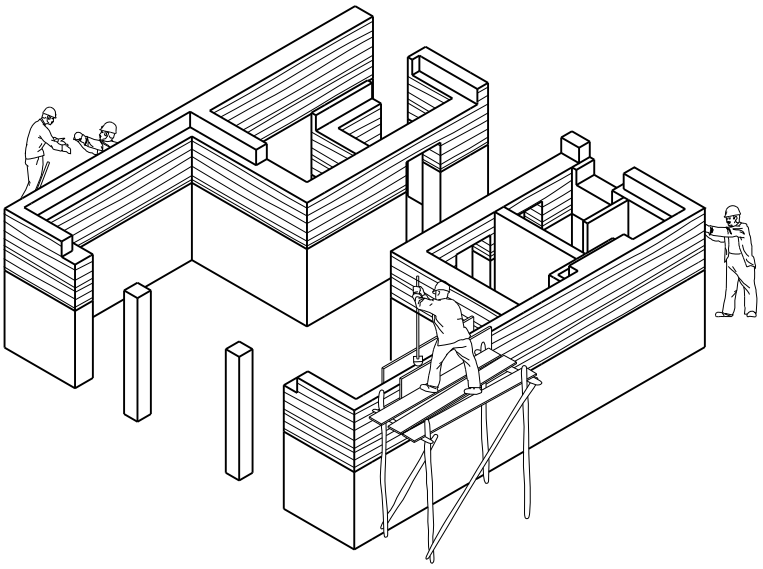
*STEP 1 - DEMOLISION*



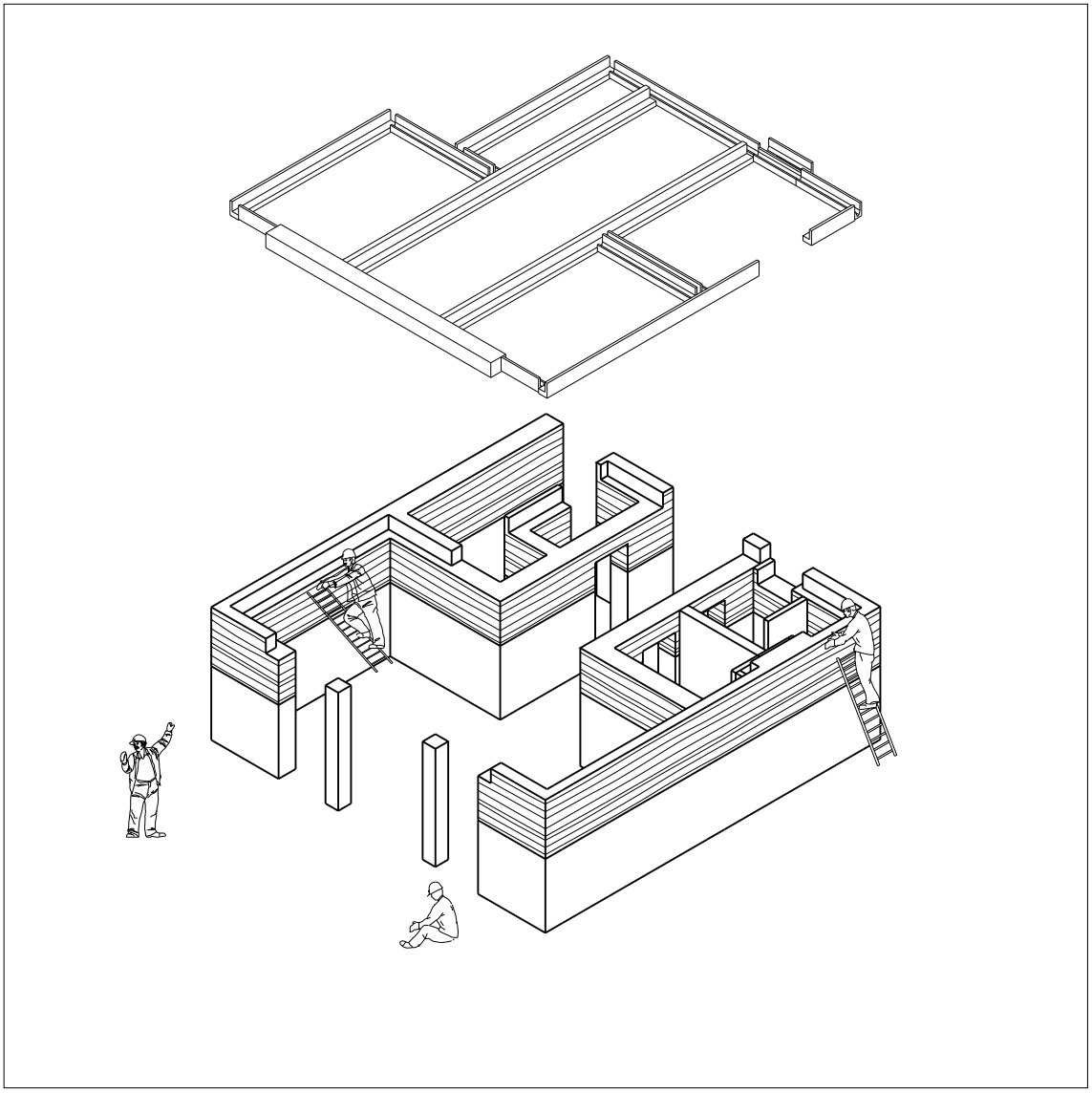
*STEP 2 - CONCRETE FOUNDATION AND FLOOR*



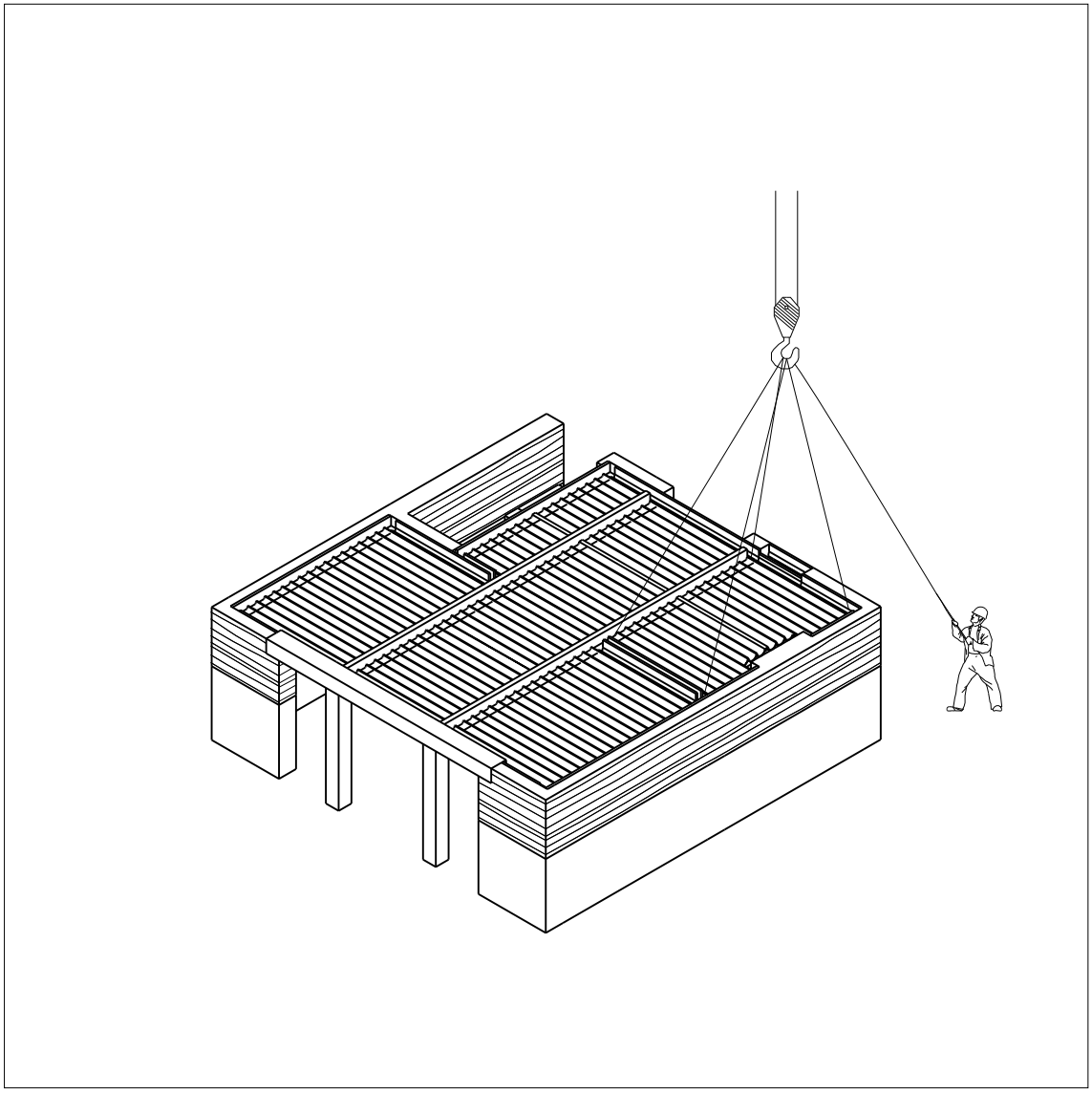
*STEP 3 - CONCRETE COLUMNS AND BASE WALLS*



