Inclusive neighbourhoods across urban waters	
A spatial design for intensifying socio-ecological resilience in communities in Addis Ababa positioned between tradition and transition.	
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who has supported me through the process of developing this thesis. For being critical and asking relevant question which highly improved the quality of this research.

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who taught me a lot about building techniques from East Africa. For always listening to my concepts and for helping to translate them into a real project.

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Figure 01: Rapid urbanisation of Addis Ababa. Photo: Resilient cities network (2021). *Addis Ababa*. In https://resilientcitiesnetwork.org/networks/addis-ababa/.

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Figure 02: Informal neighbourhood close to a river in Addis Ababa. Photo: Teklu, T. (2017). *Flood Breaks Walls*. In https://addisfortune.net/articles/flood-breaks-walls-hearts/.

ABSTRACT

Subject: Global housing, Addis Ababa living lab, Inner-city redevelopment, Densification, Affordable housing, Dwelling, Inclusive, Mixed-income housing, Flooding, River conservation, Urban river corridor.

The world is urbanising rapidly, with the Global South as the part of the world with the most rapid urbanisation. The urban population of Ethiopia is predicted to nearly triple in 25 years. The swiftness of urbanisation is resulting in extreme challenges. It causes, reinforced by climate change, that Addis Ababa is increasingly affected by flooding. The urban poor are forced to settle in the least desirable areas, such as areas around rivers which are most vulnerable to flooding. The rivers of Addis Ababa are polluted with all kinds of waste because of inadequate services. Around half the population has no water supply, forcing people to purchase water in shops. The urban poor cannot afford this and use the unsafe water from the rivers as a consequent.

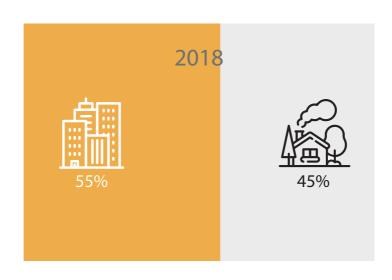
The Ethiopian government launched in 2019 the Addis Ababa Riverside project, or the Sheger beautifying project. It follows a series of ongoing beautification projects in the Global South. The project aims to clean the rivers and create public spaces, bicycle paths and walkways along the rivers. The project is criticised because it is no certainty that the rivers will not continue flooding and there is no proposition for all the waste that is currently discharged into the rivers.

Rapid urbanisation in combination with poverty and the inability of the state and the market to provide affordable housing, cause that over 1 billion people reside in informal settlements. Addis Ababa can be seen as an example of this inability. Historical grown, informal neighbourhoods called sefers are located in the city centre. Over the last decade, sefers are challenged by the swift urbanisation of Addis Ababa with a resettlement program aiming to replace these low-income neighbourhoods into denser urban schemes affecting the social, economic and political tissue. This program, the Integrated Housing Development Programme (IHDP), was introduced by the government in 2005. The inhabitants of former kebele houses claim their houses get demolished without any compensation or alternative accommodation.

Piassa is chosen as a project site, being currently challenged by demolition of the existing kebele housing. Having researched the location and its inhabitants, a housing system is designed with a combination of tenure systems for different income groups. These groups will live together in an inclusive, mixed-income environment in the inner-city of Addis Ababa.

PART I: CONCEPTUAL FRAMEWORK

BACKGROUND



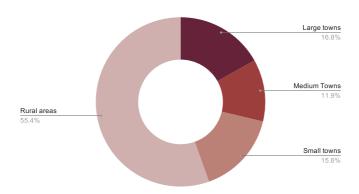


Figure 06: Global Urbanisation in numbers. Photo: Freya Crijns

Figure 05: Ethiopian migration: origin of migrants. Photo: collective booklet p. 51

"Globally, more people live in urban areas than in rural areas, with 55 per cent of the world's population residing in urban areas in 2018 [...] and by 2050, 68 per cent of the world's population is projected to be urban." (UN, 2019, p. xix)

This frequently quoted prediction by the UN brings the prerequisite to take a closer look at the concepts of *urban* and *rural*. According to the UN (2019, p. 3) "Urbanisation is a complex socio-economic process that transforms the built environment, converting formerly rural into urban settlements, while also shifting the spatial distribution of a population from rural to urban areas."

This definition of urbanisation indicates that the UN regards the concepts of urban and rural as two contrary terms. You can either be urban or rural. Recently, Schmid (2018) and his colleague Brenner questioned the nature of the urban, because as Soja (2014, as cited in Schmid, 2018, p. 591) clearly expresses: "it can be argued that every square inch of the world is urbanised to some degree."

Schmid and Brenner try to expand the perspective on the urban by acknowledging that also extended and differential urbanisation occurs. They claim that these processes could be seen through the concept of planetary urbanisation in both the Global North and Global South. (Myers, 2018) Schmid (2018, p. 591) argues that "the contemporary urbanising world cannot be adequately understood without systematically revising inherited concepts and representations of the urban."

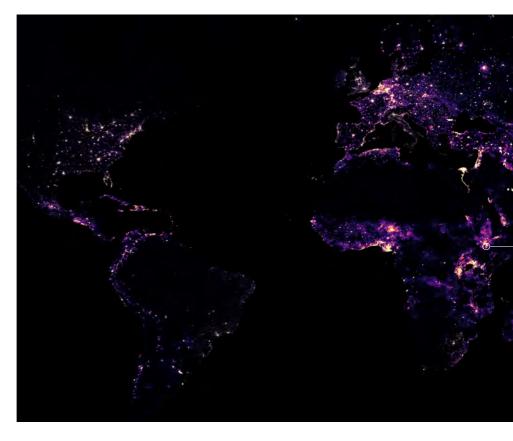
Figure 08: Rapid urbanisation of Addis Ababa. Photo: Remsberg, E. (2019). *Sprawling skyline of the developing capital of Ethiopia, Addis Ababa*. In https://remsberg.photoshelter.com/.

Figure 07: Uncontrolled development in Addis Ababa. Photo: Rosser, C. (2017). 'Addis has run out of space': Ethiopia's radical redesign. In https://www.theguardian.com/cities/2017/dec/04/addis-ababa-ethiopia-redesign-housing-projectremsberg.photoshelter.com/.

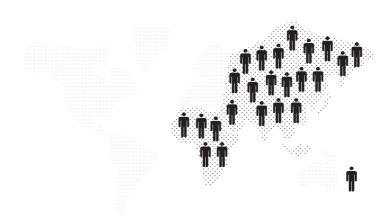




The Global South is the part of the world with the most rapid urbanisation. (Smets et al., 2014) By 2050, the urban population is expected to grow with 2.5 billion people, with 9 out of 10 urban dwellers expected to live in Africa and Asia. At this moment, Africa is the least urbanised region in the world with only 43 per cent of its population living in urban areas. (UN, 2019)



Background 20



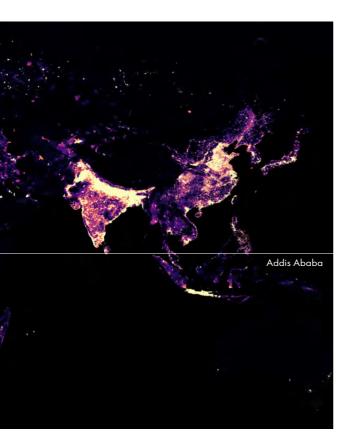


Figure 10: 90% of urban dwellers expected to live in Africa and Asia. Photo: Freya Crijns

Figure 09: Current population density in the world. Photo: collective booklet pp. 26-27

Ethiopia, located in Sub-Saharan Africa, is the second most populous country in Africa. (UN-Habitat, 2017) The urban population of Ethiopia is predicted to nearly triple in 25 years. In 2012 more than four out of five inhabitants were rural. By 2032, rural-to-urban migration will account for roughly 45 percent of the annual urban population growth, with Addis Ababa being the major recipient of migrants. (World Bank Group, 2015)

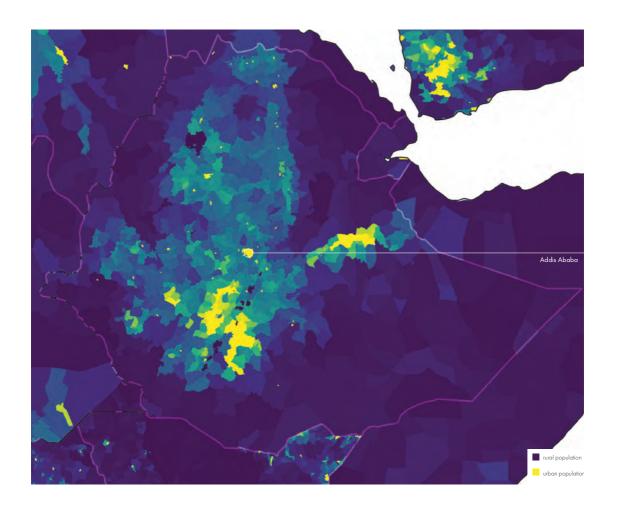


Figure 11: Current population density in Ethiopia Photo: collective booklet p. 29

The swiftness of urbanisation in the Global South is resulting in extreme challenges for cities. The urban poor – including many rural-to-urban migrants - are forced to settle in the least desirable areas, such as areas around rivers which are prone to flooding. Therefore, the urban poor are most at risk from the effects of climate change such as increasing floods. Flood events are a major problem, responsible for more than half of disaster-related mortality and a third of the economic losses from natural catastrophes. (Williams et al., 2018)

Ethiopia has large resources of water making it known as the Water Tower of Northeast Africa, mainly because of its big contribution to the River Nile's annual flow. Addis Ababa contains many rivers and streams such as two branches of the Akaki river, one of the major rivers in Ethiopia. (Cherenet & Sewnet, 2012)



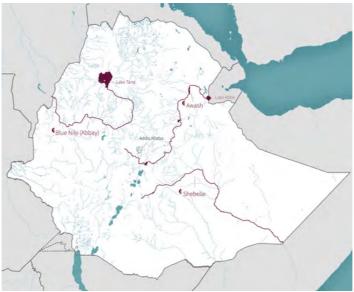


Figure 12: Settlements in floodprone areas. Photo: Magnus, F. (2018). Lessons from cities that plan for their rivers. In Flickr

Figure 13: Major rivers of Ethiopia.
Photo: collective booklet pp. 236-237

Despite these resources, water still poses many problems for the inhabitants of Ethiopia. The lack of rain can ruin the harvest causing frequent famines and food shortages. (UN-Habitat, 2010) The shortage of water for irrigation together with the lack of drinking water and regular floods, provide a great deal of rural-to-urban migrants. It is expected that climate-related migration will gain even more importance in the following years. (UN, 2019)



Figure 14: Major droughts in Ethiopia.

Photo: James, J. (2016). Ethiopia survives its
great drought, but a way of life may not. In https://www.
thenewhumanitarian.org/feature/2016/06/13/ethiopiasurvives-its-great-drought-way-life-may-not

The Ethiopian government launched in 2019 the Addis Ababa Riverside project, or the Sheger beautifying project. It follows a series of ongoing beautification projects in the Global South. The three-year project is expected to cost 29 billion Br, which is around €600 million. It will cover 56 kilometres and aims to create public spaces and parks, bicycle paths and walkways along the rivers; clean the rivers and reduce the effects of climate change. (Terefe, 2020)



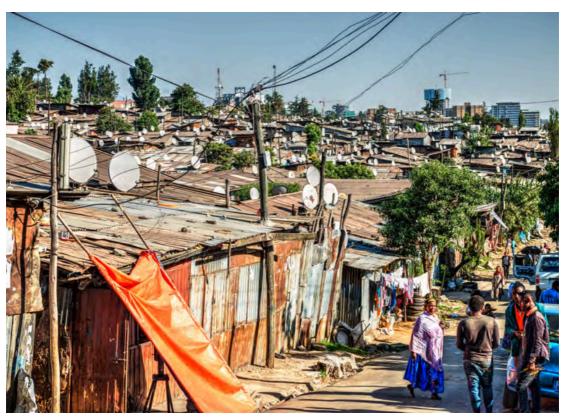




Figure 15: Render of Beautifying Sheger Park Photo: FBC (2019).

- **Figure 16:** Beautifying Sheger Park under construction. Photo: Ethiopian Architecture (2020).
- **Figure 17:** Beautifying Sheger Park under construction. Photo: Ethiopian Architecture (2020).

Rapid urbanisation in combination with poverty and the inability of the state and the market to provide affordable housing, cause that over 1 billion people reside in informal settlements. (Williams et al., 2018) These settlements are primarily located across the Global South, with the majority located in Asia and in Sub-Saharan Africa. It is estimated that around 200 million people in Sub-Saharan Africa - equivalent to the entire population of Ethiopia, Kenya and Uganda combined - live in very poor housing conditions. (UN, 2019)



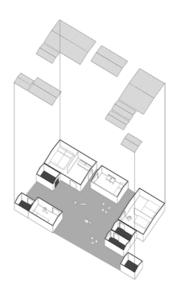












In recent decades, governments of Asia and Africa have set up large-scale housing projects to tackle the existing housing crisis. However, these were often not affordable for the poor forcing them into self-managed or self-help housing. These houses currently still represent most of the informal settlements. (Smets et al., 2014)

Addis Ababa can be seen as an example of this inability of the government to swiftly deliver affordable housing, causing the development of informal housing in the Global South. Historical grown, informal neighbourhoods called sefers are located in the city centre of Addis Ababa. In these sefers, kebele houses are often built from non-durable materials and have lacking access to services and facilities.



Figure 20: Standard kebele housing. Photo: collective booklet, p. 364.

Figure 21: Inside a sefer.

Photo: collective booklet, p. 376.

Over the last decade, sefers are challenged by the swift urbanisation of Addis Ababa with a resettlement program aiming to replace these low-income neighbourhoods into denser urban schemes. (Tola & Haileselassie, 2020)

This program, the Integrated Housing Development Programme (IHDP), was introduced by the government in 2005. The goal was to solve the existing housing shortage and reduce poverty through the construction of 400.000 condominium units for low- and middle-income inhabitants.



Figure 22: Condominium locations in Addis Ababa. Photo: collective booklet, p. 394.

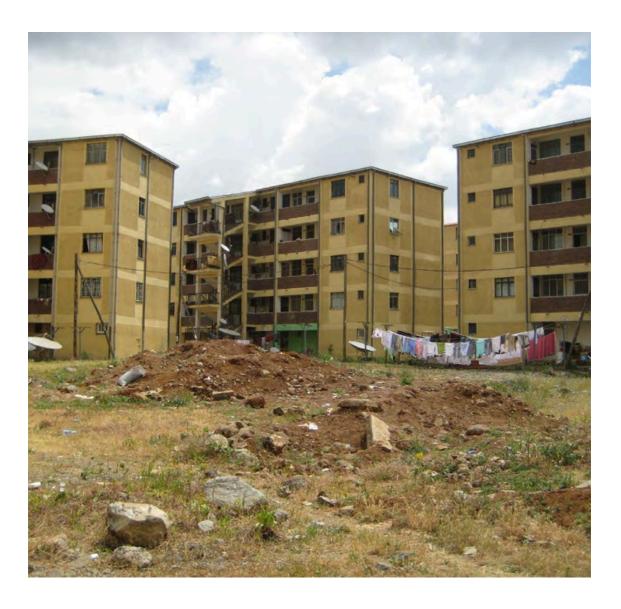
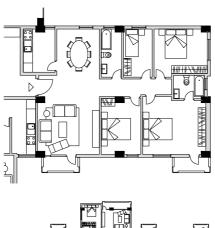
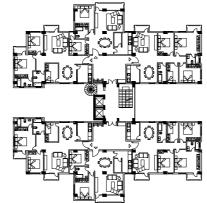
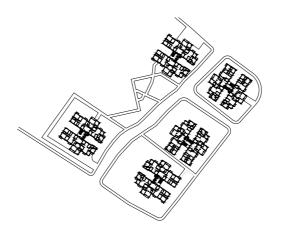


Figure 23: Condominium housing in Addis Ababa.
Photo: Delz, S. (2011). *Stand-alone housing blocks with neglected outdoor spaces*. In Ethiopia's low-cost housing program.







A condominium site consists of multi-storey housing blocks with each household having its own individual unit but sharing communal areas and facilities. (UN-Habitat, 2010)

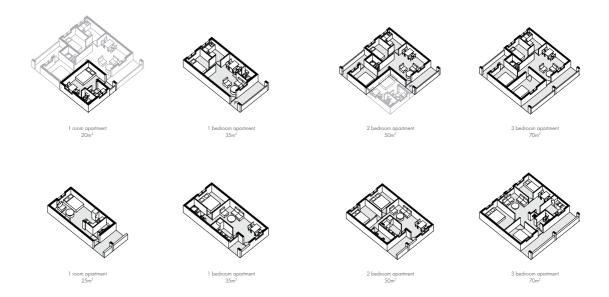
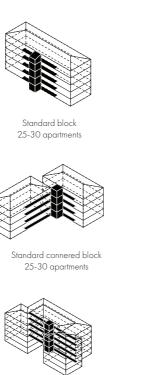
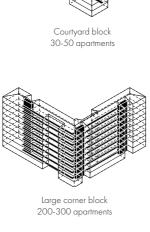


Figure 24: Individual units with shared facilities.
Photo: collective booklet p. 410
Figure 25: Condominium apartment types.
Photo: collective booklet p. 396





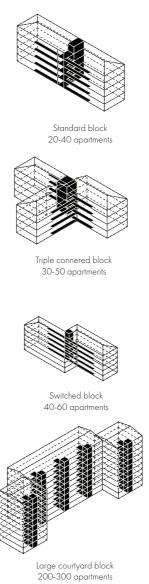


Figure 26: Condominium types. Photo: collective booklet p. 398

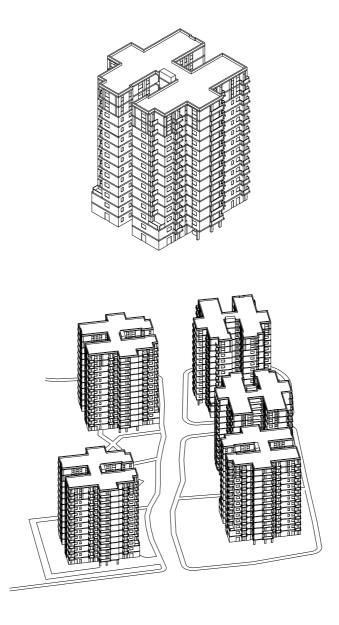


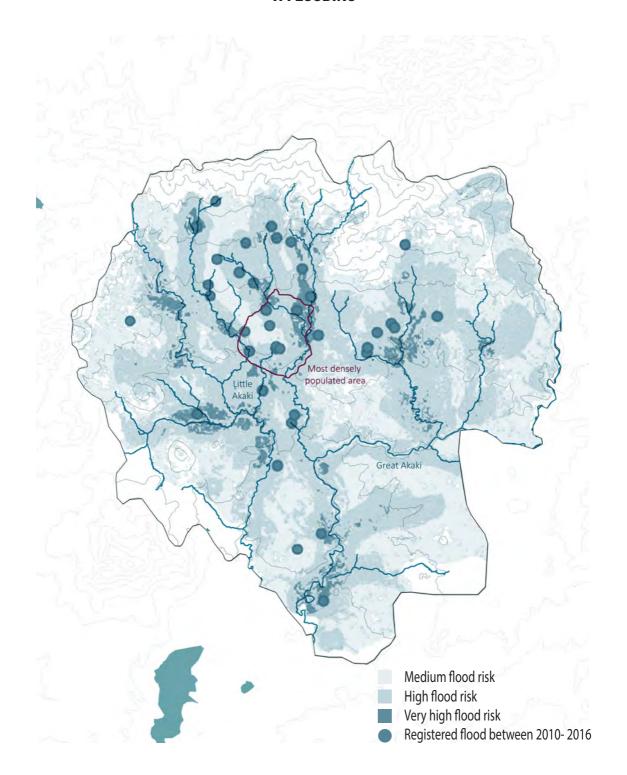
Figure 27: Condominium spatial configuration. Photo: collective booklet p. 411

PROBLEM STATEMENT

The critical issues in the urbanisation of Addis Ababa are the dilapidation of its rivers and the lack of adequate, affordable housing resulting in an unsustainable relationship between the urban waters and the urban neighbourhoods in which they flow.

This unsustainable relationship can be subdivided into **three partial problems**.

1. FLOODING



Addis Ababa has been affected by flooding for several decades. The city suffered from serious flood damages in 1978, 1994 and 1995 causing losses of human lives and houses, and damaging the infrastructure. (JICA & Region 14 administration, 1998) In recent decades, temperatures in Addis Ababa rose and rainfall became variable due to climate change.

Figure 29: House that is partly washed away by flooding of the Akaki river.

Photo: Franklin, M. (2008). Former house. In Flickr.

Figure 30: Flash floods in Addis Ababa.

Photo: Bel, Z. (2007). Flash floods kills 5 in Addis Ababa. In Ethiogrio.







