



THE CITY WATER
RESILIENCE APPROACH

CITY CHARACTERISATION REPORT
ADDIS ABABA

ADDIS ABABA
RESILIENCE
PROJECT
OFFICE

FOREWORD

Addis Ababa has developed its ever-first resilience strategy in order to tackle many of its present and future challenges. The strategy was developed in participatory manner whereby a number of stakeholders and partners have engaged on the process of identifying city priority shocks and stresses. Deeper analysis on key discovery areas were made during the research process and multiple actionable initiatives were also proposed to overcome these challenges. Some of the main challenges of the city include the provision of reliable water supply both now and for the future. The present water supply does not match the rising demand of water and fast growing population of the city. The challenges of water and sanitation service provision is much more aggravated by limited infrastructure, climate change imposed degradation, and limited municipal finance to invest on both the upstream and downstream ecosystems and natural environment. In order to overcome Addis Ababa's critical water challenges, WRI has launched an integrated and collaborative City Water Resilience Assessment (CWRA). The purpose of this assessment was to establish an in-depth water resilience profile of risks and vulnerabilities, and identify areas of intervention to enhance the resilience of the urban water system in partnership with ARUP, R-CITIES, AAWSA, and AARPO. Moreover, this intervention will help strengthen AAWSA's capacity to manage the public water supply system more efficiently and also to transform Addis Ababa into a water-Smart city. This vision of building Addis Ababa into a Water Resilient City can be realized if and only if real investment is made by all actors on the proposed initiatives that can practically end up water related misery. Let us join hands together to help Addis "a water-Smart city".

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Addis Ababa Resilience Project Office

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GLOSSARY

AACA	Addis Ababa City Administration
AACRA	Addis Ababa City Roads Authority
AAEPGDC	Addis Ababa Environmental Protection and Green Development Commission
AAPDC	Addis Ababa Plan Development Commission
AARBGADAA	Addis Ababa River Basins and Green Areas Development and Administration Agency
AARPO	Addis Ababa Resilience Project Office
AASWA	Addis Ababa Solid Waste Administration Agency
AAWSA	Addis Ababa Water and Sewerage Authority
AU	African Union
AUWR	Africa Urban Water Resilience
BLDM	Bureau of Land Development and Management
BMZ	German Federal Ministry of Economic Cooperation and Development
CSA	Central Statistics Agency
COVID-19	Coronavirus disease 2019
CRGE	Climate Resilient Green Economy
CR-WSP	Climate Resilient Water Safety Plans
CWRA	City Water Resilience Approach
CWRF	City Water Resilience Framework
EPRDF	Ethiopian People's Revolutionary Democratic Front
GDP	Gross Domestic Product
IHDP	Integrated Housing Development Program
IWRM	Integrated Water Resource Management
MoWIE	Ministry of Water, Irrigation and Energy
ONRS	Oromia National Regional State
RCities	Resilient Cities Network (formerly 100 Resilient Cities)
TNC	The Nature Conservancy
UNDESA	United Nations Department of Economic and Social Affairs
UNECA	United Nations Economic Commission for Africa
WRI	World Resources Institute
100RC	100 Resilient Cities (now Resilient Cities Network)

EXECUTIVE SUMMARY

The Addis Ababa city characterization report is part of the African Urban Water Resilience Initiative and supports pathways towards urban water resilience in post COVID-19 recovery. It is an important milestone part of the implementation of the Addis Ababa Resilience Strategy action 32 - Building of a Water Resilient City, and aims to assess the water basin and systems, key assets and governance through applying the City Water Resilience Approach (CWRA).

As the capital and largest city of Ethiopia (4.7 million people), Addis Ababa is located at the edge of, but of entirely within the Awash River basin and bordering to Abay River basin. The Awash basin is relatively urbanized and water resources are highly exploited for supply to urban centers, hydropower generation, large scale irrigation and industrial use, and manifest intensive competition of use. The rate of 3.8% population growth per year fueled by in-migration is posing immense pressure on the city's capacity to deliver water and sanitation services. Addis Ababa is the economic hub of the country, yet the increasing income gap, inequality, and vulnerability of households to shocks such as climate change and water stress is posing a risk to its resilience. COVID-19 has compounded these existing vulnerabilities.

Different layers of sectoral policies, plans, programs and organizations shape water management of the city. As a chartered city, the administration including the Addis Ababa Water Supply and Sewerage Authority is mandated to adapt policies and regulations as well as manage the city's water supply and sewerage services. Additionally, other city departments are mandated to develop, manage, and protect the environment, land, green areas, storm water, and solid waste, which are connected to the city water systems. The complex city-region

catchment governance and centralization of basin level mandates are challenges for the implementation of integrated water resource management.

Despite efforts increase access to safe water and sanitation, there is still limited coverage due to unprecedented increase in the demand and high cost of extension. On top of that, the dependence of the city on water sources outside its jurisdiction, the degradation of the watershed and the over extraction of groundwater sources, and pollution to downstream neighbouring Oromia region pose additional challenges. Climate variability and change resulting to shocks and stresses such as increasing the incidence of drought and flooding are impacting the city resilience. Above all, the culture of top-down decision making and the lack of a participatory approach to decision-making are major factors impacting vulnerable communities such as residents living in informal settlements and low-lying areas.

1

INTRODUCTION



City leaders in Africa face converging challenges: extending water and sanitation services for growing populations, managing watershed risks largely outside city jurisdiction, and designing for climate resilience. They are challenged to build urban water resilience, where communities have the safe, reliable, and affordable water they need to survive and thrive through sustainable, adaptive, and resilient urban water systems. The current coronavirus crisis has highlighted the urgent need of closing the urban services divide more than ever given that the lack of access to essential services, including water, has exacerbated the challenge of responding effectively to COVID-19 in many cities.

These converging challenges represent a significant threat to sustainable urbanization, but this moment of growth and development also presents an opportunity to “get water right.” In order to ensure sustainable and equitable urbanization, cities must build resilience to water and climate risks. This will require overcoming underlying barriers to changing existing urban and water systems, such as knowledge and capacity gaps, siloed and uncoordinated planning (vertical and horizontal), and financial and technical bias toward rigid and centralized infrastructure.

*Addis Ababa panorama,
© Carsten ten Brink*



1.1 ABOUT THE AFRICAN URBAN WATER RESILIENCE PROGRAM

The World Resources Institute (WRI) is undertaking a three-year program (2020-2022) to help advance urban water resilience in Africa. The initiative builds on WRI's strong water resources knowledge, globally-recognized data and analytical capacities as well as the WRI Ross Center for Sustainable Cities' deep capacity and track record of helping 400+ cities globally tackle tough sustainability and equity challenges, including many cities in Africa. The overall objective of this work is to help cities address their water risks and vulnerabilities through research, technical assistance, knowledge sharing and partnerships for collective action.

To this end, WRI and partners will work with city stakeholders to: map key water, climate and development risks facing a city; identify pathways for change (e.g. policy, planning and governance interventions); set specific targets and owners for actions; catalyze implementation of priority actions through various capacity building initiatives, including providing technical assistance and supporting knowledge exchange; and soliciting commitments from regional and national stakeholders to create necessary enabling conditions (e.g. policy alignments and enhanced investment).

This work is made possible by a grant from the German Federal Ministry for Economic Cooperation and Development (BMZ). WRI envisions this effort as the foundation for a larger urban water resilience program in Africa, in partnership with other international, pan-African and local partners.

The program consists of three key components:

RESEARCH ON CHALLENGES AND PATHWAYS

WRI will work with research partners to develop a report on urban water resilience, with a pan-African perspective, that identifies key pathways to address water scarcity, inadequate access and flooding challenges in African cities. This report will be developed in partnership with

Africa water experts and researchers with deep knowledge of the state of water needs and current practice in Africa. The report will include case studies of seven African cities including Addis Ababa and a spatial assessment of key urban growth trends, including an overlay assessment of how urban growth is impacting increase in impermeable surface, loss of blue green cover and the impacts on the city's water basin.

CREATE AN ENABLING ENVIRONMENT FOR URBAN WATER RESILIENCE THROUGH COLLECTIVE ACTION

WRI along with partners and cities will mobilize collective action on policy and finance through engagement with key actors influencing the enabling environment, such as national governments, regional governments, research centers, financial institutions and urban water experts in the region.

PARTNERSHIPS FOR URBAN WATER RESILIENCE ACTION

WRI will partner with a cohort of six cities, including Addis Ababa, and their regional and national governments to provide support toward advancing city water resilience agendas. We will facilitate a structured multi-stakeholder planning process to identify priority actions, providing technical assistance and facilitating knowledge exchange and capacity building with the cohort of city partners.

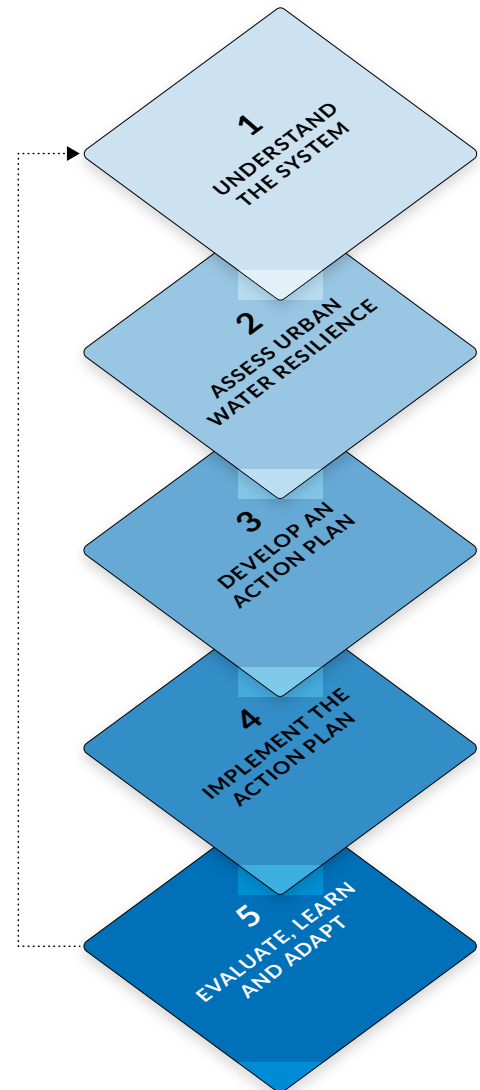
In Addis Ababa, WRI will work with the city, specifically the Addis Ababa Resilience Project Office (AARPO), Arup and the Resilient Cities Network (RCities) to develop an assessment of water risks and needs. This will be developed in close partnership with city stakeholders using the City Water Resilience Approach (CWRA).

1.2 THE CITY WATER RESILIENCE APPROACH

The City Water Resilience Approach (CWRA) responds to a demand for new approaches and tools that help cities grow their capacity to provide high quality water resources for all residents, and to protect them from water-related hazards. The CWRA process outlines a path for developing urban water resilience, and provides a suite of tools to help cities survive and thrive in the face of water-related shocks and stresses.

The CWRA is based on fieldwork and desk research, collaborative partnerships with subject matter experts, and direct engagement with city partners. The approach was developed through investigations in eight cities, and consultation with over 700 individual stakeholders, by Arup—working with the Stockholm International Water Institute (SIWI), 100 Resilient Cities (100RC), the Organization for Economic Co-Operation and Development (OECD) and in close collaboration with city partners from Cape Town, Amman, Mexico City, Greater Miami and the Beaches, Hull, Rotterdam, Thessaloniki, and Greater Manchester. Each partner city confronts persistent water-related shocks or suffer chronic water-related stresses and are committed to co-creating water resilience approaches. The cities represent diverse geographies, and face a range of shocks and stresses, in a variety of socio-political contexts.

The approach outlines five steps to guide partners through initial stakeholder engagement and baseline assessment, through action planning, implementation and monitoring of new initiatives that build water resilience. (See next page.)

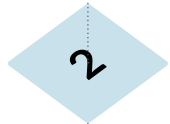




Step 1: Understand the system

The city's unique context is appraised to understand shocks and stresses, identify system interdependencies, convene local stakeholders and map key infrastructure and governance processes. This first step of the CWRA process results in City Characterization Reports that summarize the results of this research.

[this report]



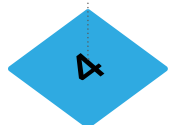
Step 2: Assess urban water resilience

The city's current practices are assessed using the City Water Resilience Framework to identify areas of existing strength and weaknesses and establish a baseline against which progress is measured. This second step results in a City Water Resilience Profile, which summarizes the assessment process and outlines potential actions to build resilience.



Step 3: Develop an action plan

Based on the city assessment, an action plan is developed for realizing interventions that develop water resilience. The action plan is based on holistic evaluation of anticipated benefits and costs and prioritization of projects identified in the previous step.



Step 4: Implement the action plan

Actions agreed upon during the previous step are implemented according to best practices. In this step, the CWRA provides best practice guidance for how ongoing actions can be monitored to ensure objectives are met, and resources are used appropriately.



Step 5: Evaluate, learn and adapt

Implementation is evaluated. Adjustments are made to the implementation plan to account for new developments or changing circumstances in the city, and to align with updated objectives for the next period.

To guide cities through this process, the CWRA offers a suite of resources that target specific

challenges identified by cities in their efforts to build water resilience:

OurWater

OurWater is a digital tool that helps cities better understand the types of shocks and stresses they confront, their impact on natural and man-made infrastructural systems, and the interaction between key stakeholders involved in urban water management. The OurWater tool is used in Step 1 of the CWRA to map the infrastructure and governance arrangements that define the urban water system.

The City Water Resilience Framework (CWRF)

CWRF assesses the resilience of a city to water-based shocks and stresses and allows the city to identify and prioritize future action. Understanding their resilience helps cities formulate a clear vision of what urban water resilience means to them, including what specific conditions must be in place to achieve this vision, what efforts will be required to build resilience and what actors are involved. The CWRF is the primary tool used in Step 2 to assess urban water resilience, and the focal point for workshops conducted in the city.

1.3 ADDIS ABABA'S RESILIENCE JOURNEY

To future-proof the city and tackle priority shocks and stresses, Addis Ababa joined the Resilient Cities Network (formerly 100 Resilient Cities Network) in May 2016. As part of this program, the City established a Chief Resilience Officer (CRO) and the Addis Ababa Resilience Project Office (AARPO) to oversee the development of a holistic Resilience Strategy.

Published in June 2020, the strategy serves as a tactical roadmap for building resilience in the city and is the result of three years of extensive research and stakeholder engagement. It builds on consultations with over 560 city officials and representatives from donors, private sector organizations and civil society organizations and a citywide door-to-door survey which gathered input from 5,392 respondents, including poor and vulnerable residents.

Through this process, the city identified a list of water related shocks and stresses, including:

Shocks

- Disease outbreak
- Drought
- Flooding
- Internal displacement
- Infrastructure failure

Stresses

- Water scarcity
- Environmental degradation and pollution
- Aging infrastructure
- High unemployment
- Population growth

During the resilience strategy development, the following shocks and stresses were prioritized:

Shocks

- Inflation
- Rioting & Civil Unrest
- Flooding
- Infrastructure & Building Failure
- Internal Displacement

Stresses

- High unemployment
- Corruption
- Lack of Affordable Housing
- Environmental degradation and pollution
- Homelessness

To address these shocks and stresses in a holistic manner, the strategy outlines three pillars which set out a total of 48 actions. The first pillar of the Strategy is about forging the economy of the future and fostering an enabling environment for the businesses and people of Addis Ababa to thrive. The second pillar aims to transform Addis Ababa's communities into more inclusive, connected, and safe centers of resilience by embracing a participatory, human-centric approach to planning the city of today and tomorrow. The third pillar focuses on creating healthy and livable places, aiming to protect

the city's natural resources and ecosystems to reduce the risks of a changing climate such as water scarcity and flooding.

In addition to advancing the implementation of these initiatives with stakeholders in the city, AARPO and AAWSA have been deeply engaged in COVID-19 response efforts and are working to leverage lessons from the pandemic to establish emergency and contingency planning procedures, alongside a communications plan that keeps staff, customers, and other stakeholders informed of developments.

1.4 CITY CHARACTERIZATION REPORT

The CWRA forms part of implementing Action 32 – Building a Water Resilient City. The first step of the CWRA is to understand the local water system, and the factors that contribute or detract from resilience described in this document, the City Characterization Report. This report details research undertaken in Addis Ababa to:

1. **Define the city water basins, the urban water system and its governance structure, and the interdependencies with other systems**
2. **Identify the factors contributing to the resilience of the city's water system, and those increasing its vulnerability**

The data for this report was collected through interviews with key stakeholders, as well as extensive desktop research. It forms the basis for further stakeholder engagement and the City Water Resilience Profile, which is the next step in the CWRA methodology.

2

ADDIS ABABA - THE CITY CONTEXT

Established in 1886 and with an estimated four million population, Addis Ababa – “new flower” in Amharic – is one of the oldest and largest cities in Africa. At an average altitude of 2,500 meters, it is also one of the highest. Being the capital of a non-colonized country in Africa, it has been playing a historic role in hosting the regional organizations such as the Organization of African Unity / African Union (AU), and the Economic Commission for Africa, which contributed to the decolonization of African countries, and later bringing Africa together. Its geographic location in the center of Ethiopia, combined with lack of effective development policies in other urban centers have given the capital the majority of social and economic infrastructure in the country. As a result, it has been a melting pot to hundreds of thousands of

people, coming from all corners of the country in search of better employment opportunities and services. This high rate of rural urban migration accounts for about 40% of the growth. Coupled with rapid natural population growth, Addis Ababa is one of the fast growing cities in Africa, posing critical challenges, including high rate of unemployment, housing shortage and environmental deterioration. Despite the rapid and steady economic progress registered over the past two decades, Addis Ababa faces various shocks and stresses that could hinder it from achieving its development goals. Shocks include flooding, urban fire, and disease outbreak; stresses include rapid and uncontrolled urbanization, water scarcity, and high unemployment.

2.1 LOCATION AND TOPOGRAPHY

Addis Ababa is situated almost at the geographic center of the country between 8°50' N to 9°5' N and 38°38' E to 38°54' E near the western escarpment of the rift valley and covers around 520 km².¹

The city's altitude is decreasing from the northern mountainous area to the south, and the highest and lowest altitude ranging between 3040 m and 2050 m above sea level.

Two major rivers flow through the city, namely Tinishu Akaki (Little Akaki) and Tiliku Akaki (Great Akaki) Rivers. These rivers, which are tributaries of Awash River, originate from the Entoto Mountains that are located north to Addis Ababa and flow to Aba Samuel Lake (43 km to the South). The entire city falls under the Awash River Basin respectively which is one of the twelve river basins of the country. The city is located in the upstream of the Awash River Basin, and on the north bounded by the dividing ridge of the Awash and Abay basins.²

Figure 1.