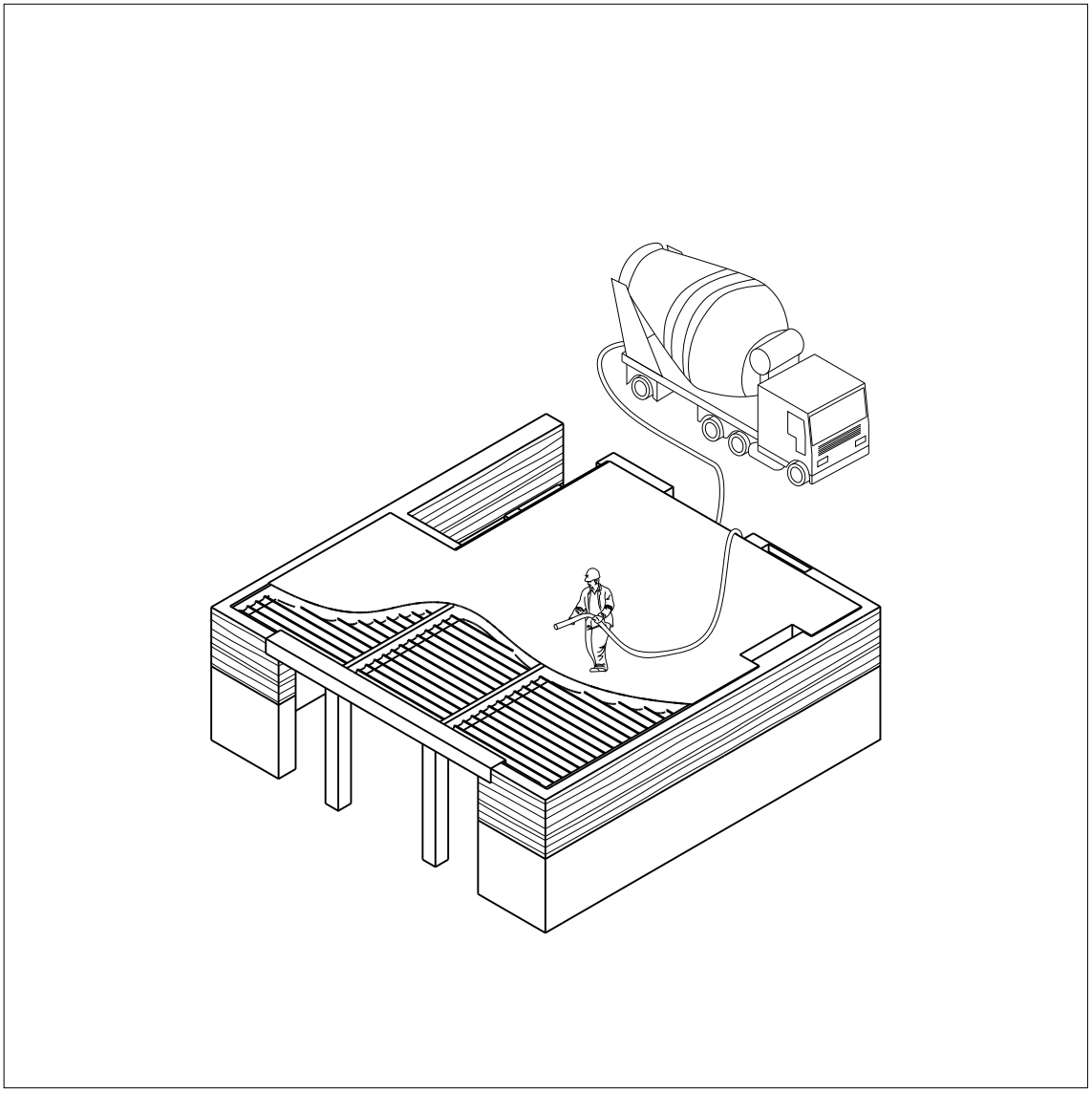
*STEP 4 - RAMMED EARTH*



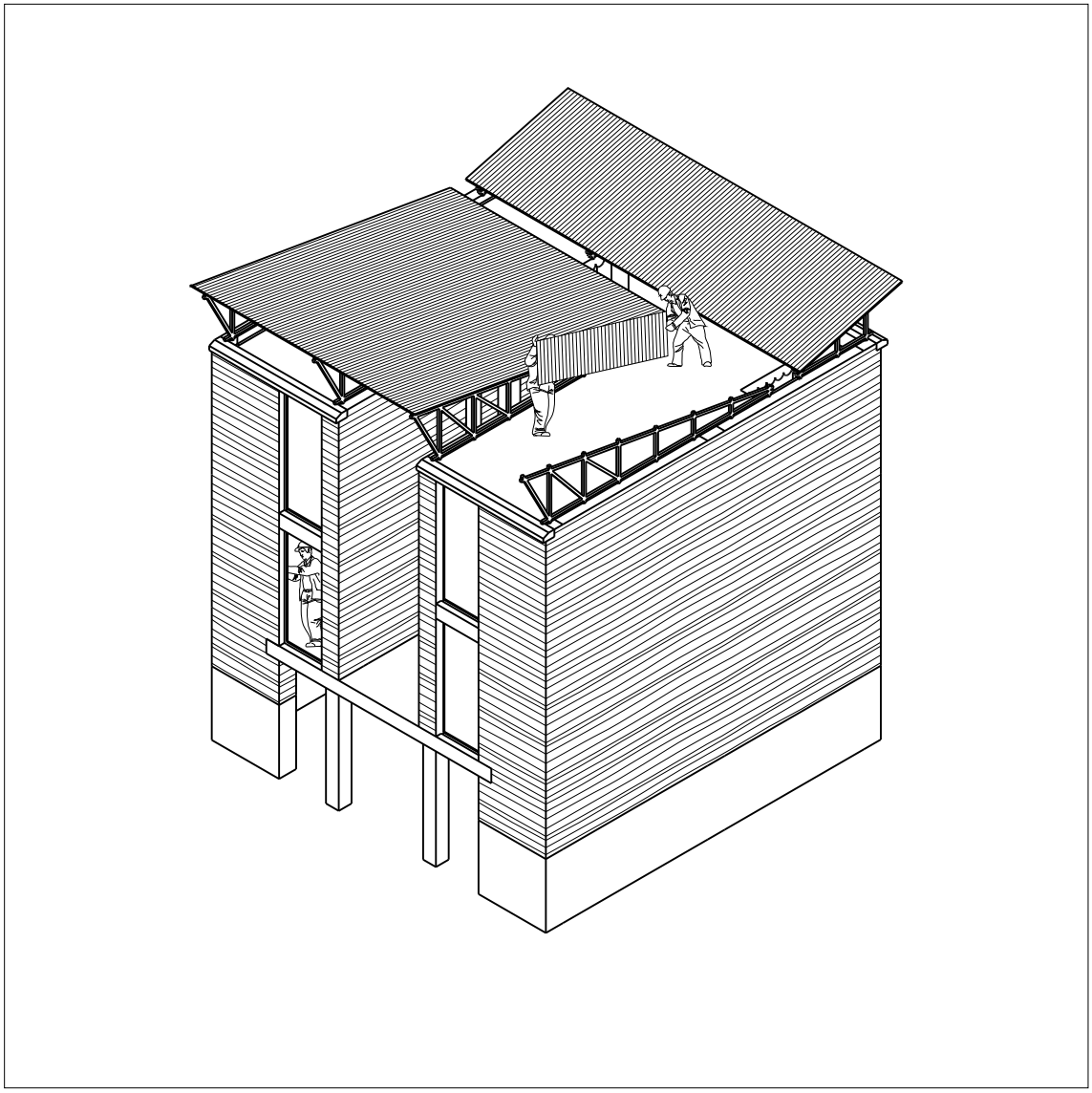
*STEP 5 - PREFAB BOND BEAMS*



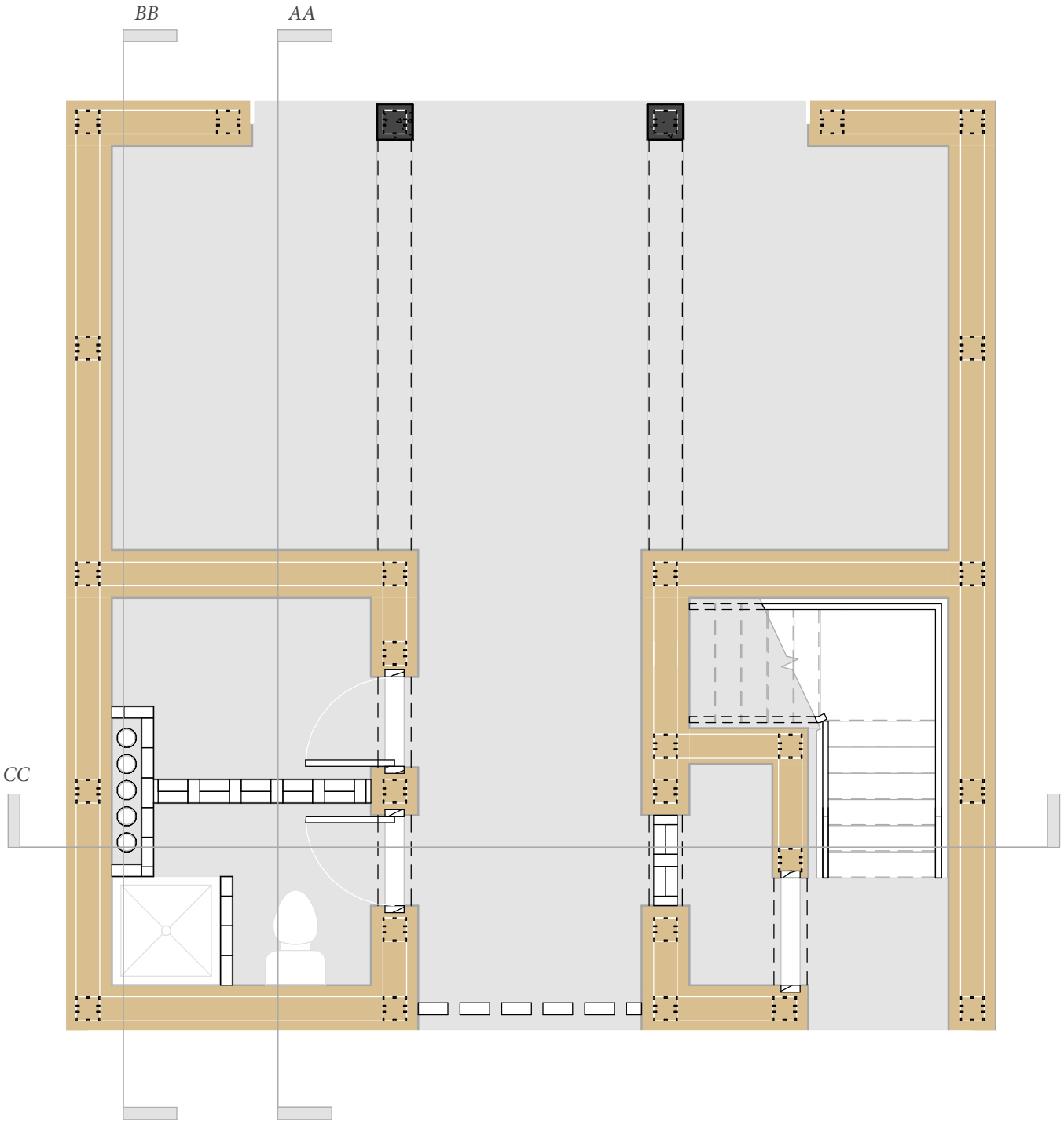
*STEP 6 - BAMBOO LOST FORM WORK*



*STEP 7 - CAST IN SITU CONCRETE FLOOR*



*STEP 8 - WINDOWS AND ROOF FINISHING*

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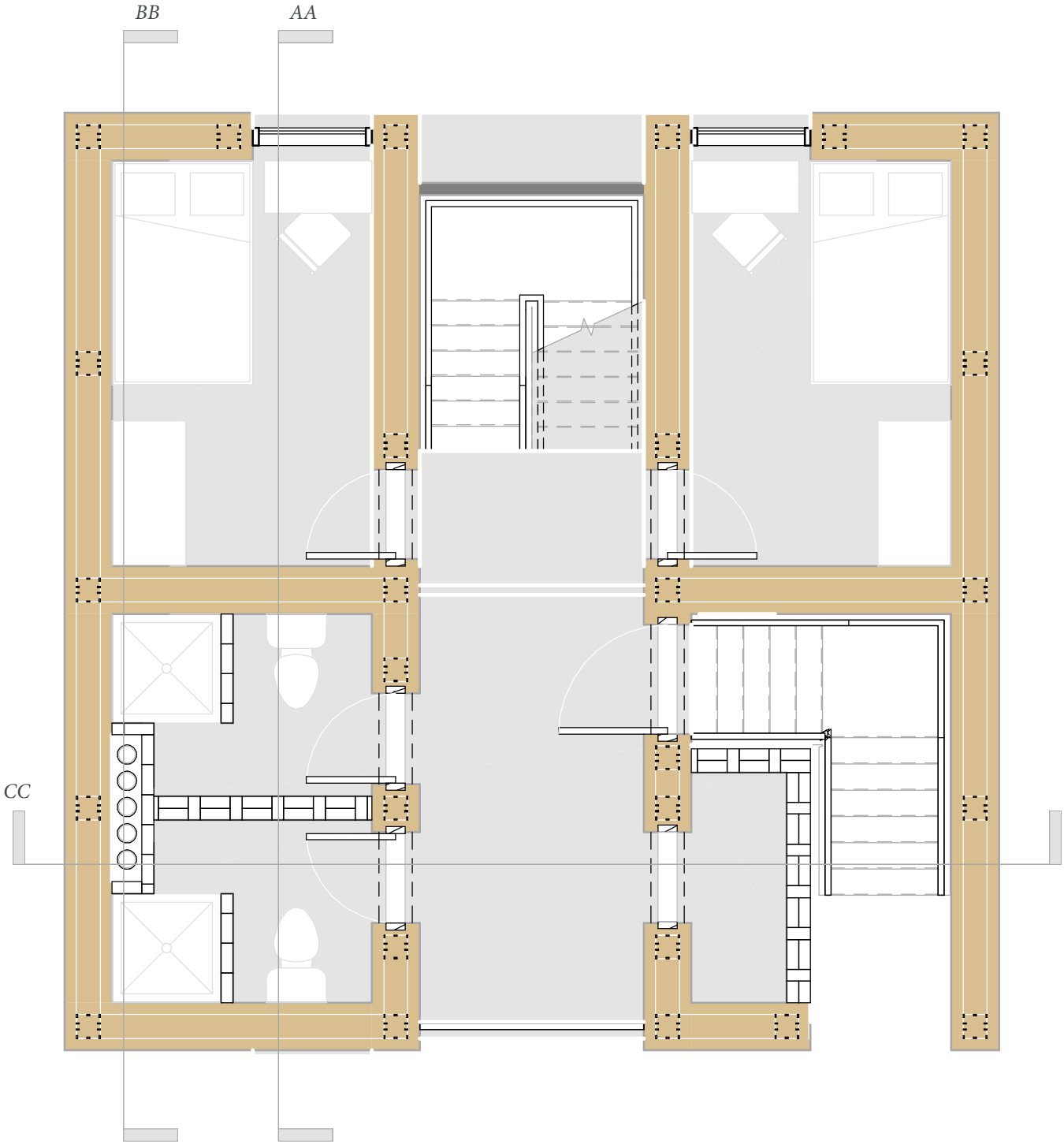
## *BUILDING TECHNOLOGY*

*construction plan - first floor*

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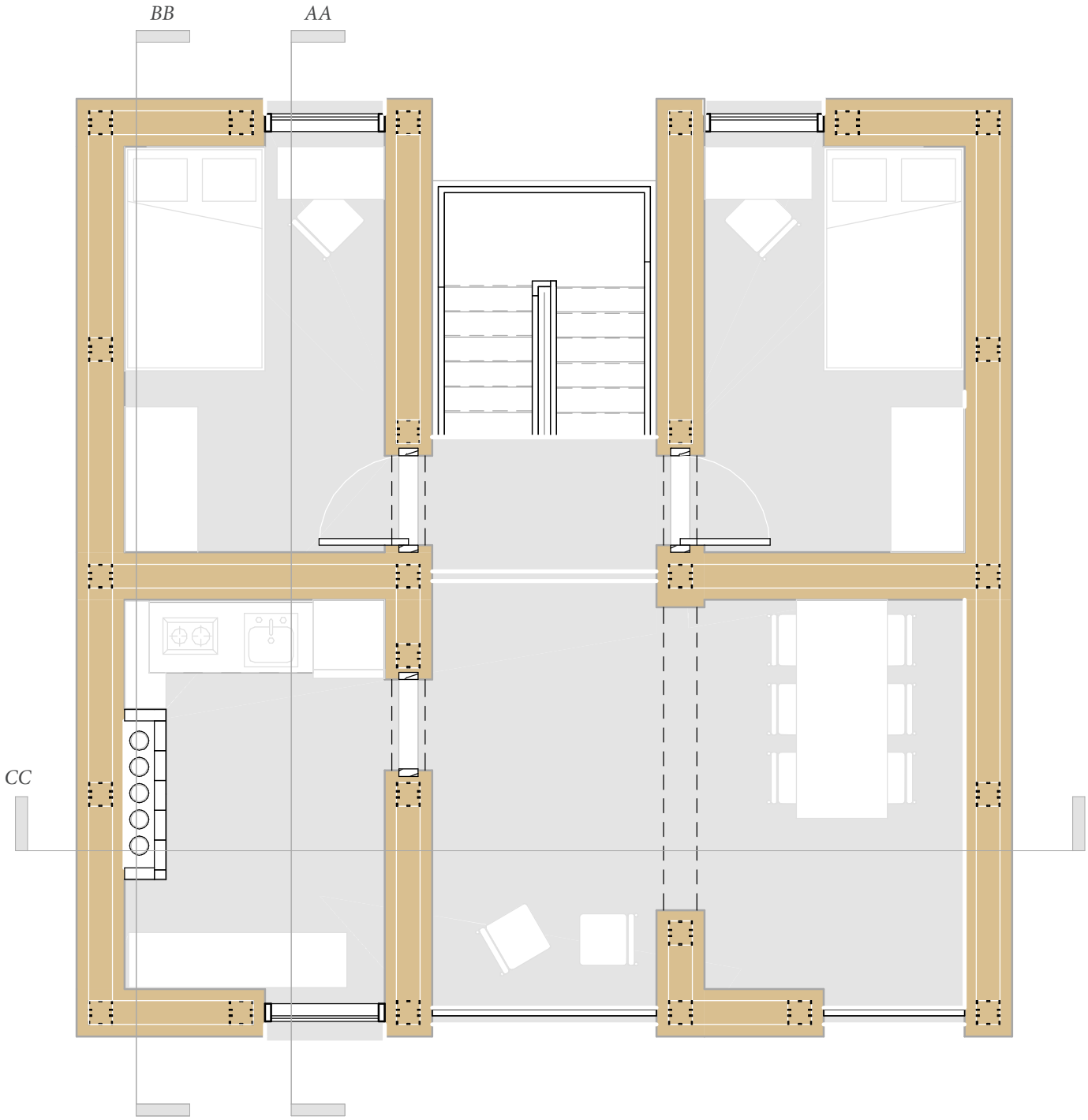
## *BUILDING TECHNOLOGY*