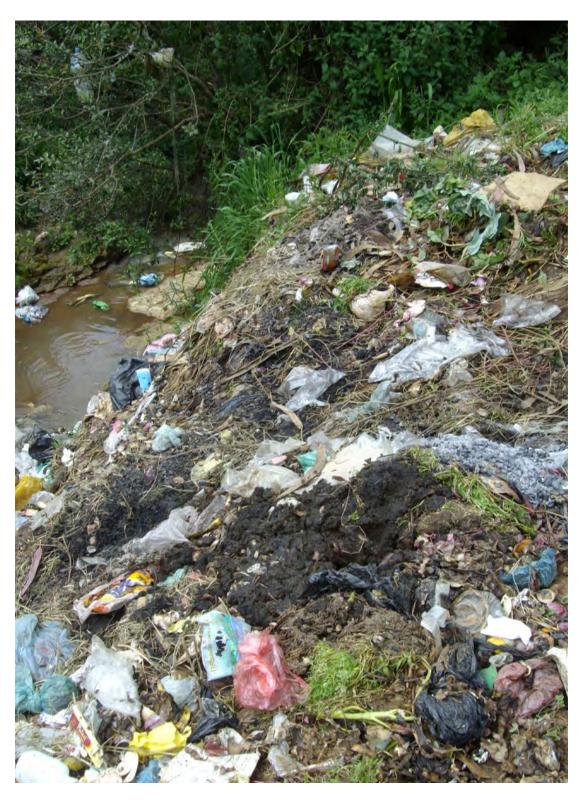
Problem statement

These impacts together with rapid urbanisation, cause that Addis Ababa is increasingly affected with disasters caused by water, impacting health, agriculture and the natural resource of water. (Birhanu et al., 2016)

Extreme rainfall or upper catchment activities can lead to riverine floods, flash floods or river overflows in the city. Poor drainage along roads, housing encroaching the riverbanks and the use of inappropriate construction materials, further increase the flood risk. (UN-Habitat, 2017, p. 86)

The rivers of Addis Ababa are polluted with all kinds of waste because of inadequate services such as the municipal sewerage system, sanitation services and garbage collection.
Figure 32: A pile of garbage at the source of the Akaki rive

2. RIVER POLLUTION



Polluted rivers bring forth the spread of cholera and other water-borne diseases, forming a risk for the health of inhabitants living in the city and in areas more downstream.

Around half the population has no water supply, forcing people to purchase water in shops. The urban poor cannot afford this and use the unsafe water from the rivers as a consequent. (UN-Habitat, 2017) In the COVID-19 pandemic, the importance of clean water -thoroughly washing your hands regularly - is emphasized again. (UN, 2020)



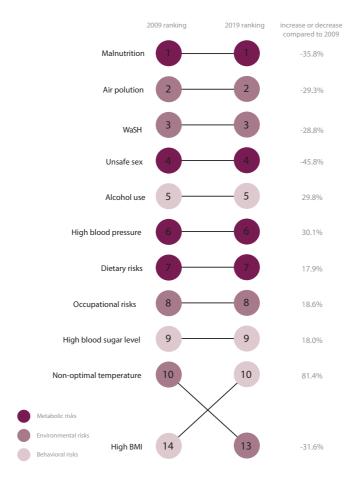


Figure 34: Malnutrition and sanitation (WaSH) are in top 3 of factors that cause most death/disability.

Photo: collective booklet p. 39

Due to rapid urbanisation, food deficits are a growing problem in Addis Ababa. Urban agriculture is already a common practice in the capital, playing an important role in the supply of vegetables for the local market. However, 40% of the vegetables supplied in Addis Ababa are derived from agricultural fields which are irrigated with the unclean water from the rivers, further exacerbating health problems because of high concentrations of metals in food. (UN-Habitat, 2017)





3. GOVERNMENTAL URBAN PROJECTS





The urban development in Addis Ababa is characterised by urban projects as embodiments of political rupture, shifting ideologies and new priorities. Since deposing the Derg in 1991, the Ethiopian People's Revolutionary Democratic Front (EPRDF) was the ruling coalition of Ethiopia. The EPRDF introduced the **condominium** social housing scheme. In 2018 Abiy Ahmed, as the prime minister, introduced the **Riverside project**. (Terrefe, 2020)

Figure 37: Newly built condominiums in Addis Ababa. Photo: Franklin, M. (2008). *Addis condos*. In Flickr.

Figure 38: Design for the Addis Ababa Riverside project. Illustration: *Addis Ababa to Spend 2.5b Br to Develop River Bank.* (2019). In https://adisfortune.news/news-alert/addisabeba-to-spend-2-5b-br-to-develop-river-bank/.

Currently the government is constructing **condominium** housing on brown and green fields, but also as redevelopment of the sefers affecting the social, economic and political tissue. (Tola & Haileselassie, 2020)

Despite the condominium system being successful in increasing the supply of housing on the market, the units are often not affordable for low-income households which forces them to rent out their unit.

The inhabitants of former kebele houses claim their houses get demolished without any compensation or alternative accommodation. After demolition many dwellers temporarily stay in a tent amid all the rubble, without water nor electricity. (Duong, 2019)





Figure 39: Urban and landscape transformations in Addis Ababa Photo: Delz, S. (2016). Housing Programs for the Poor in Addis Ababa: Urban Commons as a Bridge between Spatial and Social.

Figure 40: Demolition of current houses for condominium development Photo: Scyscrapercity (2020).

Many former inhabitants of kebele housing are dislocated to condominium houses in the periphery of Addis Ababa. These locations are far from essential social services, and thus create extra transportation costs, pushes children out of schools and reduces employment possibilities. (UN-Habitat, 2010)



Problem statement



 $\label{lem:figure 41:} \textbf{Figure 41:} \ \ \textbf{Condominium ensemble in the outskirts of the city.}$

Photo: collective booklet, pp. 390-391.

Due to rapid construction, the condominiums sometimes get built without the necessary infrastructure in place. This can lead to more problems for the inhabitants concerning water supply, than they had before the relocation. (UN-Habitat, 2017)

According to inhabitants, the pressure to supply housing in the city overshadows the idea of creating interesting community spaces. They claim that the social ties in their informal neighbourhood were much stronger than in the condominium housing.

There is a fear that if certain unique areas will not remain preserved, the city will lose its references and the knowledge that was stored in them and will end up with no memory. (Heisel & Kifle, 2012)



Figure 42: Genius Loci has been disturbed by the develop-

ment of condominium housing.

Photo: Mekonnen, E. (2017), p. 9 in Assessment of affordability of condominium houses.

The Addis Ababa Riverside project is criticised because it did not establish a detailed hydrological assessment and therefore there is no certainty that the rivers will not continue flooding. Furthermore, there is no proposition for all the waste that is discharged into the rivers, continuing the concern about pollution of the rivers. Another major problem is that the Riverside project runs through densely populated neighbourhoods. The inhabitants claim their houses got demolished without any warning. Afterwards they were relocated to condominium housing in the outskirts of the city. Many other dwellers close to the rivers fear displacement in the next phase of the project. (Terefe, 2020)



Problem statement

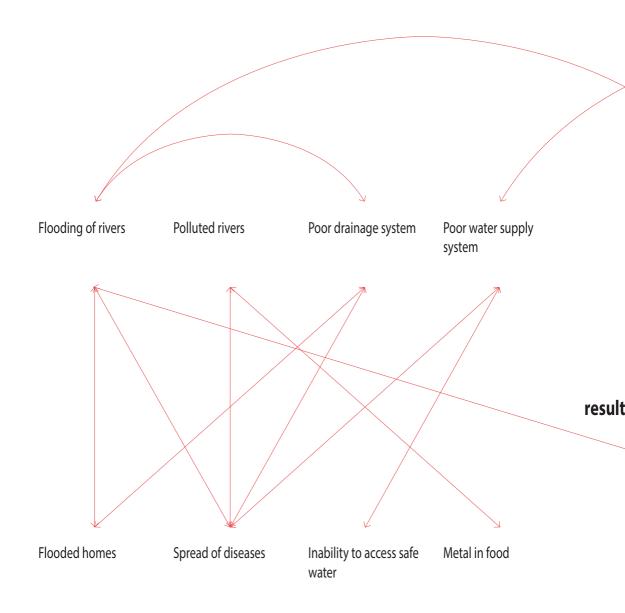
Addis Ababa has the aspiration of becoming a world-class city. However, this aspiration is not inclusive to the urban poor and their "right to the city", as Lefebvre (1968) puts it. The relocation caused by beautification can be seen as a process of gentrification.



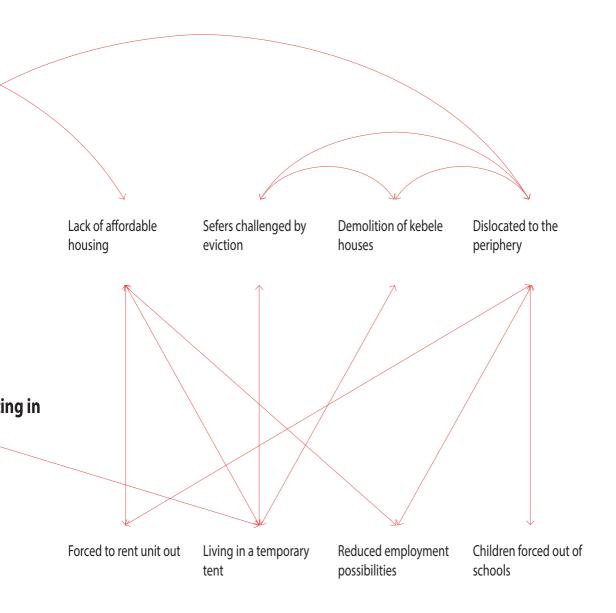
Figure 43: Major demolition for the development of the beautifying sheger project. Inhabitants got displaced.

Photo: Frederic, H. (2020)

WATER CRISIS



HOUSING CRISIS



RESEARCH QUESTION

Could the unsustainable relationship between the urban waters and the urban neighbourhoods be seen as an opportunity for the government to create a socio-ecological resilient urban river corridor towards a more inclusive and sustainable Addis Ababa?



Figure 44: Houses built close to the Akaki river in Addis Ababa. Photo: Franklin, M. (2008). *Akaki river.* In Flickr.

PARTIAL PROBLEM

SUB QUESTION

- (1) The neighbourhoods are challenged with flooding causing social, economic and health threats.
- (1) How can the neighbourhoods become adapted to flooding?

- (2) The rivers are polluted with all kinds of waste causing health problems for the neighbourhoods.
- (2) How can the rivers become clean and attractive?

- (3) The scheme by the government for the urban waters, the Addis Ababa Riverside project, has no social nor ecological connection with the scheme for the urban neighbourhoods by the government, the condominium housing.
- (3.1) How can the condominium scheme be transformed into a housing system which is genuinely inclusive for the urban poor of Addis Ababa?
- (3.2) How can the Addis Ababa Riverside project be transformed into a river conservation scheme which is sensible to the internal dynamics within the water itself?
- (3.3) How can the housing scheme and the river conservation scheme become socially and ecologically connected?

METHOD

Contextual research Material analysis Literature review

Analysis of precedents Literature review

Morpho-typological analysis Comparative analysis Literature review Ethnographic research

Literature review Analysis of precedents Interviewing

Literature review Visual ethnography Narrative methods The main research question can be subdivided into five sub questions, responding to the three partial problems described in the previous paragraph.

METHODOLOGY AND METHODS

The major method that will be used is research-by-design in which the concepts from the theoretical framework will be further elaborated by drawing and modelling. This design will then in turn strengthen the theoretical framework of this thesis in a constant loop.

Different methods will be used to answer the five sub questions.

- (1) **Contextual research** will determine which areas are most affected by flooding based upon the proximity of a river, the steepness of the topography and the amount of drainage. By means of a material analysis, materials will be researched in relation to flood resistance. Literature review will be used to determine functions that cope with flooding and can be planned in areas with high risk of flooding.
- (2) **Analysis of precedent** filtration ponds and river beautification projects in the Global South will be performed. In addition, literature review will be conducted on existing cooperatives that deal with garbage collection in Addis Ababa.
- (3.1) A **morpho-typological analysis** of housing systems for the urban poor in the Global South will be performed. This analysis will be evaluated through a comparative analysis. Furthermore, a literature review of mass housing schemes, including the condominium scheme in Addis Ababa will be important. An ethnographic research will give insight into the lives of people in the condominium scheme. This research will be based upon a literature review of, for example Sociospatial tensions and interactions: An ethnography of the condominium housing of Addis Ababa by Ejigu (2012).

- (3.2) **Literature review** on **river conservation** will be supplemented with an analysis of precedent projects that deal with river conservation. Another important method will be to interview actors in water management on the functioning and the pros and cons of river conservation.
- (3.3) A **literature review** will focus specifically on the **role of water and the dwelling** in the daily life of inhabitants, using texts such as Patterns of inhabitation in Addis Ababa by Mota (2020). Visual ethnography of existing photographs, movies and documentaries which focus on dwelling near rivers in Addis Ababa will give further insight into people's life near rivers.

Building upon the knowledge gained from the literature review and the visual ethnography, the relationship between housing and the river will be analysed through the methodology of narration. This method will connect the site with the experience of its user. Drawing and mapping inspired by The image of the city by Kevin Lynch (1960) and Design of cities by Bacon (1975) will be used as narrative research methods.

THEORETICAL FRAMEWORK

The theoretical framework is subdivided in five different but consecutive topics.

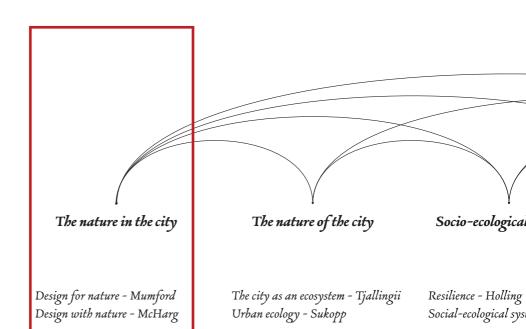
The nature in the city

Design for nature

Historically, urban planning ignored natural terrain, mapping the city without hills or rivers. Mumford (1968, p. 83) writes that "we must draw close once more to the healing order of nature, modified by human design." According to Mumford (1968, p. 87) nature in the city should look like "a permanent green matrix of open areas" and should be designed by landscape architects. The method to achieve this, was to empty congested parts of the metropolis and introduce parks, playgrounds and green promenades.

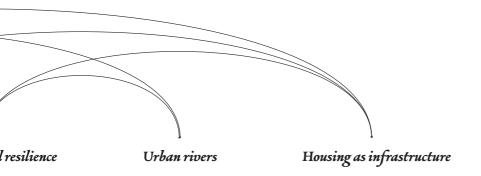
Design with nature

McHarg (1969) published the influential book design with nature.



According to his mentor Mumford, McHarg goes one step further by not arbitrarily imposing design, but by using the possibilities and restrictions that nature offers. McHarg believes there should be harmony between man and nature. He also argues that nature should be implemented in the metropolis. Areas in the metropolis which are inhospitable to man such as floodplains, should become prohibited to live in and could become open spaces. McHarg (1969, p. 56) suggests an ecological method in which the land reserved for open space is "intrinsically suitable for green purposes."

A contemporary example of the ideology explained in Design with nature can be found in the Great Green Wall of Africa across the continent's Sub-Saharan zone. This environmental design will be the largest designed living structure in the world. Senegal and Ethiopia are leading this project which is restoring degraded land with native greenery. (Steiner et al., 2019)



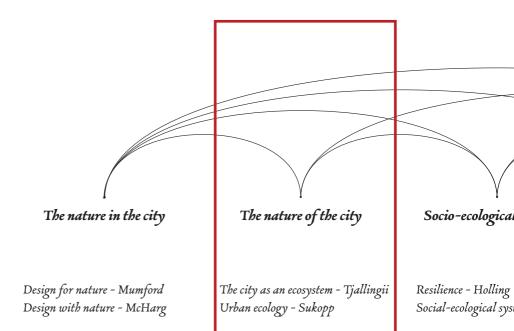
tems - Folke

Controlling - Poff Conserving - Sijmons Restoring - Corboz Re-naturalising - Clemmensen Affordable housing as infrastructure - Kushner

The nature of the city

The city as an ecosystem

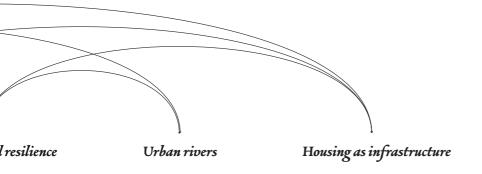
Before ecosystem studies started in the 1970s, the main interest was the nature in the city. Afterwards, researchers started looking at the nature of the city. (Sukopp, 2008) Vitousek et al. (1997) wrote that "until recently, the term human-dominated ecosystems would have elicited images of agricultural fields, pastures, or urban landscapes; now it applies with greater or lesser force to all of Earth". According to Stearns and Montag (1974), humans created besides human-dominated ecosystems also "urban ecosystems", which are ecosystems specifically for dwelling. Pickett et al. (2003) defined urban ecosystems as those "in which people live at high densities, or where the built infrastructure



covers a large proportion of the land surface." According to Tjallingii (1995), there are not only urban ecosystems, but the whole city can be seen as an ecosystem.

Urban ecology

According to Tjallingii (1995, p. 36), ecology "is the study of the relationships between living organisms and their environment." Sukopp (2008) defined urban ecology as "the investigation of living organisms in relation to their environment in towns and cities." Marzluff et al. (2008, p. vii) defined urban ecology as "the study of ecosystems that include humans living in cities and urbanising landscapes."



tems - Folke

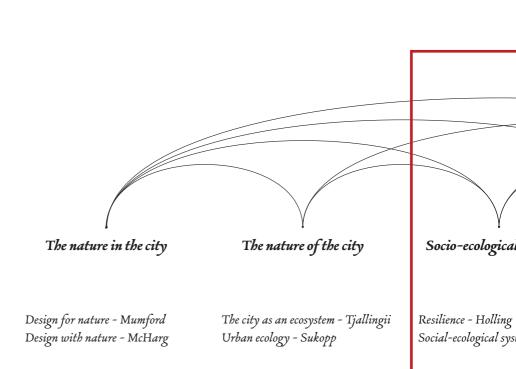
Controlling - Poff Conserving - Sijmons Restoring - Corboz Re-naturalising - Clemmensen

Affordable housing as infrastructure - Kushner

Socio-ecological resilience

The concept of resilience emerged from ecology in the 1960s and early 1970s. (Folke, 2006) Ecologist Holling (1973) makes the distinction between stability and resilience as two different kinds of behaviour of ecological systems. Stability is "the ability of a system to return to an equilibrium state after a temporary disturbance." (Holling, 1973, p. 14) Whereas resilience is defined as "a measure of the persistence of systems and of their ability to absorb change and disturbance, and still maintain the same relationships between populations or state variables." (Holling, 1973, p. 14) Sennett (2018, p. 287) defines resilience as "a recovery from forces or pressures which occur in time" which seems more connected with Holling his notion of stability than his definition for resilience. Sennett expands the concept of resilience to the built environment.

Holling (1973) suggests that a system can be very resilient and at the same time have a low stability. Posteriorly, Smets et al. (2014) write that too much resilience causes stagnation and too much efficiency would

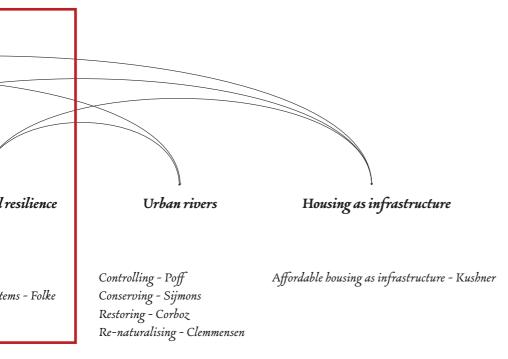


lead to fragility.

Sustainability is when an equilibrium between efficiency and resilience is reached. Ecosystems survive over time by always reconfiguring this equilibrium, once disrupted, the system is unstable.

After many studies focused on analysing the impacts of human activities on ecosystems, Berkes and Folke (2000) studied the dynamics between social and ecological systems. Folke (2006) later wrote that humanity shapes the dynamics of ecosystems and that human societies rely on ecosystems services and supports. Cumming et al. (2017, p. 653) note hereafter that in order to have a resilient social-ecological system, spatial heterogeneity is important meaning that "human communities associated with a single ecosystem can use the environment at different spatial scales."

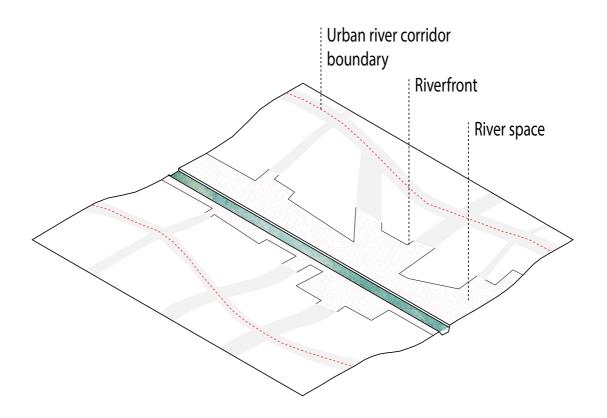
Urban river corridors are a materialisation of socio-ecological resilience due to the interaction between the social systems of the city and the ecological system of rivers. (Forgaci, 2018)



Urban River Corridor

= A materialisation of socio-ecological resilience due to the interaction between the social systems of the city and the ecological system of rivers.