Addis Ababa location

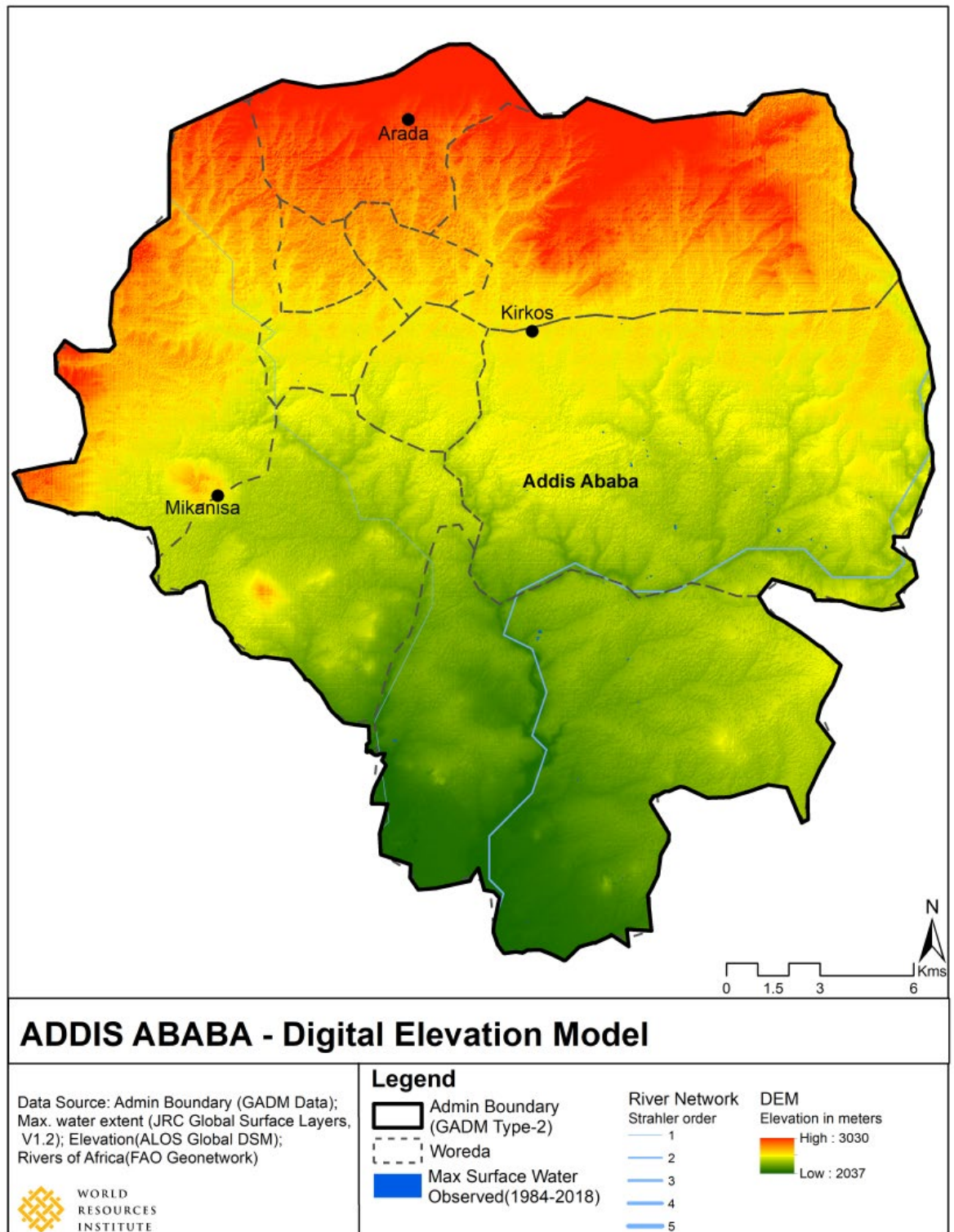
(Adapted from: <http://www.addisababa.gov.et/ar/web/guest/city-map>)



(1) Addis Ababa City Administration and Resilient Cities Network, 2020; Feyissa et al., 2018

(2) For further clarification refer to figure 10

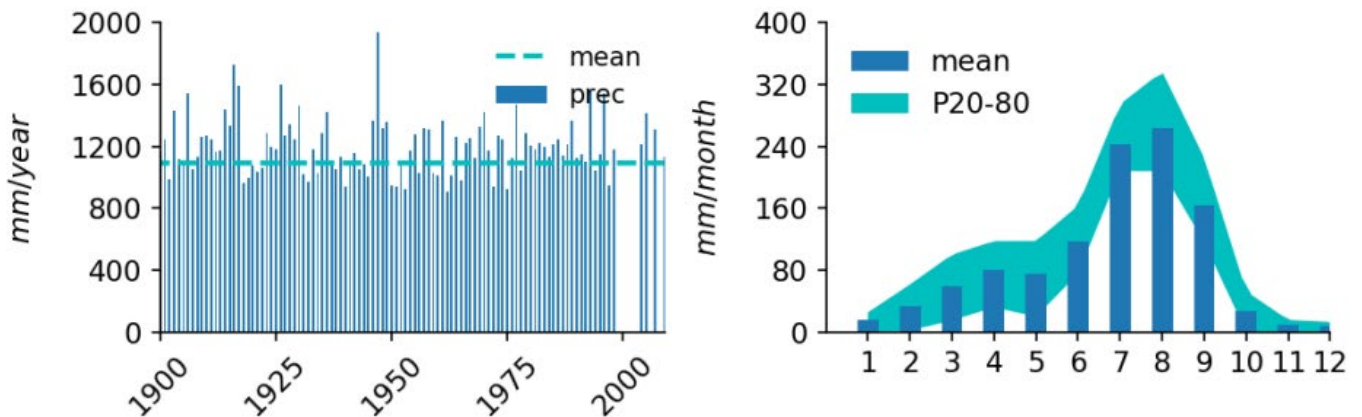
Figure 2.  Topographic map of Addis Ababa (Source: WRI, 2020)



2.2 CLIMATE

In Addis Ababa, the climate is warm and temperate. Summers are much rainier (June to September) than winters. The city's location is classified as "Cwb" (Oceanic Subtropical Highland Climate) by Köppen and Geiger. The average temperature is 16°C, and the average maximum and minimum temperatures range between 22.9°C and 10.2°C.³ The average humidity of the city is 57.67% and the average annual rainfall is 1184mm⁴, almost double than Barcelona (612 mm) and practically the same as the Scottish city of Glasgow (1,124 mm). This relatively high rainfall is due to the intensity of the rains from July to September.

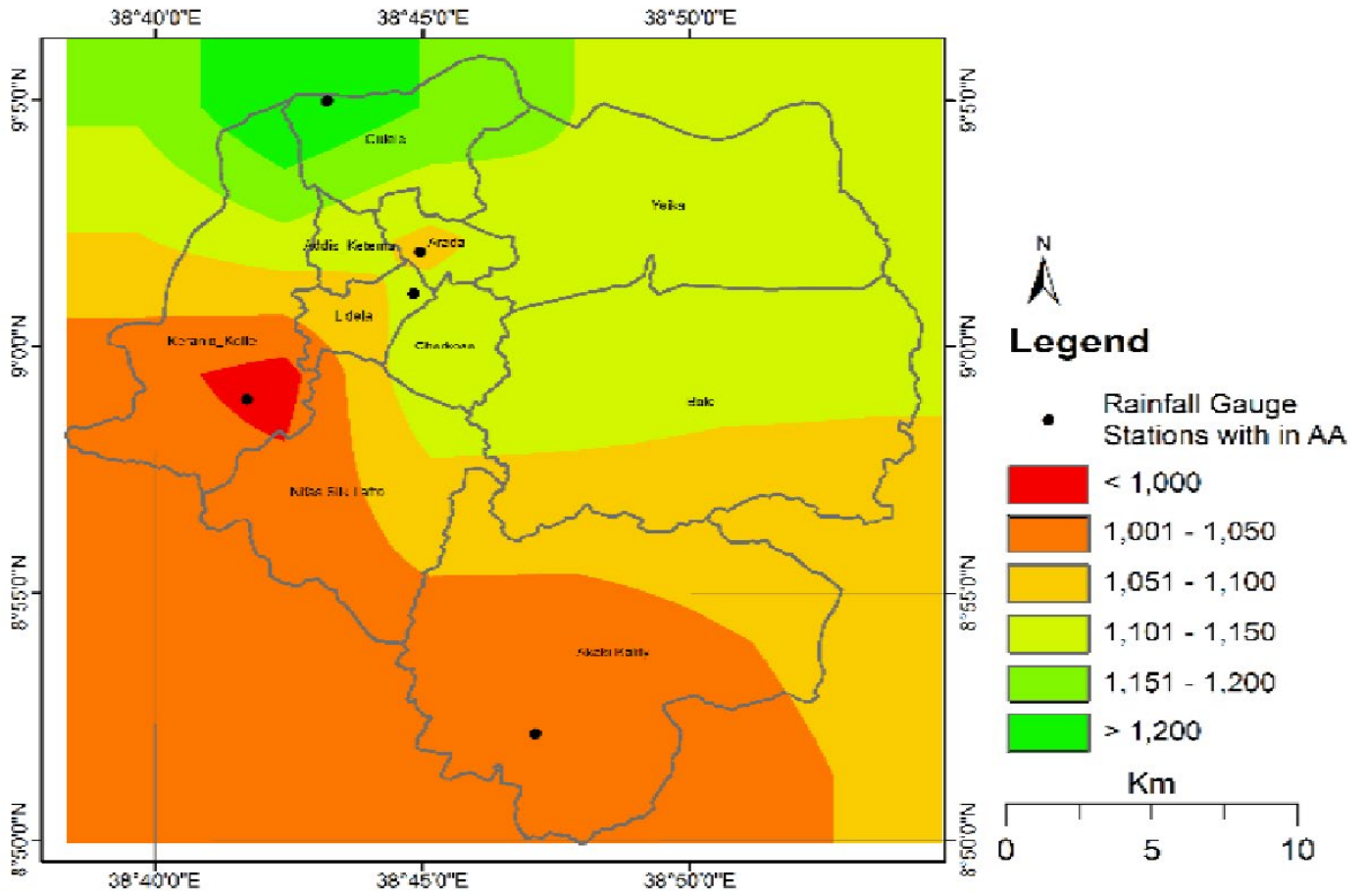
Figure 3.
Historical rainfall data
(Source: De Wildt, van der Meulen and Ketema, 2020: 14)



(3) Feyissa et al., 2018; Kuma, 2004

(4) Metaferia, 2017; Feyissa et al., 2018

▼ **Figure 4.**
 Rainfall amount
 in mm
 (Source:
 Ewunetu, 2019:
 36)



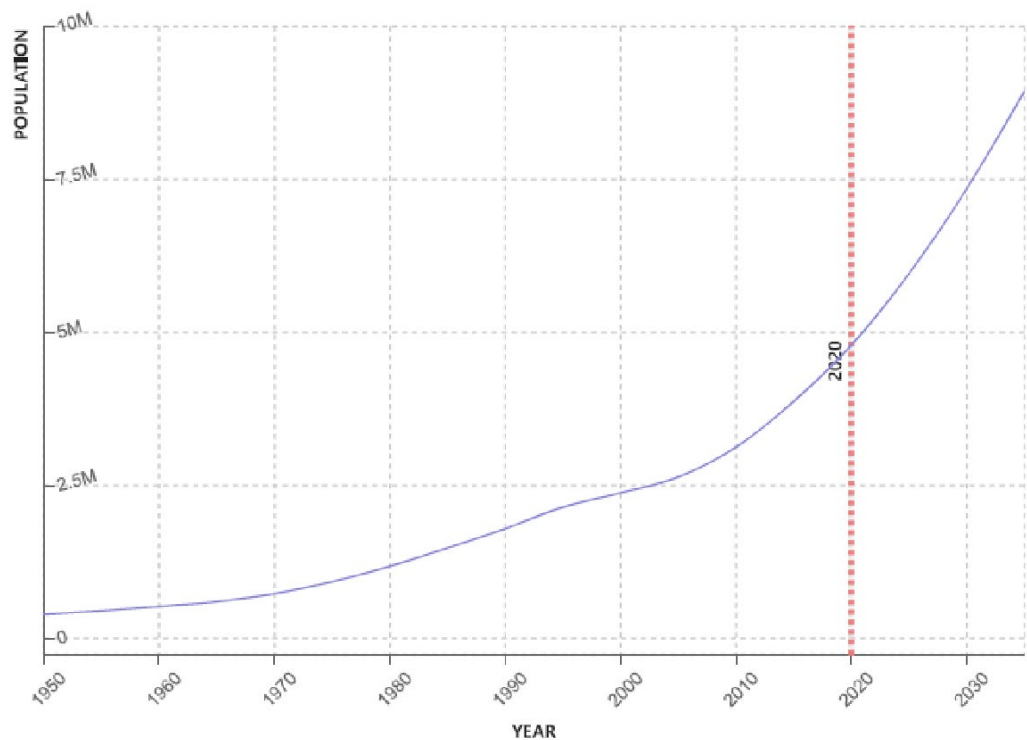
2.3 DEMOGRAPHICS

Population and Population Growth

Addis Ababa is one of the fastest-growing cities in Africa and hosts a quarter of the country's total urban population. The city population currently is estimated to be more than 4.7 million people, with a higher population of female than male residents.⁵ Addis Ababa is the single largest urban center in the country and is currently growing at an annual rate of 3.8%⁶, making it one of the fastest urbanizing cities in the world - projected to grow to over 7.3 million people by 2030.⁷ The central part of the city – Addis Ketema, Arada and Lideta are densely populated sub cities (refer to figure 6).

Addis Ababa has a large youth population partly due to high rural-urban migration and internal displacements. 11% of the city's residents are under 5 years old and 58% of the population is under the age of 30. Although Ethiopia is currently considered as one of the fastest growing economies in Sub-Saharan Africa, young people are facing numerous challenges including poverty, unemployment, recurrent droughts, political unrest and ethnic conflicts, shortage of food and water, displacement and migration, among others.

Figure 5.
Addis Ababa
population
(Source: World
Population
Review, accessed
Oct. 5, 2020)

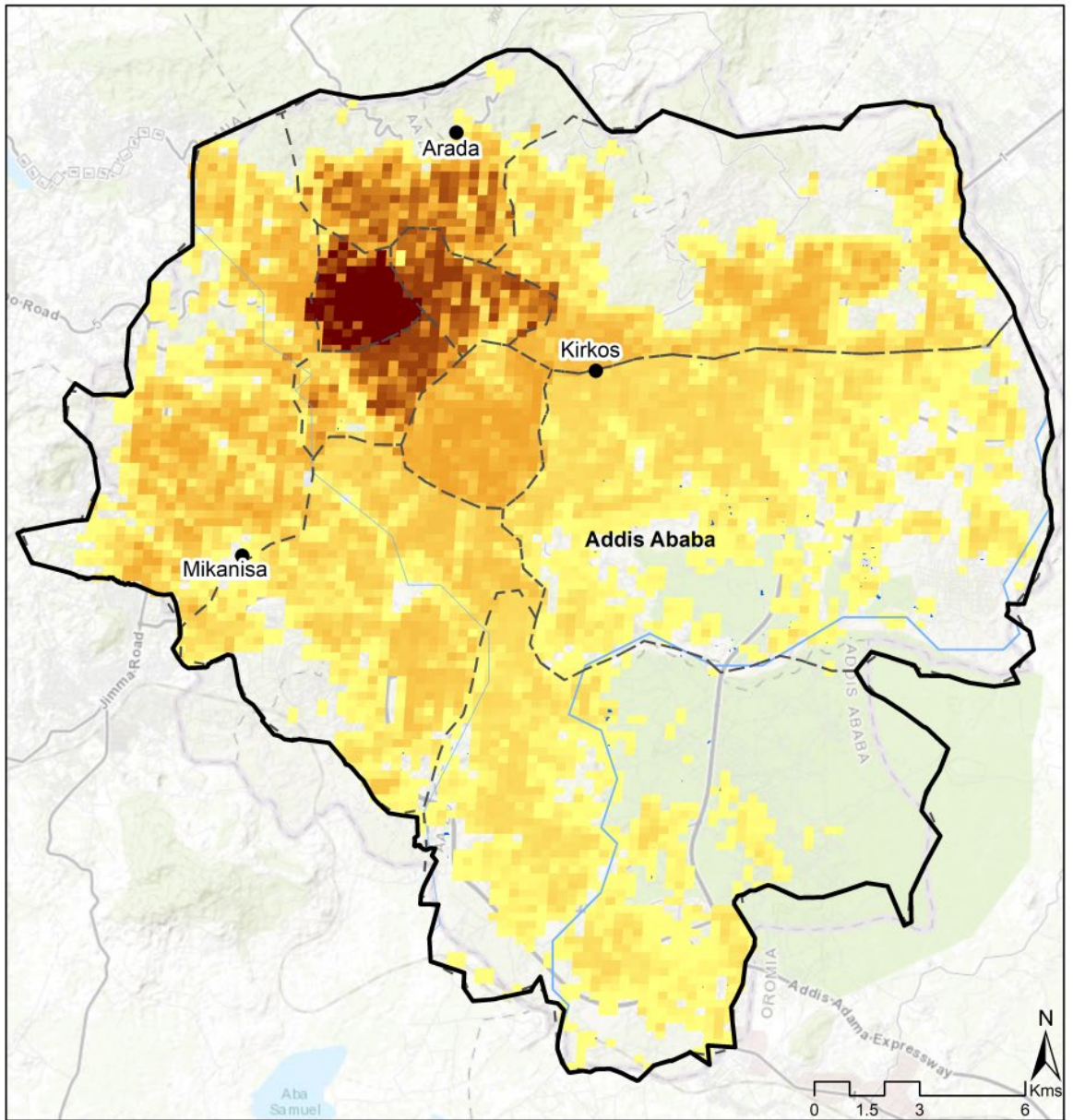


(5) World Population Review, accessed October 2020

(6) World Bank, 2015c

(7) UNDESA, 2019

Figure 6.
Addis Ababa
population
density map
(Source: WRI,
2020)



ADDIS ABABA : Population - 2015

Data Source: Admin Boundary(GADM data); Rivers of Africa(FAO Geonetwork); Max. water extent (JRC Global Surface Layers, V1.2); GHS-Population grid (EC, JRC)



Legend

- Admin Boundary (GADM Type-2)
- Woreda
- Max Surface Water Observed(1984-2018)

- River Network
- Strahler order
- 1
- 2
- 3
- 4
- 5

Population in every 250m x 250m cell

High : 3126
Low : 0

In addition to migration, the physical expansion of the city's boundary (a total increment of 37,564 ha since 1961) and annexation of peasant associations contributed to increment of the city's population. This process has brought different ethnic groups from all corners of the country together, but it has also caused negative effects to the livelihoods of peri-urban farmers because of unfair compensation and eviction resulting to political upheaval and conflicts.⁹

Ethnics, Religion and Migration

Addis Ababa is a religiously and ethnically diverse city, and home to an estimated 31,000 refugees of over 21 different nationalities.¹⁰ In the past migration was fueled as a result of people displaced from war, drought and famine affected areas, demobilized soldiers, and people migrating in search of better livelihood from rural and other urban areas.¹¹ Today education and demographics drive migration. Research confirms that most migrants move to Addis Ababa in search for work and better opportunities (mainly education), and to escape rural areas they describe as bereft of hope and prospects. Young women also migrate to escape arranged marriages and traditional gender roles. Addis Ababa has been the main destination, with close to 40 % of all rural migrants moving to the capital.¹²

The City of Addis Ababa has a strong identity of cultural and religious diversity, and is proud and values its historical, political, and diplomatic prominence in the continent.

Close to half of the population is of the ethnic group Amhara, while the majority of the remaining population is split among the groups Oromo, Gurage, and Tigray. 71% of the population use Amharic, Oromo is in use with just over 10% of the people, with four additional languages ranking more than 1% use among the population. Approximately 82% of the population is of the Orthodox Christian religion. 12.7% of

residents are Muslim, 3.9% Protestant, less than 1% Catholic, and a smaller percentage following other faiths.¹³

Adult literacy in the capital city is the highest among all of the country's cities, at over 93% for males and almost 80% for females. The city has a lower rate of infant mortality than the national average.

Poverty

The latest poverty assessment for Ethiopia¹⁴ finds that poverty has fallen, but progress has been uneven between urban and rural areas. According to the analysis, poverty decreased from 30% of the population in 2011 to 24% in 2016, the year of the most recent survey on household living standards. However, the report points out that the poorest 10% of the population did not experience any growth in income since 2005. As a result, poor people in 2016 were on average poorer than the poor in 2005. Poverty reduction was particularly strong in cities and towns, in line with strong overall economic growth.

While Addis Ababa's economy has registered double-digit growth over the past two decades, it is not creating enough jobs for its rapidly expanding population, particularly for young people (i.e. people aged 15-29) and women. High unemployment and underemployment are major contributors to high levels of poverty threatening the social and political stability of the city and a high potential to increase crime and violence. The most visible faces of poverty in Addis Ababa are "street children, the homeless and beggars, who need housing, health care, counseling, and often reunification with their families, in addition to financial support".¹⁵

Most jobs in Addis Ababa are concentrated in low-productivity sectors – trade, transport, hotels, catering, and other services such as domestic work within households – while higher

value-added business services represent only 10% of total employment.¹⁶ Although low-productivity sectors have stimulated rapid job creation so far, most of these jobs are unlikely to result in higher wages in the long term. Moreover, the service sector is likely to be significantly impacted by the COVID-19 pandemic for years to come.

Households in urban areas will be affected first and perhaps most heavily by the virus and related containment measures. Though the growth elasticity of poverty—a measure of the extent to which gross domestic product growth translates into poverty reduction—has been low in Ethiopia as a whole, it has been high in urban areas, resulting in a drop in urban poverty from 26% in 2011 to 15% by 2016. This means that a significant slowdown in economic growth is likely to affect the pace of urban poverty reduction or even reverse it.