*construction plan - second floor*

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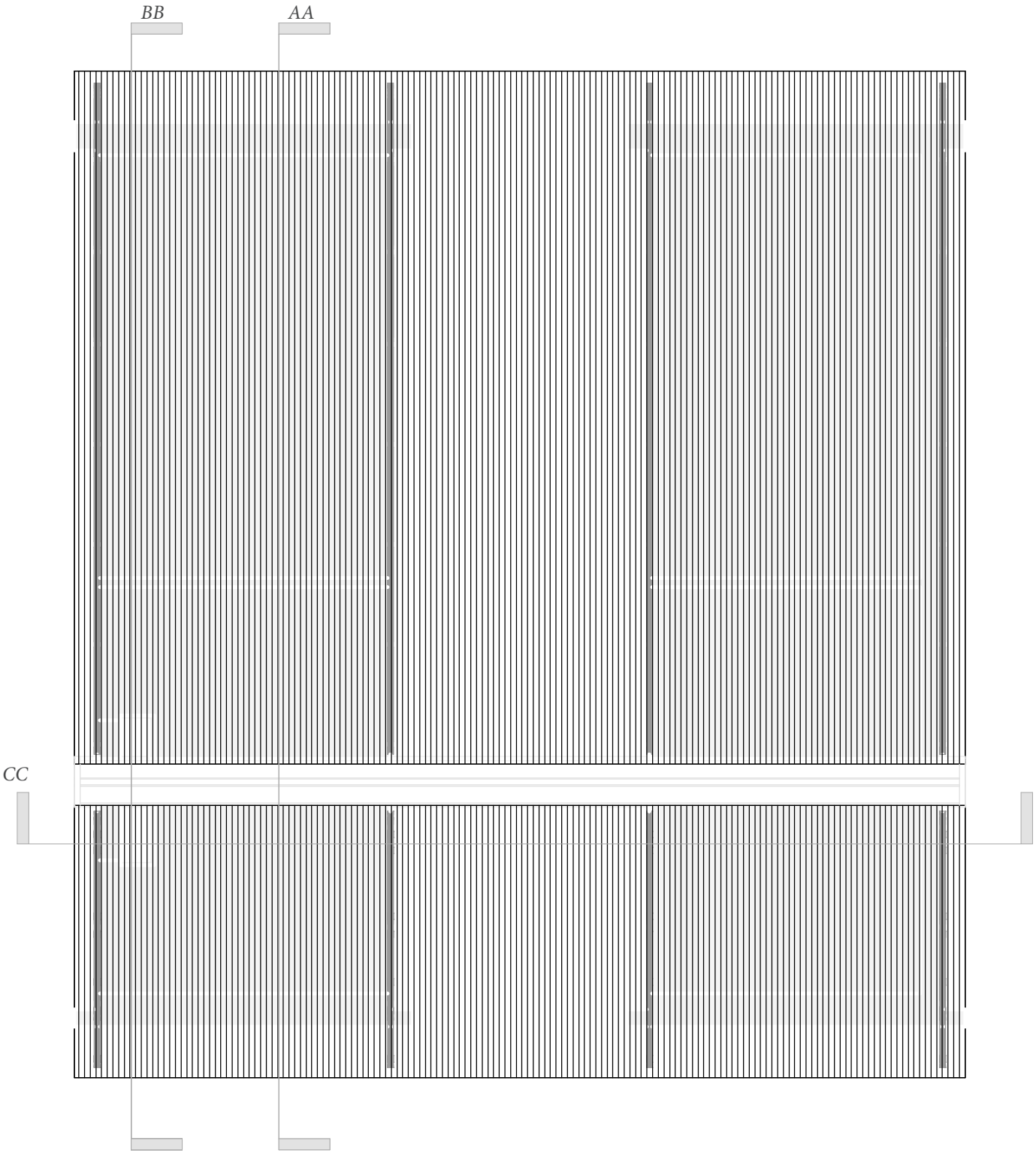
## *BUILDING TECHNOLOGY*

*construction plan - Roof*

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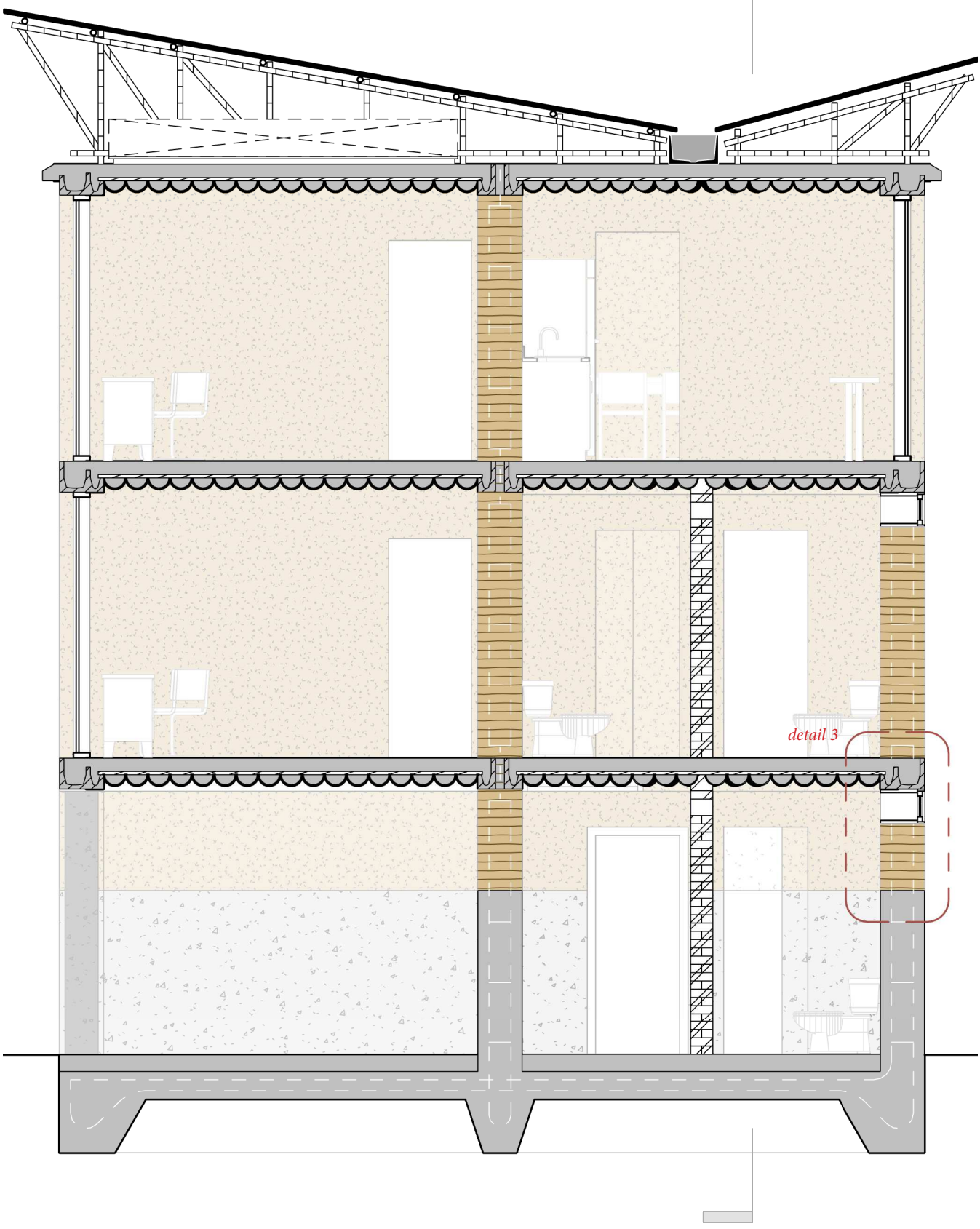
## *BUILDING TECHNOLOGY*

*construction section - AA*

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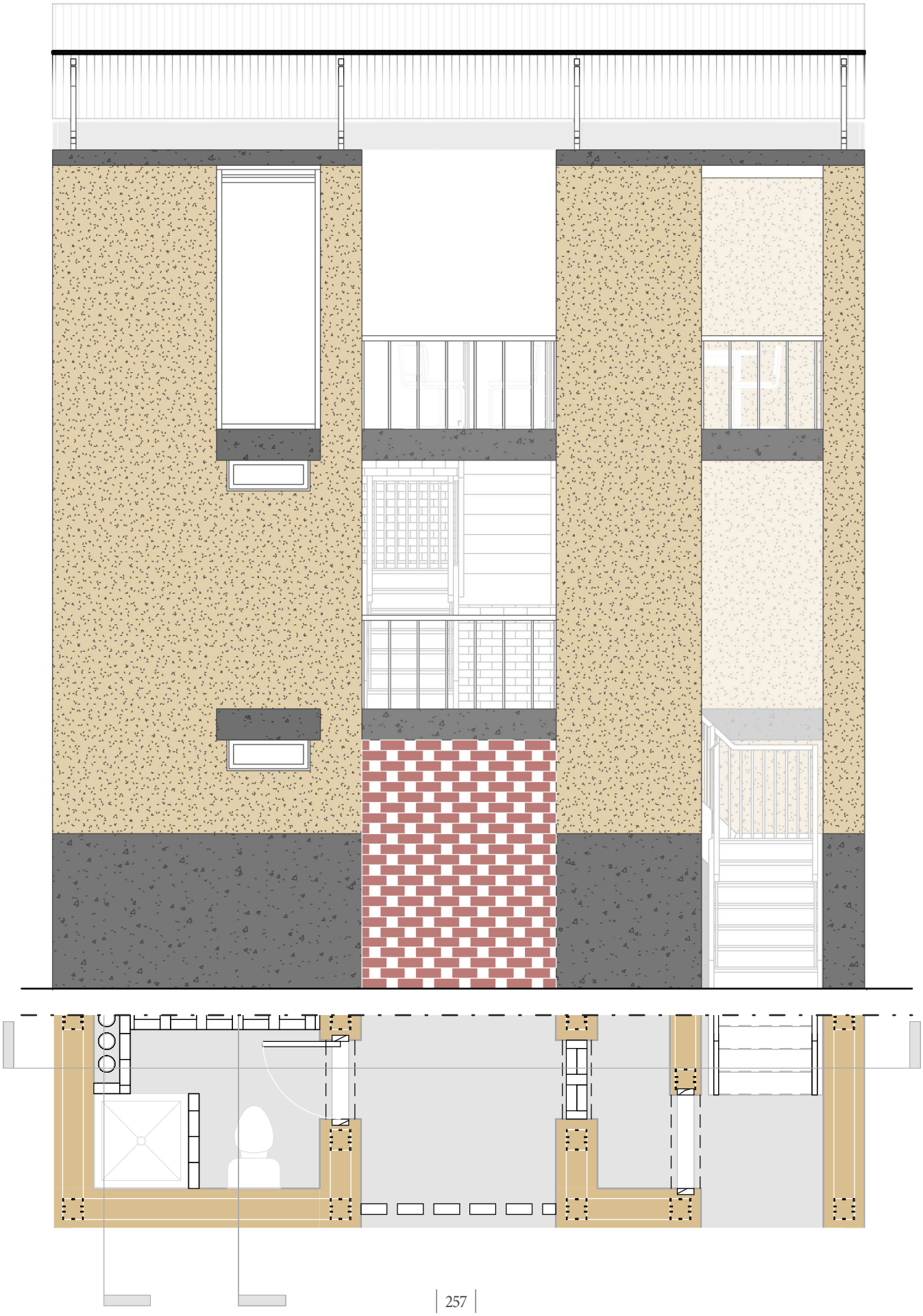
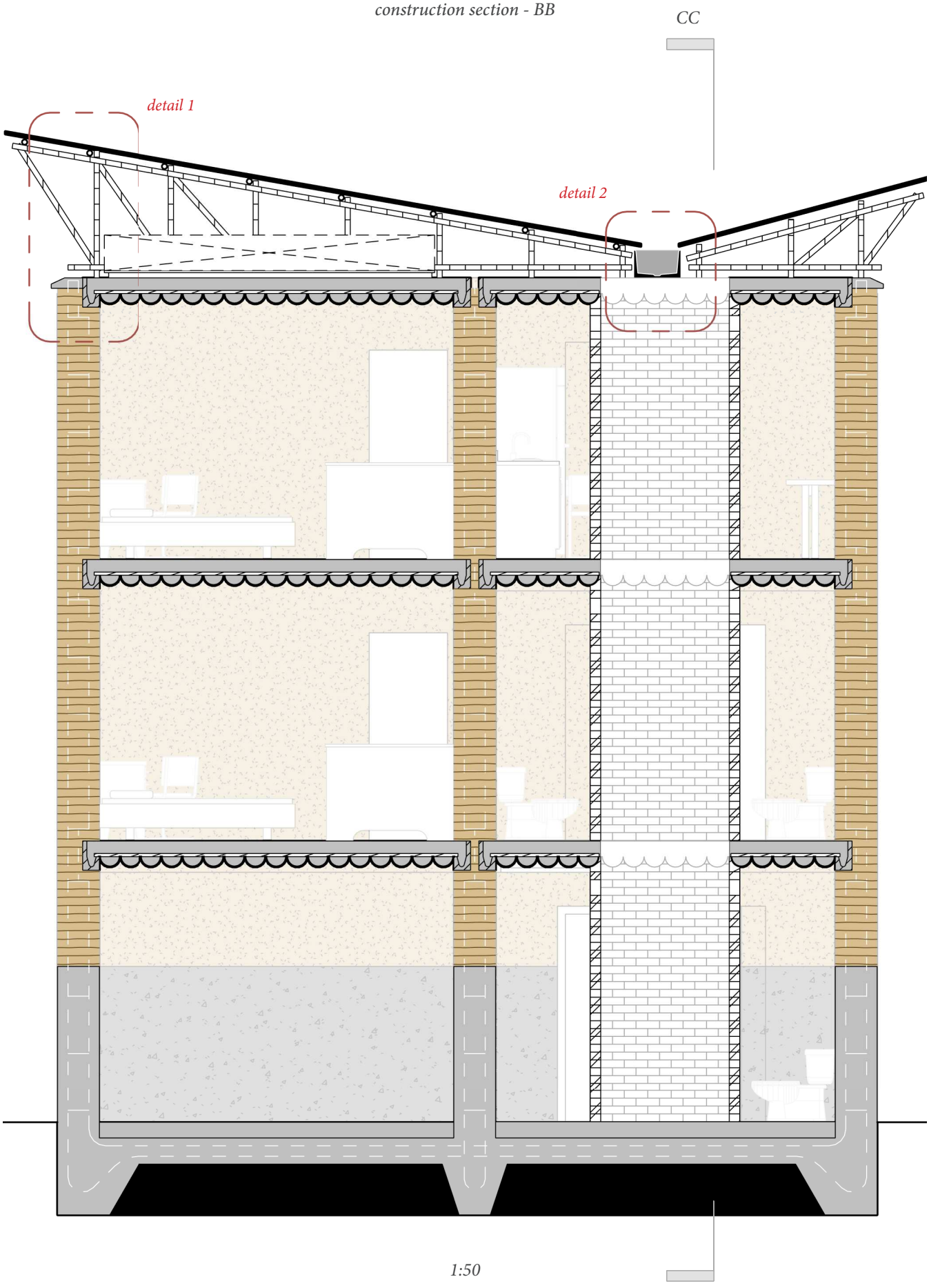
BB