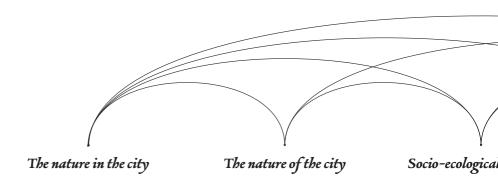
(Forgaci, 2018)



Urban rivers: Controlling, Conserving, Restoring or Renaturalising?

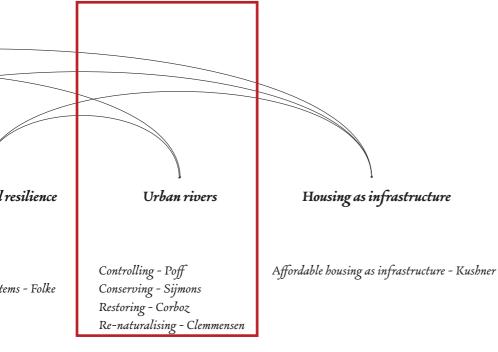
For many centuries people find it convenient to build settlements on riverbanks. These settlements started growing and the need to control the natural behaviours of rivers emerged. Nixon (1966, p. 246) writes "a simple solution which reduces the area of flooding is to build flood defences" which shows the prevailing interest in engineering works. Poff et al. (1997) recognise that the conventional river management techniques which focus on structural control, have proven difficult to maintain over time and often create a degraded river environment. According to Adams (1992), river control in Africa causes many problems for agriculture, fishing and grazing. However, Scudder (1989) believes that without water engineering works, the situation for many low-income inhabitants of Africa would be worse.

Nowadays, river conservation is widely written about by academics. Many terms are in use for river conservation such as "erodible corridor" (Piégay et al., 2005) and "streamway" (Palmer, 1976). Rossano (2016,



Design for nature - Mumford Design with nature - McHarg The city as an ecosystem - Tjallingii Urban ecology - Sukopp Resilience - Holling Social-ecological sys p. 9) defined "floodscapes" as "landscapes that make space for water where containment is no longer an option." A similar new landscape strategy is the Dutch programme "room for the river" which provides more space for the rivers by letting them flood in a safe way. (Sijmons et al., 2017) Adams (1992) wrote that the conservation movement is emerging in Africa, since a wetland conservation program started in Uganda, Tanzania and Nigeria.

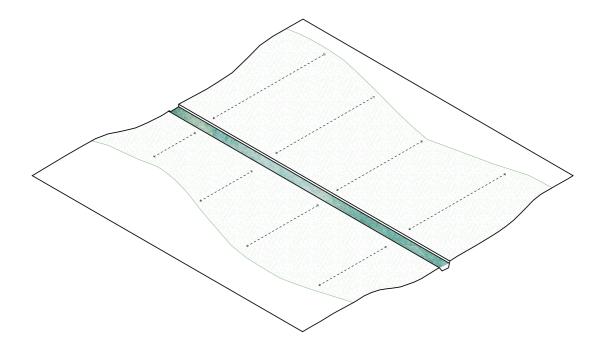
In many locations where rivers have been subject to traditional engineering, nature restoration now takes over. This concept can already be found in drawings by Viollet-Le-Duc around 1870, in which he wanted to restore the Mont-Blanc to its state before erosion. (Corboz, 1983) Clemmensen (2014, p. 54) questions the concept of nature restoration since "our nature is not necessarily their nature." According to him, an alternative can be found in "re-naturalisation" of, for example, the Aire River which was previously canalised. Currently, the canal is combined with a parallel space to allow the river to flow freely.



River conservation

- = Erodible corridor
- = Streamway
- = Floodscape
- = Room for the river
- = Space for the rivers by letting them flood in a safe way

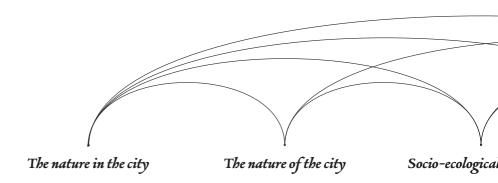
(Sijmons et al., 2017)



Housing as infrastructure

According to Kushner (2010) affordable housing should be viewed as infrastructure since adequate supply should be assured through planning and implementation just as it exists for streets, schools, offices and industry. Fearn (2014) wrote: "if housing were seen as infrastructure there would be a lot more of it." She believes that investment is deterred because housing is excluded from infrastructure policies. Roth (2019) goes a step further and argues that all housing, not just affordable housing, can be seen as infrastructure.

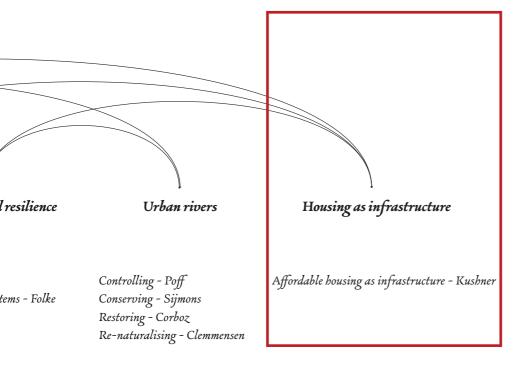
The Arlequin designed by the Atelier d'urbanisme et d'architecture (AUA), can be seen as an embodiment of housing as infrastructure through its urban pedestrian street. The street is raised above the ground and connects housing blocks and multiple social facilities. (Le Vot, 2015)



Design for nature - Mumford Design with nature - McHarg The city as an ecosystem - Tjallingii Urban ecology - Sukopp Resilience - Holling Social-ecological sys

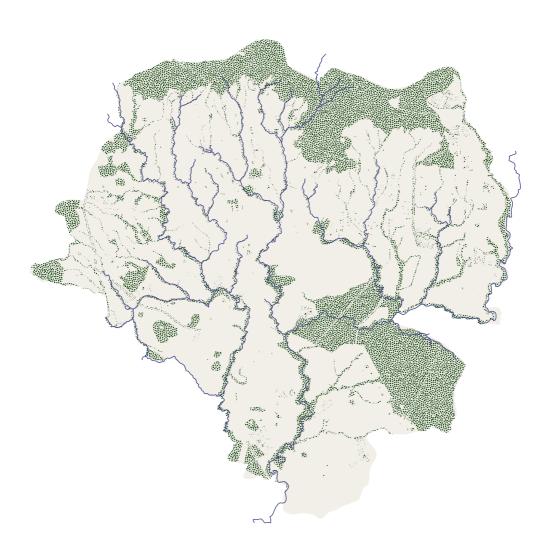


Figure 45: Raised pedestrian street in the Arlequin.
Photo: Fonds DAU. Siaf (2016). Cité de l'architectue & patrimoine. In Archives d'architecture du xxe siècle.F / Cité de l'architecture & du patrimoine / Archives d'architecture du xxe siècle



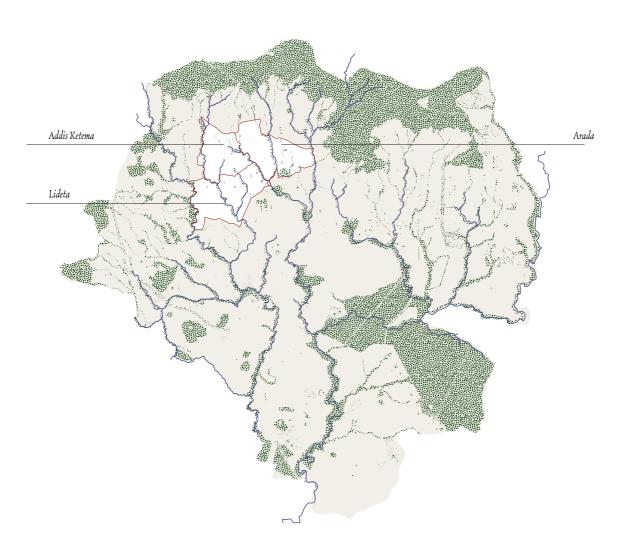
SITE ANALYSIS

Just as there is scarcity in open building plots, so there is for green infrastructure. Especially in the inner core of Addis Ababa, open green infrastructure is close to non-existing. The remaining green infrastructure, however, can be found near rivers and near the mountains in the North, as these zones are difficult to build upon. Unfortunately, these areas are unvalued and neglected.

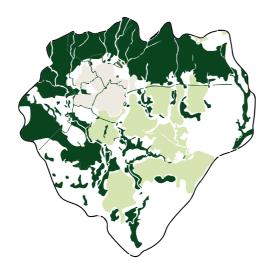


When looking at the current distribution of green infrastructure, it stand outs that in the inner city of Addis there is the least supply and the highest demand for green zones. There is a lack of green spaces in the inner city.

For these areas which are in need of greenery, the areas near rivers could provide the answer. These open spaces are not defined at the time but could be transformed into qualitative spaces.



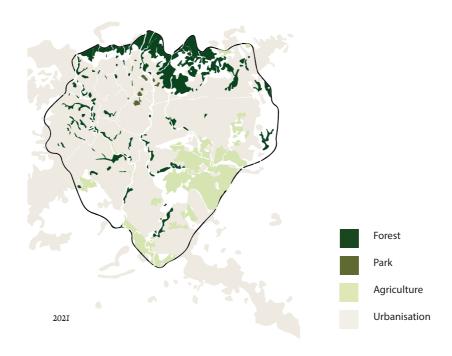
The remaining potential green zones are being destructed through time for future developments. To preserve greenery in the most prime locations of the city, strategic housing projects are needed which value the river area and its greenery. As urbanisation continues near the outskirts of the city, a profound strategy is urgently needed.



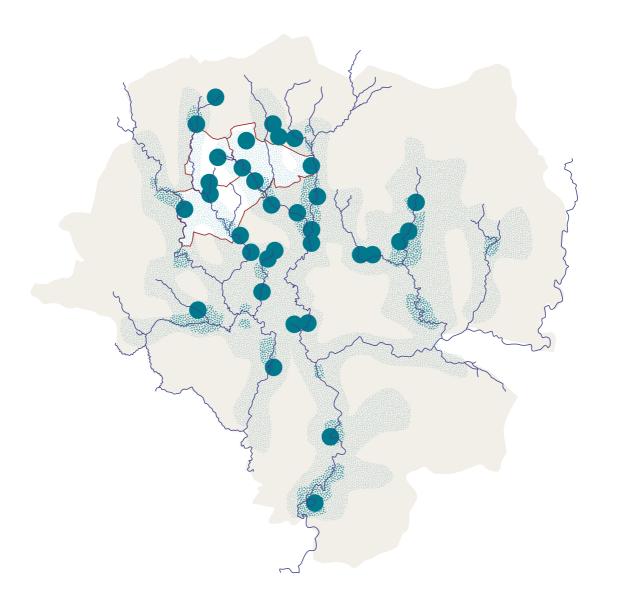


1941





These strategic projects should take in account the limitations of building near the river, as there is a potential risk of flooding. Especially in the inner core of Addis Ababa, numerous floods have been registered in the last decade.

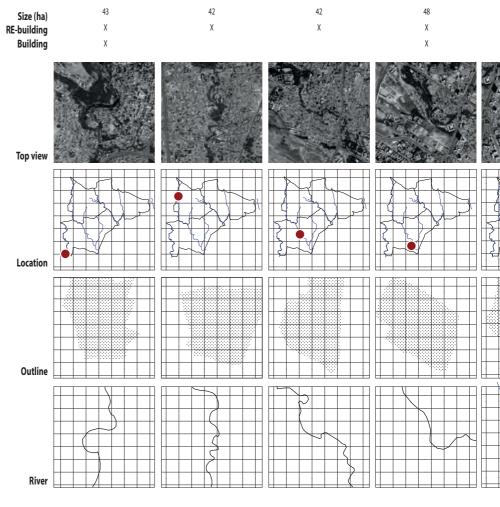


Floods registered between 2010-2021

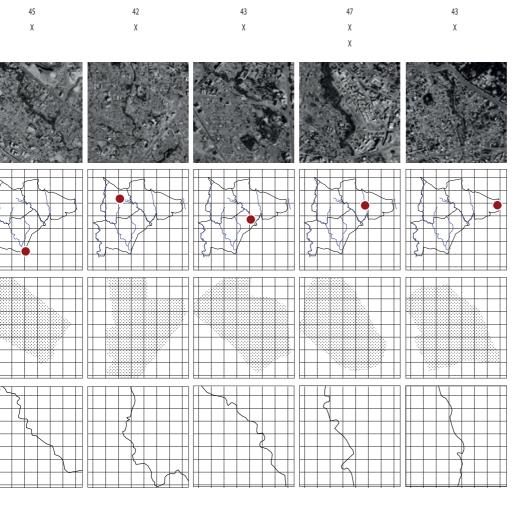
and potential risk for future flooding

In these dense urban areas, various critical locations can be identified. All these locations form a particular urban condition in Addis and can be seen as a general problem.

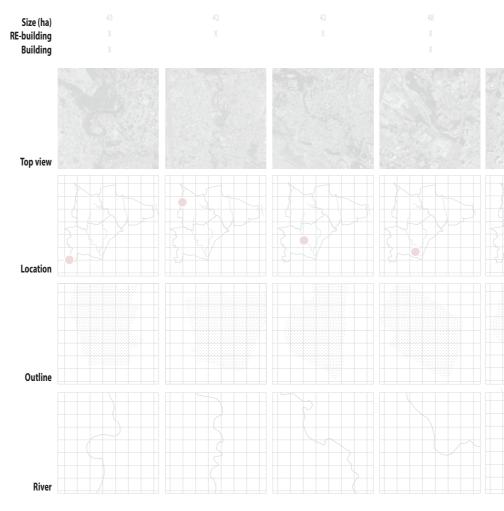
In the inner city of Addis Ababa there are no empty sites left. The locations near the river are nowadays used for (re)building housing or for the development of the beautifying riverside project.

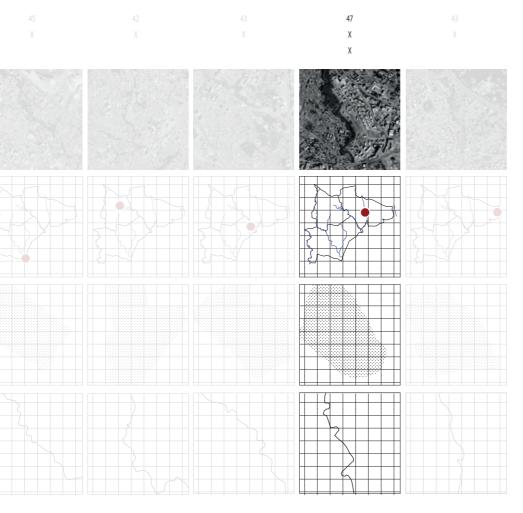


The current kebele housing is (partially) demolished and replaced by one-sided solutions, either for condominiums or the Beautifying Sheger project. Yet these valuable locations should be developed in a more prudent way, in which there should be a relation between housing and the river.



Since the purpose was to develop a strategic project which can function as a system for multiple critical zones near rivers in Addis Ababa, one specific location was chosen. This location is characterised by its prime location, steep terrain and complex tissue of built kebele housing, historical buildings and newly developed condominium ensembles.



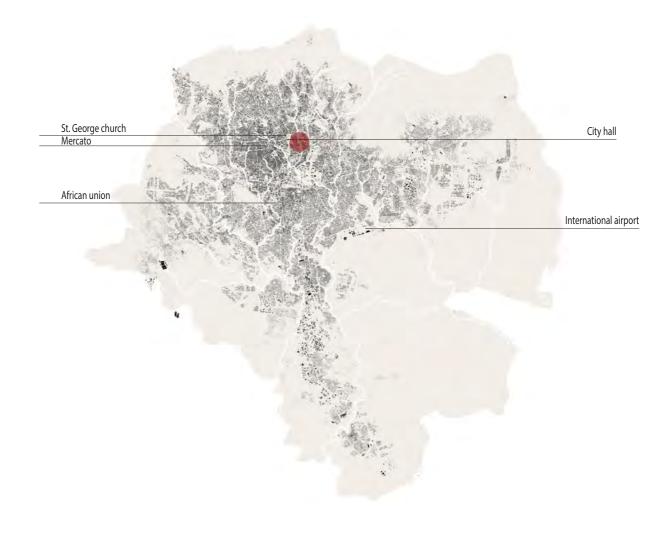


Site analysis 105

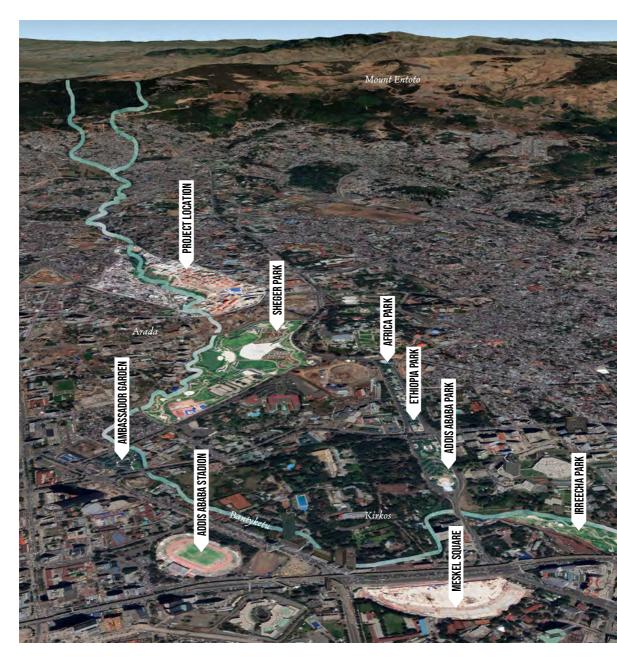
Site location

Focal point in Addis Ababa

The chosen location is Piassa. It is located in the heart of the city, in the focal point of important historic, social, infrastructural buildings and places.



Linked by Bantyketu Important locations in Addis Ababa





The Bantyketu river crosses the site and connects it with many important locations in Addis Ababa such as the Sheger Park or Meskel Square. It is also a part of the second phase of the Beautifying Sheger project, which will transform the site completely. Next to Sheger Park, the first phase of the Beautifying Sheger project is under construction and should be finished by the end of this year.

Important buildings

near and on location

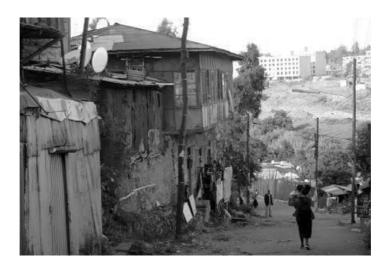
Because of the proximity of important buildings such as the City Hall and the St. George Church, it is one of the prime locations in Addis Ababa. Real estate exerts a lot of pressure on these kind of areas. Building on these plots can be very lucrative.





Topography

The site has a steep terrain, especially near the river banks. Nevertheless there is also housing on unfavourable steep plots and even on flood-prone plots close to the river.





105 m

0 m



Development through time

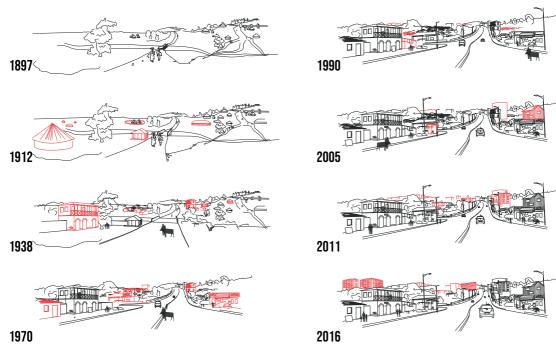
urbanisation

Looking at the development though time, it is clear that the location is a prime location in the hearth of the urban metropolis. Also, urbanisation is clearly present, over a course of 150 years, the city became eight times as big as in the end of the 19th century.

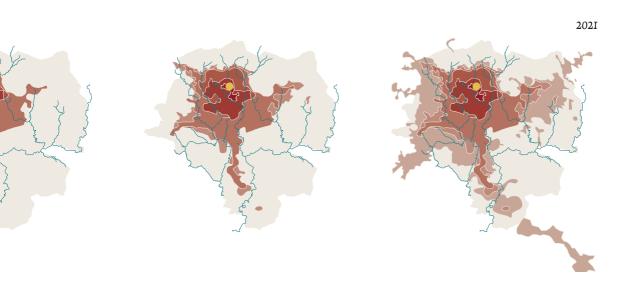








Source: collective booklet: "Addis Ababa as a Palimpsest"



Evolution of dwelling types on site

from small scale hut to large scale condominium blocks

Historically, various housing types have been built on site. Ranging from small huts to large-scale condominium housing.