In addition, poverty reduction in urban Ethiopia has been tightly linked to increasing returns to self-employment. And it is exactly this kind of employment (small shops, buna (coffee) stands, roadside cafeterias, shoe-shiners, casual laborers, etc.) that will be most heavily affected by social distancing measures necessary during the pandemic. Considering this, poverty in Addis Ababa may increase significantly over the next years.

While the government has extended support in the form of business loans and tax relief, more is needed to enable longer term economic recovery. There is also an urgent need for the city to better train and upskill the workforce while working with the private sector to generate decent jobs for all.

Addis Ababa's residents also face the challenge of rising costs of living. Despite government efforts to contain inflation to single digits, headline inflation in Ethiopia has averaged

at 16.23% between 2006 and 2018. Soaring prices, particularly of food items, coupled with lower incomes, have put pressure on the food consumption and livelihoods of poor urban households.

With food items accounting for around 57% of household expenditure, inflation is a major challenge even for residents who manage to rise above the poverty line. Employment in the informal sector is declining, and already low, at 8.6% in 2018 according to official statistics. However, evidence suggests that the definition of the informal economy used by the Central Statistical Agency (CSA) leads to underestimating the true incidence of informality in the local economy.¹⁷ Additionally, informal workers tend to have limited savings and lack social protection coverage, making them vulnerable to risks, from routine welfare shocks such as illness and old age, to systematic shocks like COVID-19.

Moreover, the UN Habitat (2016) study shows that there is an increasing income gap in recent decades) in urban Ethiopia, and the country is among the six African countries where increasing income gap manifested. Other studies have also indicated the inequality and vulnerability of households to external shocks like climate change.¹⁸ Because of this, urban poverty and youth unemployment remain to be major economic challenges of the city.¹⁹

(9) Hailemariam and Adugna, 2011; Abdissa and Degefa, 2011; Habtemariam, 2019

(10) Brown, A., et al., 2018

(11) Hailemariam and Adugna, 2011; Abdissa and Degefa, 2011

(12) Bundervoet, T., 2018.

(13) World Population Review, accessed October 2020

(14) World Bank, 2015c

(15) World Bank, 2015b

(16) World Bank, 2018

(17) UN-HABITAT. (2017). *The State of Addis Ababa Report: the Addis Ababa we want.*

(18) Gebre-Egziabher, 2011; Geda and Yimer, 2014; MUDHCo and ECSU, 2015, cited in Habtemariam, 2018: 237

(19) Cochrane and Costolanski, 2013

2.4 ECONOMIC CONTEXT

Addis Ababa is the engine of Ethiopia's rapidly expanding economy. Although the city represents only 3.6% of the country's total population, it contributes 30% of national urban GDP and 68% of total urban jobs.

According to the World Bank, Ethiopia's "strong and broad-based growth over the past decade" has lifted its GDP to an impressive average of 10% per year. The high growth admittedly started from a low base, but it has catapulted Ethiopia from being identified with the infamous famine of the 1980s into one of the world's fastest growing economies. The East African nation is pouring billions into, among other things, building basic infrastructure in energy, rail and road transport. Nothing is more obvious in Addis Ababa. The city is in the middle of a construction boom with lots of new skyscrapers, condos and roads making it look like a construction site. It is growing rapidly in modernity compared to other African cities and the skyline suddenly has more halfway-done high-rise buildings than ever before, as well as new hotels being built at a breakneck speed. Addis Ababa's construction boom — funded both from private and public coffers — is being driven by the country's recent rapid economic growth and the government hopes it will attract further investment and help industrialize the economy so Ethiopia can reach middle-income status by 2025.

Addis Ababa is the main transport hub of the country, which is connected to all regional centers and major cities by road and railway transport and also to the port of Djibouti (the main export and import outlet). Ethiopian Airlines which is based in Addis Ababa connects the city, the country and the continent with 125 destinations in the world. Therefore, Addis Ababa is a major transport hub at international and national level, and transport is a major employment sector of the city's economy.

The city is also the seat of African Union (AU) and United Nations Economic Commission for Africa (UNECA,) and because of that many embassies and international organizations have offices in the city. The service sector- hotels, catering and banking are the major jobs and employment generating sector of the city. In addition, the city's economy takes the lion share of the country's wholesale and retail trade. Moreover, Addis Ababa is a hub for the production of footwear, tanning and dressing of leather and wine, products which are also exported and bring in foreign currency. Construction is booming and one of the major employment sectors of the city's economy.²¹

In general, the Federal urban development policy envisions the city to be the main economic hub specialized in higher tech industries and services within a polycentric system of cities. In 2018/19 fiscal year the total revenue of the city was 44.7 billion ETB, which includes tax revenue, non-tax revenue, municipal service charges and investment income, external assistance, and loan.²² The two top expenditure of the city are road and water sectors, financed from domestic revenue sources (loans), which aim to increase the access to these basic services and support the economic development of the city. The economically active population of the city was 1,695,065 in 2013.²³ Micro and small-scale enterprise program has been implemented and 900,000 jobs were created in the past.²⁴

However, because of low revenue base, inefficiencies in collection, lack of system to recover the cost of major infrastructure investment and weak institutional capacity, the city has become more reliant on state revenue and the share of municipal revenue has been decreasing, which could mean unsustainable financial trend. Though the city has achieved double digit economic growth in recent decades and official reports show that more formal jobs are created and a decreasing trend of informal sector, the severe constraints to access urban land and the entry barriers to establish formal business are negatively affecting the economic performance and the potential for investment attraction of the city.²⁵ Because of these, the informal economy is significant, and a major employment opportunity and survival means for many residents of the city.

(20) World Bank. (2018). *Enhancing Economic Development and Job Creation in Addis Ababa: the role of City Administration*. Washington, D.C: World Bank.

(21) Hobson et al., 2018

(22) (Hobson et al., 2018)

(23) Getachew et al., 2015

(24) *Addis Ababa City Administration and Resilient Cities Network, 2020; Getachew et al., 2015*

(25) Hobson et al., 2018

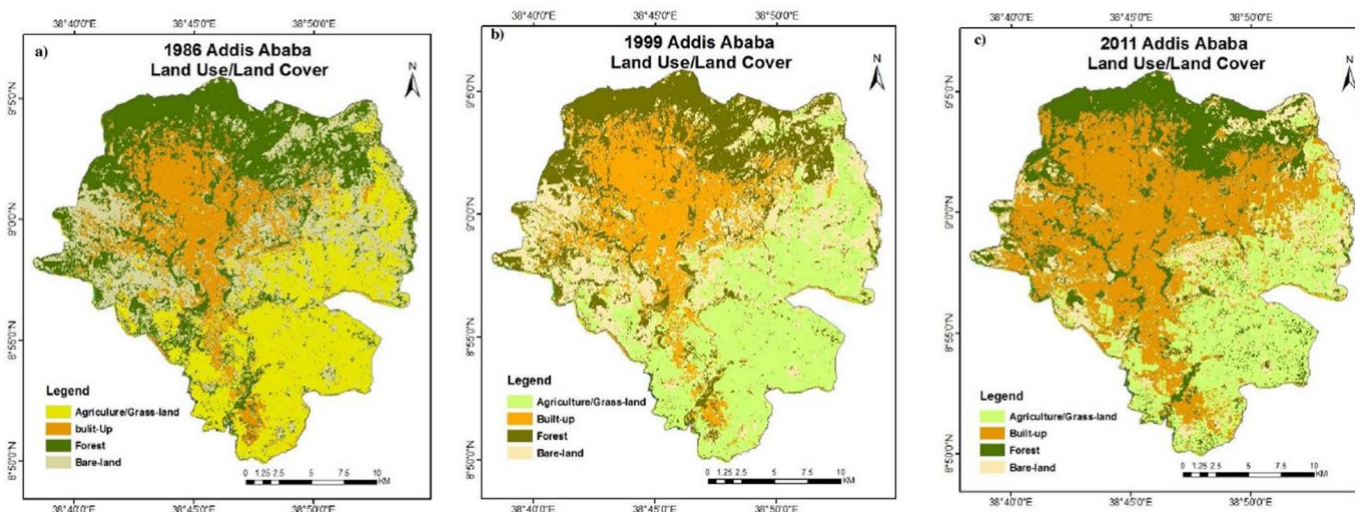
2.5 URBAN DEVELOPMENT

As historical evidence noted, one of the major reasons for the foundation of the city in 1886 was the abundance of water (finfinnee) with hot springs, which was also used for bathing and healing. Following the landform of hills, gorges and rivers, settlements were established in the form of camps where in the center was the house of the chiefs and churches located at elevated place surrounded by small houses of lower dignitaries and followers allotted to settle in the downstream of the hills hierarchically.²⁶ The churches used the springs near the rivers for holy water and the city's riverbanks provided easy access to irrigation water needed for urban farming. Therefore, areas near the riverbanks were mainly slums and informal settlements inhabited by the lower class.²⁷ Later on, as new infrastructure development and urban renewal schemes took place, some changes in the older settlement pattern were induced.

Primary growth and expansion of the city mainly takes place in the South, Western and Eastern direction (refer to figure 7). The City currently has a total surface area of 520 km². The urban footprint growth between 2007 and 2017 was 51% while the average population density declined in the same period by 7%.

(26) Tufa, 2008
(27) Mamo, 2015

Figure 7.
Land use land cover change 1986, 1999 and 2011.
(Source: Arsiso, Tsidu, Stoffberg and Tadesse, 2018: 214)



2.6 HOUSING

The freehold of land by few individuals and the tenancy of majority of the city residents continued until 1974 (until the Derg regime proclamation), which was an exploitative system exposing the poor residents to suffer from high rental price, overcrowding and lack of access to basic services. Informal housing emerged as a result of shortage of housing.²⁸

The UN-Habitat (2017) indicated that for successive six years up to 2003 more than 34 per cent of the housing supply was informal, which is believed to have proliferated since then as a result of insufficient and unaffordable formal housing. Whilst another study (Keller and Mukudi-Omwami, 2017), stated that 85 per cent of the city's population estimated to be slum dwellers, squatters or homeless in 2006. However, there is blurred demarcation between formal and informal system, in which case a wide spread corruption, legal loopholes and informal activities taking place backdoor/ behind closed door within the formal state land management and housing system, and therefore the quantification of informal settlements is challenging.

The lack of affordable and adequate housing supply has been a long-standing challenge for Addis Ababa. With the coming power of the Derg regime (with a communist ideology), all urban land and extra houses were nationalized which relieved the poor in the beginning, but through time the prohibition of private sector involvement in infrastructure and housing intensified the backlog. Furthermore, the limited capacity of the government to improve kebele houses²⁹ and the restrictions of the tenants to make changes and renovate houses resulted in further deterioration of the housing stock. The horizontal expansion of the city was halted for some time during this regime, but as squatter settlements and illegal transaction of land intensified, self-help cooperative housing was

introduced in the expansion areas in the later period of the regime.³⁰ Slum upgrading projects and infrastructure improvement programs were also launched with the support from the World Bank and International NGOs.³¹

The slum upgrading projects and infrastructure improvement programs were also continued and scaled up in the early periods of the Ethiopian People's Revolutionary Democratic Front (EPRDF) after 1991. In addition, land lease system³² was introduced, and private sector was encouraged to provide housing. The lease system enabled to generate revenue to the city administration, which is used for financing infrastructure development including water and sanitation. However, the delays in the provision of infrastructure and serviced land, and the inflated lease price discouraged the private sector particularly in the provision of housing for the middle income and the poor.³³ Above all corruption in the urban land sector has been a major impediment resulting in high inequalities and overall unfair situation undermining the system of governance.³⁴

To tackle its housing crisis Addis Ababa City Government has embarked upon a massive urban transformation through large-scale, inner-city renewal and redevelopment to replace the existing inner-city housing stock, while fast-tracking this alongside a social-housing programme (the 'Integrated Housing Development Programme' (IHDP) was launched in 2005) to simultaneously provide higher-standard housing, services, and infrastructure. Aligned with the federal government, the IHDP is an ambitious condominium construction program aimed at providing affordable housing to low- and middle-income households. The city administration has been directly involved in and subsidized the production and supply of condominium housing. Loans were provided to beneficiaries who were linked to Commercial

Bank. Condominium projects were conducted and scaled in expansion areas. While the IHDP has helped contain the city's housing shortage, created significant urban jobs, and strengthened the local construction sector,³⁵ it has managed to deliver only 179,429 housing units, providing housing for only 24% of the 734,712 residents registered under its different schemes. Furthermore, evidence suggests that the IHDP remains largely unaffordable to targeted low-income populations.

The complete renewal and redevelopment of the inner-city areas consequently provides an opportunity to develop and construct a new City-within-a-City on top of the existing urban fabric that meets modern, international standards and matches the city's global aspirations. The change from single storey houses with pit latrines separated from the main house in the previous slums to multi storey condominiums with flush toilets connected to other rooms of a unit raised the demand for water which puts pressure on the city's water supply and wastewater system. Whilst, the limitations of water supply in the condos has made it difficult for managing the pungent smell from the toilets that are not flushed. Further change in life style and awareness on the use of the sanitary systems also needed. However, the dumping of inappropriate materials into the condo unit sanitary systems with low quality fixtures that clog the pipes, blockade, overflow and malfunctioning of sanitary system manifest the challenges in the management of the sanitary systems in some of the condo sites (Keller and Mukudi-Omwami 2017).

In the inner-city, high-rise buildings and skyscrapers with hyper modern facilities are being planned and constructed, while the original occupiers of the land (when eligible for compensation) are moved to relocation housing or land in peri-urban zones. City dwellers living

in low-rise neighborhoods and inner city slums situated on high-valued, urban land earmarked for renewal and redevelopment are, therefore, at the heart of this process and face a constant threat of displacement. The relocation and displacement of the residents has substantially affected social networks and livelihoods.³⁶ The lack of access to suitable finance for the urban poor and of inclusive and sensible planning approaches intensified the social chaos in the city. Consequently, redevelopment remains a major challenge for achieving better living conditions and housing for the poor.³⁷

In 2011, the city's housing backlog reached 300,000 homes,³⁸ and approximately 1.2 million units are needed over the next ten years to accommodate projected housing demand,³⁹ of which 420,000 housing units would be for low-income residents.

Unable to access affordable serviced land in the city through formal channels, an increasing number of households are buying land informally from farmers in outlying areas. Thus, informal (untenured and self-initiated) housing, also known as Chereka Bet, is a significant source of housing for many. Unfortunately, because informal housing is built on any available and unused land, most residents live in environmentally sensitive and unsafe areas. The lack of tenure recognition also limits residents' ability to access basic services including water and sanitation.

It is estimated that Addis Ababa has a population of between 10,000 and 20,000 homeless people.⁴⁰

In addition to the shortage of affordable housing, Addis Ababa also faces challenges associated with poor housing quality and overcrowding. Close to 80% of houses in inner-city area, known as Kebele housing, are characterized

as slums due to overcrowding and the lack of adequate infrastructure such as drinking water, sanitation, and cooking facilities.⁴¹ Due to this housing's poor quality, its lack of safety, and the valuable land that it stands on, the City has been demolishing it and resettling residents who have legal claims to the homes either in condominium housing or on the outskirts of the city, where access to services and livelihood opportunities are often limited.

(28) Wubneh, 2013

(29) Kebeles were the then lowest administrative strata of the city administration which were in charge of managing the kebele houses- small inner-city houses with very minimal rental price

(30) Abdissa and Degefa, 2011

(31) Teferi, 2017

(32) Issuance of land through auction, lottery and award system with a contractual agreement between land users and the city administration defining use rights for a specified period.

(33) Wubneh, 2013

(34) World Bank, 2012

(35) UN-Habitat, 2010

(36) Teferi, 2017

(37) Teferi, 2017; Yntiso, 2008

(38) UN-HABITAT (2010), *The Ethiopia Case of Condominium Housing: The Integrated Housing Development Programme. United Nations Human Settlements Programme: Nairobi.*

(39) Addis Ababa City Administration. (2017). *Addis Ababa Structure Plan, 2017-2027.*

(40) Addis Ababa City Administration, 2017

(41) UN-Habitat, 2017

2.7 ENVIRONMENT

The one victim of rapid and unplanned urban growth in Addis Ababa has been the urban environment which has a huge impact on public health as well. Air and water pollution are exceeding acceptable standards with negative consequences for the health of the city residents. The major sources of air and water pollution include the use of old cars, the use of charcoal for cooking and heating purposes as well as the lack of proper sewage and dry waste management. Addis Ababa's green areas and the urban ecosystem remain far below desirable standards. Trends show that the built up areas are increasing at an incredible speed not least because of the City's unprecedented construction boom that led to land cover change in recent past decades. In 1975 the total built up area of both Addis Ababa and the Oromia Special Zone Surrounding Finfinee zone was 26.08 km². Since then, the average yearly increment of the built up area was 3.5 km² for fifteen years up to 1990. In the consecutive decade (1990-2000) it was 4.2 km² increasing to on average 7.85 km² per year from 2000-2015.⁴²

The built up increment comes at the cost of vegetation cover loss, which has mainly occurred while the city expanded to the west and eastern direction (refer to figure 9). Recent research shows⁴³ that Addis Ababa lacks urban green infrastructure including recreational parks and other green spaces. The land use of urban agriculture decreased significantly (by 11.9%)

followed by urban forest (by 3.7%) while other studies indicate that the City's green cover and evapotranspiration surfaces (that includes field crops, eucalyptus trees and shrubs) have been reduced by 15.5% within five years.

Today, city residents have no sufficient recreational green space. Addis Ababa's green area coverage of 1.5 m² per capita is well below the WHO standard of 9m². The city's park area per capita is very small (0.37 m²) compared to Ethiopian standards (15 m²) and the large portion of the city's population (above 90%) has no access to existing parks within the minimum walking distance thresholds. The aforementioned expansion of built up environment, density, weak implementation of policies and plans, and lack of priority for developing green spaces constitute major constraints.

The scarce green areas and poor ecosystem in the city negatively affect pollution mitigation, run-off regulation and the provisioning of clean water due to decrease in infiltration and groundwater recharge. Furthermore, it exposes and increases the vulnerability of the city and the surrounding region to flooding and water stress and impacts negatively on the wellbeing of the Addis Ababa residents. Neighborhoods accommodating the more vulnerable communities have the least access to green areas and the benefits of an adequate ecosystem.⁴⁴

(42) Woldegerima et al., 2016

(43) Azagew, S., Worku, H. Accessibility of urban green infrastructure in Addis-Ababa city, Ethiopia: current status and future challenge. *Environ Syst Res* 9, 26 (2020).