AA



## *BUILDING TECHNOLOGY*

*construction section - BB*

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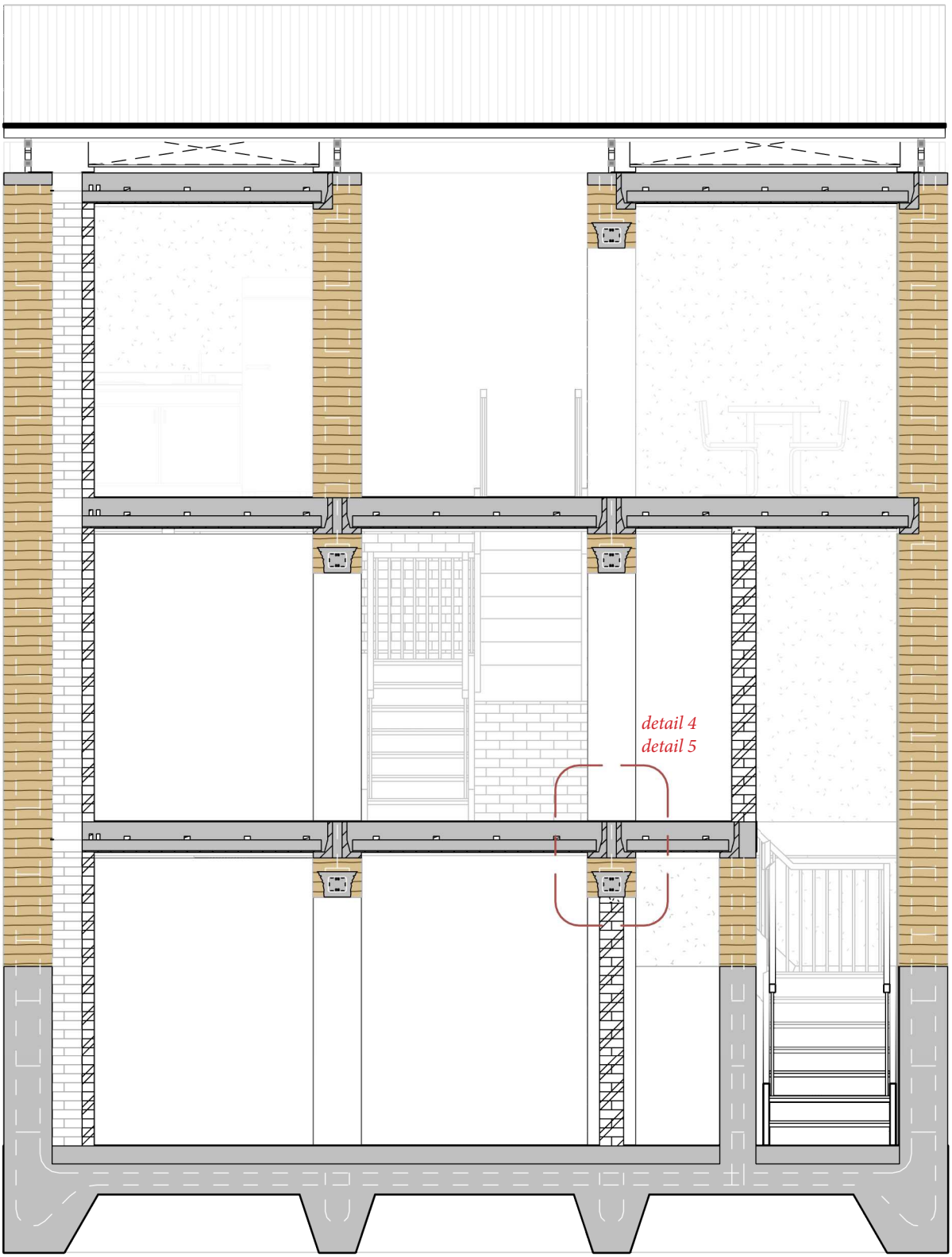
## *BUILDING TECHNOLOGY*

*construction section - CC*

*BB* *AA*

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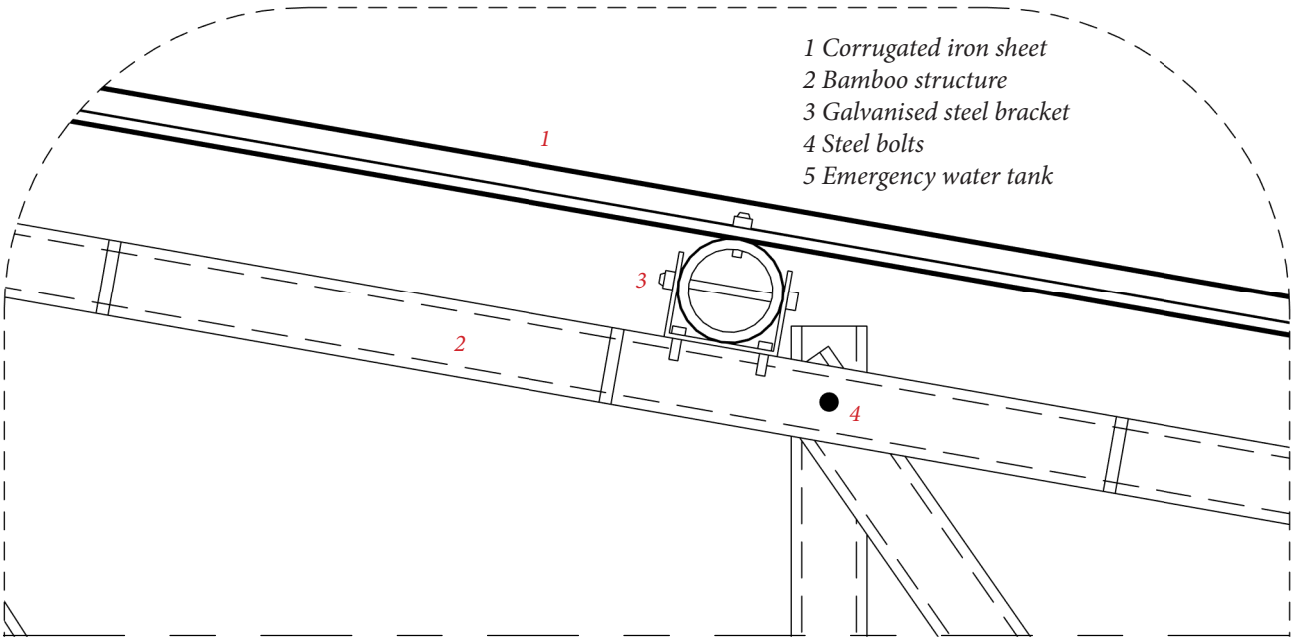
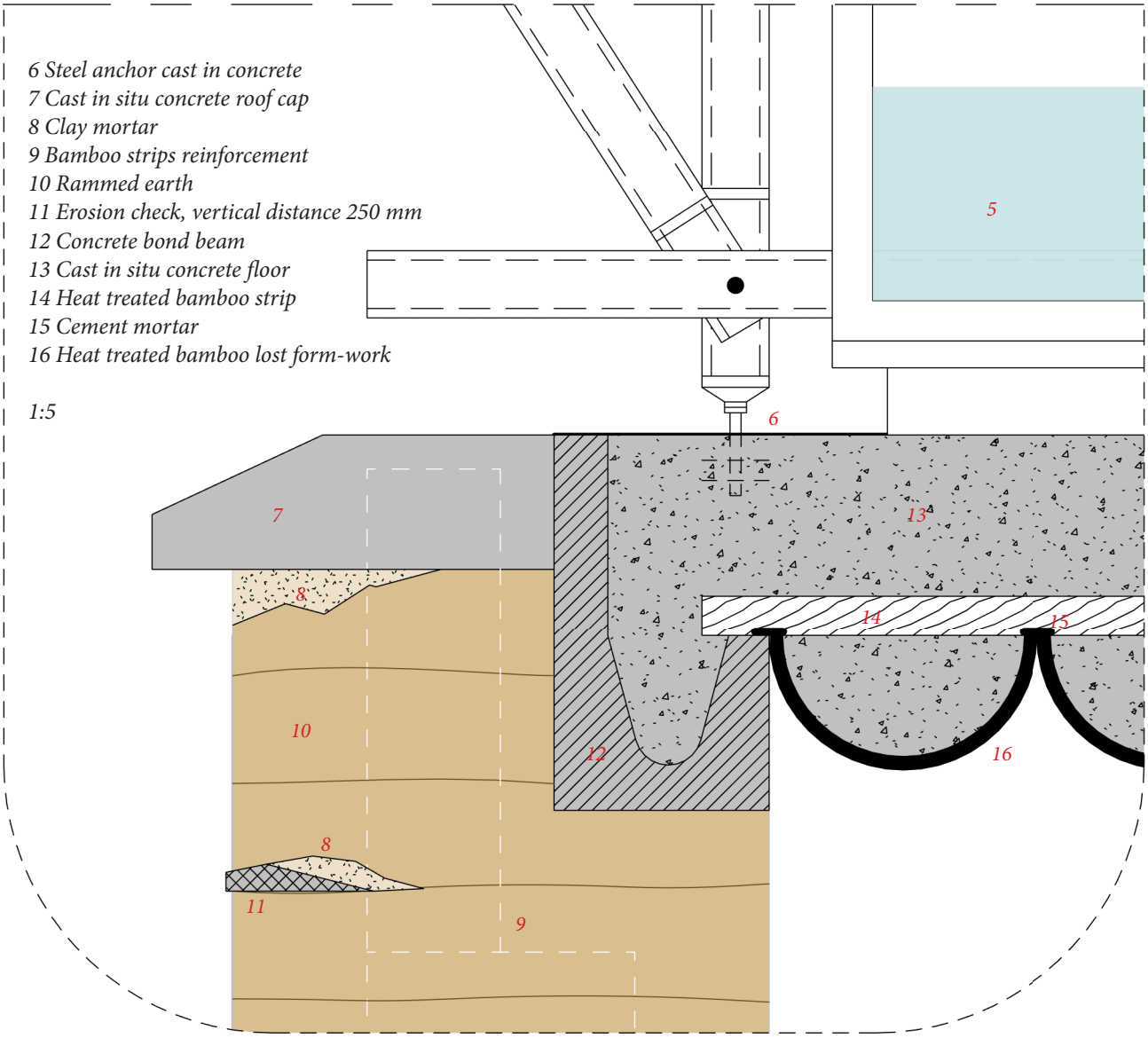

1 Corrugated iron sheet
2 Bamboo structure
3 Galvanised steel bracket
4 Steel bolts
5 Emergency water tank
1
2
3
4


6 Steel anchor cast in concrete
7 Cast in situ concrete roof cap
8 Clay mortar
9 Bamboo strips reinforcement
10 Rammed earth
11 Erosion check, vertical distance 250 mm
12 Concrete bond beam
13 Cast in situ concrete floor
14 Heat treated bamboo strip
15 Cement mortar
16 Heat treated bamboo lost form-work
1:5
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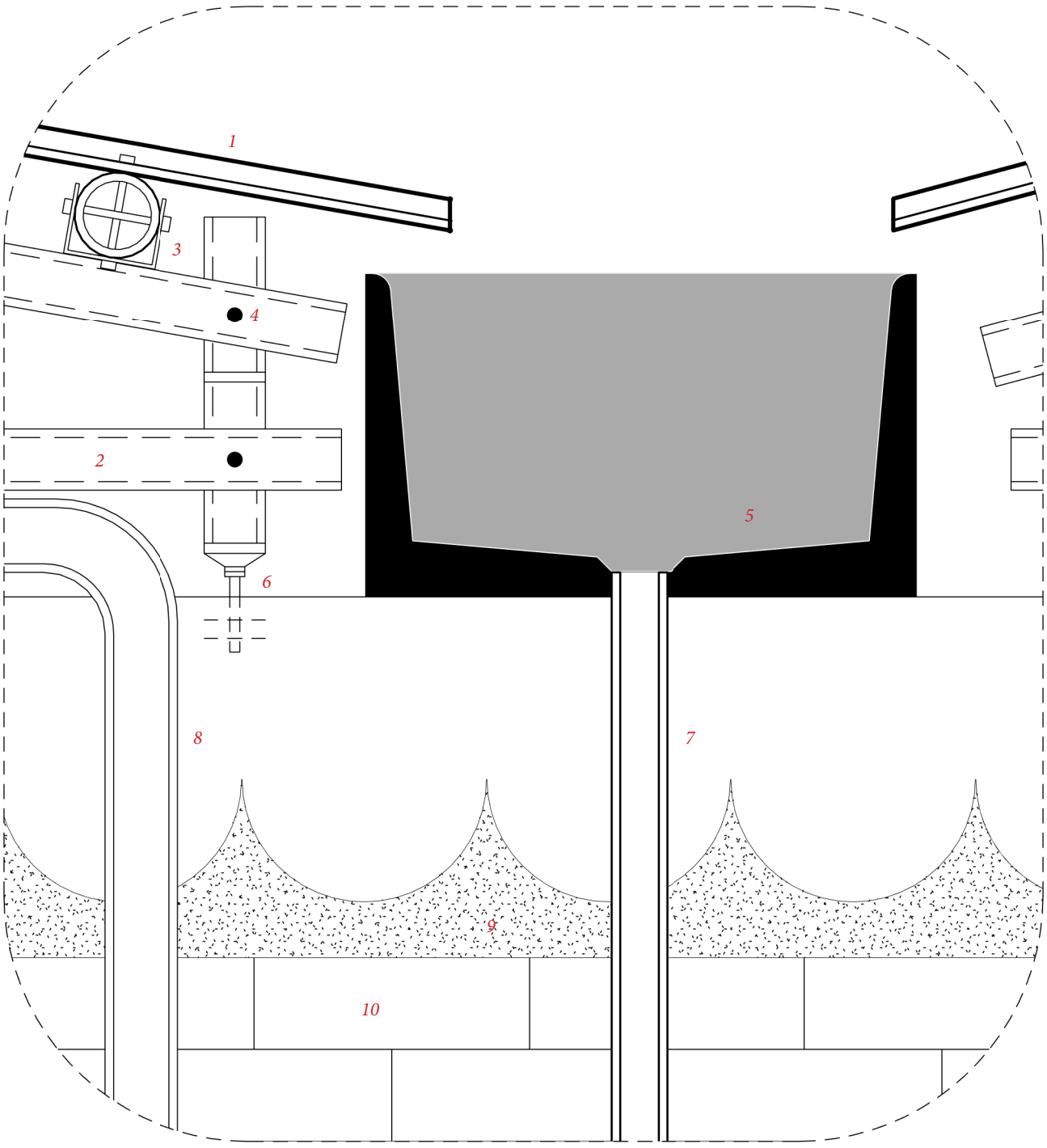
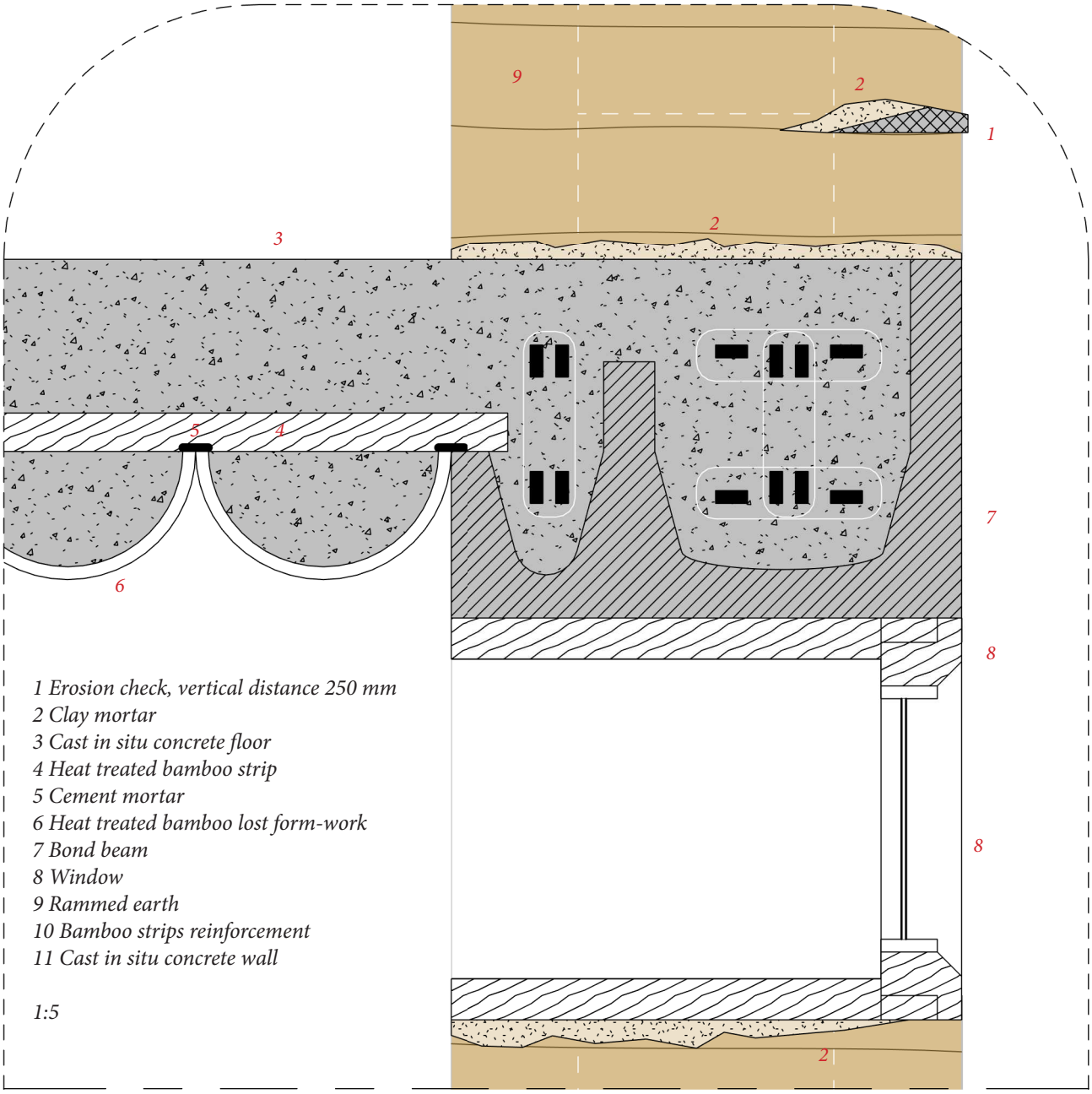
*1 Corrugated iron sheet*
*2 Bamboo structure*
*3 Galvanised steel bracket*
*4 Steel bolts*
*5 Drain*
*6 Steel anchor cast in concrete*
*7 Water pipe to courtyard water tank*
*8 Water pipe to roof water tank*
*9 Plaster*
*10 Dried mud bricks*