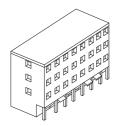


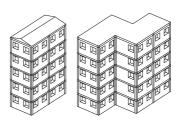
Tukul hut

Foreign influenced hut

Arm influence













enian d dwelling

Building block

Condominium block

202I



2000

The location was fully built with kebele housing in 2000. Currently a large part of the site has been demolished and replaced by (20/80) condominium housing. The remaining kebele housing is threatened by the pressure from the real estate market, due to its prime location. Also the second phase of development of the Sheger Beautifying project will soon be initiated.



2021



Kebele Small scale Threatened by demolition

Condominium Large scale Result of previous demolition



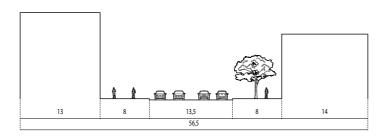


Site analysis

street condition

The main street is characterised by wide roads and pedestrians paths to provide for a large amount of traffic.





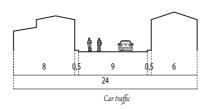


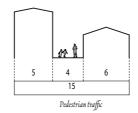
Site analysis

in-between condition

Inside the site, small scale pedestrian paths run in all directions surrounded by kebele housing.







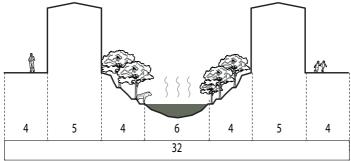


Site analysis

river condition

The river condition is characterised by the river and the greenery next to it. The river forms a boundary which can not be passed. Also the terrain is much steeper than in other parts on site.





River as a boundary rivers splits the site in two parts



"The boundary is an edge where things end." Richard Sennett in Building and Duvelling

The river currently forms a boundary. When flooded there are no passageways over the river, so you can not cross it forming a natural, physical boundary. Due to its smell it also forms a mental boundary. The river is a natural physical border which affects the neighbourhoods seasonally. In the rainy season the water reaches a much higher level making it impossible to cross to the other side. When the rainy season is over there is a possibility to cross the river using stepping stones. The stench from animal excrement, human excrement, the river and street waste act as a mental border. Socially, it is a neglected space as the border has been designated a dumping ground. As a result, the two neighbourhoods turn their backs on each other.



PART II: DESIGN PROPOSAL

DESIGN SCALES

XL Neighbourhood

L Sector

M Cluster

S Building

-> 8 design principles

-> 4 urban conditions

-> 2 types of clusters

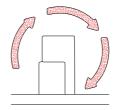
-> 4 building typologies

XL Neighbourhood

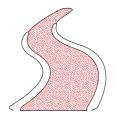
Design strategies 8 key goals



1. **Densify** the neighbourhood



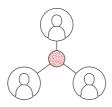
2. **Conserve** existing buildings



3. **Conserve** existing road patterns



4. **Connect** river to neighbourhood



5. **Connect** inhabitants



6. **Mix** income groups



7. **Clean** river



8. **Adapt** to flooding

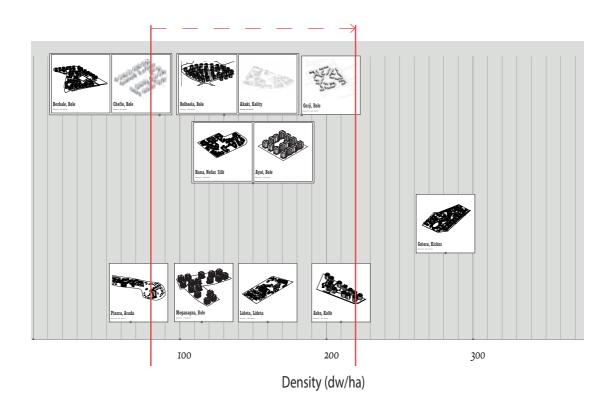
Densify First goal

Currently

Number of Dwellings: 3850 Density: 82 dw/ha FSI: 0,7 GSI: 0,3

Goal

Number of Dwellings: 10000 (x 2,5) Density: 213 dw/ha (x 2,5) FSI: 1,5 (x 2) GSI: 0,3



Decision States

| States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | States | St

Densify, Conserve & Connect Buildings & roads



Residence of Moussie Minas





Condominium blocks





"The border is an edge where different groups interact."

Richard Sennett in Building and Dwelling

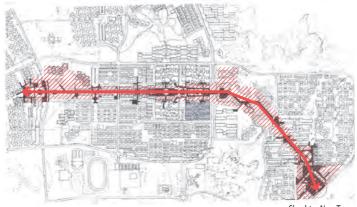
The existing fabric will be replaced with a denser one. The site will be densified by rebuilding certain parts of the site and by building upon currently empty land. However only dilapidated structures will be removed and replaced in order to preserve the collective memory. Also the roads have been preserved and extra connection is added to retain social connections and to make the site more permeable from the outside.



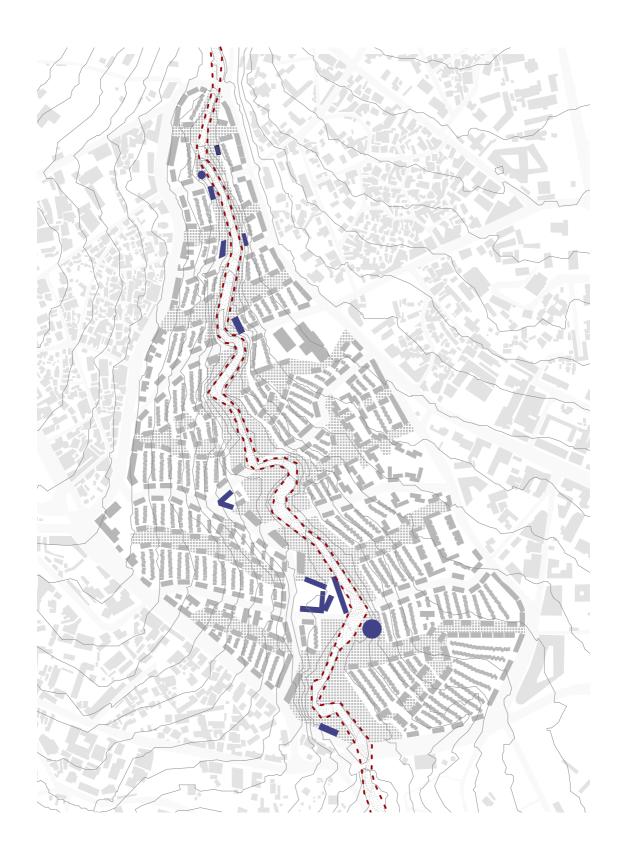
Connect neighbourhood

Large-scale amenities

The river will become the focal point instead of the border, by strategically placing amenities. This concept is inspired by Shushtar New Town, a project by DAZ Architects. The central axis will accommodate the most public and diverse programme in order to activate the waterfront as a central axis.

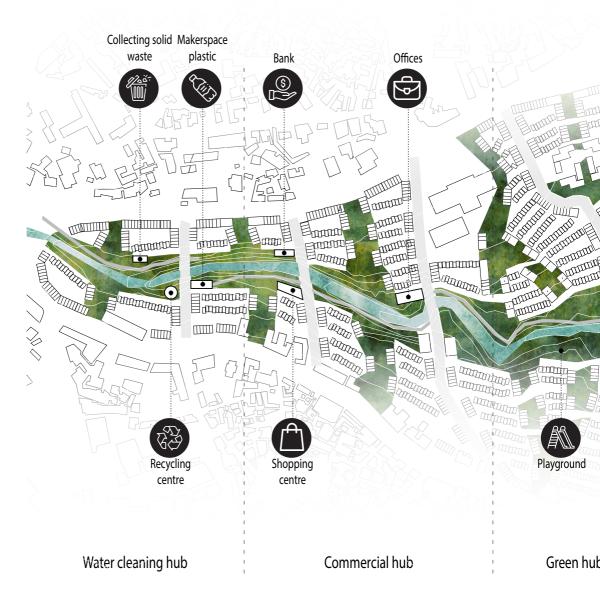


Shushtar New Town
DAZ Architects



Connect neighbourhood

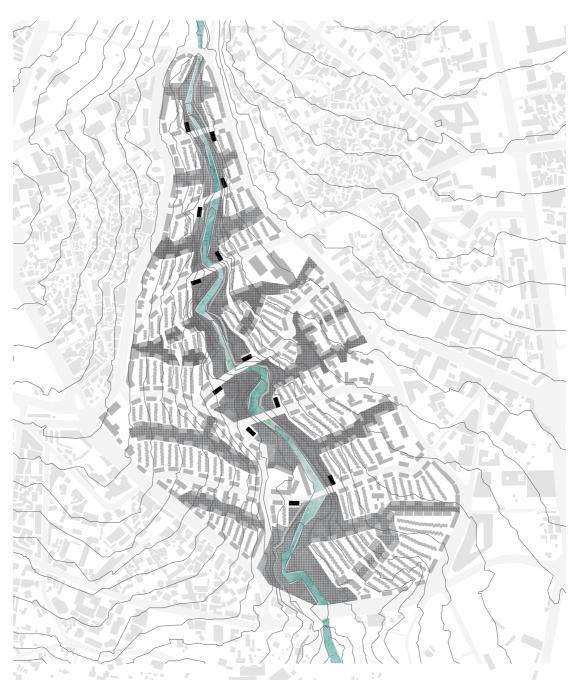
Large-scale amenities



The amenities are frequently located near the river and important pinpoints where people meet and cross. Functions are not randomly distributed along the axis, but they are chosen strategically in accordance with the surrounding functions and building types. The existing school for example is surrounded by amenities which are related to it such as a library or a construction training centre.



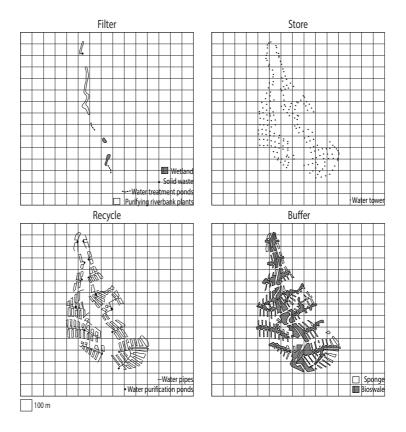
Revert image of living near river by strategically positioning high income inhabitants along it



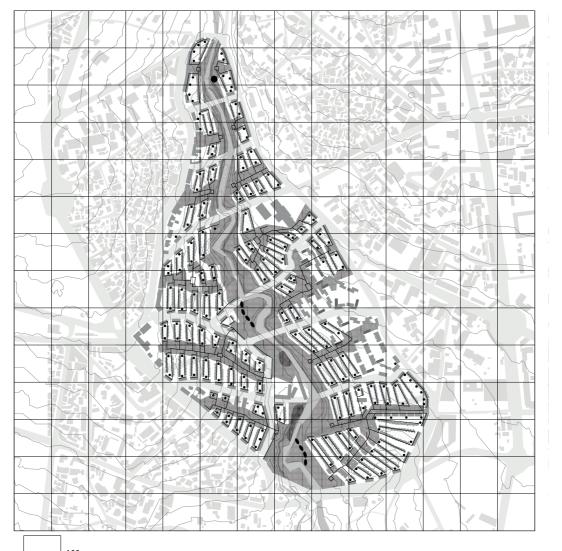
In order to bring attention to the quality of the river, high income building blocks are positioned near the river. To meet the aspirations of these dwellers, active cleaning of the river will be demanded. On the other hand, they have a exclusive view over the riverbank, again meeting their aspiration. Furthermore the buildings act as a landmark for the site, being located next to bridges which cross the river. The proximity of a bridge and a main road ensures a high level of mobility.

Urban water strategy

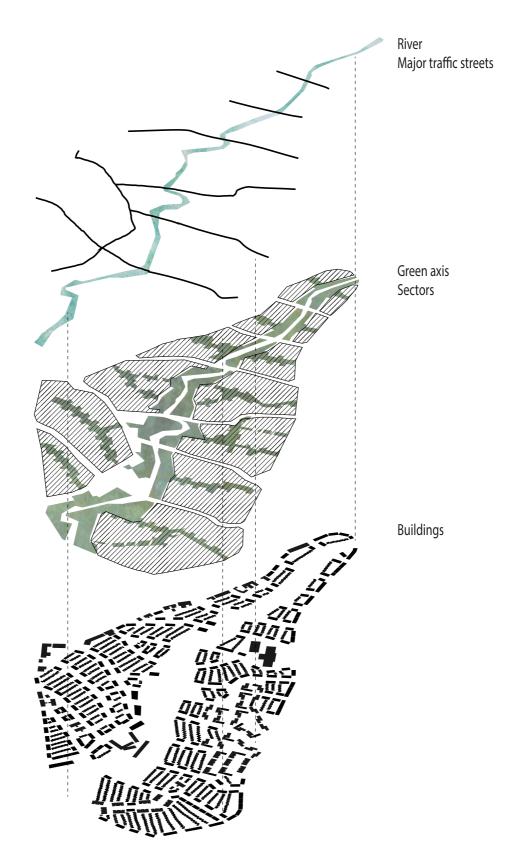
Filter, Store, Recycle and Buffer



The goal of cleaning the river will be reached by a profound urban water strategy which provides for a resilient base to clean the river and to keep it clean. The strategy is characterised by its holistic approach, tackling issues at different scales from large to small, in four different ways: filter, store, recycle and buffer. When bringing all the interventions together in one system, the system can be seen as a closed, sustainable system



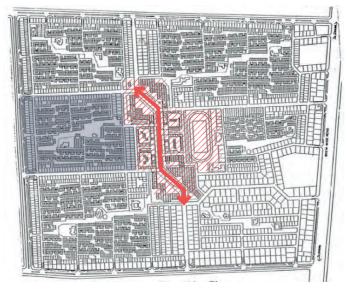
100 m



Backbones of the project

river and green axes define urban scheme

The river and the green axes are the backbones of the urban scheme. These macro-structures define the built and non-built areas, and thus the sectors, while also taking account the urban water strategy. The web of axes forms a continuous green zone near the river and extends towards the outside of the streets in the sectors, connecting the different sectors. The axis widens and becomes smaller to provide diverse meeting places and atmospheres. The hierarchy of axes and connecting sectors, is a concept which is profoundly elaborated on by Doshi in the Aranya project.

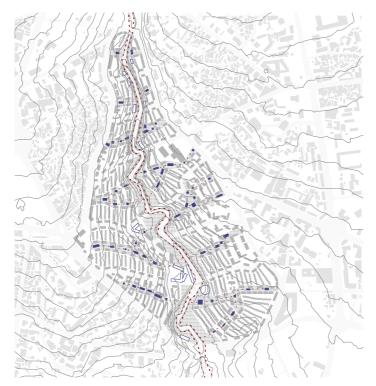


Aranya B.V. Doshi

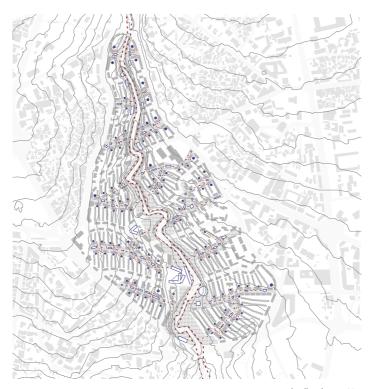
Connect people

mid-scale and small-scale amenities

Similar to large-scale amenities, there are also mid-scale and small-scale amenities to activate the neighbourhood on different scales. They act as a connector between the different scales of the urban scheme. Small-scale amenities are interventions to connect households and clusters, while mid-scale amenities connect multiple clusters in the sector.



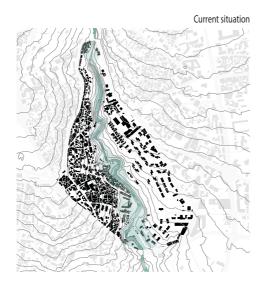
Mid-scale amenities

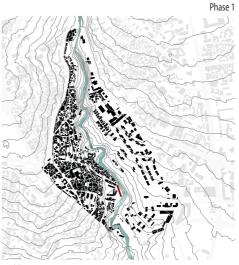


Small-scale amenities

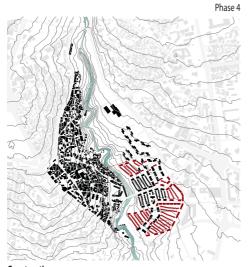
Development Urban scheme

(Re)development in phases

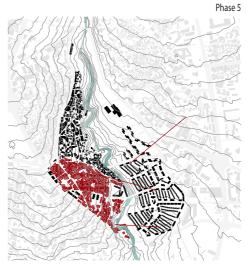




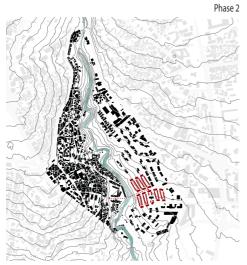
Building up construction training centre Financed: NGO (Selam Children's Village & Training Centres) Built by: building contractor (concrete plateau and wall) local builder (chika wall, roof in corrugated metal)







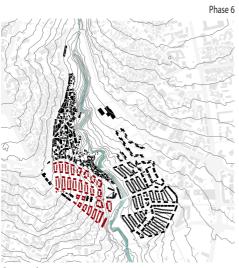
Rearrangement



Phase 3 Rearrangement

Phase 7

ConstructionPUBLIC housing types: 228 PRIVATE housing types: 120 COOPERATIVE types: 336

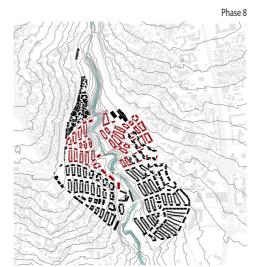


Construction PUBLIC housing types: 769 PRIVATE housing types: 395 COOPERATIVE types: 1134



Development Urban scheme

(Re)development in phases

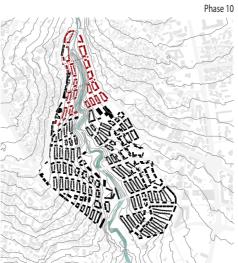


Construction

PUBLIC housing types: 941 PRIVATE housing types: 495 COOPERATIVE types: 1386



Rearrangement



Construction

PUBLIC housing types: 513 PRIVATE housing types: 285 COOPERATIVE types: 756



L Sector

Urban configuration

Four urban conditions

On the scale of the sector, four linear structures can be defined. Each defined by their own characteristics such as geometric configuration, building height, wideness or steepness. Each type accommodates different uses. It is inspired by the different urban configurations that can currently be found in Piassa.