(44) UN-Habitat, 2017

Figure 8.
 Built up areas
 (Source: WRI,
 2020)

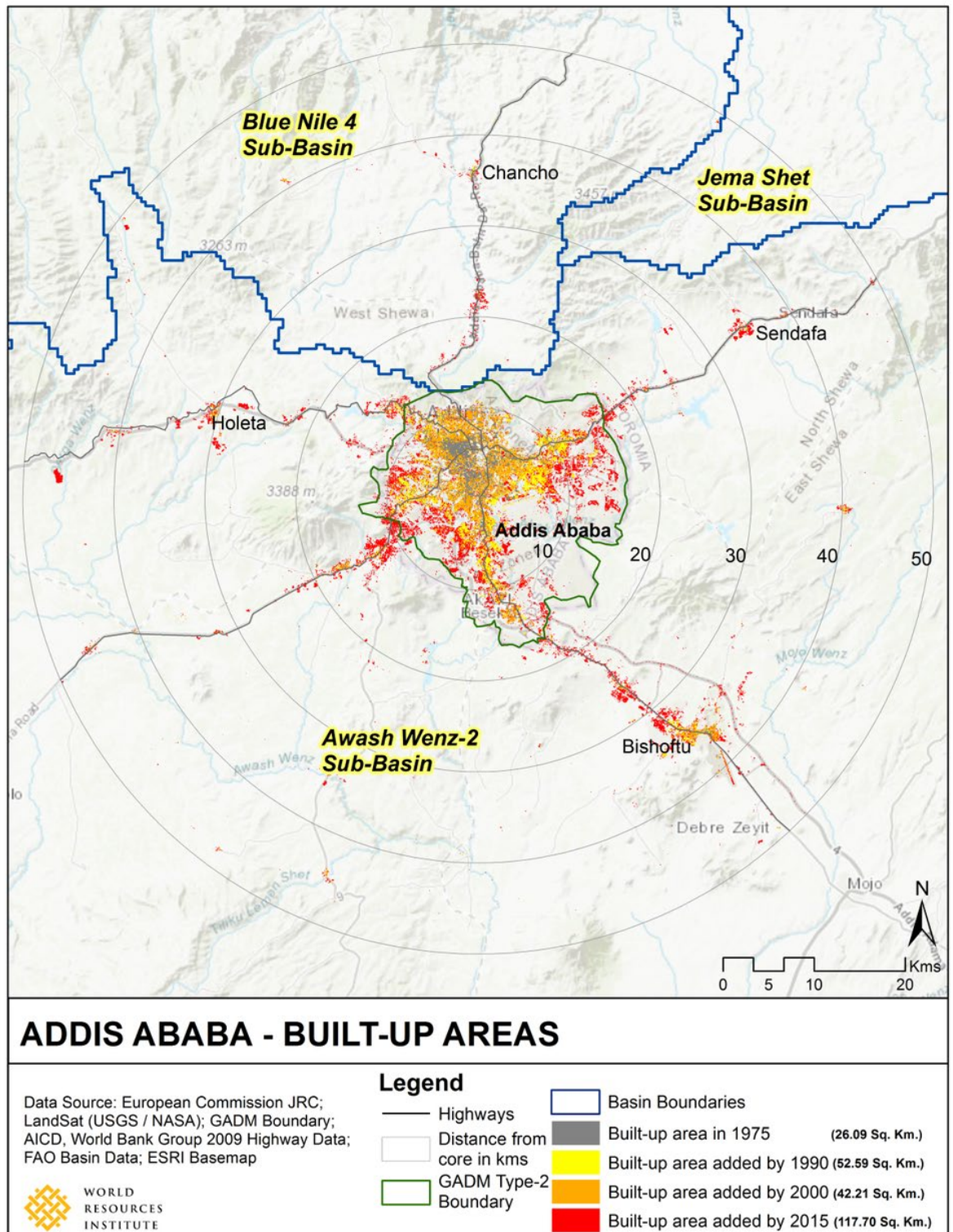
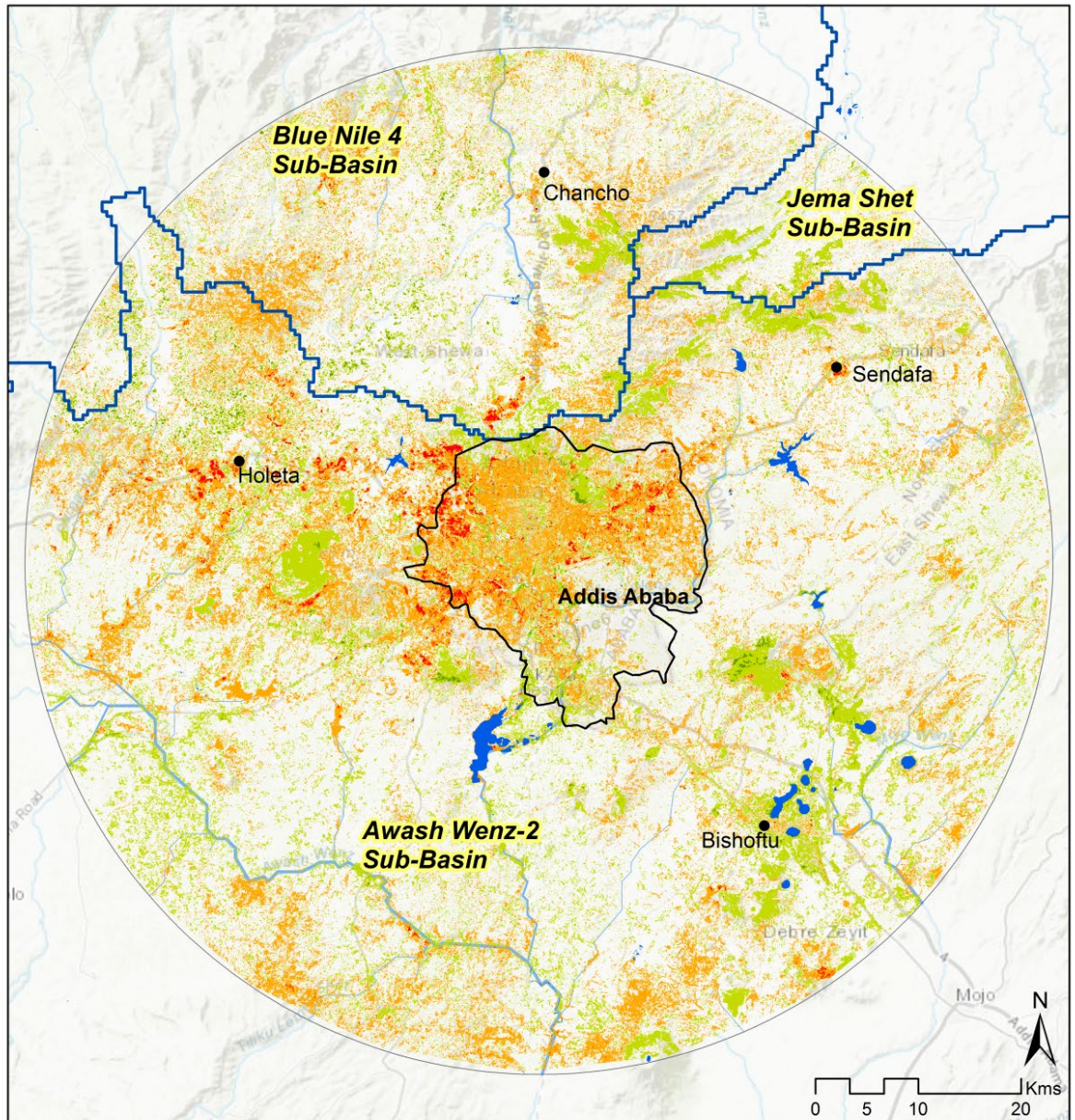


Figure 9.
Vegetation loss
(Source: WRI,
2020)



ADDIS ABABA - Vegetation Trend Analysis (1990-2019)

Data Source: JRC Global Surface Water; LandSat Data(USGS / NASA); GADM Boundary; FAO Basin Data; ESRI Basemap



Legend

- 50 Km Buffer from core
- GADM Type-2 Boundary
- Basin Boundary
- Max Surface Water Observed(1984-2018)
- River Network 1
- River Network 2
- River Network 3
- River Network 4
- River Network 5

Vegetation Trend

- High Loss (0.30 Sq. Km.)
- Moderate Loss (45.23 Sq. Km.)
- Low Loss (1199.18 Sq. Km.)
- Low Gain (937.50 Sq. Km.)
- Moderate Gain (30.60 Sq. Km.)
- High Gain (0.05 Sq. Km.)

3

UNDERSTANDING ADDIS ABABA'S WATER SYSTEM

Clearly defining the urban water system according to a holistic view is a fundamental first step in undertaking a resilience assessment for a city. In the following we define the basin(s) upon which the City of Addis Ababa depends.

3.1 DEFINE THE BASIN

Ethiopia is sub-divided into twelve river basins. According to Ethiopian water resource management policy, the basin is “a geographical area described by the watershed limits of a water system including surface and underground water flowing into a common terminus”. Furthermore, the policy directed that recognizing the hydrologic boundary of a basin as the fundamental planning unit for an integrated water resource management as important.

With intensifying water use due to economic growth, climate change, and land use changes, achieving sustainable water management on the basin scale is becoming more and more challenging particularly from the city perspective. Water needs to be allocated between different sectors and stakeholders such as irrigation, industry, drinking water supply, power generation and nature. With water demands already exceeding availability in many regions in Ethiopia, changes in climate patterns (often leading to prolonged droughts and more extreme rainfall events) are expected to further enhance complexities faced by decision makers.

The City of Addis Ababa is situated in the Western part of the Awash River Basin, which is the third largest basin in Ethiopia⁴⁵ with 112,696 km² and accommodates a population of approximately 18.3 million people.⁴⁶

Through its location the City of Addis Ababa both influences, and is influenced by, its basin and sub-basins.

Awash River basin is located between latitudes 7o53’ N – 12o N and longitudes 37o57’ E – 43o25’ E. Awash River has a total length of 1,200 km originating from the plateau of the central highlands of Ethiopia (west of Addis Ababa in Oromia Regional State, at an altitude of 3000 meters above sea level and terminates at Lake Abe (a salty lake), 250meters above sea level at the border of Djibouti.⁴⁷ Major tributary rivers include Kesseme, Kebena, Awadi, Arso, Ataye, Borkena, Cheleka, Mile and Logiya rivers.

In comparison to other basins of the country, the water sources in the Awash River basin are highly utilized for irrigation, hydropower generation, as well as to secure water supply to towns and cities within the basin. In addition to Addis Ababa, other major cities of the country are located within the basin including Adama, Bishoftu, Dire Dawa and Kombolcha. Awash River basin is highly urbanized and industrialized mainly as a result of the railway and road connection to Djibouti port that facilitated the urbanization in the basin. Besides, major import/export activities of the country are taking place through the basin.

The average rainfall in the basin ranges between 1600mm to 160mm in the highlands and lowlands respectively.⁴⁸ The annual total water flow through the river is 4.9 billion m³ while the groundwater potential is estimated to be 0.14 billion m³, while its’ share of freshwater flow at national level is only 3.75%.⁴⁹


(45) *Tadese et al., 2019; Van Rooijen and Taddesse, 2009*

(46) *Taye et al., 2018*

(47) *Hailu et al., 2017; Tadese et al., 2019; Hemel and Loijenga, 2013; Taye et al., 2018*

(48) *Taye et al., 2018*

(49) *Tadese et al., 2019; Hemel and Loijenga, 2013*

Figure 10.  **Awash and Abay basins, and Addis Ababa**
(Source: WRI, 2020)

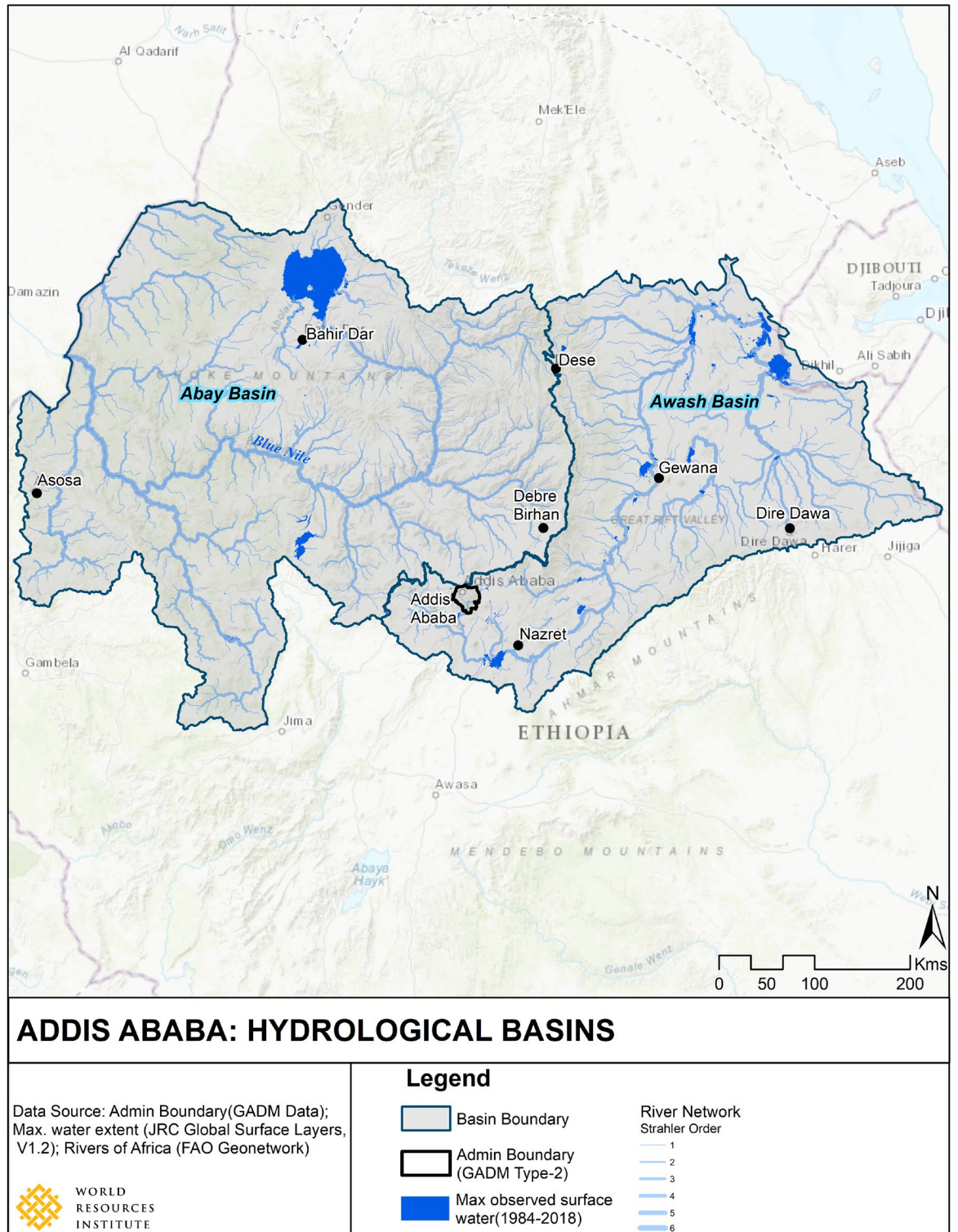
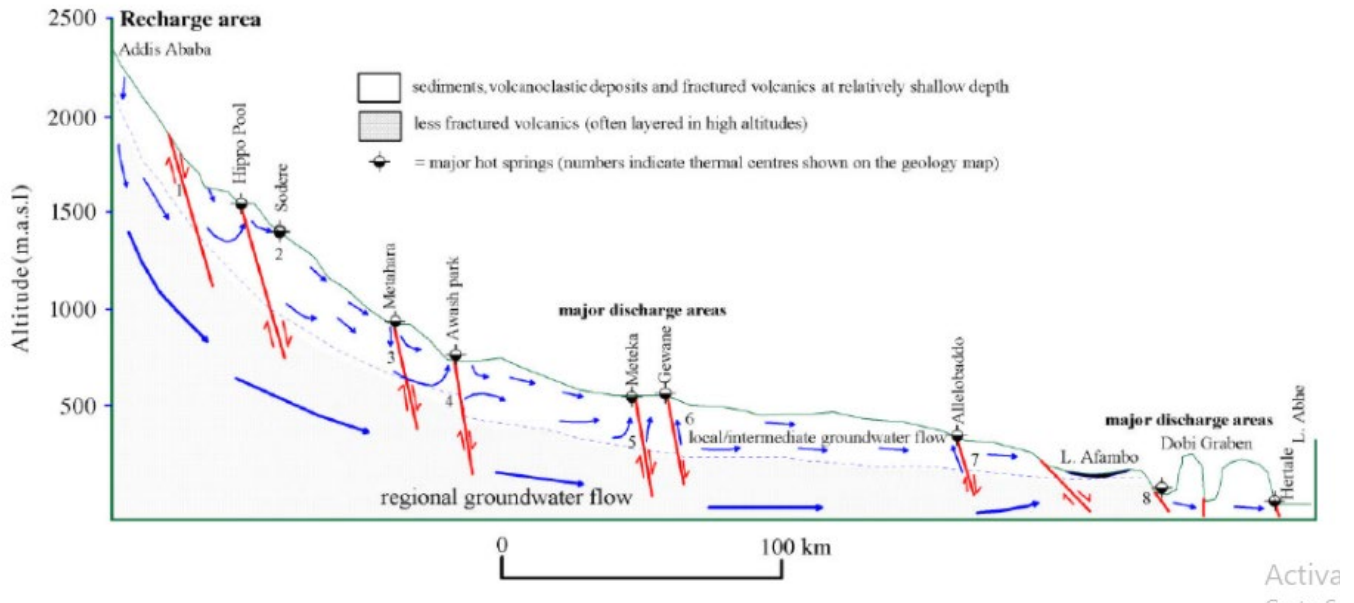


Figure 11.

Groundwater flow in Awash basin

(Source: Ayenew et al., 2007: 1551)



There are different landscapes – mountains, plateau, gorges, valleys and lowland plains within the basin. Awash National Park is also located within the basin with acacia woodland and savanna grassland vegetation which is a habitat for different wild animals (such as oryx, gazelle, dik-dik, lesser and greater kudu, warthogs, ostriches, baboons). According to the Ministry of Water Irrigation and Energy (MoWIE), Awash basin is divided into 21 sub-basins. The City of Addis Ababa is located within Akaki sub-basin, which covers an area of 1634.02 km².⁵⁰

The Akaki River flows from north to south and passes through Addis Ababa. It consists of two main branches, the confluence of which is at the Aba-Samuel reservoir. The western branch of the river called Little Akaki rises from the north-west of Addis Ababa on the flanks of Wechacha mountain and flows through the western part of the city for approximately 40 km before it reaches the reservoir. The eastern branch of the river called Big Akaki rises north-east of Addis Ababa and flows into the eastern part of the city before it reaches Aba-Samuel reservoir after approx. 53 km. The Akaki river is polluted by various discharges from tanneries, breweries, wineries, battery factories, and abattoirs. These pollutants are discharged directly into the river either before or after partial treatment. In

addition, domestic wastewater, human excreta, and surface run-off contribute to its pollution. Despite its bad odor, black color, and potential toxicity, the river is still used for various daily activities, including laundry, bathing, swimming, irrigation, and drinking.

Due to its downstream location of Akaki sub-basin the Aba-Samuel reservoir receives all the flows and discharges from Addis Ababa and upstream areas of Oromia Region. The Aba Samuel Reservoir is the oldest Reservoir in Ethiopia and was created in 1939 to produce electricity for Addis Ababa, and production continued until 1970 when the machinery became too old to maintain and the plant stopped working. Aba-Samuel reservoir catchment area is 1,495 km² and includes the catchment of the Lege Dadi dam. The reservoir originally had an area of 12,068 km², but the catchment has suffered much erosion resulting in silt deposition in the reservoir that has also been invaded by *Eichhornia crassipes*. Both of these factors have severely reduced the area of open water.