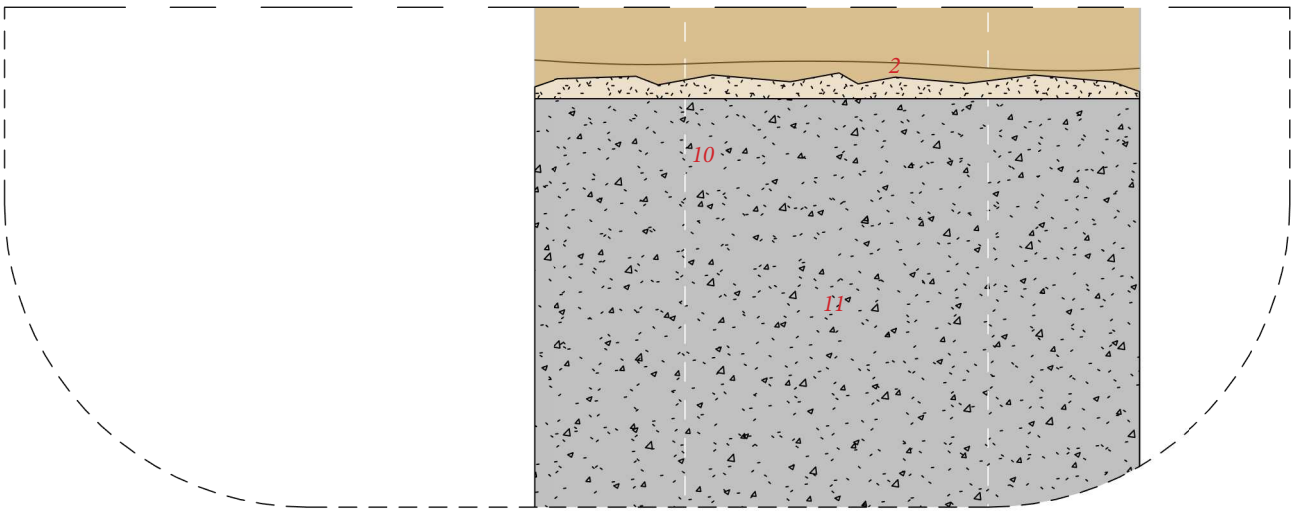
*1:5*

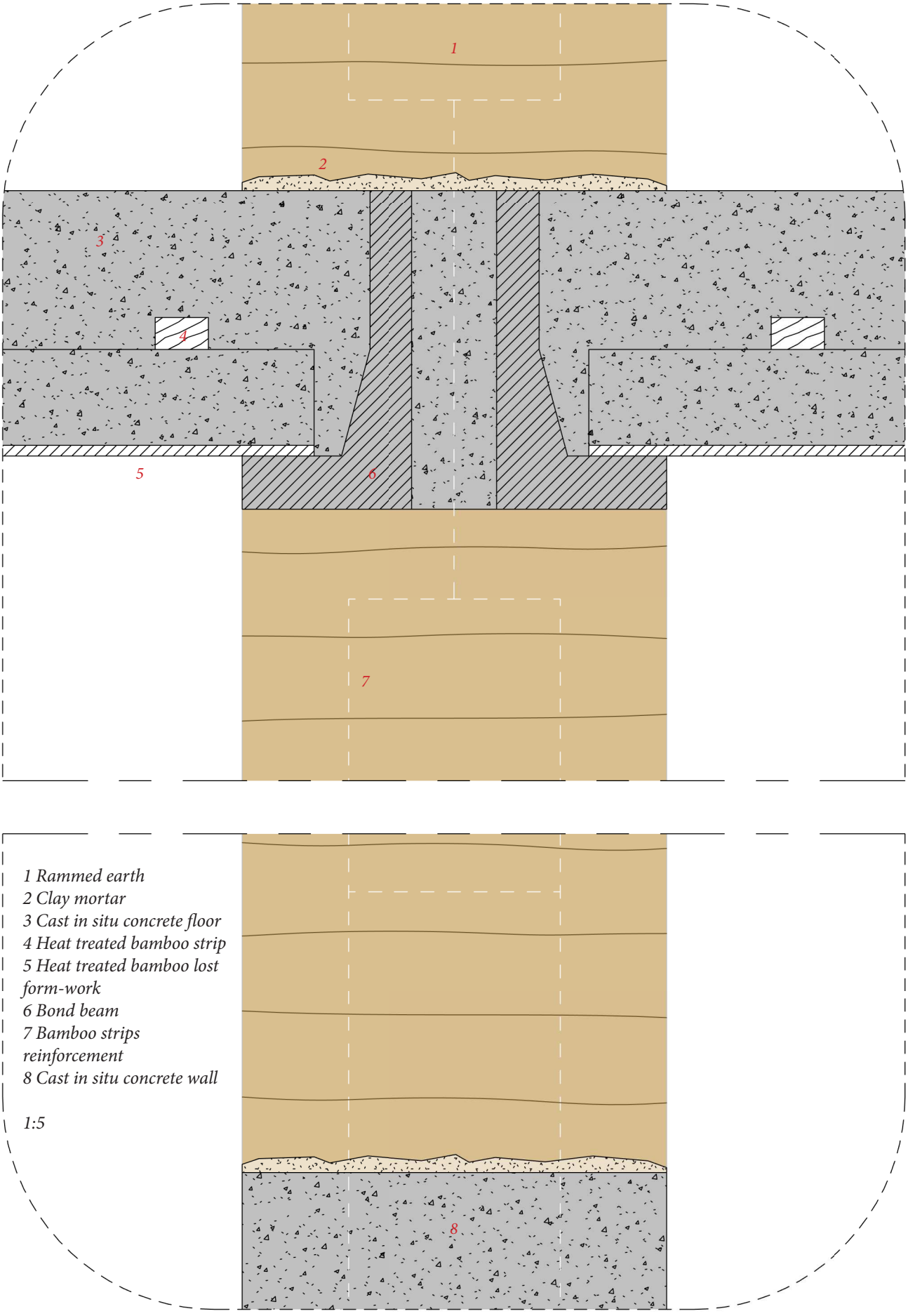





*1 Erosion check, vertical distance 250 mm*
*2 Clay mortar*
*3 Cast in situ concrete floor*
*4 Heat treated bamboo strip*
*5 Cement mortar*
*6 Heat treated bamboo lost form-work*
*7 Bond beam*
*8 Window*
*9 Rammed earth*
*10 Bamboo strips reinforcement*
*11 Cast in situ concrete wall*

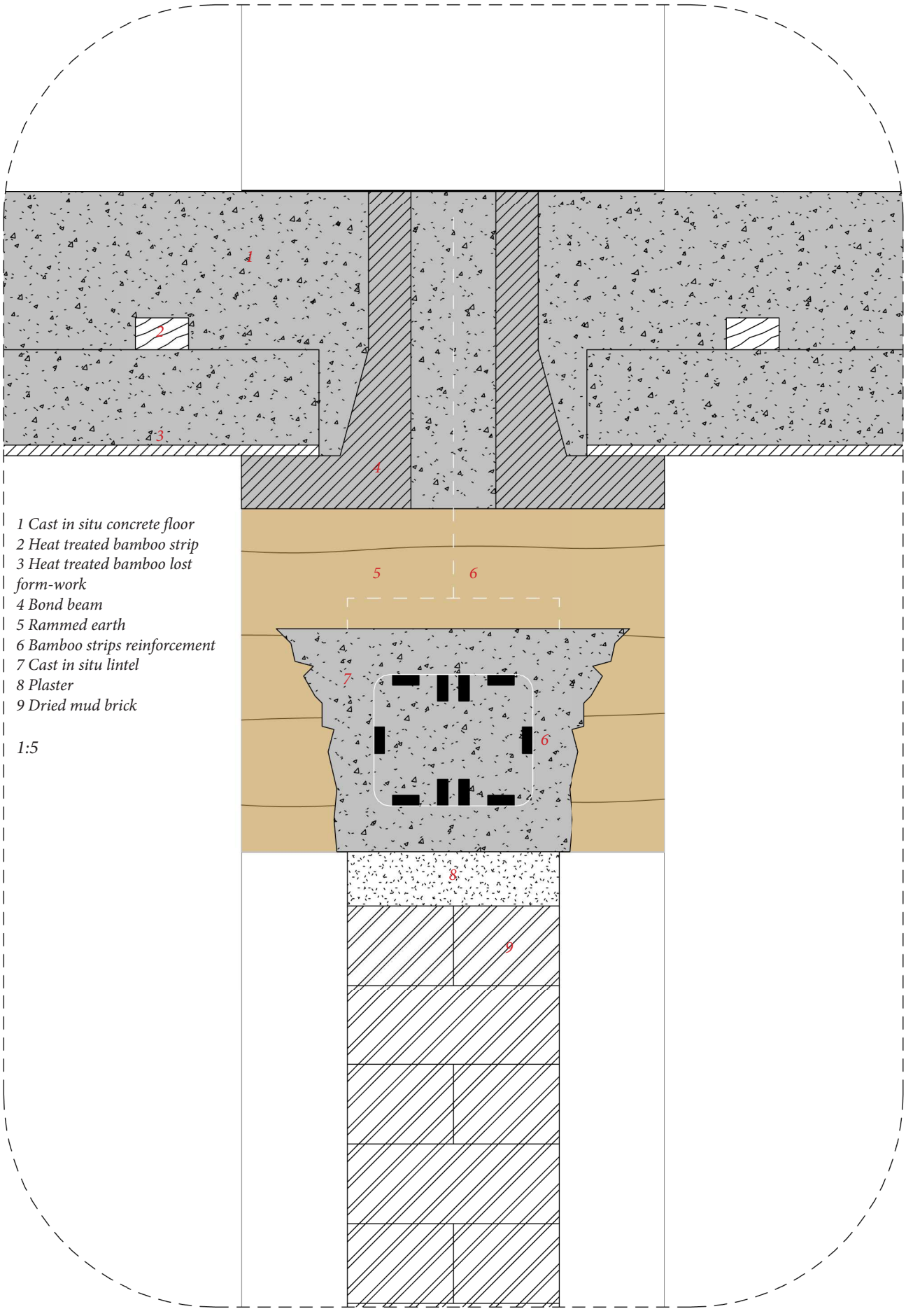
*1:5*





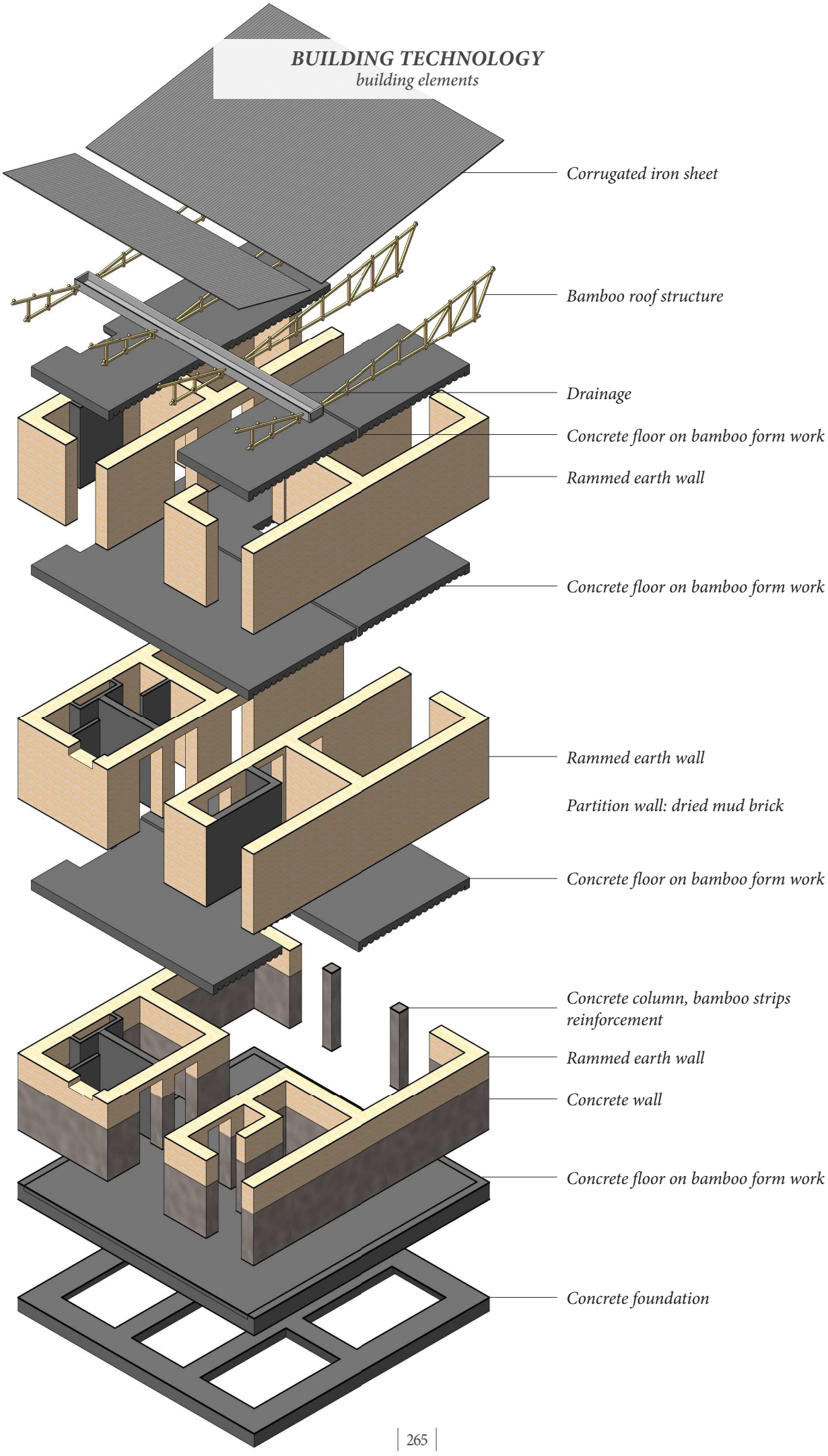

*1 Rammed earth*
*2 Clay mortar*
*3 Cast in situ concrete floor*
*4 Heat treated bamboo strip*
*5 Heat treated bamboo lost form-work*
*6 Bond beam*
*7 Bamboo strips reinforcement*
*8 Cast in situ concrete wall*