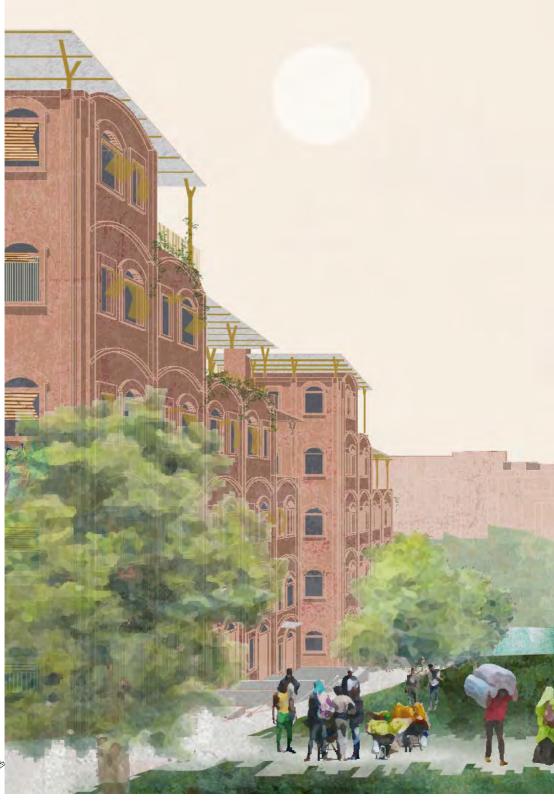








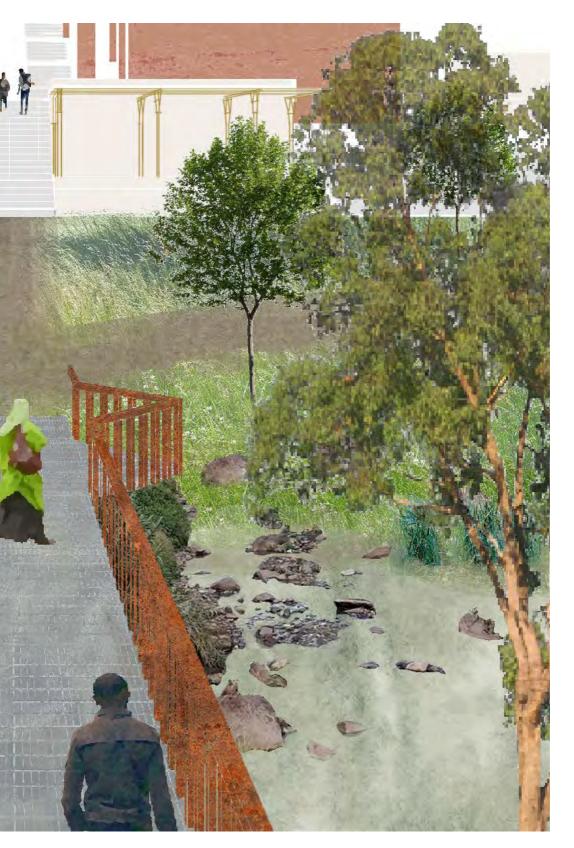








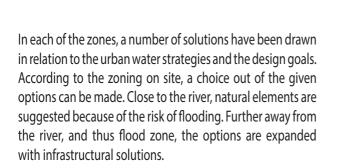


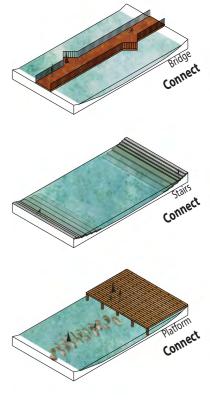


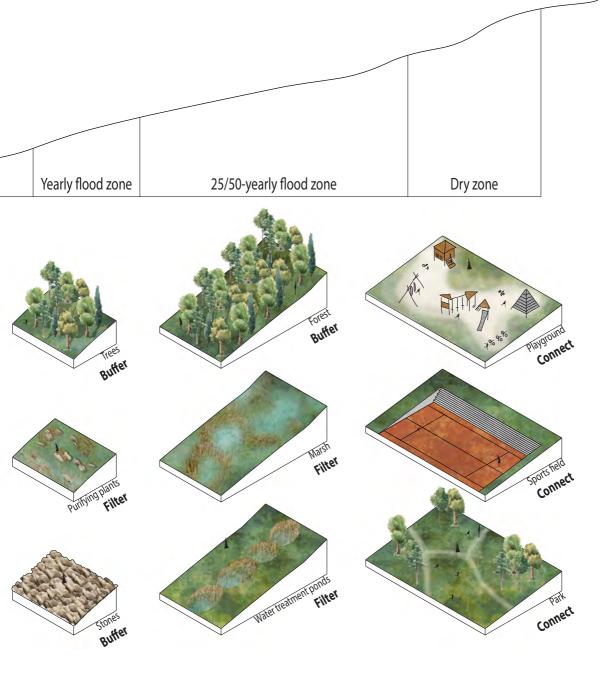
Greenery configuration

Four zones

River zone



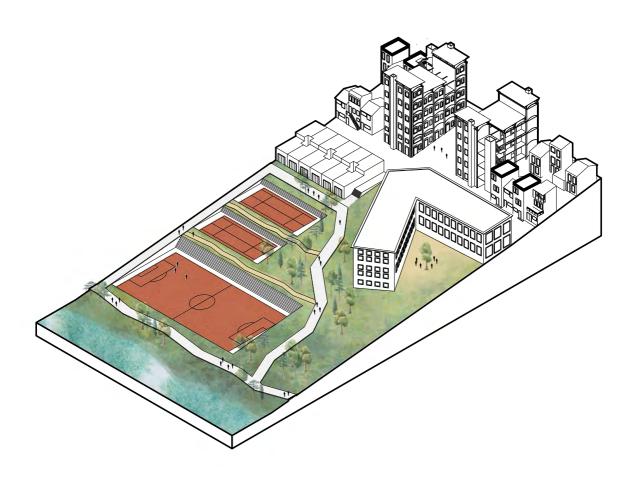




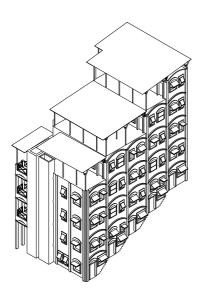
Greenery configuration

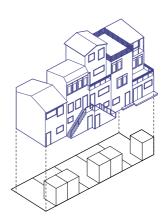
Hypothetical example

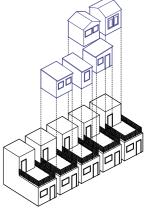
In this axonometric drawing, a hypothetical example of a greenery configuration is shown. Near the river, in the flood zone, one can see trees and pathways. Further uphill there are sport fields and playgrounds. The decision of which solution to pick is always in relation with the surrounding buildings. In this example there is school and workshops nearby. The main users of the spaces will most likely be of a younger age and could potentially make use of the sport infrastructure.



Building typologies adjusted to the urban condition

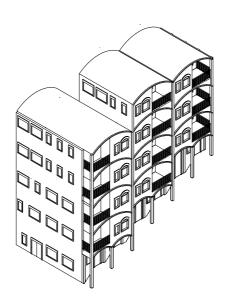


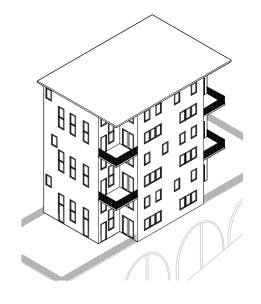










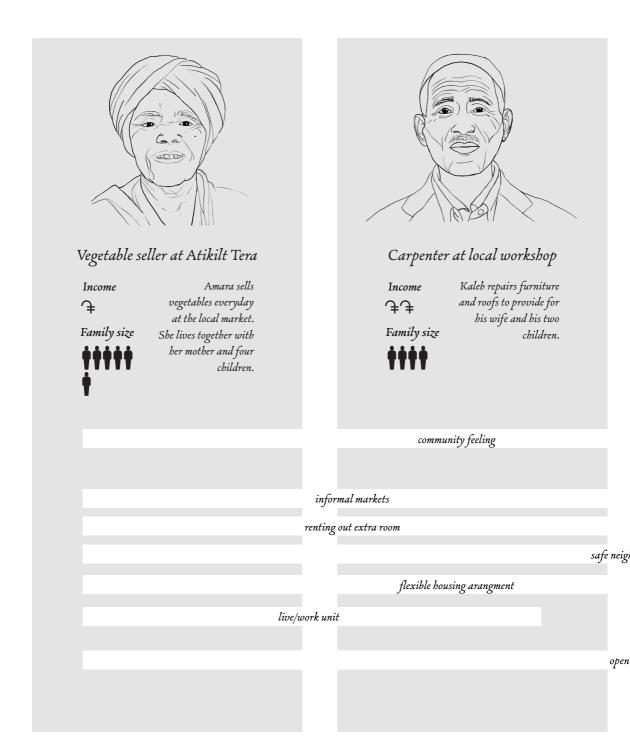






Aspirations

Different aspirations according income group





Teacher at elementary school

Income

争争争

Family size

While her husband is out for work, Kayla teaches children at the local school. Their three kids also go to that particular school.



Employee at embassy

Income

444

Family size

††††

Salim works at the embassy at weekdays and enjoys the weekend with his wife and their two children.

underground parking

elevator

privacy

bbourbood

panoramic view

large balcony

formal shops

space

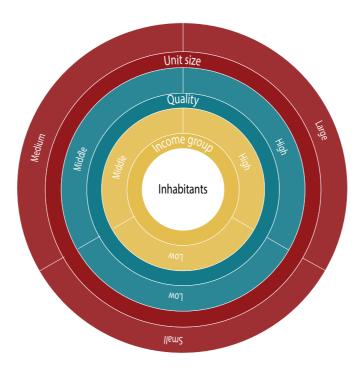
Different target groups

Distinction in type of ownership

In a traditional way, the distinction between groups of people is made upon their income. Subsequent, their ambitions and possibilities are determined by their income. Small, low-quality houses are preserved for low-income dwellers. Large, high-quality houses are destined for high-income dwellers.

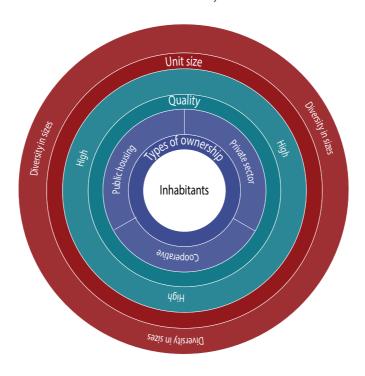
In a more social way, the distinction could also be made upon type of ownership. Households who are interested in buying a house, have different wishes than people who rent. In the project, the second approach is chosen. The different apartment types are not categorised in matter of size or quality, but rather in specificities of the way of living in those apartments, such as rent-out rooms or live-work apartments.

<u>Traditional chart</u> Undesirable distinction



Proposed chart

Desirable diversity

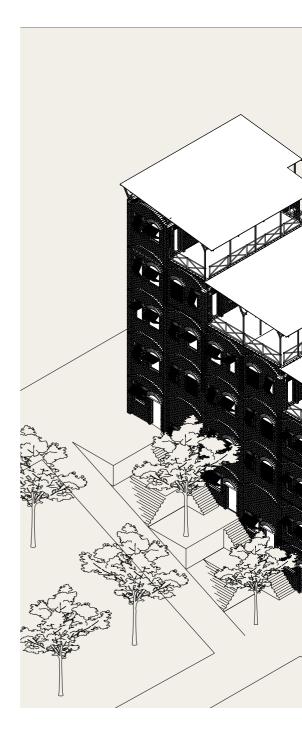


Building typologies

EWS - Park building

The park building is located at the end of the cluster, adjacent to the green axis. The building is developed in a way so that it can accommodate the needs of the future dwellers. The main entrance is on the inner side of the cluster, shops are located on the outer side of the building. According to the aspirations of the future dweller, there are rent-out rooms, open collective spaces throughout the building and informal shops on the ground floor.









Amara

Amara sells vegetables everyday at the local market. She lives together with her mother and four children.

Job

Vegetable seller at Atikilt Tera

Income

 $\widehat{}$

Family size



Aspirations

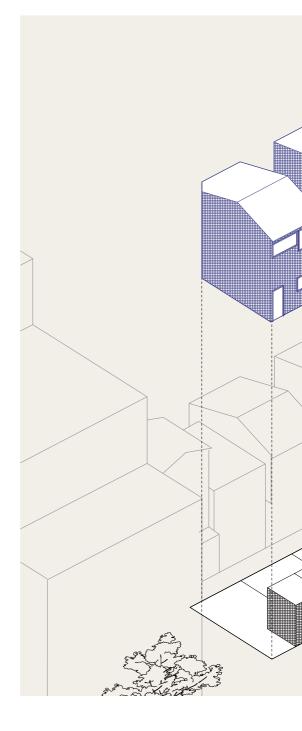
Community feeling
Informal markets
Renting out extra room
Safe neighbourhood
Flexible housing arangement
Live/work unit
Open space

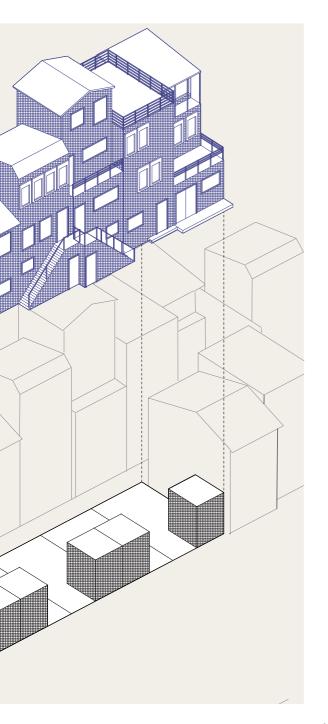
Building typologies

LI - Incremental building

The core of the cluster consists of back to back land-bound houses. In this category there are two housing types, a starters home and a sites and services plot. Both types encourage incremental growth by the inhabitants. By only providing the utmost necessities such as a waterproof house, tap water and access to the drainage system, the investment can be spread through time. In this way such houses become affordable. Also future dwellers can change the spatial configuration as they wish. On steep terrain, plots have a private garden, on less steep terrain, there is collective courtyard.









Carpenter at local workshop

Income 44

and roofs to provide for his wife and his two Family size children.

Kaleb repairs furniture

community feeling

informal markets

renting out extra room

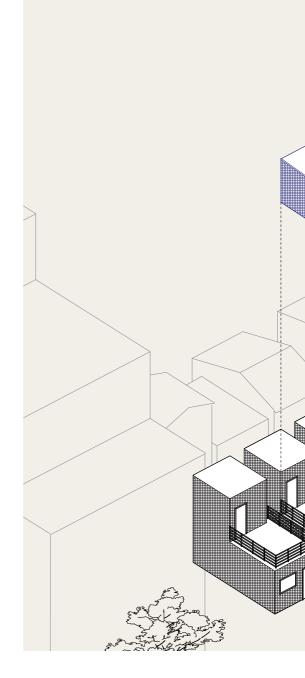
safe neighbourhood

flexible housing arangment

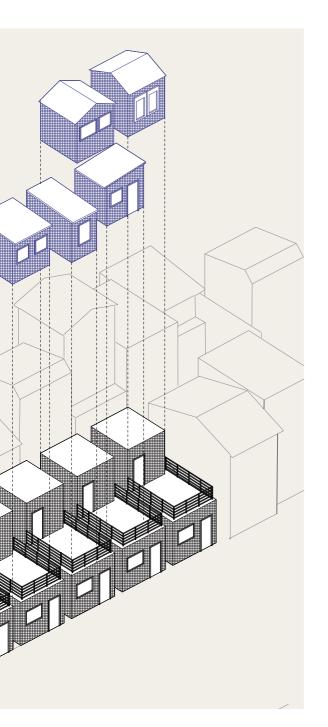
live/work unit

open space

Building typologies LI - Incremental building









Carpenter at local workshop

Kaleb repairs furniture

Income 44

and roofs to provide for his wife and his two Family size children.



community feeling

informal markets

renting out extra room

safe neighbourhood

flexible housing arangment

live/work unit

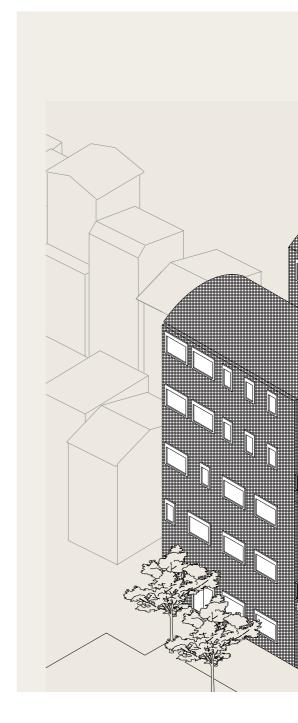
open space

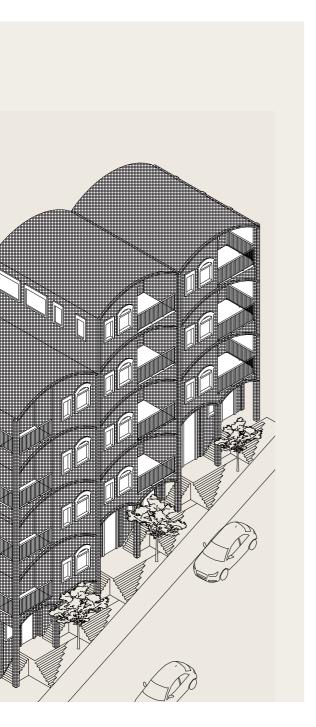
Building typologies

MI - Street building

On the opposite side of the park building, at the end of the cluster, there is the street building. This building type is developed for private sale in which buyers can make minor adjustments but are able to own a fully serviced, modern apartment. This housing type is located near the main streets and has a commercial plinth on the ground floor for formal shops.









Teacher at elementary school

Income

\$\frac{1}{4}\$

Family size

While her husband is out for work, Kayla teaches children at the local school. Their three kids also go to that particular school.

community feeling

underground parking

elevator

safe neighbourhood

flexible housing arangment

large balcony

formal shops

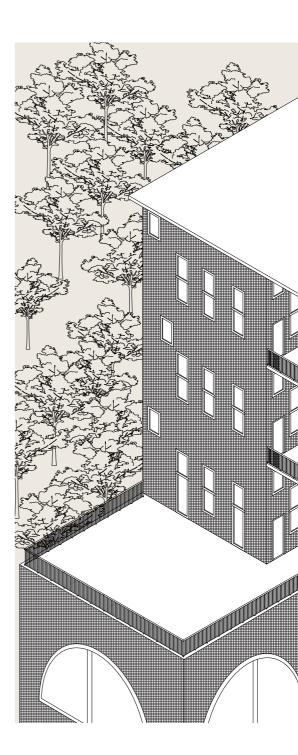
open space

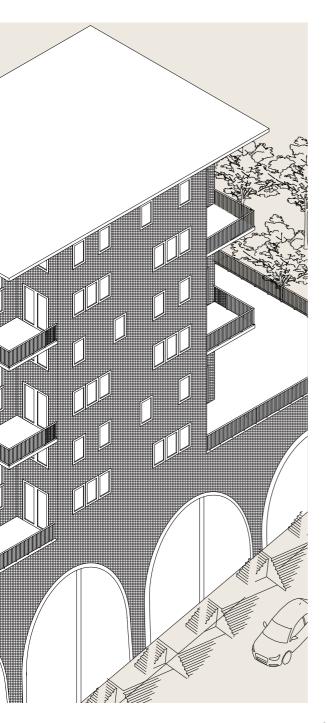
Building typologies

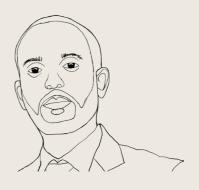
HI - River building

Tower buildings are distributed throughout the site along the river and near the main roads and bridges. The apartment are designed with large balconies and beautiful views on the river and greenery. Also elevators and an underground parking is present. The apartments will be sold on the real estate market as private sale apartments. The plinth consist of functions which are in relation to the lifestyle of the future dwellers, for example a fitness area or restaurant.









Employee at embassy



Salim works at the embassy at weekdays and enjoys the weekend with his wife and their two children.

underground parking

elevator

privacy

safe neighbourhood

panoramic view

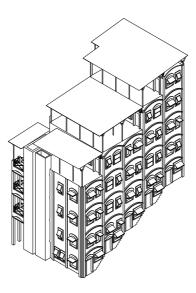
large balcony

formal shops

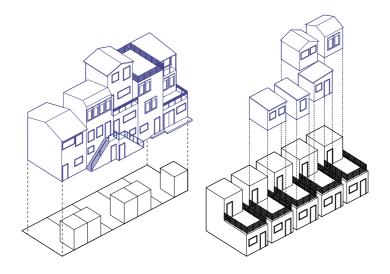
open space

Type of ownership Depending on building block

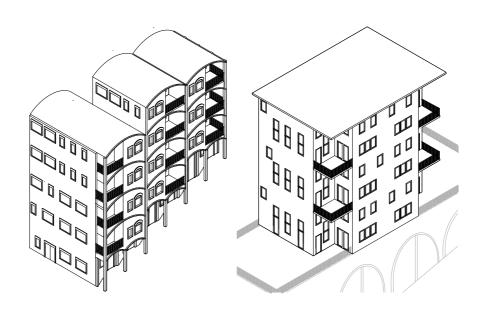
The project is located on a prime location in Addis Ababa. Many people with different backgrounds are interested in living here. This large and diverse group of people is in need of different things, inspiring the designs of particular buildings. Providing a large variety of building types and characteristics is beneficial for a successful social inclusion and mix. Also financially there is a big differences between the interested people. The varying types of ownership gives more opportunities for underprivileged dwellers.



Public housing



Cooperative housing



Private housing

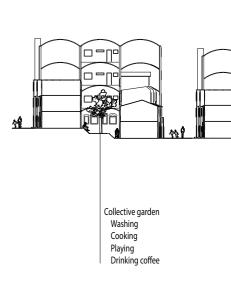
M Cluster

Two type of clusters

Communal compound and byelaw terraced cluster

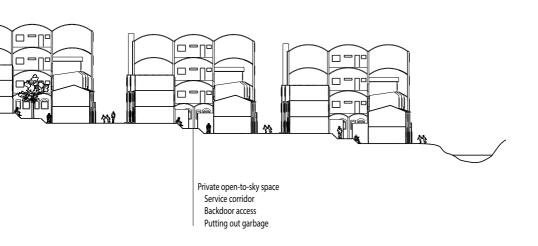
The clusters are composed of an end building, either a park building type or street building type, with in between incremental land-bound houses. In the incremental houses, two types occur. The communal compound consists of back to back houses with a collective courtyard. On the other hand there is the byelaw terraced-cluster which is characterised by private garden plots.

Communal compound





Byelaw terraced cluster



Communal compound

Collective courtyard

The communal compound type is a permeable cluster which is connected with the public space. The courtyard itself is a semi-public space. The courtyard typology fits the lifestyle of current kebele dwellers. Neighbours can remain in close contact thanks to the collective space. In the existing social tissue social bonds are very present. As an ending of the cluster, there is either the park building and/or the street building.