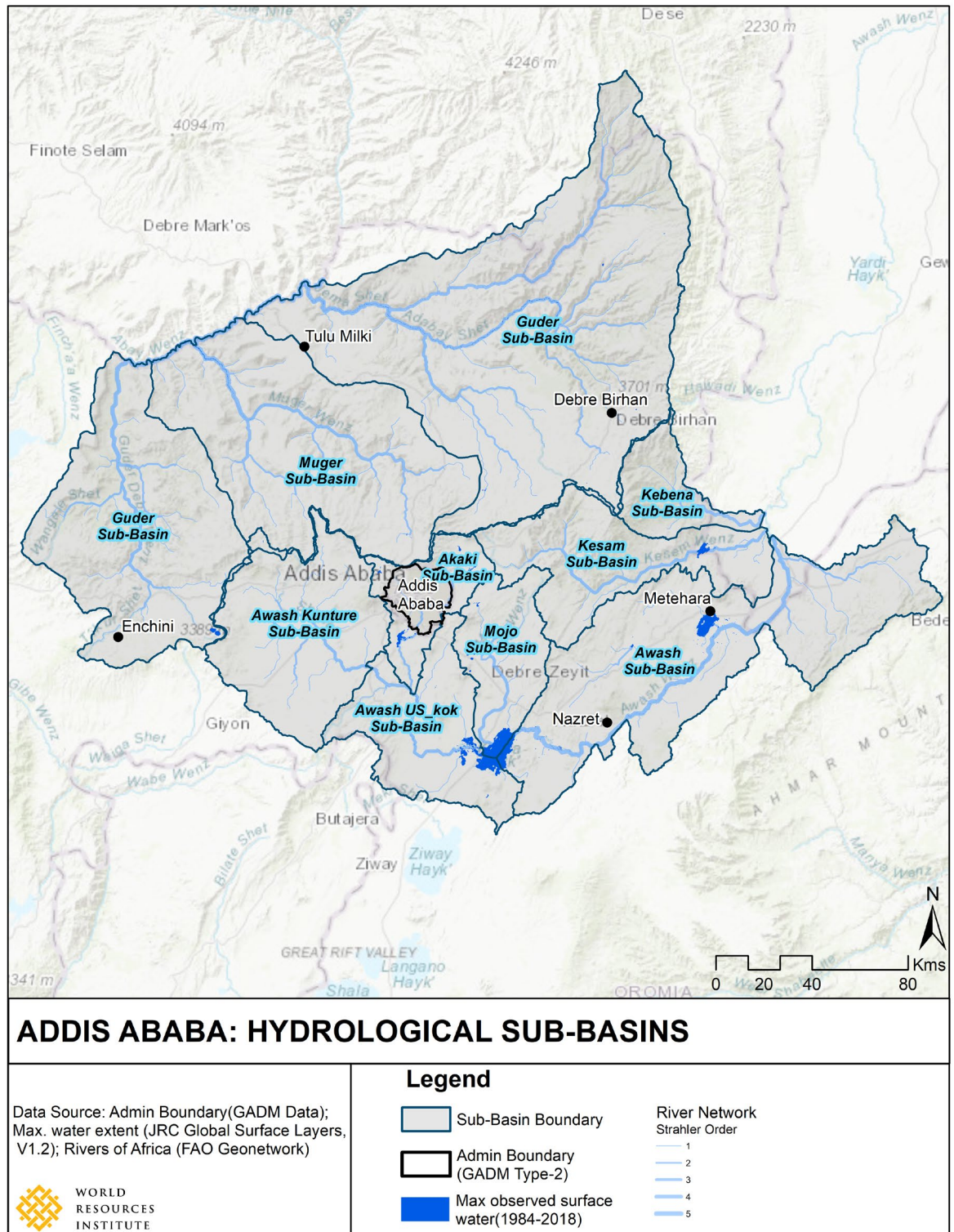
Fresh water sources, in and around Addis Ababa city, including rivers, lakes and ground water are utilized for irrigation, sand mining, industrial

(50) Water Governance Centre, 2013

consumption, electric power generation, making food, recreation purpose, habit for birds, and aquatic animals, drinking and sanitation purposes. In southern parts of Addis Ababa city, the same rivers and streams serve for horticulture, watering cattle, and for other domestic activities.

The principle of basin management to protect and sustainably manage water resources and related ecosystems is not adequately implemented. Coordination between different administrative entities is difficult and complex, further exacerbating water challenges.

Figure 12. Hydrological sub-basins surrounding Addis Ababa (Source: WRI, 2020)

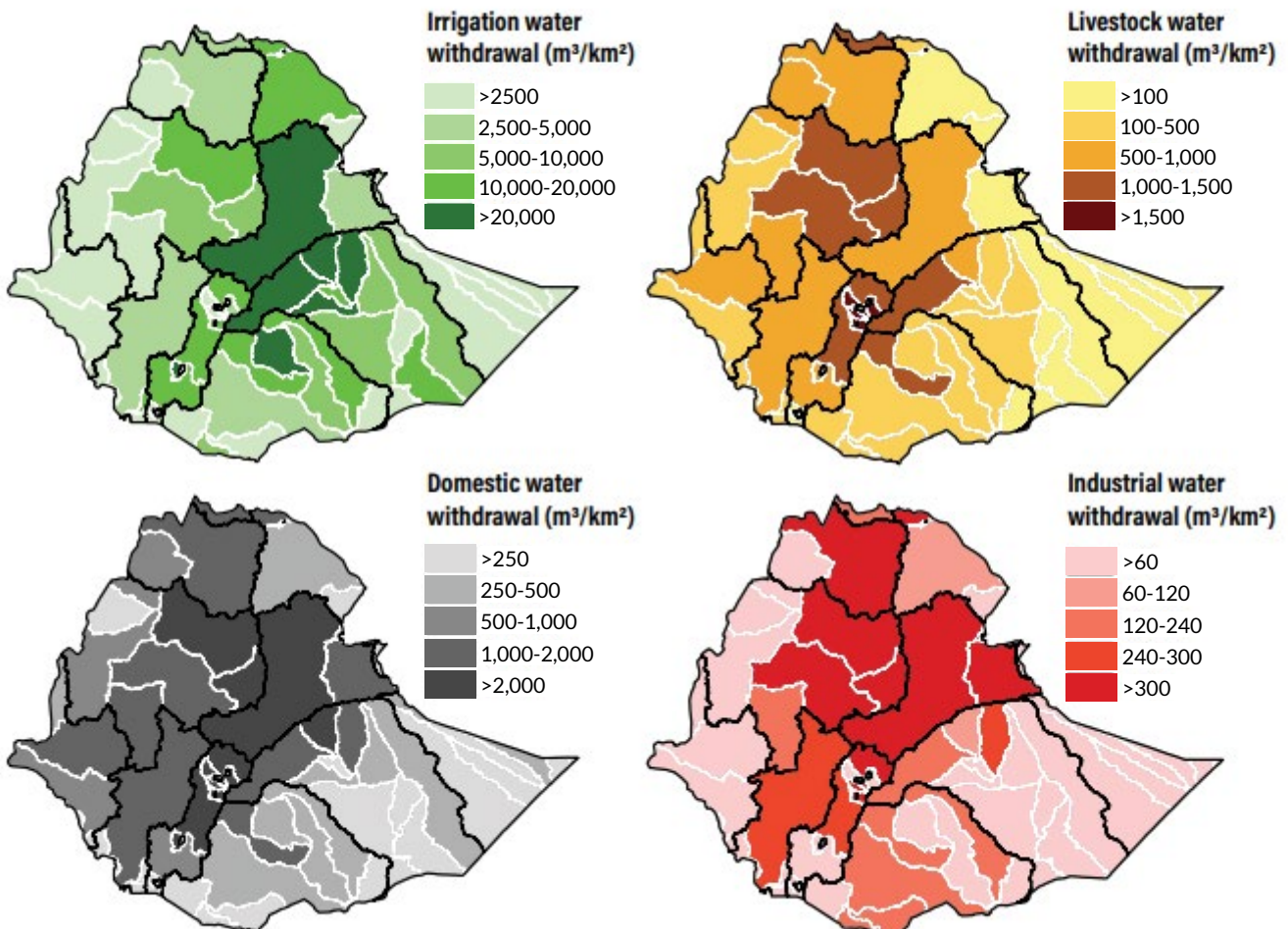


As for water supply, all of Addis' surface water sources are reservoirs located outside the city boundaries. Water is being supplied from three reservoirs namely Legadadi and Dire Dams (~30 km Northeast of Addis) and Gafersa Dam (~20km Northwest of Addis). All the dams are located in the Akaki sub-basin. Koka dam located further downstream to Akaki sub-basin (in upstream Koka and Awash sub basins) is serving

mainly for hydropower station, but also serve as the main source of water supply to large scale sugar and fruit farms (such as Wonji sugar cane), Adama city residents (the third biggest city of the country), Amibara, Gewane and to downstream pastoralists.⁵¹

(51) Tadesse et al., 2019; Reis et al., 2011

Figure 13.
Water withdrawal in Awash basin in comparison to other basins
(Source: Adane, Gelassie and Swedenborg 2020a: 3)

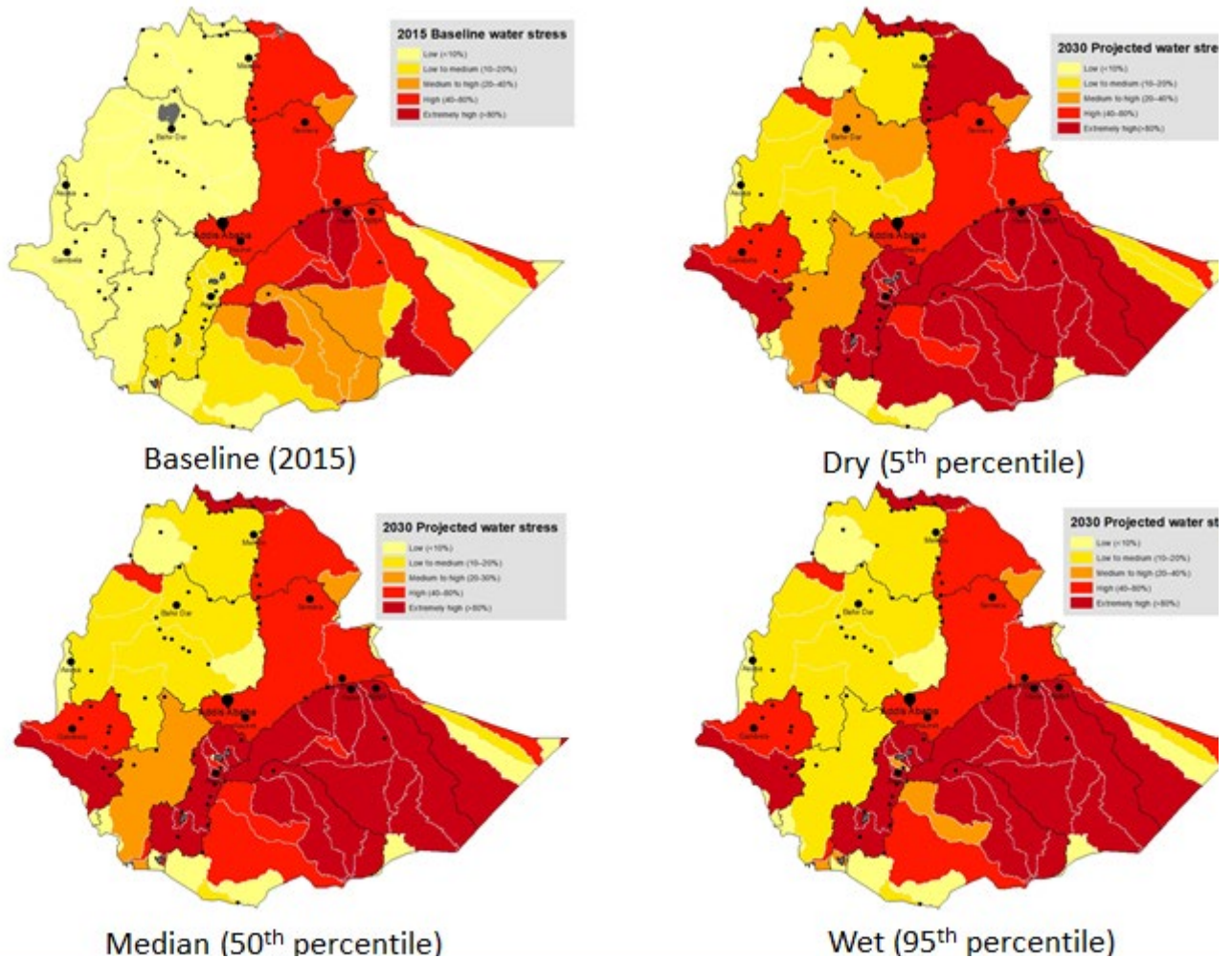


Other dams in the middle and lower Awash basin (i.e. Kesseme and Tendaho) are also important sources for large scale irrigation/commercial farms (such as Wonchiti, Tendaho, Abadir, Merti, Amibara, Tebli, and Nura hera irrigation projects) and households. There are also a number of small scale irrigation systems and community farms

which covers more than 68% of irrigated land within the basin.⁵² Rain fed agriculture is also practiced mainly by the highlanders of the basin.

(52) Hailu et al., 2018

Figure 13.
Baseline project water risks
(Source: Adane, Yohannes and Swedenborg, 2020b)



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3.2 WATER SERVICES

Water Supply

As to the historical evolution of the conventional water supply system, piped water was introduced in 1901. Modern water supply started in 1924 and water department organized under the municipality of Addis Ababa in 1940s and Gefersa dam and centralized distribution network was established in 1944.⁵³ As the city's water demand increases the additional centralized water supply dam at Legedadi with treatment plant started in 1970s. Addis Ababa Water Supply and Sewerage Authority (AAWSA) established in 1971. Therefore, through time city's water supply system expanded from small scale springs mainly at the foot of Entoto Mountain and hand dug wells in different locations to more sophisticated centralized "modern" water supply system. Deep groundwater boreholes and surface water sources are exploited to boost the supply in response to increasing demand, and the coverage was 76.6% in 2017.

Water Sources, Availability and Demand

The city currently gets its water from three surface water sources (Gefersa, Lagadadi and Dire dams, which are located in Oromia regional state) and groundwater sources (Akaki well fields and small boreholes distributed in different parts of the city). This indicates that the city is largely dependent on water sources outside its jurisdiction.

Currently the total water supply is 580,000 m³ per day, while the city demand is 1.1 million m³ per day.^{54,55}

Production of 450,000 m³/day is sourced from surface and groundwater, and it is estimated that about 36.5 percent of this water is lost due to leakage and other system inefficiencies. The per capita distribution is estimated to be around 40 liters/day, well below the city's goal of 110 liters/day.

Around 30,000 m³ of water per day is produced

from Gefersa dam and 195,000 m³ per day from Lagadadi and Dire dams and the rest from groundwater sources including 70,000m³ per day from Akaki aquifer.⁵⁶

Despite significant gains achieved over recent decades, access to safely managed and reliable water services continues to be a major challenge facing the city. AAWSA provides safely managed water through its piped network to less than 60% of the population in Addis Ababa. AAWSA has 670,000 customers and supplies water to 2,249 public fountains (public outlets). However, earlier during the Millennium Development Goals (MDG) there were faulty reports and exaggerated figures about the coverage such as 92% in year 2011, which signifies the problems and gaps in the system of monitoring and underestimation of the problems of access to water.⁵⁷ In general, even though the supply has increased in the recent decade, the coverage is still limited and there is shortage of water due to unprecedented increase in the demand.

Out of the total produced water, 20% is lost due to leakage and 17% is financially unaccounted for. In addition, water produced from surface water sources takes a larger proportion, i.e. 51%.⁵⁸ An overall water flow analysis conducted in 2015 shows that significant of produced water is lost due to leakage while the lion share of used water is discharged to receiving river system without treatment (refer to figure 16).

(53) Metaferia consult, 2017; Ewunetu, 2019

(54) Interview, 2020b

(55) It is to be noted that there is a difference in the numbers between the key informant interview and the figure in the table no. 1, which is to be validated through stakeholder engagement.

(56) Interview, 2020b

(57) Worku, 2017

(58) Ewunetu, 2019; Worku, 2017

Figure 15. Addis Ababa's water supply network and locations of reservoirs
(Source: The Nature Conservancy, Global Resilient Cities Network and Addis Ababa City Administration, 2020)

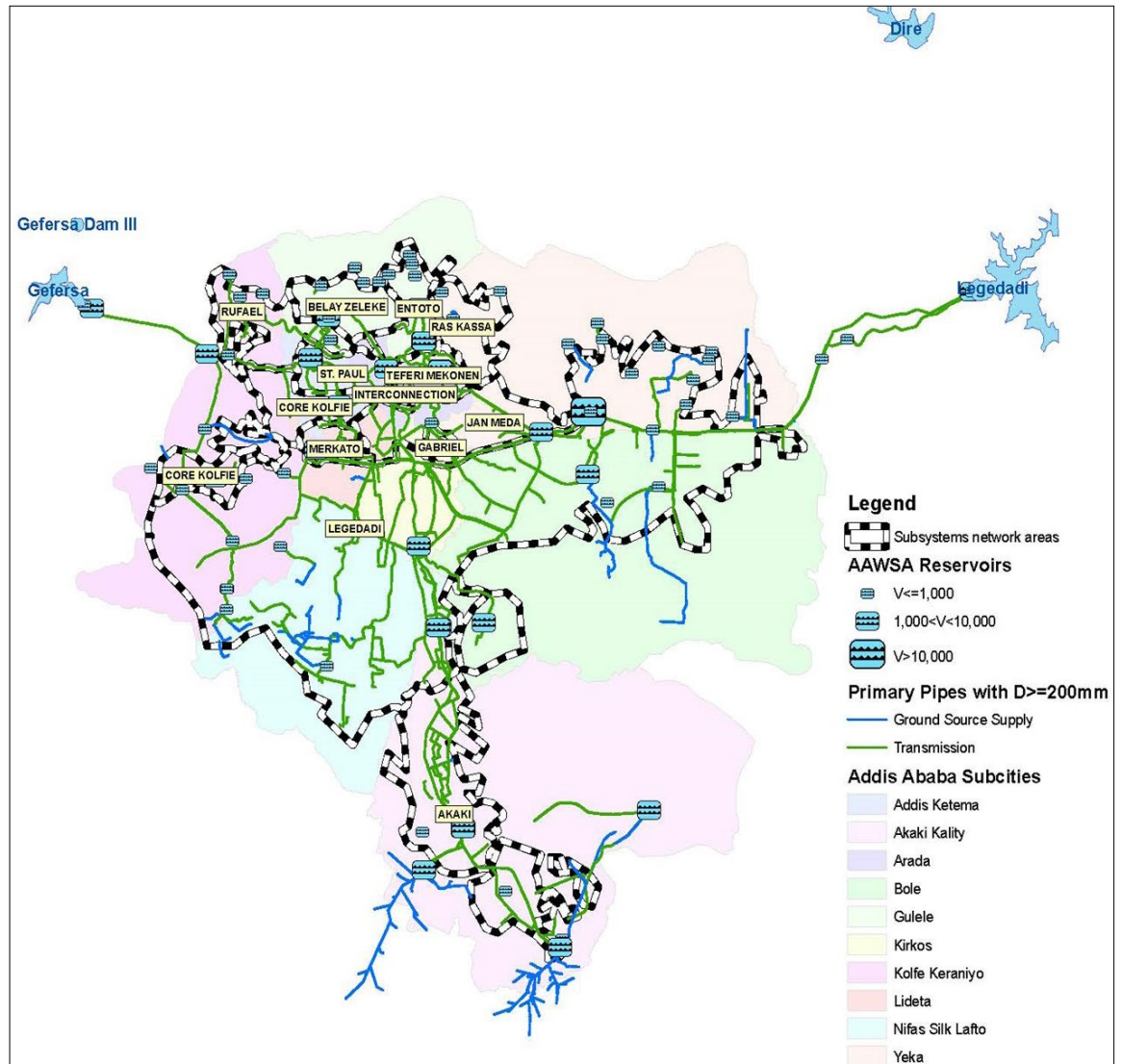
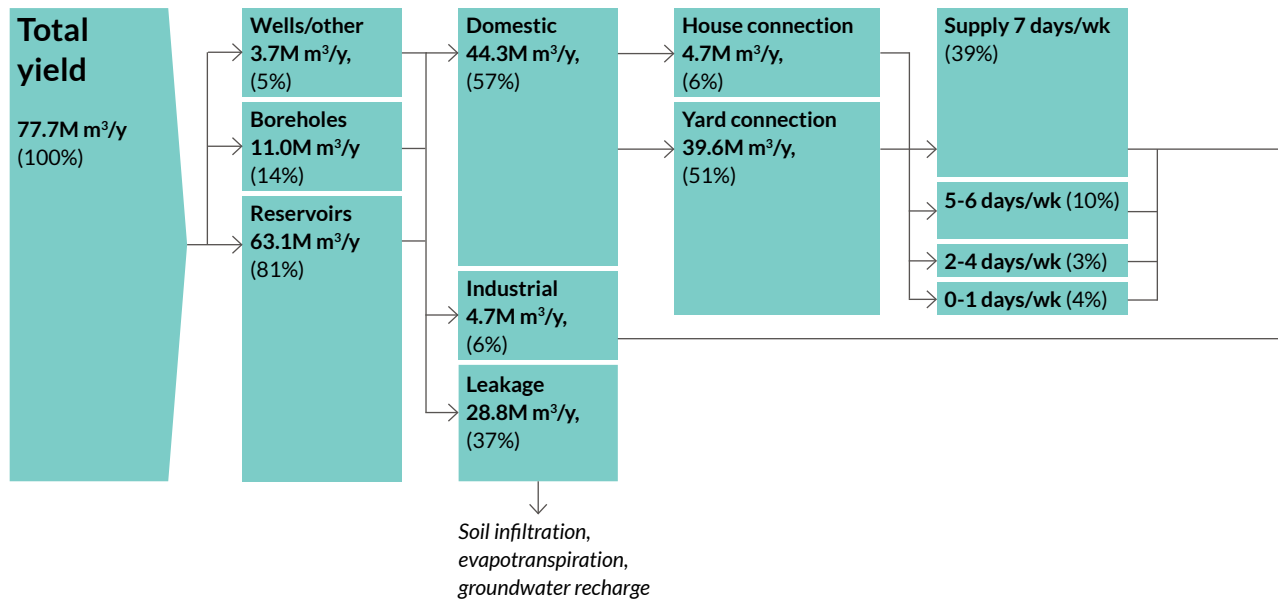