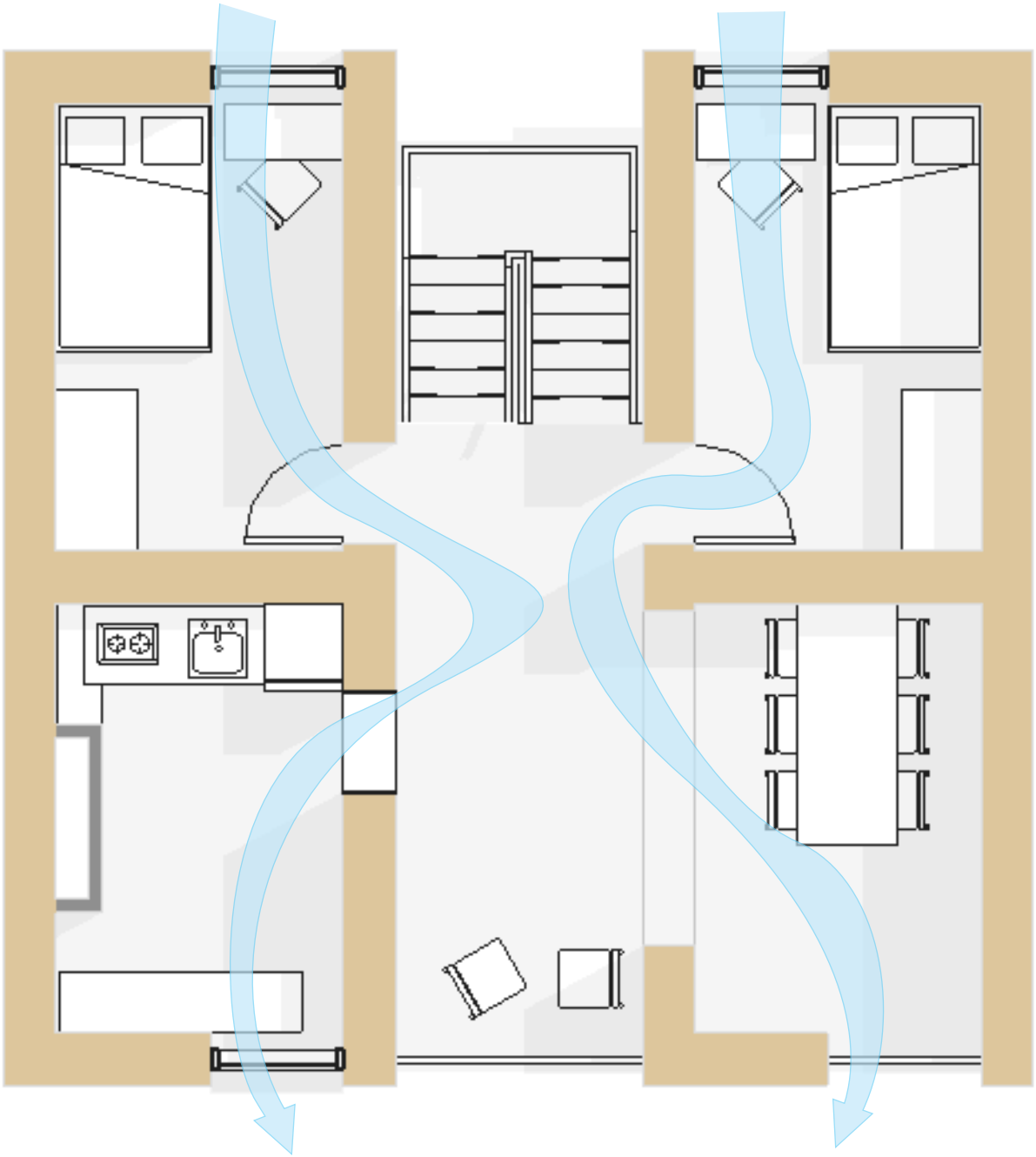
*1:5*




*1 Cast in situ concrete floor*
*2 Heat treated bamboo strip*
*3 Heat treated bamboo lost form-work*
*4 Bond beam*
*5 Rammed earth*
*6 Bamboo strips reinforcement*
*7 Cast in situ lintel*
*8 Plaster*
*9 Dried mud brick*

*1:5*

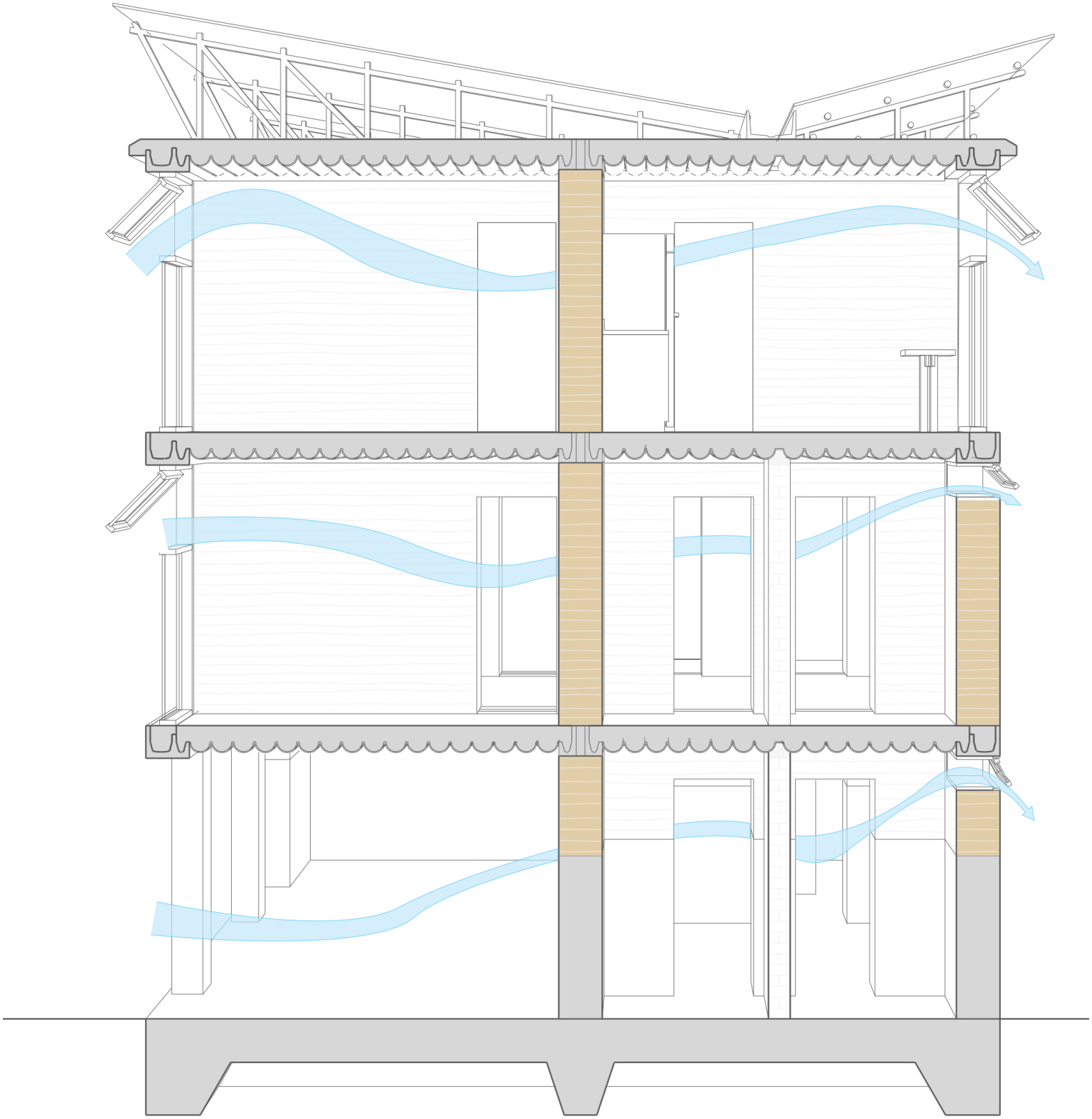

Corrugated iron sheet
Bamboo roof structure
Drainage
Concrete floor on bamboo form work
Rammed earth wall
Concrete floor on bamboo form work
Rammed earth wall
Partition wall: dried mud brick
Concrete floor on bamboo form work
Concrete column, bamboo strips reinforcement
Rammed earth wall
Concrete wall
Concrete floor on bamboo form work
Concrete foundation

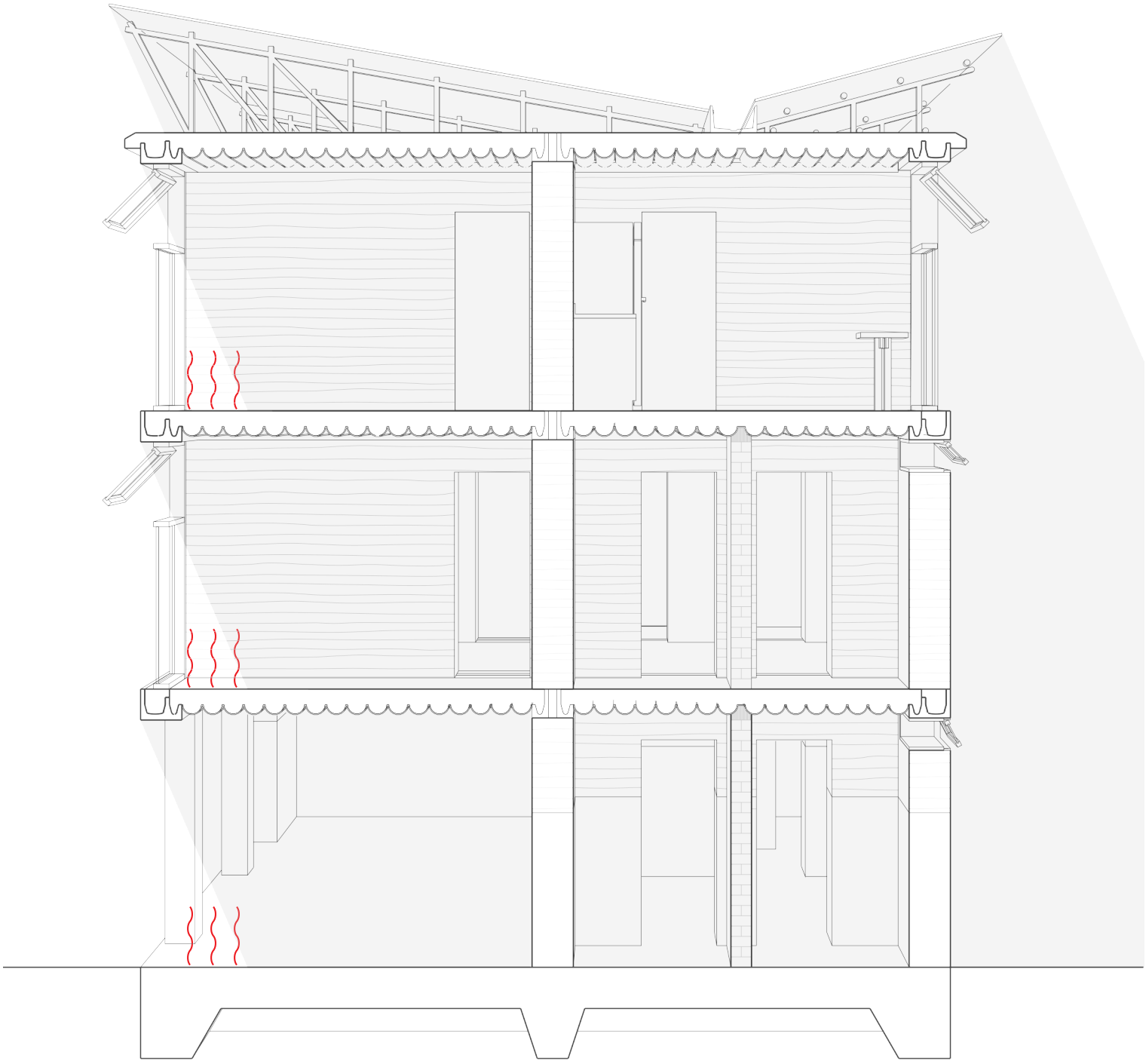


*All typologies are design with cross ventilation in mind. It means that all spaces in the dwelling are bordering the outdoor space, and can use open-able windows to cross ventilate the whole unit. The corrugated iron sheet on the roof will serve as a first barrier to sunlight, while natural wind will cool down the heat quickly, before it reaches to top floor. The roof water tank will also serve as an additional heat buffer, reducing the heat gain on the top floors.*