+0 Floor plan



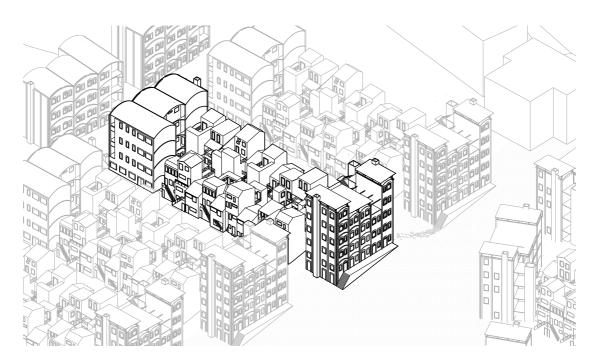
+1 Floor plan



Byelaw terraced cluster

Private gardens

The Byelaw terraced cluster type has private gardens instead of a collective courtyard. The gardens are open-to-sky-spaces and are accessible through a back-door in the collective corridor. The corridor runs through the whole cluster and is connected to the public space. In this way the dwellers have two entrances, one formal and one informal. This typology fits with the lifestyle of other current kebele dwellers. These houses accommodate dwellers who are looking for more privacy. Again, as an ending of the cluster, there is either the park building and/ or the street building.



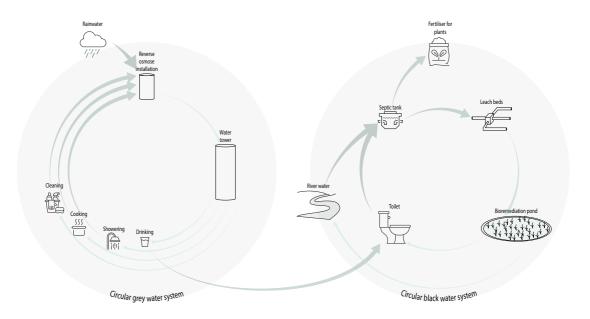
+0 Floor plan



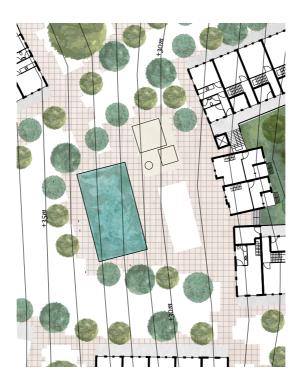
+1 Floor plan



Decentralised water system



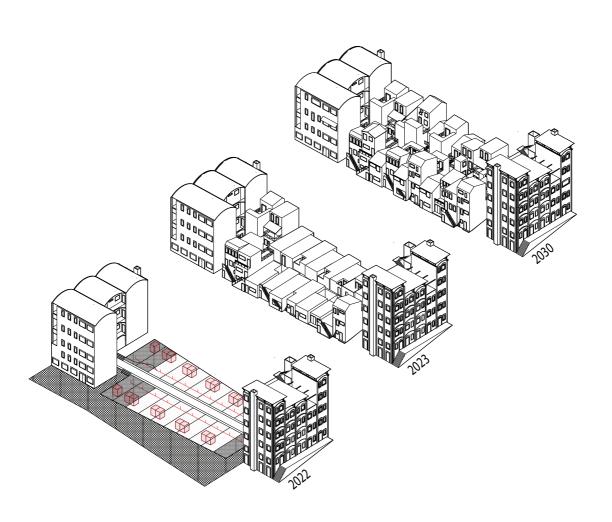
In the core of the green zone a big bioremediation pond is placed. This pond is part of a decentralised water system designed for the site. Since the municipal water supply in Addis Ababa is inadequate, the system is designed to be circular on site. This creates great water provision for the inhabitants and releases pressure on the municipal system. The circular water system will also contribute to further cleansing of the river.



Development through time

Incremental growth

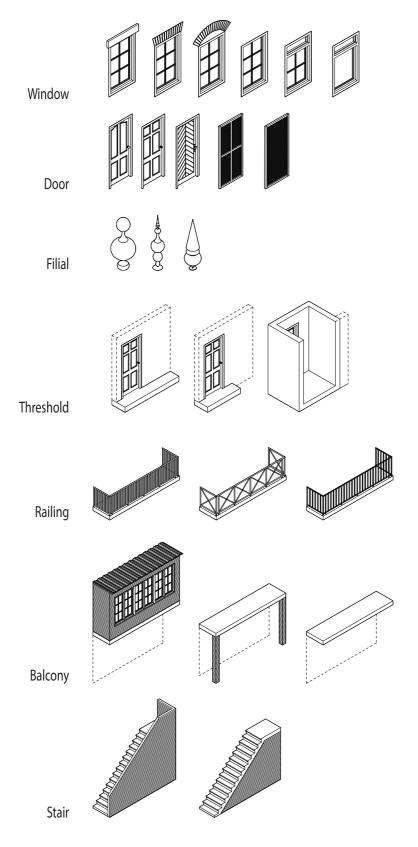
In order to lower the threshold for the (underprivileged) buyers, only the most necessary elements will be constructed. Each cluster type has its own type of incremental growth. In the communal compound, the main idea is to have a collective courtyard. Therefore, horizontal growth towards the courtyard is not preferable. To avoid such evolutions, a starters home will be constructed which clearly demarcates the boundary. The starters home is a simplistic small house with sanitation, a kitchen and 1 bedroom. It is up to the future dweller to grow, but only in a vertical direction. In the Byelaw terraced cluster however, only a small hub is constructed, consisting of sanitation. The rest of the plot is at the disposal of the dweller. According to the wishes of the dweller, one could choose for a larger garden, while someone else chooses for a fully built garden.



Building components

Incremental growth typology

The future dwellers have the possibility of incrementally building their house. As a starting point they are provided with either a starters home or a sites & services plot. On site their is a construction training centre at which the knowledge will be available to build up the house in different ways, using local vernacular elements, according to the desires of the dwellers. These building components can be bought at the construction training centre or they can even be built by local trainees of the construction training centre. This service is an addition to the general task of the construction training centre. The main task is to provide materials and labour for the development of the starters homes and the other buildings on the site, such as the park building and the street building.



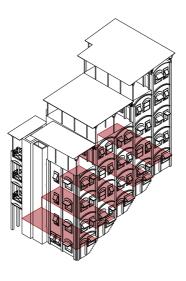
Cluster 201

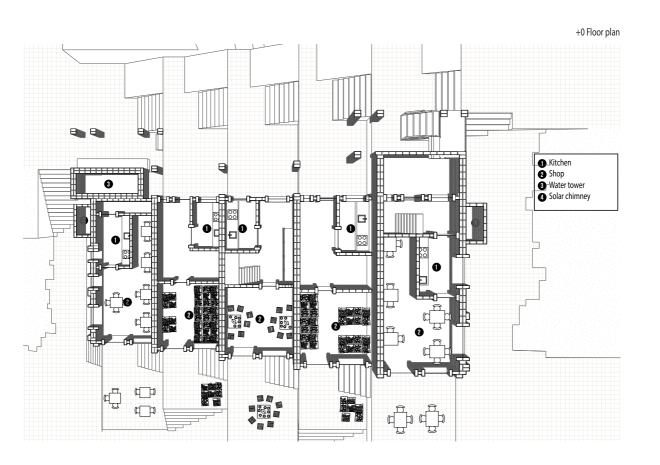
S Park building

Park building

Adjusted to steepness terrain

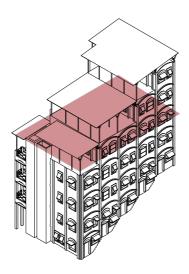
The park building is a 4-5 storey high building next to the green axes in the project. It is characterised by its two façades. A formal facade facing the green park and an informal facade on the inner side of the courtyard. The ground floor is reserved for small live-work apartments. Due to the steepness of the terrain, the apartments are stacked in a specific way to avoid staggering storey heights. The solar chimney on the sides of the building take care of the ventilation of the different apartments. On the side of the courtyard, there are water towers. Rain water is caught and stored in these water towers and the water is accessible in periods of drought.



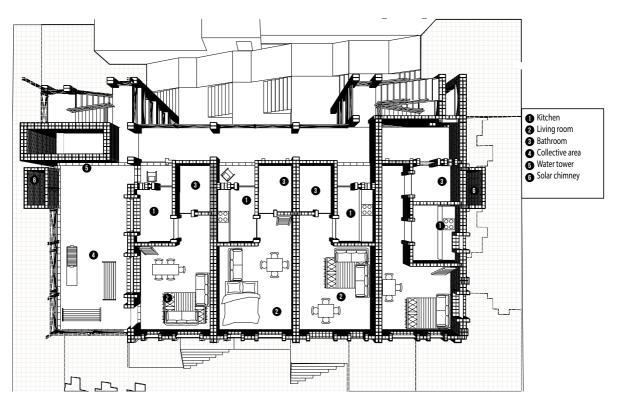


Park building Third storey

The circulation of the building lies on the courtyard side and the individual dwellings are accessible through galleries and two staircases (in case of a fire outbreak). On several places in the buildings there are collective spaces to encourage social interactions and casual conversation between neighbours. For example, near the water tower there is small meeting space. On the roof there are multiple roof terraces with a view on the river, thanks to the topography of the terrain.



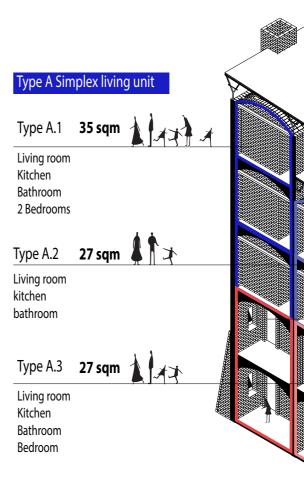
+3 Floor plan

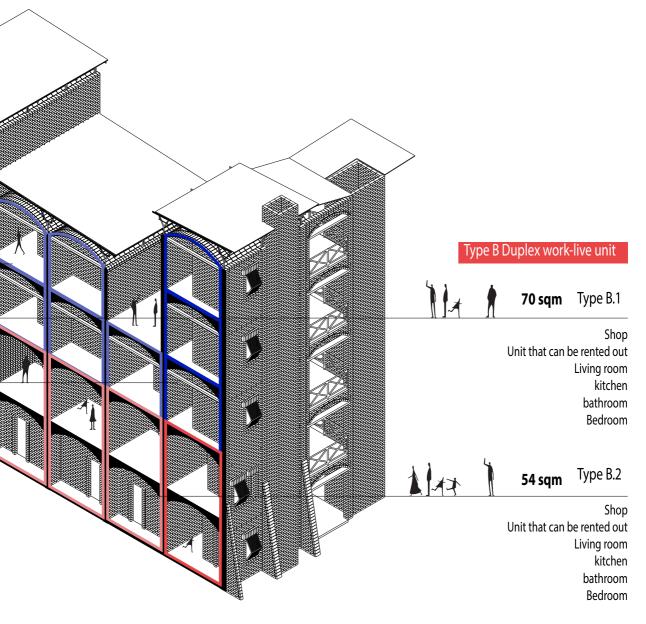


Park building

Distribution of units

When looking at a vertical section, it is clear that the building consists of stacked units with varying layouts. In general there are the simplex living units ranging from small units to larger units which often have a rent-out room. This is a common request of local dwellers. On the two lowest storeys there are the duplex work-live units with a work function on the ground floor.

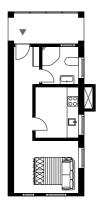




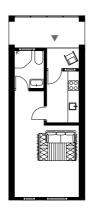
Park building Typical floor plans

There are three different configurations of the simplex unit, although they follow the same design principles. The units are accessible through the staircases and the galleries. Wet zones, kitchen and bathroom, are always close to each other and ventilated. They are located near the entrance door, while the living room/bedroom can be found on the park side of the building. These rooms have the best views of the units. Units on the corners have three façades, the others have two.

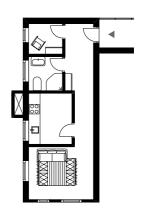
The duplex units have a small shop and kitchen on the ground floor and the bedroom/living room and bathroom on the first floor are accessible by an internal staircase. Some units also have a rent-out room which can be reached through the gallery on the first floor.



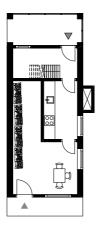
Type A.1

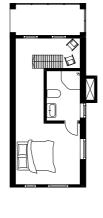


Type A.2



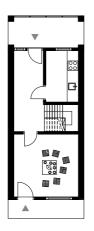
Type A.3

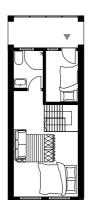




Type B.1

Plan 1





Type B.2

Plan 1

ENVIRONMENTAL SUSTAINABILITY

Uniformity in materials

Qualitative affordable housing

In general, many dwellers in the informal segment have the aspiration of living in a concrete building, as it is representative for a step-up and quality. However concerning the environmental impact of concrete, it is not a preferable building material, also the cost and level of difficulty is high. Therefore CSEB blocks provide a good alternative. This cheap material can be produced and manufactured on site improving the level of knowledge of local builders and staying low in budget. In order to wipe out the mental image of CSEB blocks, also the high income buildings will be constructed witch CSEB blocks. In this way there will be no visual difference in material between high-income housing and low-income housing.

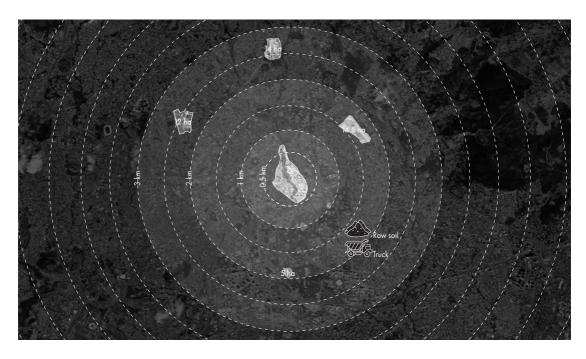




Environmental sustainability

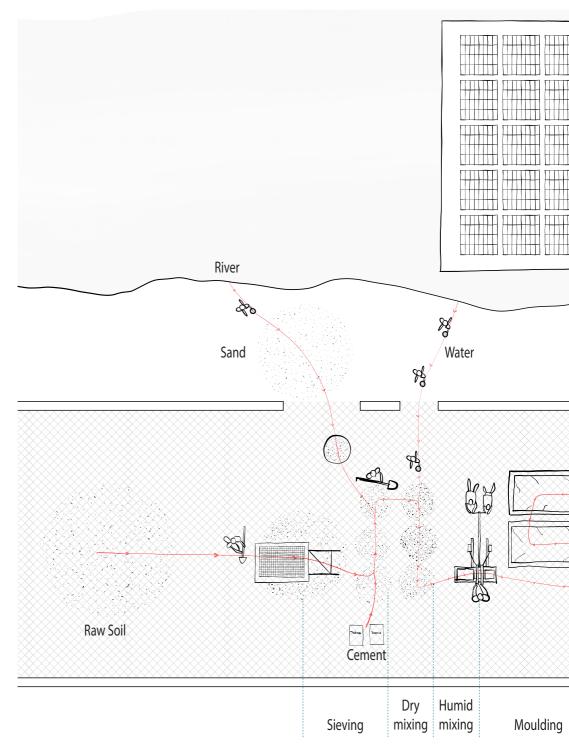
Local available building materials Characteristics & available site for sand

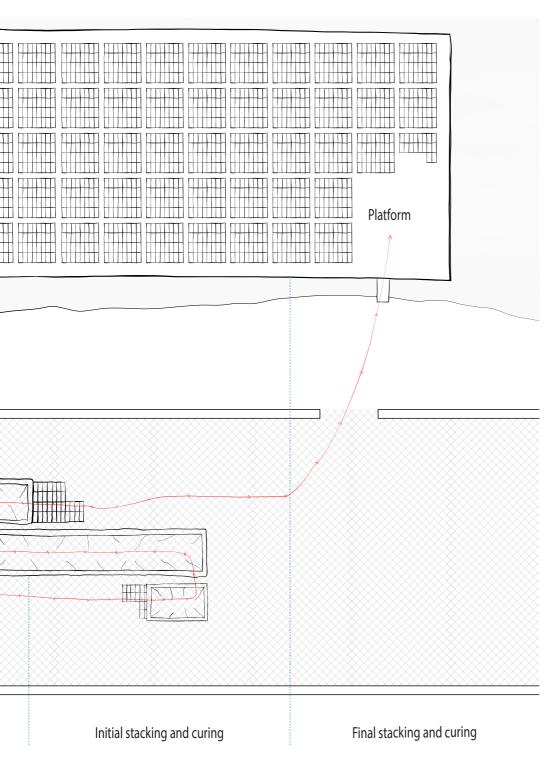
Building Material	Adobe blocks	Compressed earth blocks	Compressed stabilised earth blocks	Rammed earth	Concrete	Steel	Bamboo
Composition	Earth, straw, water	Earth, water	Earth, water, sand, lime or cement	Sand, gravel, clay	Stone, cement, sand, water	Steel	Bamboo
Time for production				-	+	++	++
Price	++	++	+	+	-	-	++
Resistance to moisture	-		+		++	++	-
Local/Imported	Local	Local	Local	Local	Imported	Imported	Local
Availability	++	++	+	++		-	++



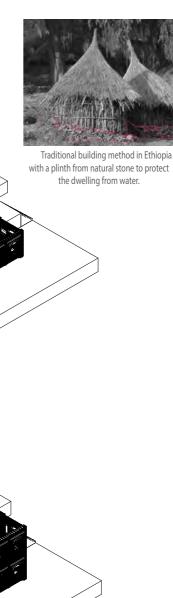
When comparing different commonly used materials in Addis Ababa, the CSEB blocks come out as the best, thanks to the local availability, price and resistance to moisture.

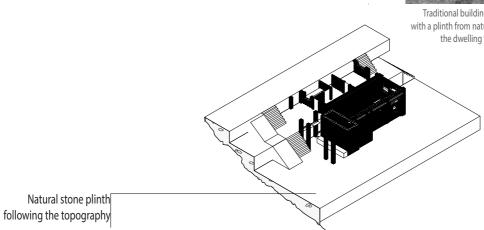
The main components of the building material can also be found very close by. In a radius of 3 km several sites can be found with hectares of raw material, which are earth and sand. Even on site many components are already present. On the next page the production process is drawn. It is clear that this way of building is very site specific and in a way poetic. Using the materials on site to build a better environment than it was before.