Table 1. Addis Ababa water supply sources, estimated production and cover rate
(Source: De Wildt, van der Meulen and Ketema, 2020: 14)

AAWSA water sources	Estimated production (m ³ /day)	Cover rate (%)
Surface water sources		
Legedadi & Dire dam reservoir (combined)	174,000	32.10%
Geferssa reservoir	30,000	5.54%
Groundwater sources		
Legedadi deep well	40,000	7.38%
Akaki old well field	8,000	1.48%
Akaki Phase II	66,000	12.18%
Akaki Phase 3A	36,000	6.64%
Akaki Phase 3B	68,000	12.55%
Akaki Koye Feche	30,000	5.54%
Pocket area wells	90,000	16.61%
Total	542,000	100%

Figure 16. Addis Ababa water flow analysis in 2015 (Source: adapted from Backhaus et al., 2015)



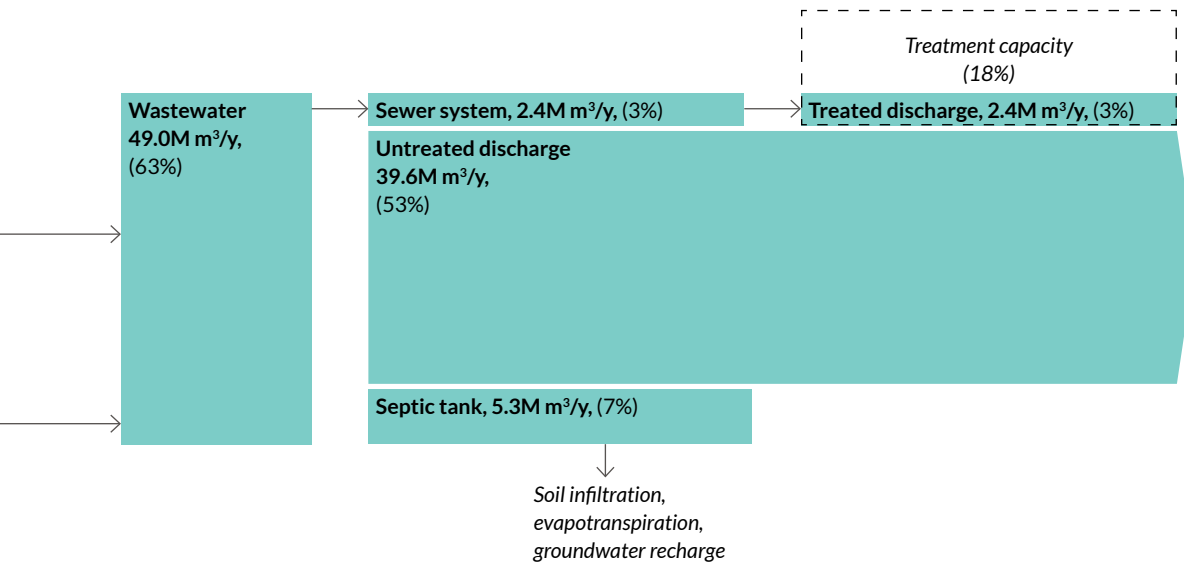
The pressure of rapid population growth, coupled with higher living standards, has resulted in increased water demand and per capita consumption. Water demand from industrial, commercial, and construction sectors is also on the rise, fueled by a rapidly expanding economy and unprecedented construction boom. While demand for water has grown in all major sectors, the availability and supply of water is decreasing as a result of intensive groundwater development, natural resource degradation and climate change.

Because of water demand exceeding water availability, water shortages and city-wide water rationing are common in Addis Ababa. Parts of the city are supplied in shifts with some areas only getting water twice a week through distribution lines or water trucks⁵⁹ which negatively impacts public health and economic productivity. While these restrictions are necessary to manage limited water resources, poor communication and unpredictable rationing are eroding public trust in the water utility and government. Not least, because water shortages and rationing seem to impact particularly the sub-cities of Gullele, Kolfe Keranio, Addis Ketema, and Arada, which have higher concentrations of low-income residents.⁶⁰ In general, residents in informal and low-income

areas are disproportionately impacted by reduced water availability as they have limited means to supplement public water supply with other sources of water. The limited availability of clean water impacts personal hygiene of low-income residents while at the same time combined with inadequate sanitation increasing the risk of waterborne and infectious diseases, as revealed by successive cholera outbreaks and the recent COVID-19 pandemic.

Recurrent power cuts negatively affect water distribution, especially in elevated areas of Addis Ababa. The city's dilapidated infrastructure is vulnerable to contamination, especially during the rainy seasons, which places Addis Ababa at a high risk for outbreak of waterborne diseases.

Addis Ababa Water and Sewerage Authority (AAWSA), recognizing that water is a constitutional right of all citizens, charges a very low, non-cost covering tariff. Coupled with low collection efficiencies AAWSA is struggling to maintain and replace aging infrastructure, and to provide adequate, reliable services to all residents in its service area. "In period between 2001/02-2009/10 fiscal years, AAWSA was able to cover, on average, only 40.5 percent of its total (recurrent and capital) annual expenditures."⁶¹



To address the city's water shortage and increase water availability, AAWSA has recently launched mega projects with the objective of doubling its daily water production capacity. In recognition of the limitations in water provision, AAWSA is encouraging institutions (both governmental and private) that have high water consumption rates to source their own water through institutional or private boreholes. While these boreholes help to address supply challenges in the short term, uncontrolled drilling and uncontrolled abstraction could lead to groundwater depletion, threatening the city's long-term water security. Currently underutilized opportunities include capturing rainwater, storing stormwater, and reusing effluent for a variety of non-drinking purposes. Additionally, the public lacks awareness about water as a finite resource and economic good leads to high consumption figures and water wastage (if it is available).

However, it is important to note that this story is only confined to the formal level water management system (mainly from the utility-AAWSA perspective), which largely misses the different informal water systems and providers at local level. More than half of city residents (50-55%) are forced to buy water regularly from private vendors with higher prices.⁶²

A local elder interviewed in an informal settlement (Repi) noted that the local river water was clean and springs were abundant in the former times and residents used to drink the water, but since two decades the same communities have been facing increased water stress due to population growth, settlement, pollution and depletion of natural water sources.⁶³ In response to that individuals and communities have tried to develop community and individual boreholes to meet their demand and basic needs. Particularly in inner city slums multiple households share a water connection / source. In fact, the reduction of yield and abandonment of a number of boreholes due to over extraction were noted during key informant interviews from AAWSA⁶⁴ as well as in Metaferia Consult (2017) study.

(59) World Bank (2015), *City Strength Resilient Cities Program, Addis Ababa - Urban Resilience*

(60) World Bank, 2015a

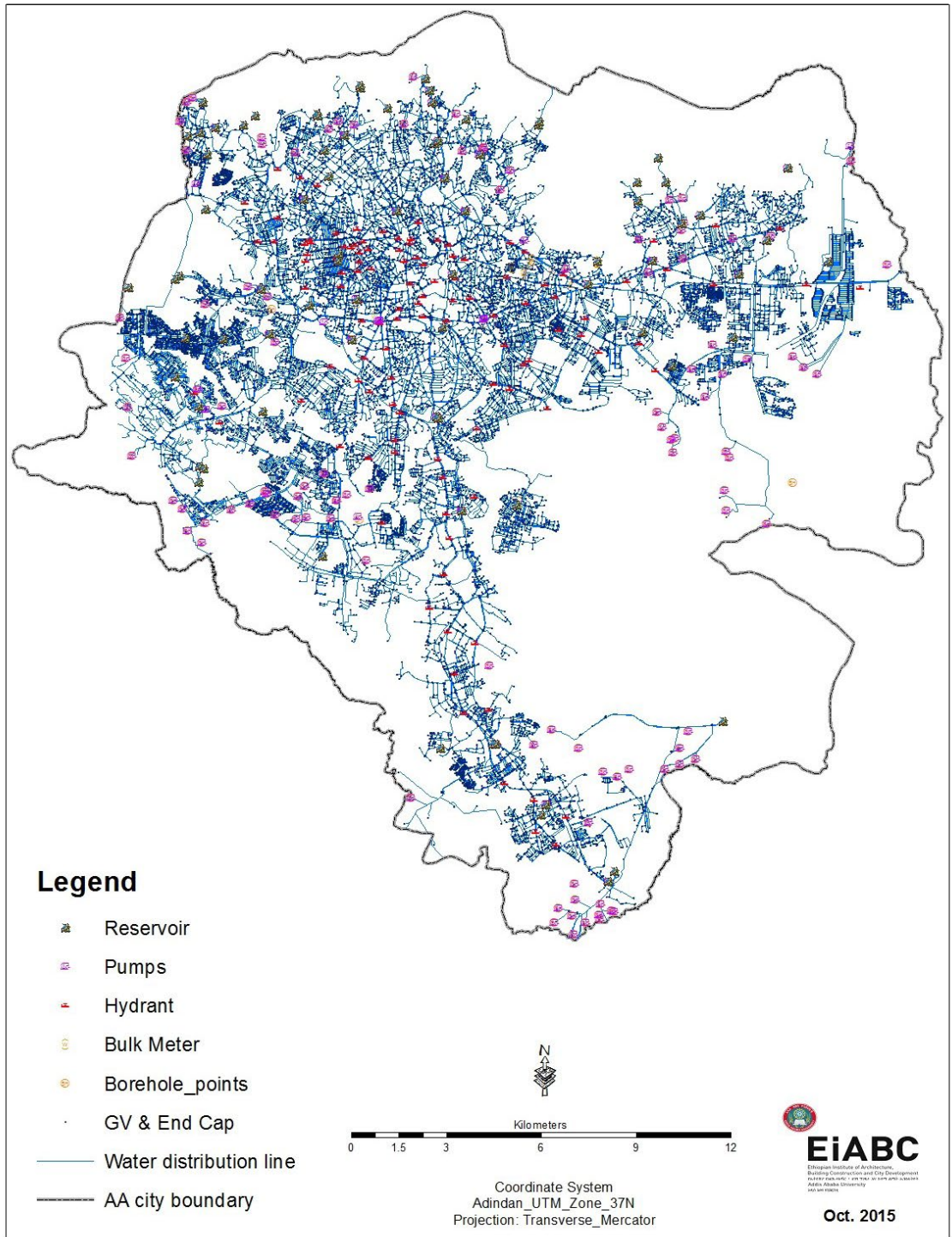
(61) Teshome et al., 2013: 24

(62) UN-Habitat, 2017: 83

(63) Interview, 2015

(64) Interview, 2020b

Figure 17. Addis Ababa city water supply infrastructure network
(Source: Habtemariam, 2016)



3.3 WASTEWATER MANAGEMENT & SANITATION

Wastewater management started in Addis Ababa around 1935 after public water supply services and evolved from the use of individual septic tanks and indiscriminate discharge to connection sanitation facilities to sewers discharging into centralized treatment plants and lately decentralized treatment facilities. Faecal sludge from septic tanks was transported and dumped in peri-urban locations. During the short lived Italian occupation period, a combined system for wastewater and storm water was installed in parts of Piassa and Mercato (the current central parts of the city). Through time the city adopted a separate system of sewers with a centralized treatment plant and drainage system.⁶⁵

In 1997 the city's road authority was established by regulation no. 7 of 1997, which was then mandated to protect roads from floods, signifying a partial mandate to storm water management. Others like the Environmental Development Office of the city Administration was in charge of supporting neighborhood development such as construction of drains, public fountains and communal pit latrines through a matching fund arrangement. In 1998 a flood master plan for the city was prepared in collaboration with JICA and since then more of grey engineering solutions were implemented to address storm water challenges.

However, it is important to note that there are a large number of building and households that connect their sanitation facilities and indoor plumbing to drains, which leads to "open sewers" and the mixing of wastewater with storm water. AAWSA continues to expand the existing sewer system and respective decentralized treatment plants and encourages the construction of additional decentralized treatment facilities to meet increasing demand. In 2017, there were 86,535 sewer connections and sewer coverage was estimated to be around 12.9%.

The city's sewer system is subdivided into three catchments i.e. Kality, Eastern and Akaki, and in total there are 200 km sewer lines.

The modern sewerage system covers only 23% of residential houses.⁶⁶ All wastewater treatment plants, and stabilization ponds are working under capacity. The Kality central treatment plant has a design capacity of 100,000 m³ per day whereas the actual amount of wastewater that is treated at the facility is 46,000 m³ per day. Kotebe lagoons, its drying beds and stabilization pond are the eastern catchment facility with a design capacity of 26,760 m³ while the actual amount of wastewater and faecal sludge treated at the facility is 15,600 m³. The Akaki catchment is currently under study and it is where many industries are located.

(65) Metaferia Consult, 2017

(66) Interview, 2020a

Figure 18.
Wastewater catchment areas
(Source: Metaferia Consult, 2017: 35)

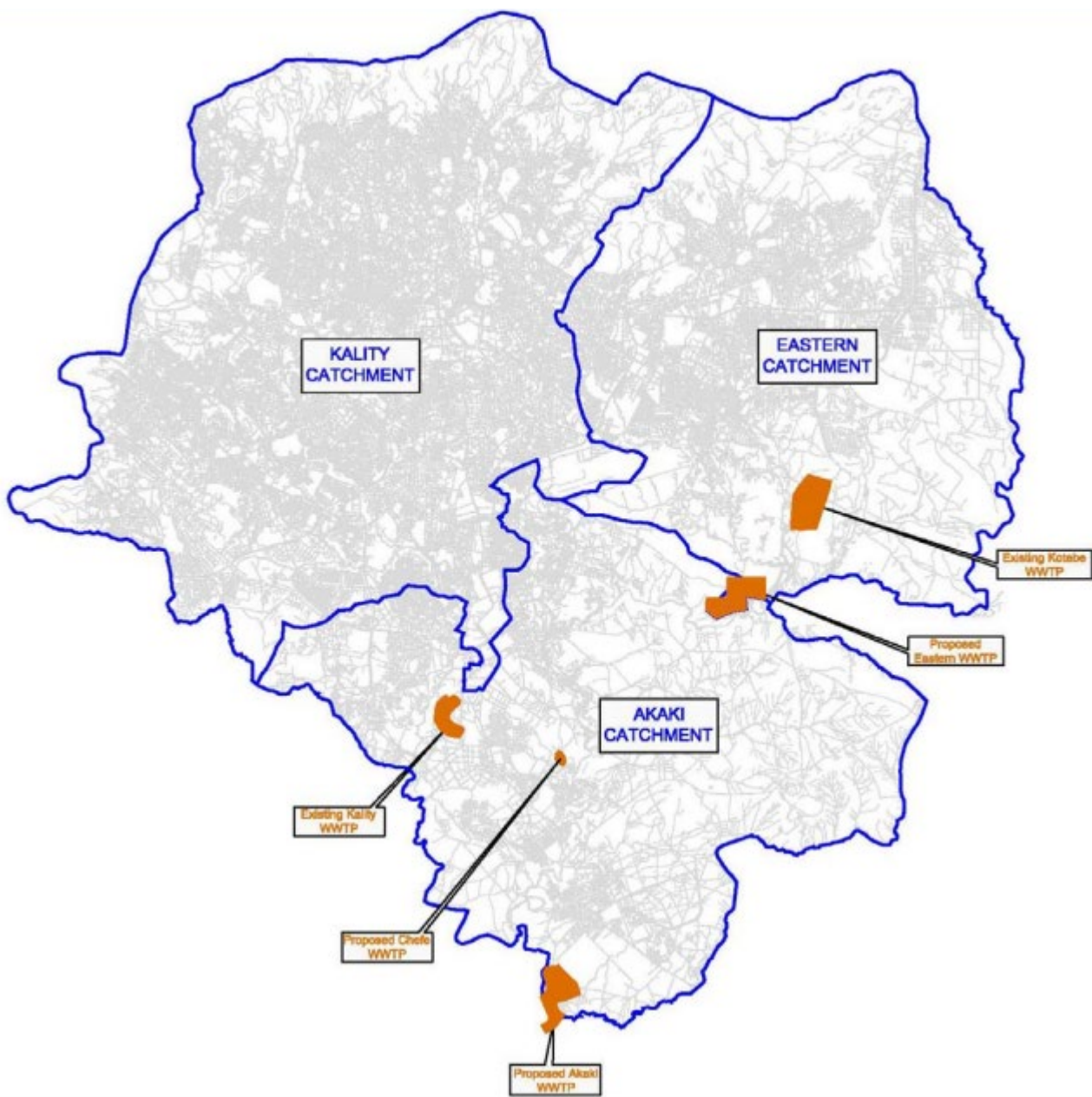


Figure 19. Addis Ababa wastewater sewer infrastructure (Source: Habtemariam, 2016)

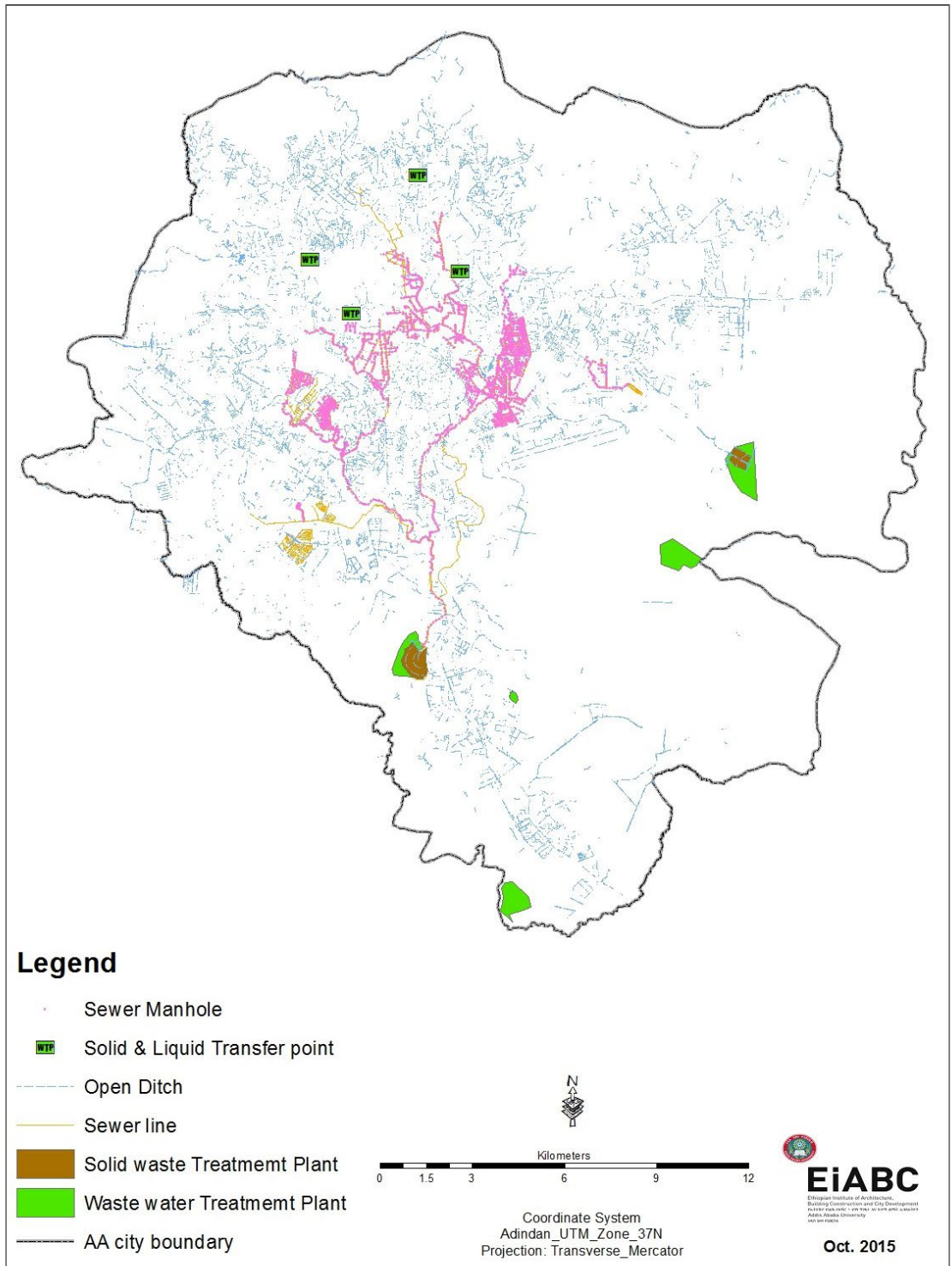


Table 2.
Existing wastewater treatment plant assets
(Source: xxx)

No.	Existing wastewater treatment plants assets	Design capacity m ³ per day	Actual treated m ³ per day
1	Kality central treatment plant	100,000	46,000
2	Kotebe lagoons & drying beds stabilization ponds	100,000	50,000
3	Small stabilization ponds	26,760	15,600
4	Membrane bioreactor treatment (MBR)	21,800	-

Small stabilization ponds located in different parts of the city are among the decentralized wastewater treatment facilities constructed for managing the sewage in condominiums sites, with a total design capacity of 26,760 m³ per day. It is estimated that these facilities currently treat about 15,600 m³ wastewater per day. Membrane bioreactor treatment (MBR) and anaerobic baffled reactors (ABR) are also part of existing decentralized treatment facilities used in condominiums, while the construction, operation and maintenance of MBR are costly and challenging.⁶⁷

The majority of the City's population has not been connected to the sewer system, 63% of the households use shared pit latrines, while 5% do not have access to any sanitation facility and openly defecate. Because of widespread illegal discharge of wastewater the city's rivers are said to be open sewers.⁶⁸

Key informant interviews highlighted a number of challenges to extending conventional sewer infrastructure.⁶⁹ One of the challenges is the high cost of extension and there is an affordability issue of such type of technology and the connection takes time. Even though there are efforts to increase the sewer coverage and the central treatment plants' capacity, the willingness to pay for the connection (which is 3,000 ETB⁷⁰) is low. This is because households can easily connect their sanitation facilities to storm water drains while others continue to use septic tanks leaking and seeping into the ground where enforcement is lacking.