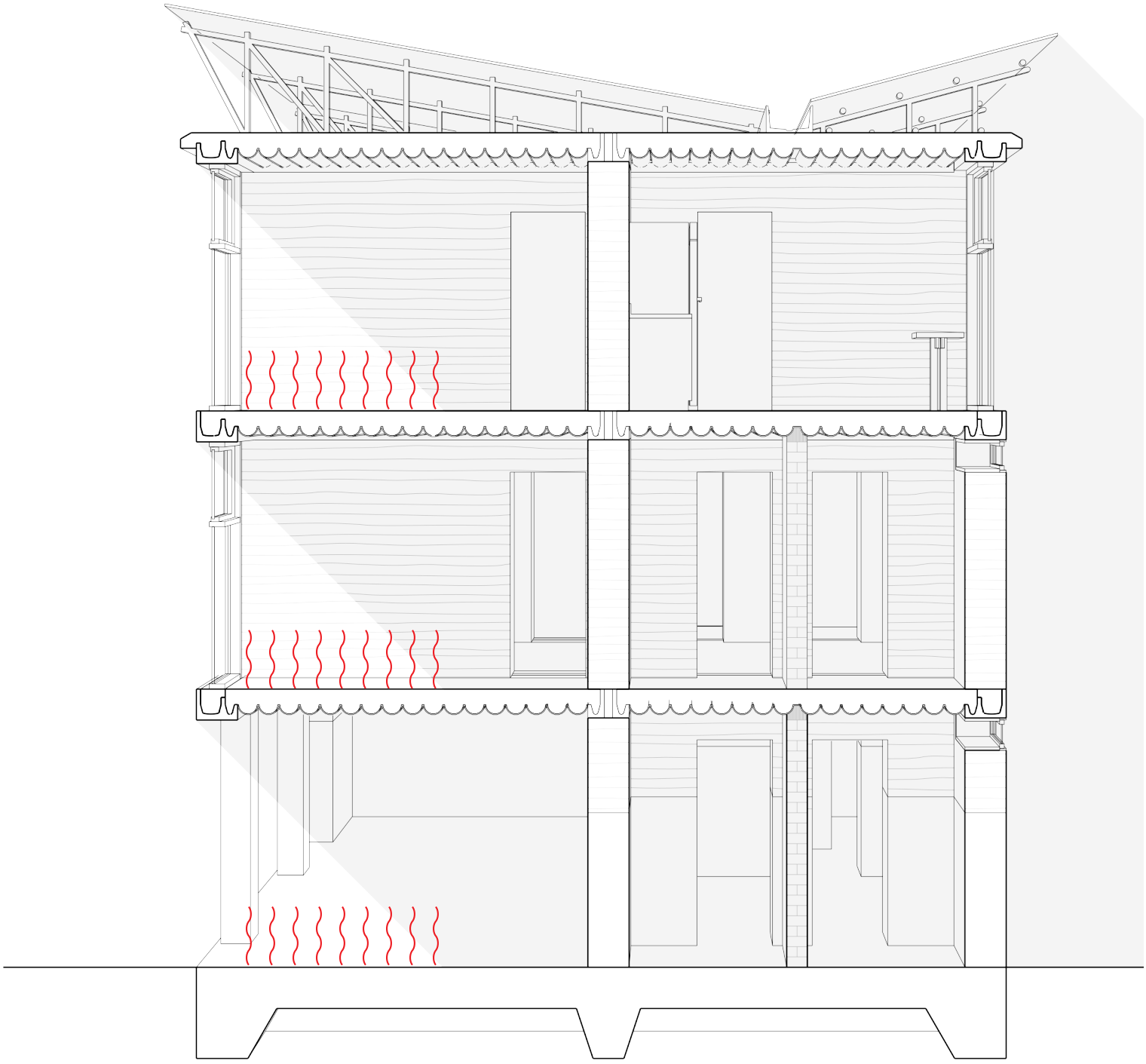
## *BUILDING TECHNOLOGY*

*ventilation - section*

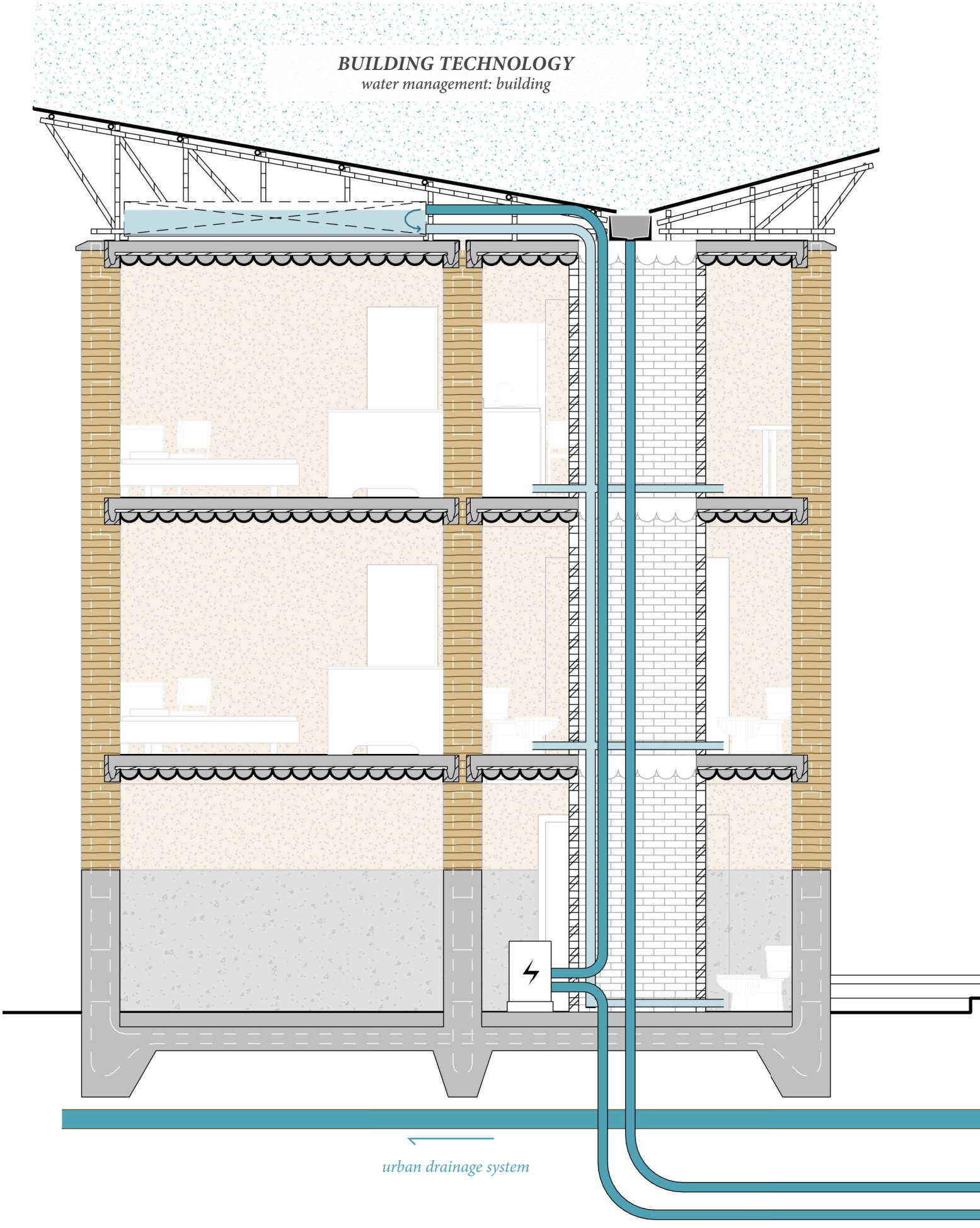




*In the situation of high sun the sunlight entering the interior of the building will be limited. This means that only a small area of the interior floor and wall will be heated. Openable windows can cool down the interior by natural cross ventilation.*

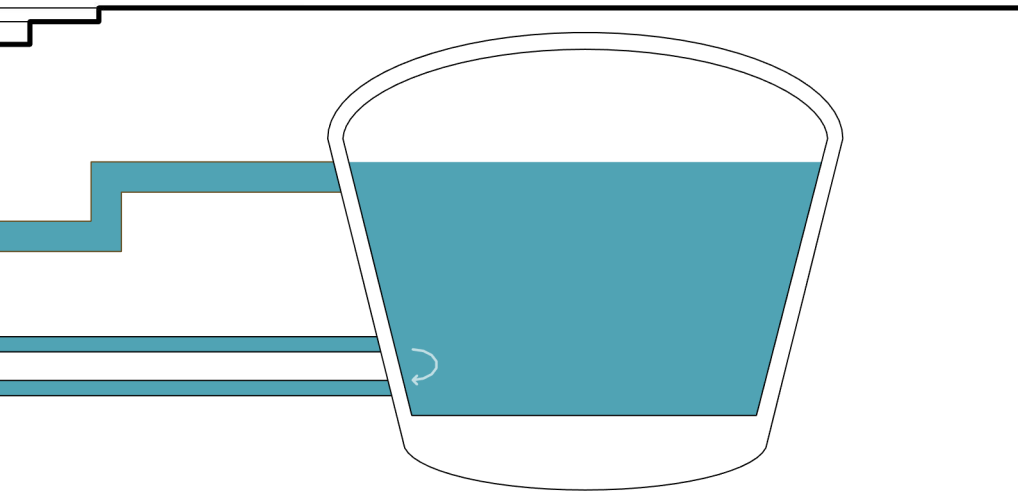


*During winter, the lowered sun will bring in more sunlight in the interior. The heavy concrete floors and rammed earth walls will serve as thermal mass that will store up heat during the day. Closed windows will secure the heat within the building. The heat will then be released during the cool nights.*

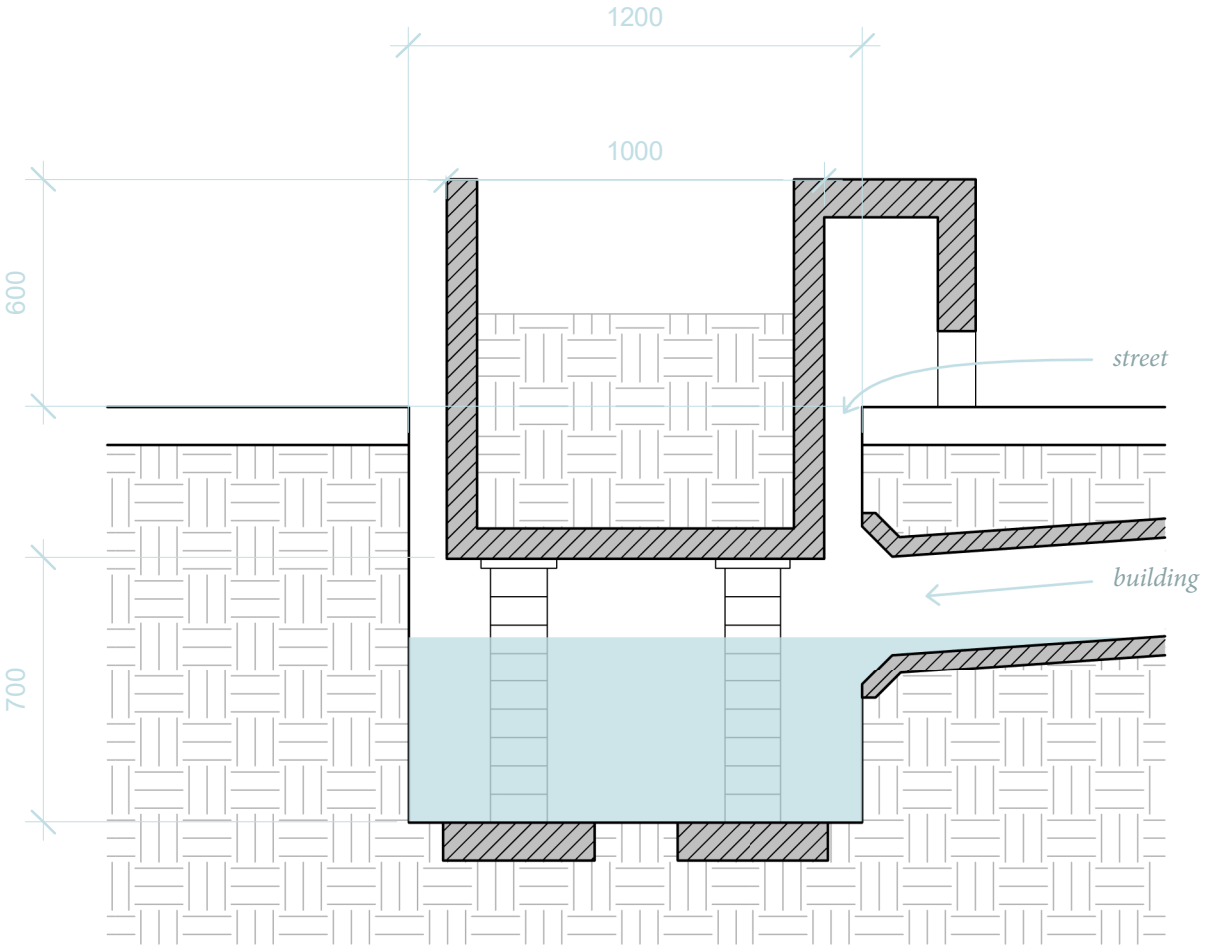

urban drainage system

*The rainwater that is being collected by the corrugated iron sheet roof flows automatically to the water basin in the courtyard. As water supply and electricity is unstable in Addis Ababa, a small electric pump will transport water to the roof water tank whenever there is electricity available. The water from the roof tank can go to the different floors by gravitational force. This way the water from the roof water tank will supply the building's need of water even when there is no electricity available.*