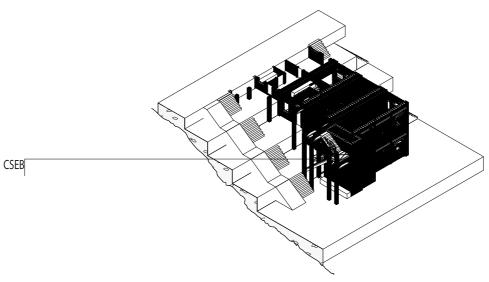


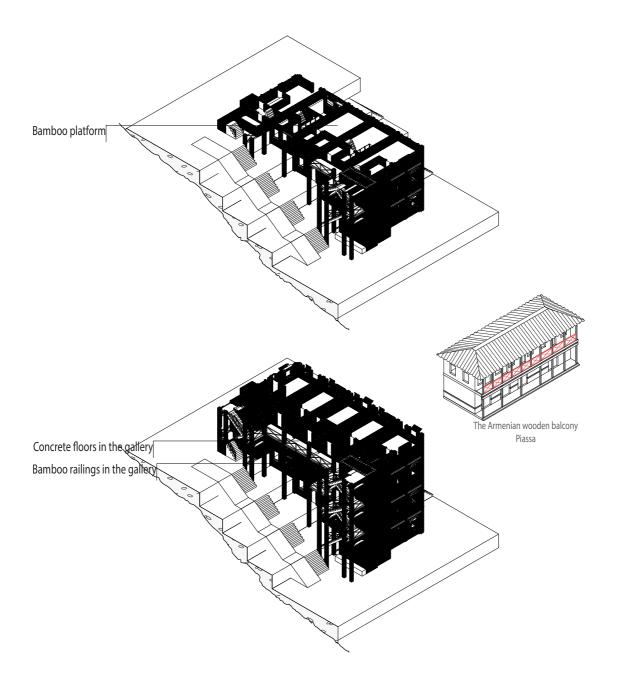


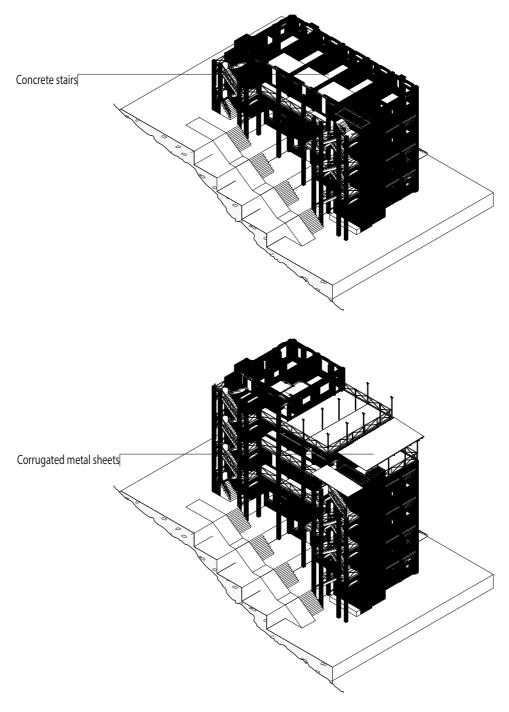
Environmental sustainability



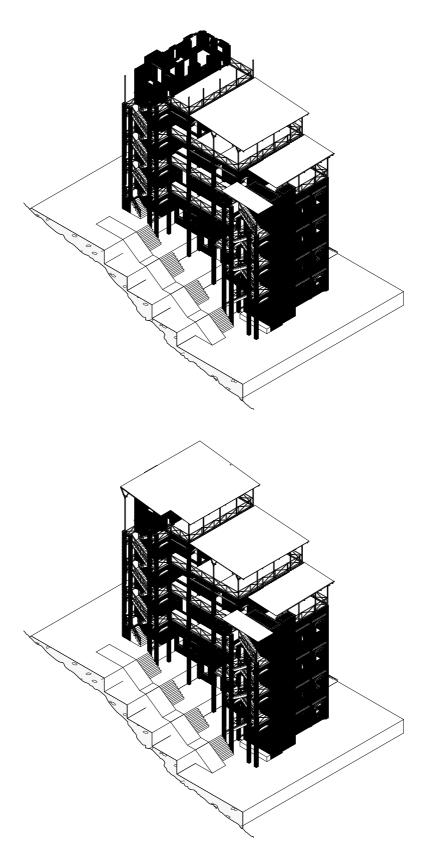






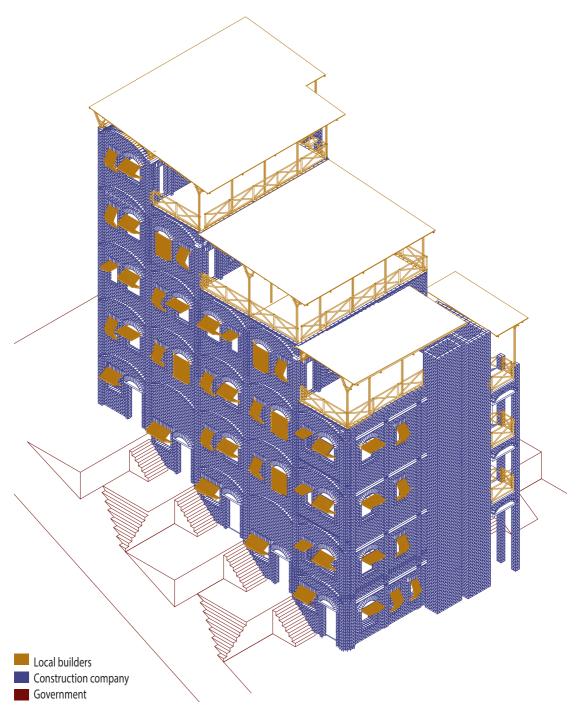


Environmental sustainability 222



Environmental sustainability 223

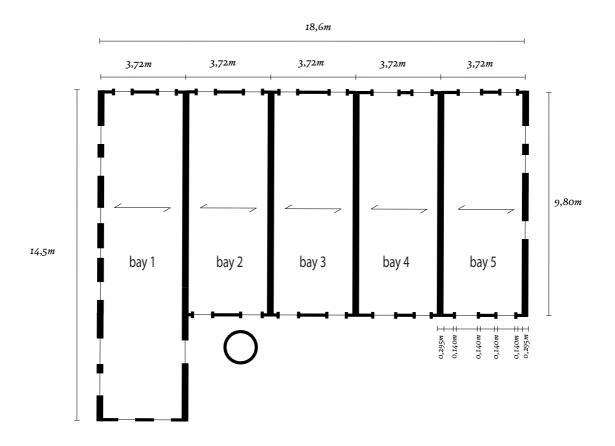
Type of craftsmanship



The buildings are constructed in layers, storey by storey, as can be see in the previous exploded drawings. Moreover the building process follows a clear sequence. The construction company is responsible for building the structural walls and beams. The local builders, which are connected to the construction training centre, will build the non-constructive elements such as the secondary roofs, fences, shutters or non-bearable walls and floors. After the construction company finishes the main construction, the local builders start with the finishings. Both parties will work in a sequence. In this way each party has its own defined activities, and thus liability is clearly separated.



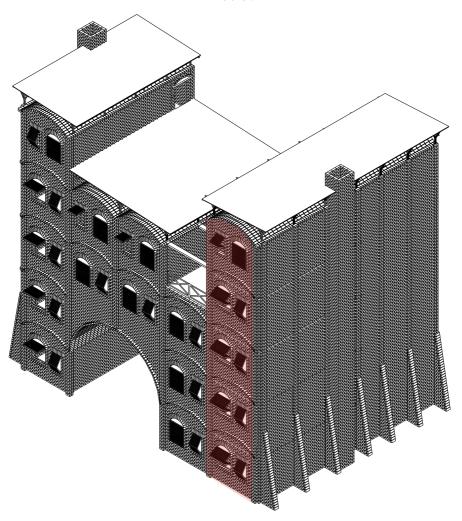
The building has equally distributed bays in order to keep the same width for the arches. This way they can take on the same curve, and exert the same horizontal forces on each other.



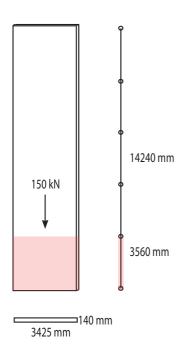


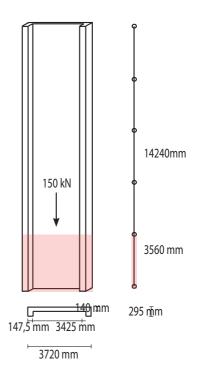
- 1. Buckling wall
- 1.1. Non-load bearing wall

It is chosen to dimension the bay which consists of five stories, since this is the worst situation for buckling. If this wall will not buckle, it can be assumed that the others will neither.



Stability Quantitative calculation



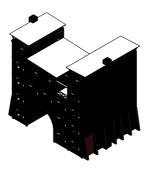


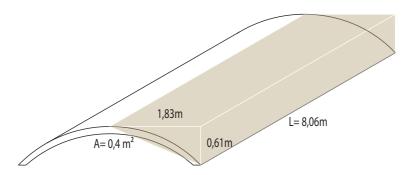
$$\begin{split} E_{\text{CSEB}} &= 3750 \text{ N/mm}^2 \\ I &= 1/12*b*h^3 = 1/12*3425*140^3 = 783*10^6 \text{mm}^4 \\ F_{\text{crit}} &= (\pi^{2*}\text{E*I})/(\text{K*L})^2 = (\pi^{2*}3750*783*10^6)/(1*\underline{3560})^2 = \underline{2286 \text{ kN}} \\ F &= 2200 \text{ kg/m}^{3*} (3,425*0,14*14,24)\text{m}^3 = 150 \text{ kN} \\ F &< F_{\text{crit}} \end{split}$$

$$\begin{split} E_{CSEB} &= 3750 \text{ N/mm}^2 \\ I &= 1858*10^6 \text{mm}^4 \\ F_{crit} &= (\pi^{2*}\text{E*I})/(K^*\text{L})^2 = (\pi^{2*}3750^*\underline{1858*10^6})/(1^*3560)^2 = \underline{5425 \text{ kN}} \\ F &= 2200 \text{ kg/m}^{3*} (3,425^*0,14^*14,24)\text{m}^3 = 150 \text{ kN} \\ F &< F_{crit} \end{split}$$

1. Buckling wall

1.2. Load bearing wall





 $\frac{Vault:}{0,4\,m2^*8,06m^*2200\,kg/m^3\,*10N/kg} = 70,9\,kN$ Self weight/meter = 70,9kN / 8,06m = $8,80\,kN/m$

Sand:

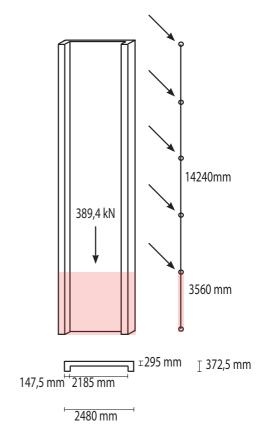
Self weight/meter = ((1,83m*0,61m*1m)/2)*1500kg/m³ *10N/kg = 8,3kN/m

Stability Quantitative calculation



Vault: 8,8 kN/m / 2 * 2,48m = 10,9 kN Sand: 8,3 kN/m * 2,48m = 20,6 kN Typical load dwelling: 2 kN/m²* 2,48m * 1,83m = 9,1 kN

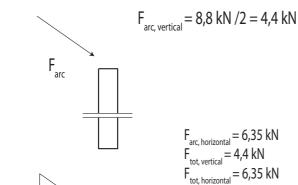
Total force = 40,6 kN

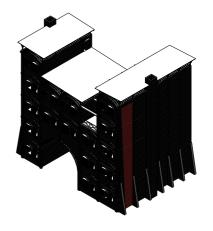


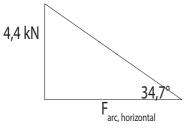
$$\begin{split} E_{CSEB} &= 3750 \text{ N/mm}^2 \\ I &= 5945*10^6 \text{mm}^4 \\ F_{crit} &= (\pi^{2*}E^*I)/(K^*L)^2 = (\pi^{2*}3750^*5945^*10^6)/(1^*3560)^2 = 17 \ 361 \ \text{kN} \\ F &= 2200 \ \text{kg/m}^{3*} \ (2,48^*0,295^*14,24) \text{m}^3*10 \text{N/kg} + \underline{4^*40\ 600N} = 391,6 \ \text{kN} \\ F &< F_{crit} \end{split}$$

2. Compression wall Load bearing wall

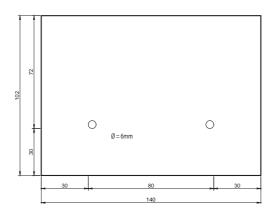
Level 5







This would mean that a 3,5m high wall should be 5.5m thick. As an alternative solution it was decided to work with tie rods in concrete to take the horizontal forces.



Yield stress structural steel = 220 N/mm²

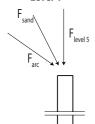
Area $_{min}$ = tensile force / stress $_{max}$ = 6350 N / 220 N/mm 2 = 28,8 mm 2 Radius = square root (Area $_{min}$ / π) = 3 mm

 $Diameter_{min} = 6 mm$

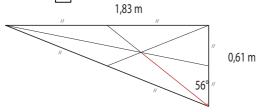
The concrete beam is designed with 2 steel rods from 6mm to include extra safety. A concrete cover of 30 mm is ensured around the steel rods.

Stability Quantitative calculati

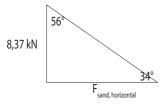
Level 4



$$\begin{split} F_{level,5} &= F_{tot\,5,\,vertical} + F_{wall} = 4,4\,\,kN + (3,56m^*0,295m^*1m)^*\,\,2200\,\,kg/m^{3*}10N/kg = 21\,\,kN \\ F_{arc,\,vertical} &= 4,4\,\,kN \\ F_{arc,\,horizontal} &= 6,35\,\,kN \\ F_{sand,\,vertical} &= (1,83m^*\,0,61m^*1m)/2^*\,1500\,\,kg/m^{3}\,^*10N/kg = 8,37\,\,kN \end{split}$$



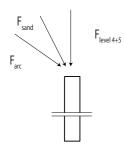
The triangle medians are drawn to determine the centroid. F_{sand} goes through this centroid and the support point.



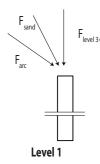
 $F_{sand,horizontal}=12,4 kN \\ F_{tot,vertical}=8,37 kN+4,4 kN+4,4 kN+23 kN=40,17 kN \\ F_{tot,horizontal}=6,35 kN+12,4 kN=18,75 kN \\ This would mean that a 3,5m high wall should be 1,63m thick. As an alternative solution it$

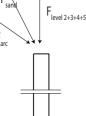
was decided to work with tie rods in concrete to take the horizontal forces.

Level 3



Level 2





$$\begin{split} F_{level\,4+5} &= F_{tot\,4,\,vertical} + F_{wall} = 40,17\;kN + (3,56m^*0,295m^*1m)^*\,2200\;kg/m^{3*}10N/kg = 40,4\;kN \\ F_{arc,\,vertical} &= 4,4\;kN \\ F_{arc,\,horizontal} &= 6,35\;kN \\ F_{sand,\,vertical} &= 8,37\;kN \\ F_{sand,\,horizontal} &= 12,4\;kN \\ F_{tot,\,vertical} &= 63,17\;kN + 4,4\;kN + 8,37\;kN = 75,94\;kN \\ F_{tot,\,horizontal} &= 6,35\;kN + 12,4\;kN = 18,75\;kN \end{split}$$

This would mean that a 3,5m high wall should be 0,86m thick. As an alternative solution it was decided to work with tie rods in concrete to take the horizontal forces.

$$\begin{split} F_{level\,3+4+5} &= F_{tot\,3,\,vertical} + F_{wall} = 75,94\,kN + (3,56m*0,295m*1m)*\ 2200\,kg/m^3*10N/kg = 98,94\,kN \\ F_{arc,\,vertical} &= 4,4\,kN \\ F_{arc,\,horizontal} &= 6,35\,kN \\ F_{sand,\,vertical} &= 8,37\,kN \\ F_{sand,\,vertical} &= 12,4\,kN \\ F_{tot,\,vertical} &= 98,94\,kN + 4,4\,kN + 8,37\,kN = 111,7\,kN \\ F_{tot,\,vertical} &= 6,35\,kN + 12,4\,kN = 18,75\,kN \end{split}$$

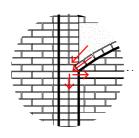
This would mean that a 3,5m high wall should be 0,59m thick. As an alternative solution it was decided to work with buttresses to take the horizontal forces.

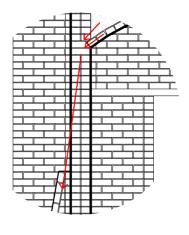
$$\begin{split} F_{level\,2+3+4+5} &= F_{tot\,2,\,vertical} + F_{wall} = 111,7\,\,kN + (3,56m*0,295m*1m)*\,2200\,\,kg/m^{3*}10N/kg = 134,7\,\,kN \\ F_{arc,\,vertical} &= 4,4\,\,kN \\ F_{arc,\,horizontal} &= 6,35\,\,kN \\ F_{sand,\,vertical} &= 8,37\,\,kN \\ F_{sand,\,vertical} &= 12,4\,\,kN \\ F_{tot,\,vertical} &= 134,7\,\,kN + 4,4\,\,kN + 8,37\,\,kN = 147,47\,\,kN \\ F_{tot,\,horizontal} &= 6,35\,\,kN + 12,4\,\,kN = 18,75\,\,kN \end{split}$$

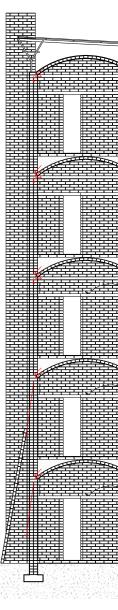
This would mean that a 3,5m high wall should be 0,49m thick. As an alternative solution it was decided to work with tie rods in concrete to take the horizontal forces.

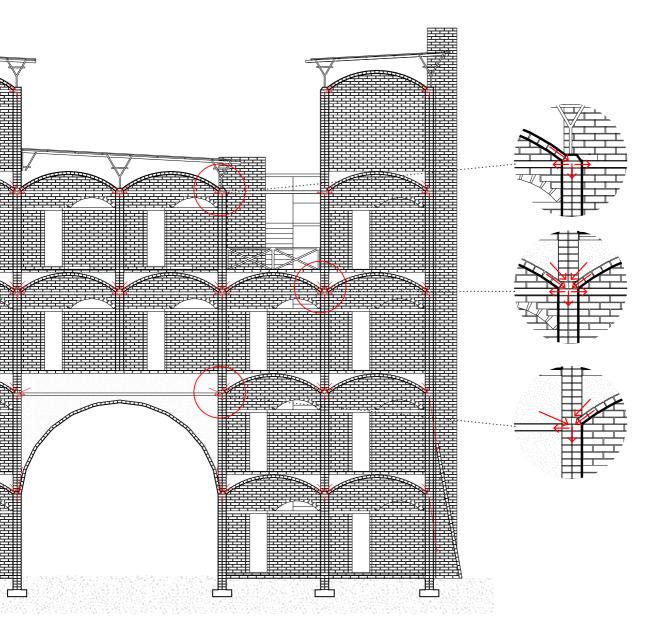
Forces diagram

The main principle is that the horizontal forces of the arches are in opposite direction which means they cancel each other out. Vertical forces are passed onto the columns and finally the columns pass it to the foundation. Only the arches on the sides have no "partner" next to them, which causes that the horizontal forces are exerting a force outwards. To hold everything into place, horizontal tie rods are added to cancel out the outwards directed forces.





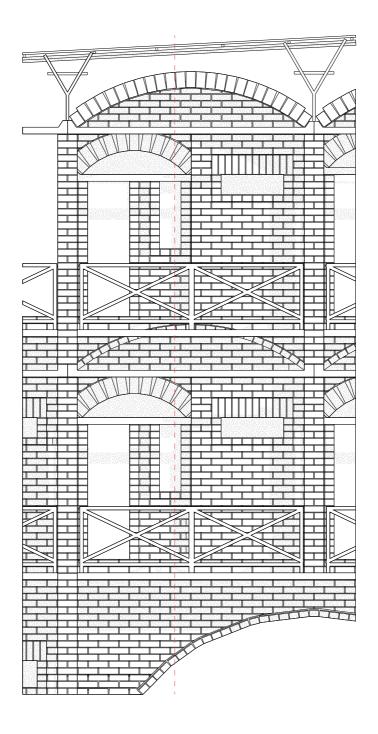




Facade details

Labour cost in Ethiopia is not the main cost, since it is not that expensive. This opens up the possibility of designing architectural details with bricks. The facade is a multi-layered relief of brick details. The constructive core consists of stacked CSEB blocks, steel rods for tie forces and concrete for the circulation zones.

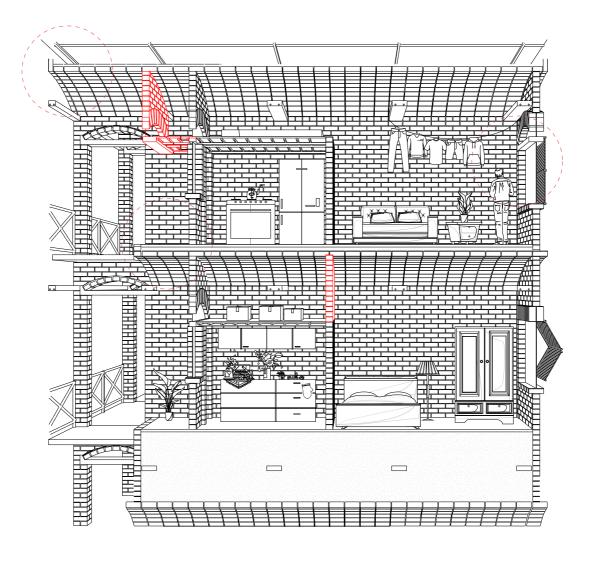
Facade detailing

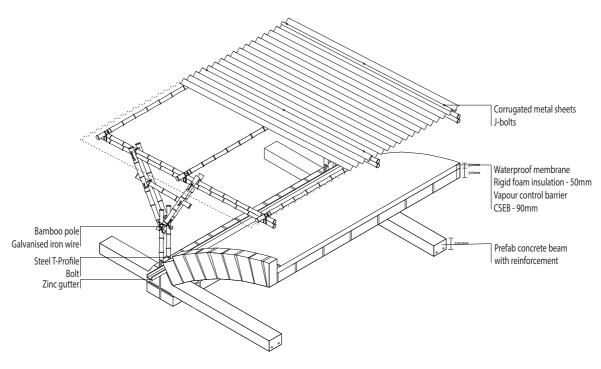


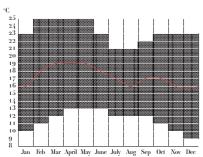
Detailed section

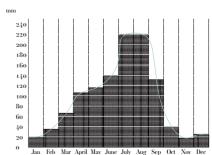
Adaptahility

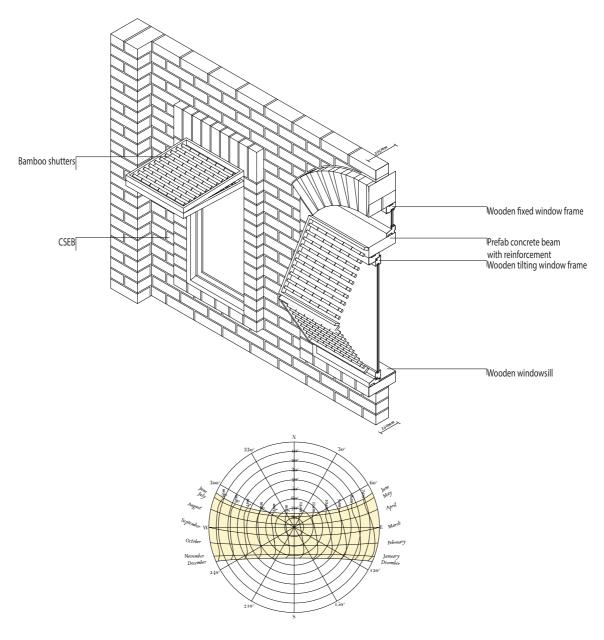
Inner walls which are perpendicular to the direction of the bays are non-bearing walls. This means they can be removed and placed elsewhere according to the needs of the dwellers.