The illegal transportation and disposal of industrial wastewater into manholes and therefore the municipal wastewater system remains a major challenge in the City.

Furthermore, the frequent theft of manhole covers, the disposal of inappropriate materials in toilets and the dumping of solid waste, cart away soil and debris in manholes results in clogging of sewers and sewer overflows. Illegal connection of storm water runoff and wastewater into sewer lines, the low workmanship and limited supervision overwhelm and increase flooding during particularly during the rainy seasons.

During the rainy season, the flooding that occurs in many neighborhoods of the city brings to light the mismanagement of waste and the poor condition of sanitation, as it spreads the diseases related to poor water. Downpours in the rainy season cause an abundant runoff in which little water can be saved due to the lack of storage infrastructures. The mountainous topography and the city's lack of infrastructures provide a very low water storage capacity, around 30%, compared to other countries like Australia, with a high water stress (an average rainfall of 534 mm per year), which reaches 80%. In addition, effluents from industries, garages and hotels are polluting the rivers and increasing water stress downstream. This is also posing challenges in Kality treatment plant, which is designed for treating sewage from residential houses and not industrial chemicals.⁷¹

60% of the food that is consumed in the capital is irrigated with untreated wastewater and food poisoning is common. According to the World Bank, the epidemics caused by pathogenic agents in the water of Addis Ababa imply a medical treatment cost of around 700,000 dollars per year, without taking into account the job losses.

(67) Interview, 2020a

(68) Addis Ababa City Administration and Resilient Cities Network, 2020; Worku, 2017

(69) Interview, 2020a

(70) Ethiopian birr, which is 32.2 birr equivalent to one dollar

(71) AAWRM&P Framework Preparation Task Force, 2016

Table 2.

Overflow of sewer manhole in the city center
(Source: Habtemariam, 2016)



4

CHARACTERIZING RESILIENCE

Water resilience describes the capacity of cities to function in the face of water-related shocks and stresses so that those living and working within the city can survive and thrive. Moreover, because overall city resilience, water resilience and catchment level resilience are mutually interdependent, any assessment of urban water resilience must consider the hydrological context (including water basins), built infrastructure, and the sociopolitical and economical context (i.e. human, social, political, economic, physical and natural capitals).⁷² In a similar sense, water resilience must consider the interrelationships between water and other critical urban systems. Therefore, it is of utmost importance to understand the

system in which the city's unique context is appraised to understand shocks and stresses, map key manmade and natural assets and governance processes, identify important system interdependencies, understand existing resilience plans and programs and convene local stakeholders. The following chapters summarize key shocks and stresses faced by the City as identified during the Resilience Strategy Development process and additional factors identified during the preparation of this report.

Please note that in the context of this report, we refer to climate change as a stress that refers to long-term modifications to climate, whether due to natural occurrences or human activity.⁷³

⁽⁷³⁾ Arup, 2014
⁽⁷³⁾ IPCC, 2007

4.1 KEY SHOCKS AND STRESSES FACED BY THE CITY

Developing a holistic understanding of risks and vulnerabilities is an important first step towards building resilience. One of the key tasks undertaken during Phase 1 of the Resilience Strategy Development process was to assess Addis Ababa's priority assets, shocks, and stresses. AAPRO engaged several stakeholders through workshops, focus group discussions, interviews, and surveys, to identify and prioritize (based on likelihood and impact) the most significant shocks and stresses currently facing Addis Ababa, and those anticipated to affect the city in the future. In addition, the findings were triangulated with evidence from extensive literature review, to ensure that long-term trends (both past and future) were captured.

The following priority shocks and stresses were identified during the Resilience Strategy Process and during the desk research, with further details below on the inter-relation of some of the shocks and stresses with the water system.

Water scarcity

Addis Ababa is already suffering from water scarcity and is expected to experience water supply stress because of the complex interaction of rapid urbanization, increased individual water demand as incomes rise, and the impacts of climate change. Water demand and water use from industrial, commercial, and construction sectors is on the rise, fueled by rapidly expanding economy and an unprecedented construction boom. While demand for water has grown in all major sectors, the availability and supply of water is decreasing because of intensive groundwater development, natural resource degradation and climate change. Unregulated groundwater abstraction and increasing hard surfaces reduce the natural recharge of depleting groundwater sources. Water scarcity in Addis Ababa is not only a result of physical shortage but manifests itself in low access rates due to the failure of institutions to ensure a regular supply and the lack of adequate infrastructure.

Currently 50-60% of the demand that is around 520,000 m³ of water is unmet demand⁷⁴, while an increasing trend of unmet water demand per annum is imminent, which will reach to 130 million m³ and 319.94 million m³ by 2030 and 2037 respectively as a result of increasing of the population growth and decreasing supply of surface water sources caused by a drier climate, which needs a different approach.⁷⁵ Recurrent power shortages are common in Addis Ababa. Almost all of the electricity distributed through the country's power grid comes from hydropower. When the country gets less rainfall than expected and dam levels drop, so does the power supply - which, in turn, makes it difficult for the government to supply water, including to the capital.

The aging of pipes and the limited financial capacity and revenue of AAWSA, the depletion of groundwater sources (due to unregulated extraction), and the irregularity of rationing are problems that exacerbate the water scarcity.

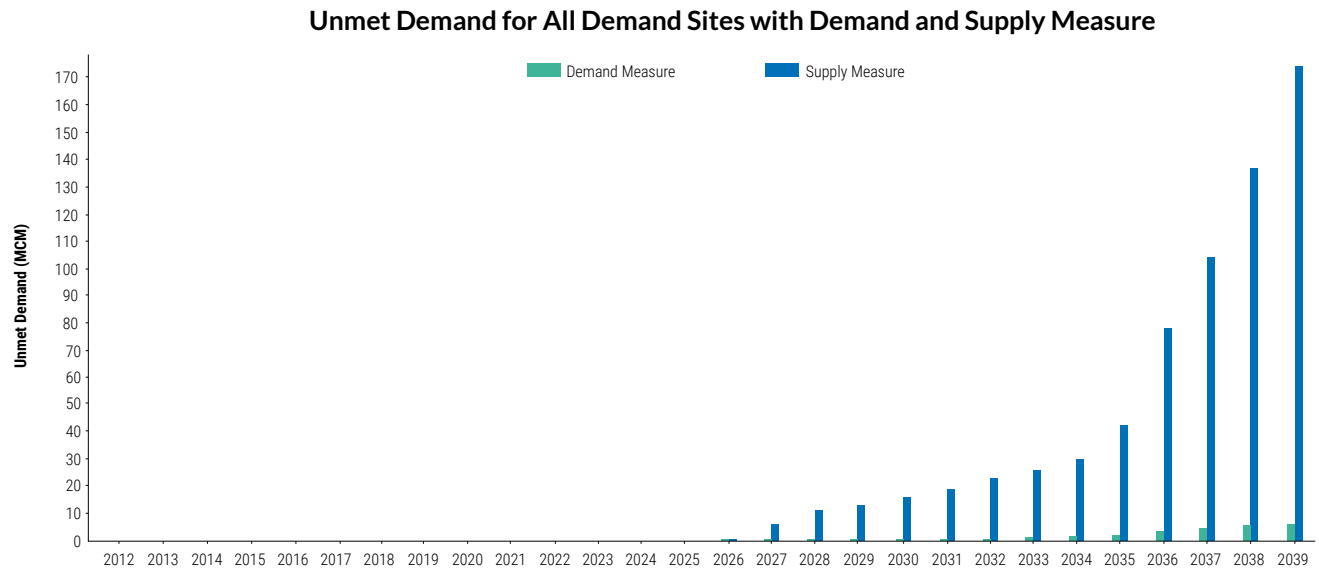
Residents in informal and low-income areas are disproportionately impacted by reduced water availability as they have limited means to supplement public water supply with other sources of water. Unable to practice proper hygiene, residents in informal and low-income areas face greater risk of waterborne and infectious diseases, as revealed by successive cholera outbreaks and the recent COVID-19 pandemic.

(74) Interview, 2020b

(75) Arsiso, 2017; Elala, 2011

Figure 21.**Unmet water demand**

(Source: Adapted from Arsiso, Tsidu, Stoffberg and Tadesse, 2017: 12)



Inadequate sanitation systems, environmental pollution, and degradation

Inadequate waste management systems have had negative consequences on the city's rivers and have cost the lives of residents. Addis Ababa is home to 65% of the country's industry, and more than 90% of these industries discharge their waste directly into nearby rivers without proper treatment, due to poor enforcement of environmental regulations. Consequently, the city's rivers have become heavily polluted. The widespread occupation of riverbanks by informal settlements, coupled with the lack of adequate sanitation, has led to riverbank erosion, and transformed the city's rivers into open sewers. This poses a significant danger to ecosystems, is a threat to future water supply, and has serious health implications, as urban agriculture is commonly practiced along these riverbanks. Pollution, watershed degradation, increasing siltation and flooding are caused due to rampant discharge of waste, land cover change and loss of green spaces.⁷⁶ Industrial waste transported by truck and disposed illegally in manholes causes clogging and increases the vulnerability to flooding. Illegal connections of storm water runoff and wastewater to sewer lines and

manholes, the low workmanship and supervision of sewer lines and manholes overwhelm and increase flooding during wintertime poisoning the bacteriological treatment of domestic sewage.

Flooding

Due to its undulating topography, poor waste management and the absence of sustainable storm water management, Addis Ababa is prone to severe flood events during the rainy seasons. The City's vulnerability to flood risk is further aggravated by the combination of poor drainage systems, a proliferation of poorly constructed informal housing in flood-prone areas, improper solid waste disposal, and loss of green spaces and associated expansion of impermeable surfaces. Metropolitan Addis Ababa is crossed by several small watercourses. Torrential rains, very common during the rainy season, cause a sudden rise in the flow of these water courses, inundating and damaging the settlements along their banks and affecting livelihoods of the local population. The combination of climate change and development pressures are expected to exacerbate the current situation in the years to come.

Unemployment and poverty

While Addis Ababa's economy has registered double-digit growth over the past two decades, it is not creating enough jobs for its rapidly expanding population, particularly for young people (i.e. people aged 15-29) and women. Most jobs in Addis Ababa are concentrated in low-productivity sectors, while higher value-added business services represent only 10% of total employment. Although low-productivity sectors have stimulated rapid job creation so far, most of these jobs are unlikely to result in higher wages in the long term. Moreover, the service sector is likely to be significantly impacted by the COVID-19 pandemic.

Lack of safe and affordable housing

Unable to access affordable serviced land in the city through formal channels, an increasing number of households are buying land informally from farmers in outlying areas. Thus, informal (untenured and self-initiated) housing, also known as Chereka Bet, is a significant source of housing for many. Because informal housing is built on any available and unused land, most residents live in environmentally sensitive and unsafe areas. The lack of tenure recognition also limits residents' ability to access basic services. In addition to the shortage of affordable housing, Addis Ababa also faces challenges associated with poor housing quality and overcrowding. Close to 80% of houses in inner-city area, known as Kebele housing, are characterized as slums due to overcrowding and the lack of adequate infrastructure such as drinking water, sanitation, and cooking facilities.

Lack of risk awareness and emergency preparedness

Despite being vulnerable to risks such as urban fire, disease outbreaks, and flooding, and seismic activity, the city has limited capacity to plan for, withstand, and respond to the broad range of

threats and hazards facing its residents and its critical physical assets. For instance, the city lacks a disaster risk management strategic framework that can serve as a guiding document for decision-making regarding the design and implementation of disaster risk management related plans and programs. In addition, there are currently no regulatory tools that can be used to establish responsibilities, duties, plans, concepts, and priorities in a coordinated manner with the participation of all actors.

Weak governance

Above all there are major governance limitations that hinder participation, cross scale and cross level governance learning and feedbacks, which are important ingredients of building water resilience. The underdeveloped democratic system and the culture of top-down decision making system are major factors that undermines local perspective, complex realities of households' livelihood issues, and local adaptation and copying mechanism, which are negatively impacting local community's and households' resilience capacity. This has also been compounded in the past with the narrow mindsets of officials and practitioners that focus on conventional and business as usual water management system, whilst usually decisions favor to short term solution disregarding complex issues and long term effects.

4.2 COVID-19 PANDEMIC

The global COVID-19 pandemic has not spared Ethiopia. In several aspects, the country may be better positioned to weather this crisis than many of its neighbours, recording long-term economic growth, continued poverty reduction, and infrastructure development⁷⁷. However, major underlying stresses and common shocks including high levels of unemployment⁷⁸, political unrest, lack of routine health services, and inadequate water and sanitation facilities related to a high proportion informal housing⁷⁹ have made it challenging to stop the spread of the highly infectious disease.

Addis Ababa remains at the heart of the COVID-19 outbreak in Ethiopia. Particularly those in urban informal settlements have suffered, where social distancing is challenging due to a higher population density, and access to basic services is limited meaning residents are unable to practice proper hygiene. Water distribution is estimated at 40 litres per capita per day, far below the City's goals of 110 litres per capita per day.⁸⁰ Only 7% of the population is connected to a sewer system (ibid), with the majority relying on collection services or illegal dumping.

Since the start of the outbreak, the City has been intensively engaged in combating and controlling the spread of the virus with health professionals, youth groups, universities, media, businesses, development partners, and other key stakeholders. AAWSA, responsible for the city's water and sewer systems, has rolled out 35 water tanker trucks in areas with high water scarcity. Water supplied to industries, which typically accounts for 20% of the city's total demand, has been reduced by 75% and temporarily redirected to avoid water scarcity. Portable hand washing stations have also been deployed at various locations such as transport hubs to promote hygiene. And while it previously took a week to connect a building to the water- and sewerage

system, under emergency circumstances AAWSA managed to expedite it to just one day. Yet some existing challenges with water and sanitation services have been exacerbated during the pandemic.⁸¹

- The shortfall between demand and supply averages 523,000 m³ per day. With COVID increasing water consumption at the city level, it has forced AAWSA to further ration water use in shifts and supply additional water via trucks. The establishment of 65 COVID centres which all require continuous water supply has put further strains on the demand.
- The increased frequency of power failure during the pandemic has negatively impacted the city's water network. The 42 pumping stations, 186 boreholes, and two dams that make up the water system require continued power to supply water.
- Collection of sewage by vacuum truck accounts for over half of the sewage collection. As these trucks work in densely populated and congested areas, staff are at increased risk of infection.
- AAWSA employs over 300 staff who are trained to read customer water meters every month. During COVID, customers are less willing to let staff enter to read the meter in fear of contamination. As meter readings are not submitted, AAWSA cannot bill customers its already low tariff, further reducing the authority's revenue stream.

(77) UN, 2020

(78) CAS, 2018

(79) World Bank, 2015a

(80) World Bank, 2015b

(81) The challenges listed were shared by Eng. Zerihun Abate, General Manager, Addis Ababa Water and Sewerage Authority on 27 August 2020 at SIWI World Water Week at Home: Urban Water Resilience under COVID-19: What happens next?

Looking to the future, opportunities to strengthen resilient water management in Addis Ababa that will reduce vulnerability to the next crisis will include further water source development, strengthening sewerage systems, improving access to water and sanitation services in low-income areas, and increasing public awareness of water usage. There is a need to prioritise investment in water supply and sanitation infrastructure to residents living in underserved areas, so they too can practice proper hygiene and access clean water.

Access to clean water, sanitation, and hygiene is the first line of defence in the battle against COVID-19, protecting human health and preventing the spread of the disease. This crisis will certainly not be the last one, and water utilities have a key role to play in building a resilient water system that can withstand shocks and stresses.

Fruit seller in Addis Ababa, Ethiopia during covid-19 pandemic.



4.3 CLIMATE CHANGE

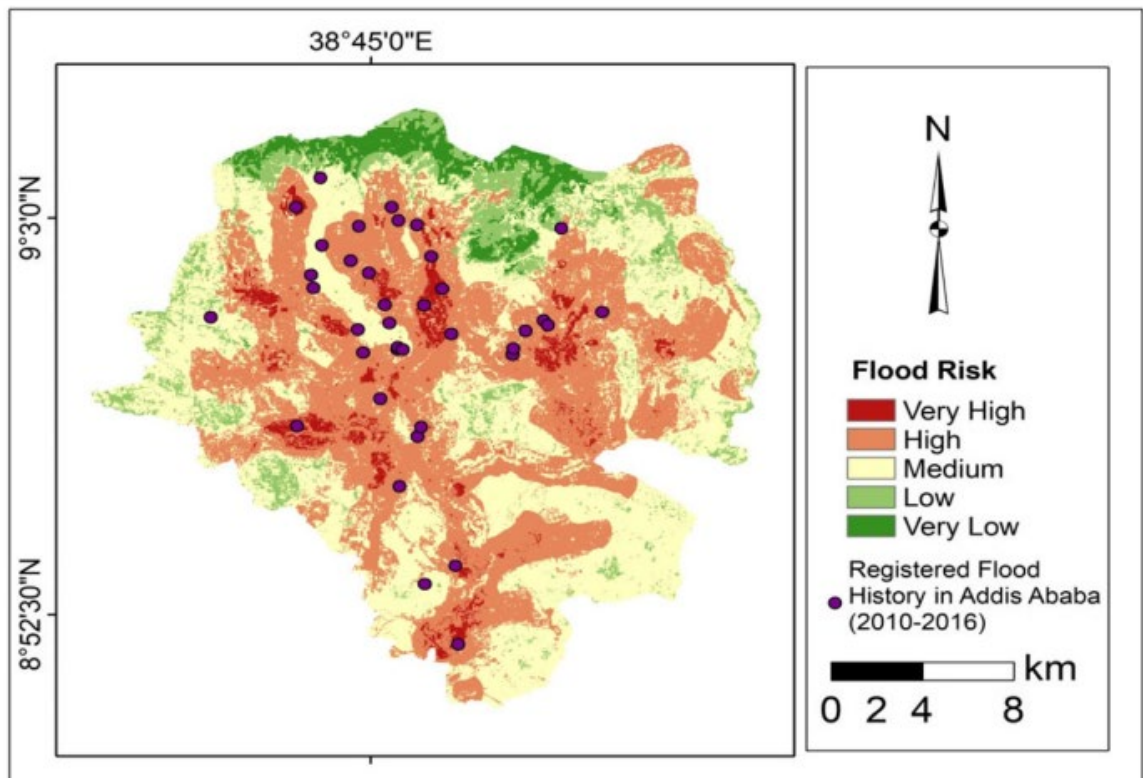
Increasing temperatures and sea levels, changing precipitation patterns and more extreme weather are threatening human health and safety, food and water security and socio-economic development in Africa⁸². Climate change is a major determinant factor impacting Addis Ababa's resilience and the resilience of its urban water system. Several studies suggest that climate variability and change is leading to increased incidences of drought and flooding affecting people's everyday life in Addis Ababa.⁸³

Climate change has manifested itself through an increase in maximum temperature, increasing rainfall during the Kiremt (long) rains and decreasing rainfall during the Belg (short) rains. The incidence of heavy rainfall events during Kiremt months (June-September) significantly increased over the past several decades leading,

more recently, to flash floods. These findings corroborate observations of increased flood risks and untimely rains that farmers are experiencing impacting farming and agricultural activities. Besides, the city is exposed to heat waves (increased frequency of hot days and hot nights) and drought.