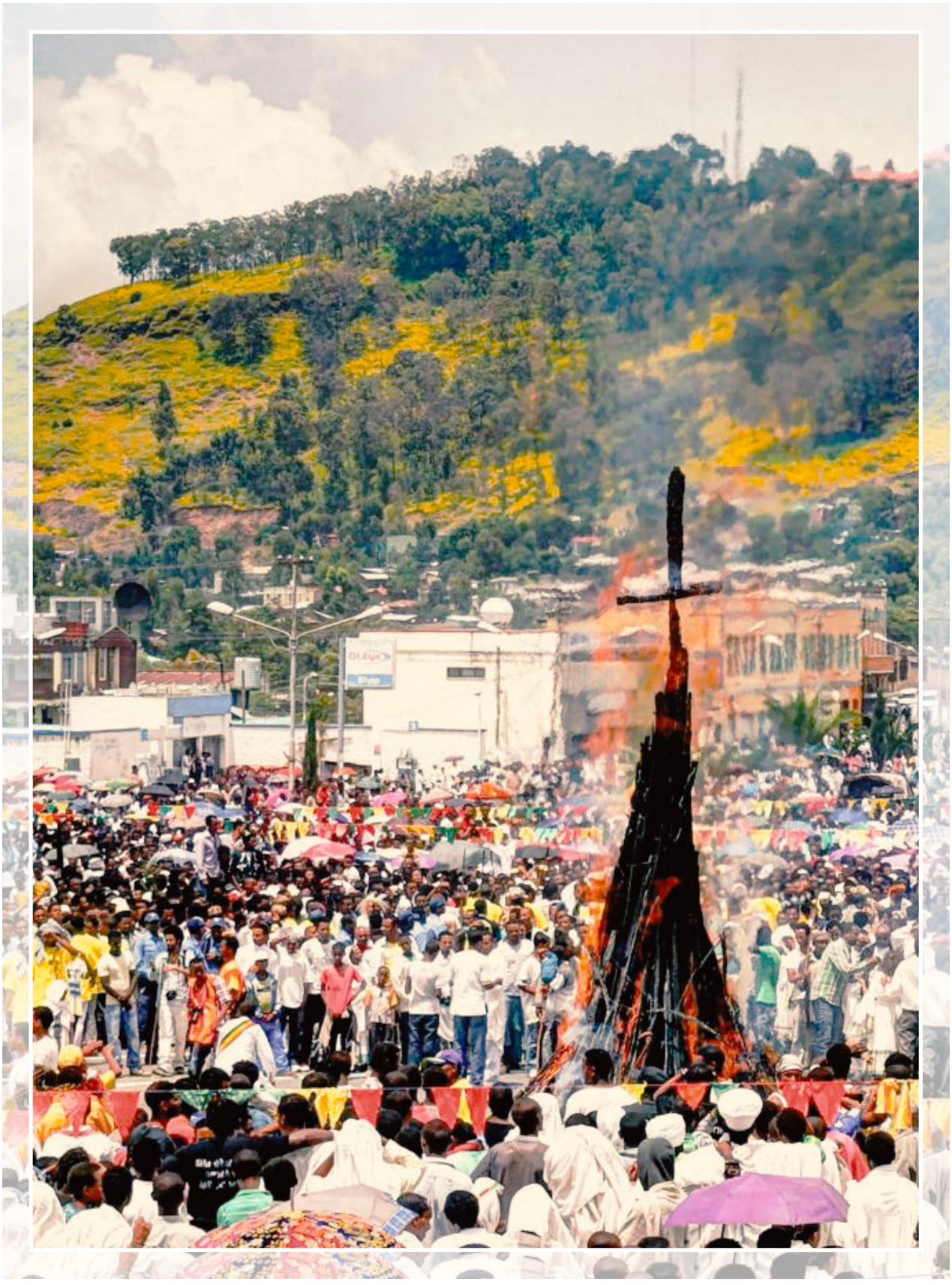
*Whenever the water basin in the courtyard reached its maximum capacity, excess water will automatically flow from the basin into the urban drainage system.*








*In the urban water management scheme, a system of underground drainages will be used to transport the water towards the river. As the rainwater will first be collected in the water basin for reuse purposes, this system will also be connected to the urban drainage. Whenever the full capacity of the water basin is reached, the excessive water will automatically flow into the drainage. It is then flown into the gutters on the internal streets of between the urban blocks. The gutters will be covered with urban green elements, and will also be capable of absorbing water from the streets. The natural slope will guide the water towards the rivers.*



*Chapter IV*

# OUTRO

## *REFLECTION*

*Making a Living - Son Hei (Sunny) Sou*

### *FIRST IMPRESSION*

*The studio began with a preliminary research on hard data, soft data, spatial mapping, and vernacular architecture of Ethiopia. This research serves as a foundation in understanding the local context of the design project. An especially strong impression that I gained after arriving the Addis Ababa is that the country is one marked by contrast. The first contrast in the booming urban construction sites, filled with machineries obvious of foreign origins, and the vernacular tukuls and many other types of traditional self built housing that are the physical manifestation of centuries old lifestyles and traditions. The second contrast is derived from the fact that Ethiopia is one of the fastest growing economy in the world. The growth in economy does not benefit everyone equally. A small selection of people caught up with the growth and ensure themselves a place in the middle-class, while the overwhelming part of the population are still trapped in the lower class and risk remaining so indefinitely if their aspirations and resources are neglected in planning for the future. The question of how to bridge this contrast between the new and the old, poor and the rich became my main interest in the development of this design.*

### *THE RELATIONSHIP BETWEEN RESEARCH AND DESIGN*

*In the studio 'Global Housing: Addis Ababa Living Lab', I intended to do research upon the interaction between formality and informality in the design to enhance the power of income generation, especially for low income people in the Urban Global South. Often, the formal and the informal are seen as opposite to each other. Formal institutions often overlook or even fight against the informal ways of living. This has led to the problem of both the formality and informality not reaching their fullest potential as positive systems, and could possibly even become the source of problems instead of solutions. An example in Kolfe shows that the formal institution (Federal Housing Cooperation Addis Ababa) prohibits the informal economy within the project area, leading to a situation where it is even harder for the poorest inhabitants to make their living. Another way is to see formal-informal divide not as counteractive, but as interactive. This is why I propose the research question: how to study the formal (planned) city and the informal (used) city, in order to improve low-income quarters in Addis Ababa? In this study the formal city is understand as the physical space on different scales, from the urban system (open spaces and social/commercial programs) to the dwelling unit. The informal city is interpreted as how these physical spaces are occupied, used or even adapted by the inhabitants. The goal of this research is ultimately to show a consistent line of patterns of inhabitation that starts in the existing local context and extend into a new design in which the old ways of living can be preserved and coexist with the newly invented inhabitation patterns that is suitable for the future. The research is hereby a tool of firstly understanding the context and secondly examination of the design. By showing a clear effect between the 'planned' design and the ways of 'using', the informal could be better understood as a positive integral part in good formal planning.*

### *THE RELATIONSHIP BETWEEN YOUR GRADUATION (PROJECT) TOPIC, THE STUDIO TOPIC, YOUR MASTER TRACK (ARCHITECTURE), AND YOUR MASTER PROGRAM (MSC AUBS)*

*The graduation topic, studio topic, master track and master program all have the same reasoning in why I have followed this path. There is still an unsettled debate on whether architecture can actually change the world. That is also still unclear for me. What I am sure of is that architecture can change the people who inhabit architecture. More precisely is that there is an interactive influence exchanging between people and architecture. Architecture as a study and also as a profession can in my view serve as a catalyst, instigating changes towards a positive future. Especially dwelling is the part of architecture that is the most critical to the lives of people. For me, the graduation topic is to show the possibility of improving the lives of people who are the most vulnerable in changes that are coming in the future. It is this master study, this studio topic and this project that I hope can be an integral part of the solution. Architects are by nature advocates for positive change.*

## *RESEARCH METHOD AND APPROACH*

***Preliminary research***

*Before having any knowledge about the Ethiopian context, we would not be able to even formulate a proper design question. It was there for important to have a solid preliminary understanding of the project site as a foundation for further research. The preliminary research was divided into four research directions: hard data about the statistical information, soft data about the historical-cultural background, spatial mapping about the urban spatial planning, and lastly, the vernacular architecture. The research method was predominantly a literary review and inventory of any informations that we could find, combined into a presentation of four research booklets.*

***Site survey and interview***

*Being able to examine and experience the local context was an important part of the research. Through a simple walk around the neighbourhood we have discovered many informations that are not possible to obtain through other means. Especially the local customs and even the emotional bond between people and place were understood after engaging in interviews with the local inhabitants. Through every interview, different people with different social-economic status and each their own aspirations and resources have taken shape in my mind. It was from these interviews that made clear to me who my 'client' is.*

***Participatory design***

*Beside starting conversation about their ways of living we have also tried to understand their longings from an architectural points of view. Using a prepared set of foam masses that indicates different programs of a dwelling unit, we have asked to local inhabitants to build their own dream houses. Surprising to us, is the wide variety of the different aspiration in housings. From just a simple wish of having bigger/more rooms and outdoor spaces, to an elaborate scheme of three-storey single family homes with their own garage and workspaces.*

***Research Methods***

*As the exploratory and inventory phase end, the main research phase will start. As described in the Research Question segment, the goal of this research is to study the 'planned' and the 'used'. The research consists of two different parts: the study of the physical space and the study of the usage of the space. Due to the nature of both studies, two different research methods will be used: topology and praxeology.*

***Typological research***

*In the study of the physical space, especially focusing on the dwelling scale, typological research will offer a systematic view on the morphological patterns on the local residential architecture. Especially relevant is that typological research can show how the "planned" types are developed under the Ethiopian contextual influences and subsequently allows for the theorization of how these influences are relevant for the design.*

***Praxeological research***

*In the study of the usage of the space, praxeology as the study of human action and conduct will be used as the research framework of the second part of the research. If typology is the study of the space, then praxeology would be the study of the people inside the space. The Ethiopian lifestyle is without saying very different from other parts of the world, with its emerging modernisation while retaining traces of local traditional constructs. Through praxeological research it is possible to understand and document these subtle differences that would otherwise be inconspicuous to foreign observers. The praxeological research is furthermore extended into two branches of research methods: architectural ethnography and patterns of inhabitation.*

***Architectural ethnography***

*The primary base of research used in unravelling this non-familiar environment is mainly the site survey and interviews. Through conversations with inhabitants we can derive their everyday living patterns and their opinions and aspirations on their living, working and communal environments. Architectural ethnography is a tool used to transform these findings into a documentation in the form of a graphic novel. This is essentially the re-imagining of the stories of inhabitants as a visual anecdote.*

***Patterns of inhabitation***

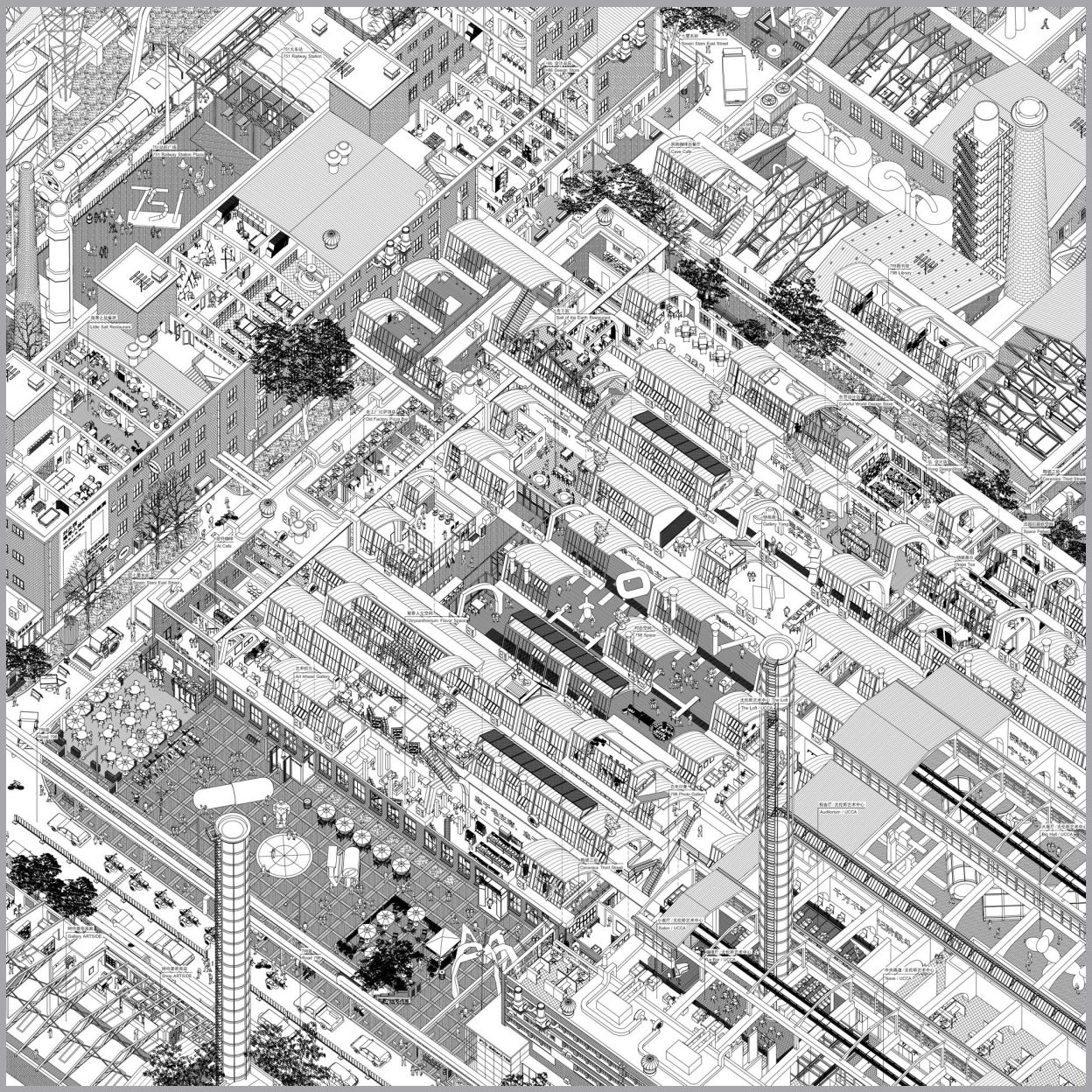
*Patterns of inhabitation is another way of studying the human living in a praxeological research. The difference with the architectural ethnography is that in the patterns of inhabitation there is less of a focus on the anecdotal storytelling, and more on showing the different patterns as an isolated spatial snapshot of different subjects. The subjects are amenities, border, building techniques, income generation and social space. By comparing two sets of patterns, one of the existing situation and one of the design, we can examine how the human living has changed (or not) in these two stages.*

***GRADUATION PROJECT AND THE WIDER SOCIAL, PROFESSIONAL AND SCIENTIFIC FRAMEWORK,***

*In the scientific research of architecture, the researcher's aim is mainly to arrived to solutions that is applicable in solving problems that are outside the realm of architecture. In the context of the studio 'Global Housing: Addis Ababa Living Lab', rapid urbanisation combined with a vast population with low income is the main problem that we are trying to tackle. 'Making a Living' as a graduation project aims at improving not only the housing quality and quantity of the project site, but also tries to improve upon the income generation possibilities that the low income households so desperately needs. Furthermore, this project also aims to disrupt the stigma of informality as a way of organising a community and building houses. It is especially rewarding to discover existing local informal social frameworks that could be integrated into the design and there for also as part of the solution that could be repeated elsewhere. I believe that this project could be part of the wider array of experiments in scientific research looking into the housing problems in the Urban Global South.*

***ETHICAL ISSUES AND DILEMMAS***

*The biggest ethical dilemma is the realisation that the plan in the making is something that could disrupt the lives of thousands of people. A similar example is the Grand Housing Scheme, in which many people got the opportunities to live in government provided housings that are of much higher standards, but the underlying effect is that existing communities are being torn apart. Even if the project is developed with all the good intentions in mind, unforeseeable effect that it could have would mean that the lives of people are drastically changed. Especially in the context of Kolfe, where the formal institution FHC holds ownership and there for the absolute power over the future of the project area. The residents who are all tenants, could be subjected to any form of changes that the FHC decides to execute. Without the careful consideration of the plan, it could mean dire consequences for the already vulnerable population of Kolfe. Design with the existing inhabitants in mind, in how to accommodate them both in the process as well as after the development would be an important part of the success of the plan.*



*Architectural Ethinograpy (Li & Hu, 2017)*

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