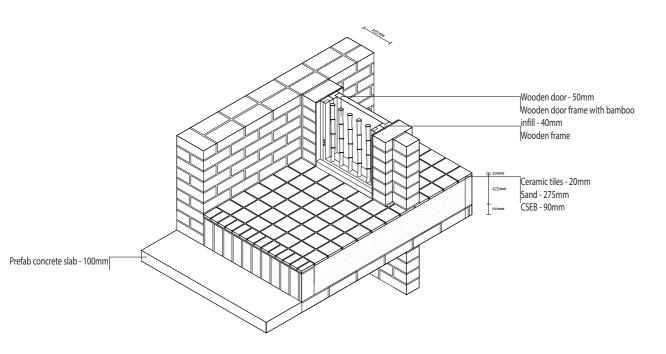






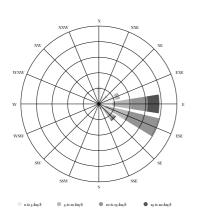
Environmental sustainability

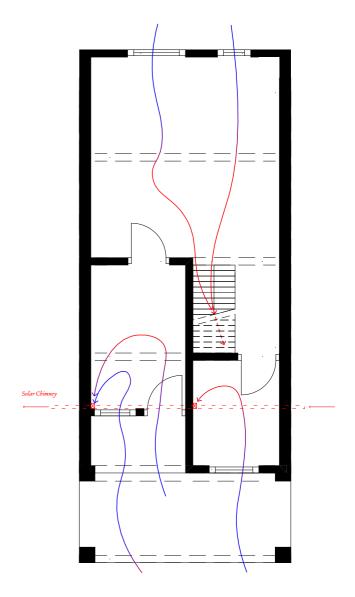
Details Double door & threshold

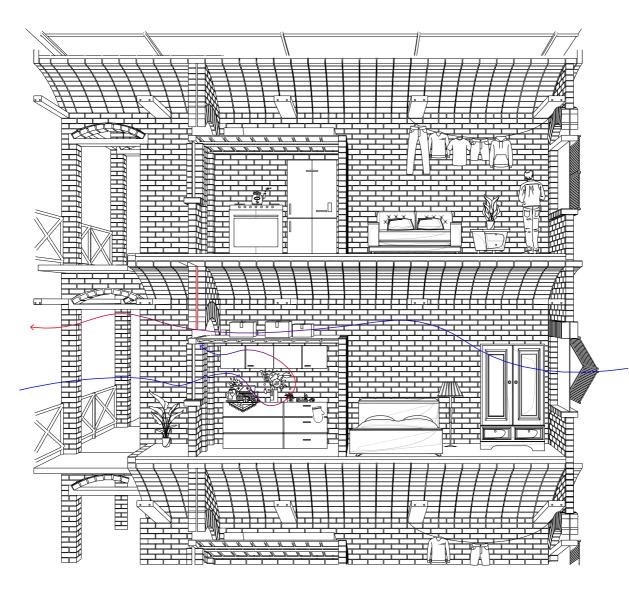


Ventilation Ducts and solar chimney

The bathroom and kitchen are connected to the main duct, which is in turn connected to the main shaft of the solar chimney. The chimney heats, resulting in a higher temperature in the chimney. This creates a pull force and an air flow is initiated from the dwellings to the chimney. Due to under pressure caused by the pulling force of the chimney, fresh air is sucked in through the facade openings.





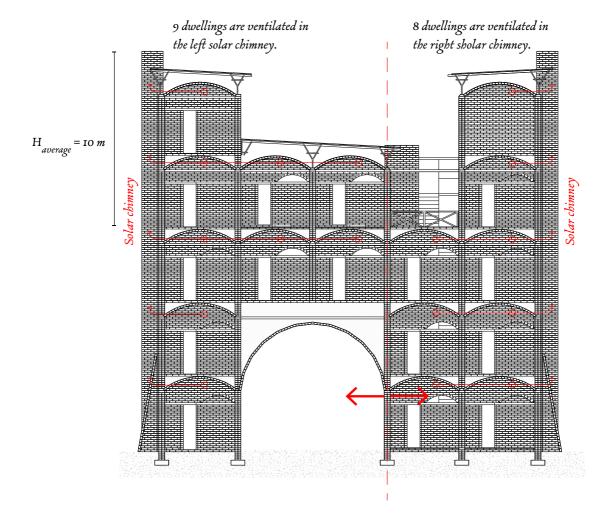


Ventilation

Solar chimney calculator Extreme Technology MsF | DRC Congo Gravitational constant 9,8 Height difference 10 h m Atmospheric pressure at ground level P0 100000 Pa Gas constant of air 287 J/kgK Outside temperature T0 21 oCTemperature in solar chimney T1 24 оC $\Delta P(h) = \frac{ghP_0}{R} \left(\frac{1}{T_0} - \frac{1}{T_1} \right)$ Pressure difference Pa DP 1,17 Discharge coefficient Cd 0.8 Inlet opening size 0,74 m2 Density of air kg/m3 1,2 $Q = C_d A_{eff} \sqrt{\frac{2\Delta P}{\rho}}$ Airflow rate Q 4214,5 m3/h Room volume 760,5 m3 Air change rate per hour 6 x/h $V = 84,5 m^3 / dwelling$ Total volume to be ventilated: $A_{duct/dwelling} = 0.74 \ m^2 / 9 = 0.095 \ m^2$

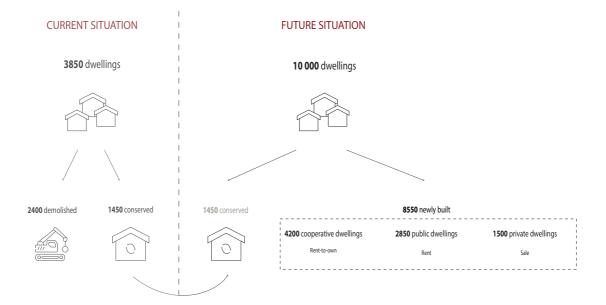
 $A_{chimney} = 0.74 \ m^2$

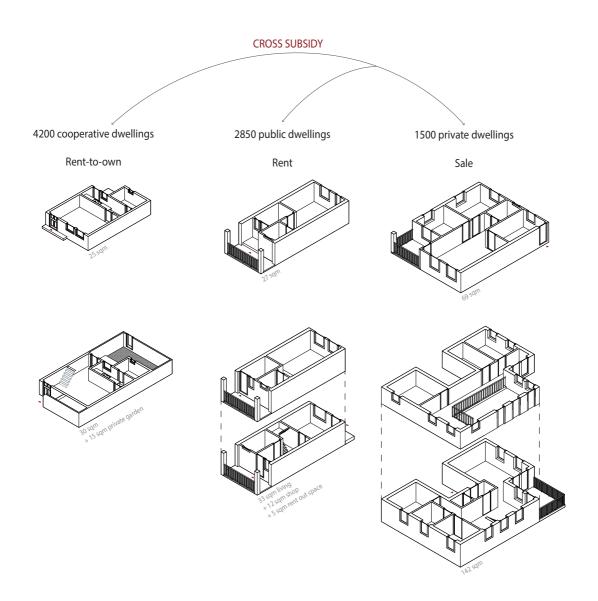
 $9*84.5 m^3 = 760.5 m^3$



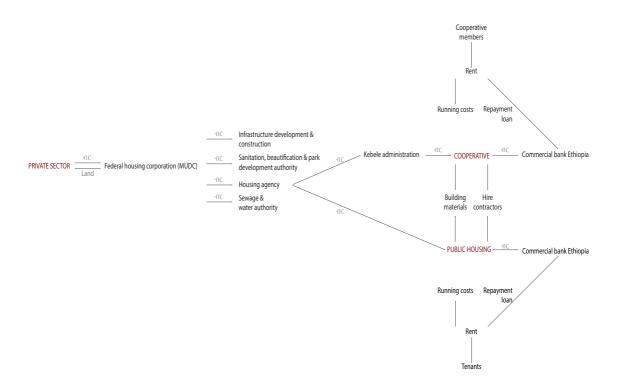
SOCIAL AND ECONOMIC SUSTAINABILITY

(Re)development Development goal & cash flow



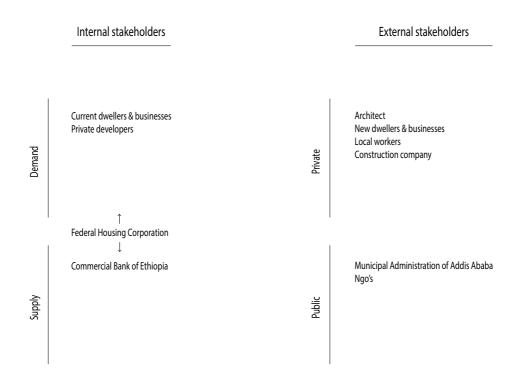


When looking at the cash flow, the private sector will buy land from the federal housing corporation. Which will then divide the money for infrastructure, sanitation, sewage and housing. The housing agency will divide the money over the kebeles which will then communicate with the cooperatives. The rest is loaned from the commercial bank from Ethiopia, which will be repaid by the rent of the cooperative members. In the development scheme the money is also divided to built the public houses.

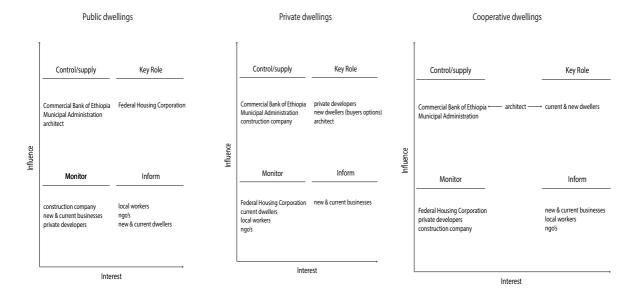


Stakeholders analysis

Role of stakeholders



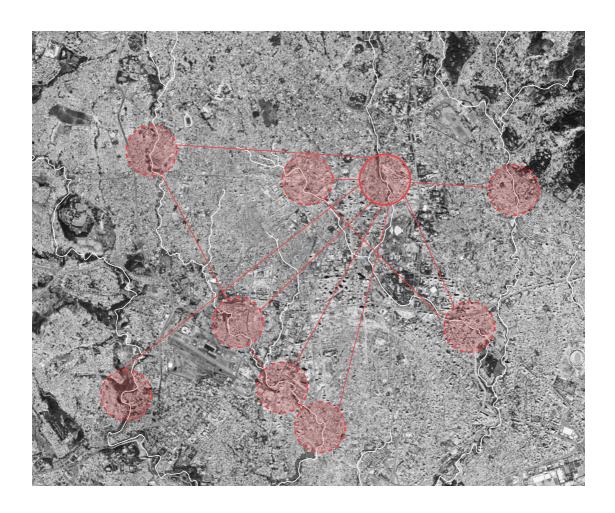
The relationship between the different stakeholders is divided into internal and external stakeholders. Current dwellers & businesses and private developers demand for redevelopment of Piassa. The Federal housing corporation also demands for redevelopment but is also a supplier of land. Capital is supplied by the commercial bank of Ethiopia. To develop Piassa external stakeholders are integrated including architects, new dwellers & businesses, local workers and construction companies. Public stakeholders include the municipal administration of Addis Ababa and NGO's.



The three different methods of tenancy lead to differences in the roles of the stakeholders. In the public dwelling the Federal housing corporation plays a key role. In the private dwellings the private developers have the most interest and influence. The new dwellers also play a key role because of the buyers options which are designed in collaboration with the architect. In the cooperative dwelling the current & new dwellers are key players because they form the cooperative members and therefore highly influence the design. The architect is positioned between control and design, designing a structural framework to which the dwellers can give their own infill.

Future development on other locations





As stated before, the goal was to develop a system containing design principles which could be implemented on other locations near rivers, which are in need of a revaluation. Also it proves that the way of dwelling can be adjusted to living near a waterway, instead of building until the edge of the plot and seeing the river as a boundary and garbage dump. By implementing these principles, Addis Ababa will be more resilient against floods, have better quality of water (and food), while also having characteristic open green spaces.























Relevance

Socio-ecological relevance

This thesis explores the scale in which design decisions can play an important role in accomplishing the United Nations' Sustainable Development Goals for 2030. This project will particularly contribute to three of those goals. Goal six "clean water and sanitation" is a very important topic in this thesis. The access to water and sanitation is also recognised by the UN as a human right. (UN, 2021) One of the targets of this goal is to "protect and restore water-related ecosystems" including rivers by 2020. (UN, 2020) Additionally, the aim is to develop a lively and inclusive living environment for the inhabitants, addressing the "sustainable cities and communities" goal. This corresponds with the goal of Addis Ababa to become a resilient city, apparent from the 100 resilient cities program. (Resilient Cities Network, 2020) Furthermore, the goal of "innovation and infrastructure" is addressed by innovatively tackling the urbanisation of riverbanks through housing as infrastructure.

Scientific relevance

This thesis aims to raise the need for interdisciplinary thinking by actors such as landscape architects, ecologists, architects and urban planners. This thesis will investigate the possible relationship between rivers and housing in Addis Ababa through the lens of spatial design, showing how a possible synergy between housing, ecology, flood protection and amenity could look like. Besides, it is also an invitation to look at this subject through other lenses.

Many urban river areas in the world are currently challenged by similar problems and could therefore benefit from design strategies applied in other cases. In this context, the design proposal can be seen as a starting point for transferable knowledge in the shape of a design catalogue where other academics could contribute to.

The aim is to contribute, from an architectural perspective, to the current conversation about socio-ecological resilience. The writer is currently not aware of research concerning this topic in the context of Ethiopia, besides the paper Taking a livelihood perspective to building urban water resilience (Habtemariam et al., 2018). Even though the problem of flooding in Addis Ababa is extensively researched, there are almost no academic writings about what possible design solutions could look like. This thesis contributes to this by introducing concepts such as "floodscapes" (Rossano, 2016), "room for the river" (Sijmons et al., 2017) and "river conservation" (Piégay et al., 2005) in the context of Addis Ababa.



Access to safe and affordable drinking water;
Access to adequate and equitable sanitation;
Improve water quality;
Protect and restore water-related ecosystems.



Develop quality, reliable, sustainable and resilient infrastructure.



Access to adequate, safe and affordable housing and basic services;

Reduce the number of deaths and the number of people affected by water-related disasters;

Access to safe, inclusive and accessible, green and public spaces.



Make efficient use of natural Ensure the conservation, resources.



Ensure the conservation, restoration and sustainable use of freshwater ecosystems;

Halt deforestation and restore degraded forests.

Reflection

The aim of this text is to reflect upon my experience in the Global Housing Studio. This engagement can be described with adjectives from all angles of the spectrum. It has been a challenging, interesting, informative and enjoyable journey. The graduation studio challenged me to not only tackle issues concerning my design on an architectural scale but also made me reflect on social questions on a bigger scale. What is the role of the architect? What is a community? When do you feel a sense of ownership?

As a group we started by looking at Addis Ababa through research. Before conducting this research, my knowledge of Addis Ababa was very limited. During the research we looked at geography, economy, politics, religion and patterns of inhabitation. The analytical research gave a guiding line in defining the location, the required density and the affordability of the project. The ethnographic research was however equally important, providing a deeper insight into water harvesting, dwelling and income generating patterns. This provided a solid base to design a neighbourhood which would be sustainable over time. All the research was combined in a written report which highly influenced my design proposal afterwards.

After this analytical and ethnographic research a second type of research took place, research-by-design in which the design was seen as a type of research. By testing different design solutions for a certain problem, I often came to insights which brought me closer to the solution or sometimes arose new questions. Through the whole process of my graduation, research and design can not be seen as separate nor as consecutive processes. The first step was research but once the design followed, I often looked back to the initial research. The subject also became more and more specified. Causing that more detailed research was conducted during the design process. This happened through reading looking at precedents but also through designing in the manner of drawing.

The topic for the graduation studio Addis Ababa Living Lab is "New Standards for Contemporary Ideals". The aim is to explore alternative approaches to deal with Addis Ababa's housing issue, in particular the dramatic shortage of affordable housing options.

My graduation topic focusses on creating a relationship between Addis Ababa its waters and its neighbourhoods. These neighbourhoods are conceived as inclusive, adaptable and sustainable, creating a diverse environment. The designed housing system is genuinely inclusive for the urban poor of Addis Ababa offering them a range of possibilities; a rental apartment, an apartment for sale or a plot on which they can build their own house which can grow incrementally. The project is also seen as a housing system which can be adapted to suit multiple locations in Addis Ababa, catering for the urgent demand for affordable housing. However it is sensitive to its location, topography and different patterns of inhabitation.

The studio formed a fascinating platform to discuss the process of designing affordable housing. This was discussed for locations on multiple scales, from the context of Addis Ababa to a wider context of Africa and even to projects in the whole Global South. The studio consists of students and tutors from different backgrounds,

creating a dialogue between different people with various experiences and visions on both the terms 'housing' and 'affordability', establishing a wide perspective on the subject affordable housing. Discussing this subject is very interesting and also very relevant in the increasingly urbanising world in which many homes are needed. Sharing knowledge and experience between people with diverse backgrounds is peculiar to the master track of Architecture. The master program focusses on creating sustainable development by blending knowledge and skills from design practice, from the physical and social sciences, technology and engineering. This is closely linked to the experiences I had this year conducting analytical and ethnographic research, and by designing the architectural as well as the construction and climate aspects of the housing project.

A study of the relationship between housing and rivers in Addis Ababa proved to be challenging. There are not many examples in this context which have a good relationship between both aspects. This confirms the assumption that there is no established relationship and that this subject is in need of research to provide possible answers to this question. On the other hand, the shortage of precedents challenged the design process. Literature review was a method that I mentioned I would use to tackle all my partial problems, and this also proved to be the main method I used.

The thesis explores to which extent design decisions can play a role in accomplishing the United Nations' Sustainable Development Goals for 2030. This project will particularly contribute to three of those goals. Goal six "clean water and sanitation" is a very important topic in this thesis. The access to water and sanitation is also recognised by the UN as a human right. One of the targets of this goal is to "protect and restore water-related ecosystems" including rivers by 2020. Additionally, the aim is to develop a lively and inclusive living environment for the inhabitants, addressing the "sustainable cities and communities" goal. The project wants to bring different income groups together, this is encouraged by the specific configuration of the dwellings and through the placement of certain amenities. Bringing these groups together can have an influence on the social connections that exist on the location. Prior, in the inner city of Addis Ababa there were strong social bonds between people from different income groups and backgrounds. They lived closely together in the same neighbourhood. Recently, this started changing and gated communities and ghettos gained momentum. By designing this set-up for an inclusive neighbourhood, I expect this neighbourhood to re-grow into a mixed neighbourhood.

There is a great challenge ahead in providing sufficient affordable housing in the world. It is very useful to study this challenge from an academical perspective as an architecture student. However, to really meet the housing shortage, it is important that it also becomes a main item on the agenda of architects, urban planners, politicians and the private sector. The design proposal could, together with the other design proposals of the studio, be seen as a database which can support these other branches. For instance for policy makers or the private sector

it could be used as an example to show how a dense, affordable neighbourhood could be achieved while still maintaining architectural and social qualities. I believe this could give a great insight for these actors. For example the condominium housing scheme in Addis Ababa could become much more qualitative through this communication. However, I believe that currently this relationship is not yet established in Addis Ababa. I hope that the dialogue between developers and designers, both professional and academic, can strengthen in the near future.

The location I worked on, Piassa, is in the inner core of the city. This neighbourhood has been growing over many years and many inhabitants have been living in this location for all of their lives. How to design something convenient for these dwellers that are so used to their ground-bound dwelling? Since being located in the inner city, the location is now a prime location. It is challenged by complete redevelopment for higher income groups. I tackled this challenge by creating a denser neighbourhood in which there would be place for both the current inhabitants and for new low to high income dwellers, without taking too much away from the customs of the current residents.

The most prevalent ethical question that sustained during my design project was how to design something as a Western architecture student in a context that is so different than the one I grew up in, coming from Belgium and currently studying in The Netherlands. How to design something in a context that you try to understand but you have never fully been emerged into. There was always a thin line between seeming authoritarian and being sensitive to the context. Especially because the challenge was to design housing which is, when appropriated, very intimate and personal. I often questioned myself why I would provide answers to the housing problem in this context in a better way than for example architects of Ethiopia or students from the EiABC could answer these questions. How to design thousands of dwellings, in a context that is not my own, which would still allow for different types of occupation by thousands of different kinds of families and even the families who will live thereafter in these dwellings when they would get sold or rented out. All of this while still keeping in mind the affordability and the replicability of a certain system.

After this graduation process I can say that I do believe that it is necessary and very helpful to study the housing crisis in a context that is not our own. By looking through a different lens at the problem, we can provide answers which arise from experiences in our own, different background. In collaboration with the local knowledge, craftsmanship and experience this can create a wonderful symbiosis in which we can maybe find some of the solutions to this challenging problem ahead of us.



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