

# **Adaptive neighbourhoods across urban rivers**

A spatial design for intensifying socio-ecological resilience in communities in Addis Ababa positioned between tradition and transition.

## **Research plan**

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## 1. Background

### Urbanisation

“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.”



Title page - **Figure 1:** 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/>.

**Figure 2:** Rapid urbanisation of Addis Ababa. Photo: Remsberg, E. (2019). *Sprawling skyline of the developing capital of Ethiopia, Addis Ababa*. In <https://www.gettyimages.nl/detail/nieuwsfoto's/sprawling-skyline-of-the-developing-capitol-of-ethiopia-nieuwsfotos/1199221861?adppopup=true>.

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) 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)

### **Water crisis**

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. (Cherinet & Sewnet, 2012)

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)

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)

## Housing crisis

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



Left - **Figure 3:** Condominium housing in Addis Ababa.

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

Right - **Figure 4:** Kebele housing in Addis Ababa.

Photo: Crawshaw, F. (n.d.). *Addis Ababa*. In <http://www.felicitycrawshaw.com/places/addis-ababa>.



## **2. 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.

### **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. 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)

### **River pollution**

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. 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)

Due to rapid urbanisation, food deficits are a growing problem in Addis Ababa. Urban agriculture is already 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)

**Figure 5:** House that is partly washed away by flooding of the Akaki river.  
Photo: Franklin, M. (2008). *Former house*. In Flickr.



**Left - Figure 6:** A pile of garbage at the source of the Akaki river.  
Photo: Franklin, M. (2008). *Akaki rubbish*. In Flickr.



**Right - Figure 7:** Houses close to the Akaki river.  
Photo: Franklin, M. (2008). *Slum by the Akaki*. In Flickr.



## **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)

### Condominium housing

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)

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)

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)

### Addis Ababa Riverside project

The 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)

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



**Figure 9:** Design for the Addis Ababa Riverside project.  
Illustration: *Addis Abeba to Spend 2.5b Br to Develop River Bank*. (2019). In <https://addisfortune.news/news-alert/addis-abeba-to-spend-2-5b-br-to-develop-river-bank/>.



### 3. 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?

The main research question can be subdivided into five sub questions, responding to the three partial problems described in the previous paragraph.

PARTIAL PROBLEM	SUB QUESTION	METHOD
(1) The neighbourhoods are challenged with flooding causing social, economic and health threats.	(1) How can the neighbourhoods become adapted to flooding?	Contextual research Material analysis Literature review
(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?	Analysis of precedents Literature review
	(3.1) How can the condominium scheme be transformed into a housing system which is genuinely inclusive for the urban poor of Addis Ababa?	Morpho-typological analysis Comparative analysis Literature review Ethnographic research
(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.	(3.2) 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?	Literature review Analysis of precedents Interviewing
	(3.3) How can the housing scheme and the river conservation scheme become socially and ecologically connected?	Literature review Visual ethnography Narrative methods

**Figure 10:** Houses built close to the Akaki river in Addis Ababa.  
Photo: Franklin, M. (2008). *Akaki river*. In Flickr.



#### 4. 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 *Socio-spatial 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.

## 5. 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)

### **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."

### **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 rivers: Controlling, Conserving, Restoring or Re-naturalising?**

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, 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.

## **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)

## **6. 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.

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