In 2020 the maximum temperature increased by 0.9°C. Further projections estimate an increase in mean annual temperatures of 1.5°C in 2050⁸⁴ and 2.1°C in 2080 respectively.⁸⁵ Arguably one of the most widespread and potentially devastating impacts of climate change on the water system in Addis Ababa and the region will be changes in the frequency, intensity, and predictability of precipitation. Precipitation is also likely to change with a projected increase in the highest precipitation of 16.62% by 2080⁸⁶

Figure 22.
Addis Ababa
flood risk map
(Source: Feyissa
et al., 2018: 9)



and an increase of mean annual rainfall of 35 to 50% by 2050⁸⁷. Changes in regional precipitation will ultimately affect water availability and may lead to decreased agricultural production and potentially widespread food shortages.

Erratic rainfall events including an increase in the maximum rainfall and the concentration of rain periods in the four months of the rainy season cause pluvial and fluvial flooding in low laying and downstream areas of within the Akaki catchment. The flood risk is exacerbated due to substantial increase in impervious areas, concentration and channelizing of runoff, degradation of watershed and loss of natural storage capacity, siltation in rivers and dams.

The increase in temperature and the occurrence of heat waves increase water consumption and evaporation and cause drought especially in drier seasons, while on the other hand the increased precipitation alongside with the increase in the impervious surfaces result in increased runoff, flood occurrence and risk, which are causing property damage and casualty. It is also to be noted that there are consequential compounding health and livelihood shocks, such as vector-borne diseases, loss of income and destitution.⁸⁸

Climate variability has had far-reaching affects to human health, and includes, but is not limited to, the following: heat stress, air pollution, asthma, vector-borne diseases (such as malaria, dengue, schistosomiasis and tick-borne diseases), water-borne and food-borne diseases (such as diarrhoeal diseases). Climate change is expected to exacerbate the occurrence and intensity of future disease outbreaks and perhaps increase the spread of diseases in some areas. It is known that climate variability and extreme weather events, such as high temperatures and intense rainfall events, are critical factors in initiating malaria epidemics.

Cholera outbreaks are common in the city especially during rainy seasons. Addis Ababa witnessed an outbreak of cholera in different periods starting from its foundation and particularly in 2016 recorded the highest number of cases at country level.⁸⁹ Addis Ababa lead in the number of cases of cholera at country level with a maximum attack rate (241.8 per 100,000 population) recorded in 2016, which is because of poor access to safe water and sanitation complimented with high density that created potential environment for rapid spread of the disease.⁹⁰

(82) World Meteorological Organization (2020), *State of the Climate in Africa 2019*

(83) Arsiso et al., 2017; Herslund et al., 2017; Birhanu, 2016; Weldesilassie, 2014

(84) CLUVA, 2013

(85) Feyissa et al., 2018

(86) Feyissa et al., 2018

(87) CLUVA, 2013

(88) Weldesilassie, 2014

(89) Dinede et al., 2020; Pankhurst, 1968

(90) Tesfay and Biru, 2020

4.4 FACTORS IMPACTING THE RESILIENCE OF WATER SUPPLY AND SANITATION SERVICE PROVISION

The following shocks and stresses were identified by the Source to Tap and Back (S2TAB) project that piloted a Climate Resilient- Water Safety Plan (CR-WSP) with Addis Ababa Water and Sewerage Authority (AAWSA) in February 2019.⁹¹

- Heavy rainfall leading to increased overland flow and introducing physical and chemical hazards to the source water.
- Event Reduced vegetation covering the catchment area and deforestation leading to dusty surfaces, and potentially shortage of water, and increased erosion of the area.
- Widespread water succulent weed uses a lot of water and thus has an effect on source water quantity.
- Landslides accelerate erosion, leading to increased introduction of hazards to the surface water body.
- Climatic variations lead to increased/reduced water flow or flooding, influencing hazard transport and/or quantity available.
- Extended drought periods lead to accumulation of deposition on surfaces, and to enhanced run-off due to reduced absorption capacity.
- Topsoil is washed into the surface water body after the dry season.
- Changed catchment conditions (e.g. climatic changes, increased surface sealing, landscaping activities) create new/changed hazardous events.
- Reduced flow/water stagnation in winter season causes algal blooms.
- Seasonal changes of water quality may cause taste and odor problems and will affect drinking-water treatment processes (e.g. algae, iron, turbidity).
- Sudden increases in the rate in which water passes through the sand filter (water treatment) will shake loose particles that have already been trapped in the sand, causing “spikes” in the turbidity, and may reduce removal of particles.
- Water temperature is too low to allow for efficient chlorination so that pathogens are insufficiently removed.
- Chlorination is not adapted to fluctuations in raw water quality and flow variations, leading to insufficient reduction of pathogens.
- Lack of preparedness for recurring disasters causes interruption to the process or poor water quality.
- At the household level domestic storage containers/jars kept at ground level allow for contamination to enter from water pooling during rainy season.

(91) Source: Rickert et al., 2019: 752

4.5 HIGHLY VULNERABLE GROUPS

Addis Ababa is among the three regions of the country facing rise in food and general consumer price index, which implies increasing pressure and stress on households.⁹² The CSA (2010/11) data showed the net calorie intake is the second lowest in the country. From 2005-2011, consumption growth in Addis was worse than other urban areas.⁹³ Studies indicated that because of the poverty situations residents living in old and peri urban slums of the city are severely affected especially during the periods of structural adjustment measures, global and local market inflations and economic shocks, and political instability. In addition to overcrowding and polluted environmental situations, residents in these locations are facing health and economic shocks due to price inflation of food items, poor sanitation and limited access to safe water services. Plastic bags are used for defecation and disposed on ditches while others openly defecate.⁹⁴

Women headed households are particularly affected by health and economic shocks, and are forced to mal-adaptation (reduced amount of purchase, limiting amount of number of meals and water consumption, reduction of food and lesser calorie intake, shift to cheaper and less preferred foodstuffs and using unsafe water sources) due to limited opportunities. In addition, children are pulled out of schools and are forced by the desperate situation to supplement family income that further deepens long term vulnerability to health and economic shocks and family breakdown. Many of these slum dwellers form local community organizations such as *edir*⁹⁵ and *equb*⁹⁶ as social assets which are important institutions for social support, while others like poorest of the poor have no opportunities for membership and benefits of such social assets.⁹⁷

There is a general division of gender roles in household water and sanitation management, which is among the household chores undertaken by women and girls, and thus takes much burden. Significant time and energy is spent in fetching water from private vendors and public fountains especially by those living in informal settlements and slums. Getting water is a daily livelihood struggle in poor neighborhoods- residents in informal settlement and slum.⁹⁸

Residents living in elevated areas are mostly affected due to severe water shortage because of less pressure and frequent disruption, consequently forced to purchase at a higher price and to carry and transport water filled jerry cans from far distant places uplifting steep slope exposing them to backache and exhaustion. In addition, children, elderly and disabled people are among the highly vulnerable social groups to water stress. Slums and informal settlers in low lying areas (such as Mekanissa farming community and Akaki) are affected by frequent flooding.⁹⁹ In general, urban and peri-urban farmers are facing increasing challenges – reduction of their natural assets and water stress as a result of rapid change in the land use and land cover.

(92) CSA, 2014

(93) World Bank, 2015: 11

(94) Tolossa, 2009

(95) *Traditional local organization established through trust and mutual interest for supporting members during loss of family member and mourning* (Habtemariam, 2018)

(96) *Traditional rotating saving and credit organization* (Habtemariam, 2018)

(97) Habtemariam et al., 2018; Teklehaymanot, 2009; Tolossa, 2009


(98) Habtemariam, 2019)

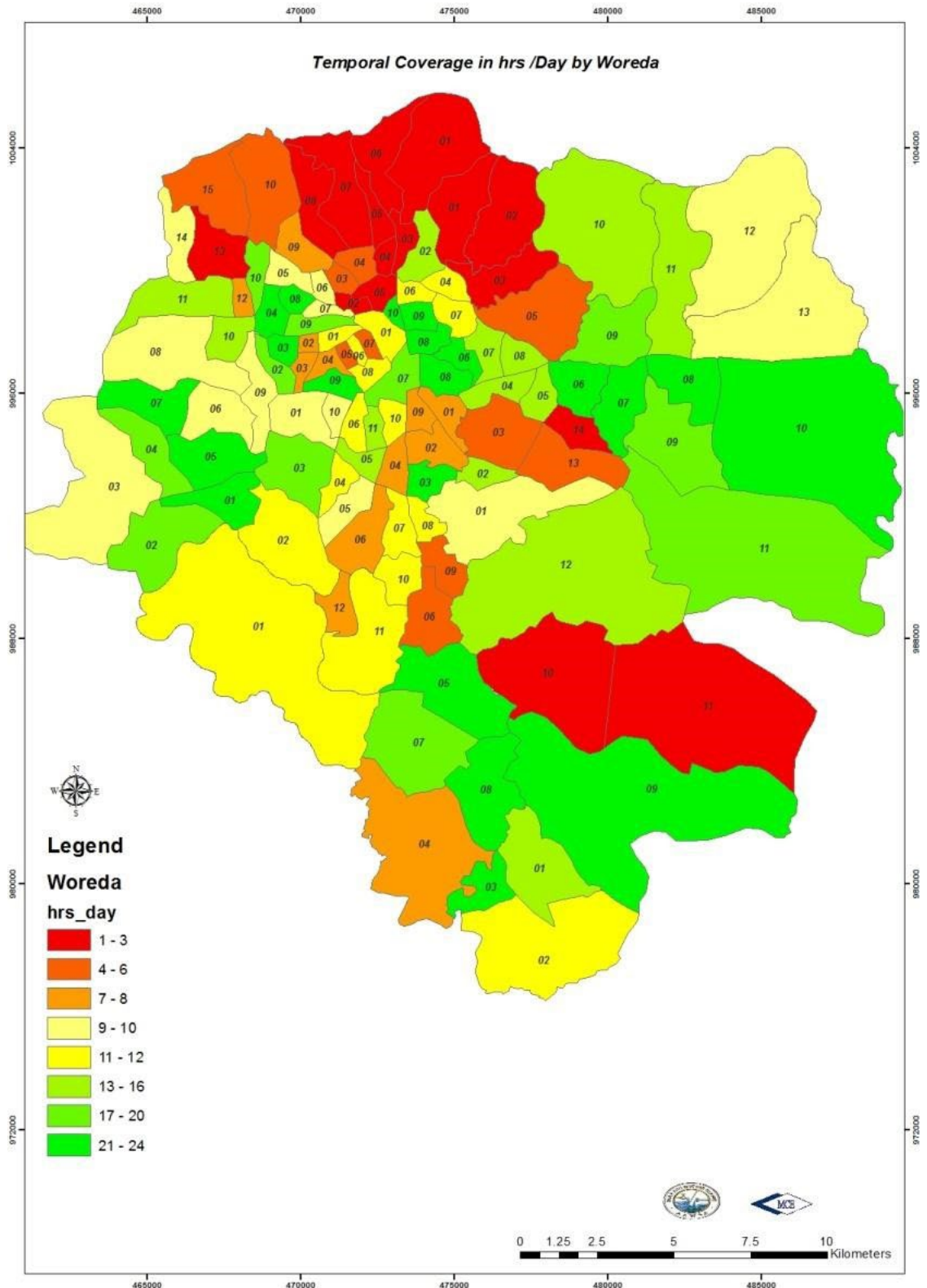
(99) CLUVA, 2013

Figure 23. ▼

A woman carrying water filled jerry can uplifting steep slope in an informal settlement
(Source: Habtemariam, 2019: 213)



Figure 24. 
 Water supply distribution and vulnerable areas
 (Source: AAWSA, 2017)



5

WATER GOVERNANCE

As water crosses administrative boundaries, water governance is complex. In Ethiopia, different tiers of government and other stakeholders influence the water system directly or indirectly, including the federal, regional, and city administration, international donors, and river basin authorities.

5.1 NATIONAL GOVERNANCE

On a country level, the Constitution outlines the basic rights for citizens, and specifies the shared responsibilities of the regional states and the federal government. The Office of the Prime Minister develops the 10-year National Development Plan (currently underway), and sets the direction for environmental policy, urban development policy, climate resilient green economy (CRGE), and the disaster risk management policy, determining the framework in which regional sectors operate. The federal Environment, Forest and Climate Change Commission oversees the implementation of the Resilient Urban Development Greening program.

The administration of trans-regional rivers falls under the mandate of the federal government.¹⁰⁰ The House of the Peoples Representative holds executive decision-making power, while the Ministry of Water, Irrigation and Energy is tasked with strategy delivery and river management. On a basin levels, the Awash Basing High Council and Authority have the mandate to implement integrated water resource management with the basin (see Basin governance).

A key federal level program is the National One Wash Program (with planned targets up to the year 2030) and gives an overall direction to urban water management which also contains a climate resilient WASH component. The focus of the program is integrated water resource management through incorporation and enforcement of catchment and watershed management plans into urban planning, conservation and protection of sources, enhancement of groundwater recharge, and reducing runoff and wastage. The program outlines the use of mixed technologies in regard to wastewater management – centralized treatment systems with sewerage for high income and commercial business areas in city centers and decentralized onsite sludge

management and low cost urban faecal sludge management for the rest of the city to be accompanied by reuse of effluent in a cost effective manner. The reuse of effluent is planned to be implemented through inter-relationship agreements and contracts between owners, operators, and users of recycled liquids. This is specifically programmed to be implemented in Addis Ababa through linking the treated wastewater effluent from the centralized treatment to downstream irrigation (in Kality and Akaki) (Wilson et al., 2018).

Another major component of the program is enhancing equity in WASH program outcomes. A direction for special emphasis to poor and marginalized social groups (those living in informal settlements and slums, disabled people, children and elderly) is outlined in the program. This is planned to be implemented through improvement of access to WASH, testing and promoting appropriate technologies that address the needs of the urban poor and marginalized people, advocacy and awareness of low level of equity to urban WASH needs, and gender responsive programming.

(100) Habtemariam, 2019; Water Governance Centre, 2013

5.2 REGIONAL GOVERNANCE

Addis Ababa is the seat of the Oromia National Regional State (ONRS) government. The city's main water sources are located in Oromia Regional State (Finfinnee), and the regional bureaus and offices responsible for urban planning, agriculture, forestry and water, land and disaster risk management are important stakeholders shaping the landscape at catchment and basin level. The municipalities included in Oromia Special Zone surrounding Finfinnee (Sebeta Hawas, Burayu, Sululta, Sendafa, Gelan, and Dukem) are also managing the day-to-day water supply and wastewater of the respective cities, which requires coordination.

Yet regional competition of natural resources is a source of tension, exacerbated along ethnic and political lines. For example, the rise in built-up areas in Addis Ababa has increased surface runoff and flooding which is affecting downstream Oromia localities, while the increased siltation in surface water dams of the city due to upstream deforestation, increased farming activities and soil erosion in upstream Oromia region in turn affects the water supply sources of the city. While the constitution acknowledges the special interest of Oromia Regional State in Addis Ababa's natural resources strategy and vice versa, it is not specific enough to avoid disputes and discontent.

5.3 CITY GOVERNANCE

Addis Ababa is a chartered city and as such, is considered both a city and a state.¹⁰¹ It has been granted some level of autonomy, and reports directly to the central government rather than the state it is located in. Thus, the city of Addis Ababa has been exercising a level of self-rule. As a chartered city, Addis Ababa also serves as the capital city of the Oromia Region and is the seat of the Oromia National Regional State (ONRS) Government.

The city is given the chartered status by proclamation no. 361/2003. Accordingly, “the city Council is entitled to adapt policies, issue proclamations and regulations pertinent to the establishment of executive organs and judicial bodies of the city, approval of the city master plan and budget, and about financial matters falling under the power of the city (levy taxes, duties and service charges)” (Habtemariam, 2019: 105). The City Mayor is also given the mandate to propose and execute decisions, laws, proclamations, regulations, plans and budgets of the city upon approval of the city Council.

The city is administratively organized into 11 sub-cities and 120 weredas¹⁰², which are mandated to administer, implement and facilitate conditions for services in their respective jurisdictions. Weredas are given responsibilities to mobilize community, neighborhood infrastructure improvement and code enforcement; however, the limited financial and human capacity constraints the execution of these mandates.¹⁰³ The city is divided into 328 dwelling associations (Kebeles), of which 305 are urban and 23 rural. The city council is made up of 18 bureaus, offices and authorities. Amharic is the working language of the city administration.

The Addis Ababa City Administration (AACAA) has issued proclamations to specify the organizations, mandates and powers of bureaus,

authorities and offices that manage the city’s affairs. The Office of the Mayor is the central organ that oversees and coordinates the executive bodies of the AACAA.

Addis Ababa Water Supply and Sewerage Authority is responsible for planning, operating and managing the city’s water supply and sewerage infrastructure and services, while the Addis Ababa City Roads Authority is given a partial mandate to build drainage infrastructure for protection of the city’s road. According to 2014/15 fiscal budget year, AAWSA and AACRA are allocated the largest share of the city administration budget, 2.559 and 5.801 billion respectively. The water budget takes 12.32% of the city’s total budget.¹⁰⁴

AAWSA is led by Board of Directors and under it is the General Manager. There are three major sections under the General Manager, which are Water and Sanitation Projects, Sewerage Disposal Service Core Process, and Water Supply and Distribution Core Process. The Water and Sanitation Project Office has the responsibility of installation of new major water supply pipe networks and sewer lines, development and expansion of water sources, reservoir and treatment plants, whereas the two other sections deal with managing existing water supply infrastructure networks and sewer networks respectively.

(101) Ethiopia is administratively divided into regional states and chartered cities, zones, woreda (districts) and kebele (wards).


(102) Weredas are the lowest administrative levels of the city

(103) Teferi, 2017

(104) Hobson et al., 2018

In addition, there are eight branch offices (Addis Ketema, Akaki, Arada, Gulele, Gurd Shola, Megenagna, Mekanissa and Nefas Silk) which are directly accountable to the General Manager of AAWSA. The branch offices are in charge of installation, management and operation of tertiary lines and customer services. Trunk mains and the primary pipes are managed by the head office of AAWSA, while distribution and private connections are managed by the branch office.

The Addis Ababa Resilient Project Office is established to lead and engage the key stakeholders in the process of developing and implementing the city's resilience strategy and to serve as a liaison to the Resilient Cities Network. In addition, Addis Ababa Environmental Protection and Green Development Commission, and Addis Ababa River Basins and Green Areas Development and Administration Agency are responsible for the management of the environment, natural resources, parks and rivers of the city.

Figure 23. 
AAWSA branch offices
(Source: Metaferia Consult, 2017: 7)



5.4 BASIN GOVERNANCE

The natural basin and the administrative regions of Ethiopia do not overlap neatly. Awash Basin includes parts of five Regional States (Oromia, Amhara, Afar, Somali and Southern Nations, Nationalities and Peoples' regional states) and two administrative cities – Addis Ababa and Dire Dawa.¹⁰⁵ The Awash Basin High Council and Authority established based on Proclamation No. 534/2007 and regulation no. 156/2008, to ensure the implementation of integrated water resource management in the basin in an equitable and sustainable manner. Presidents of the above mentioned Regional States and Mayors of the two administrative cities as well as the Ministry of Water, Irrigation and Energy, Ministry of Finance, Minister of Health, Minister of Agriculture, FRDE Environment, Forest and Climate Change Commission are members of the Basin High Council and chaired by the Deputy Prime Minister, which holds executive decision-making power.

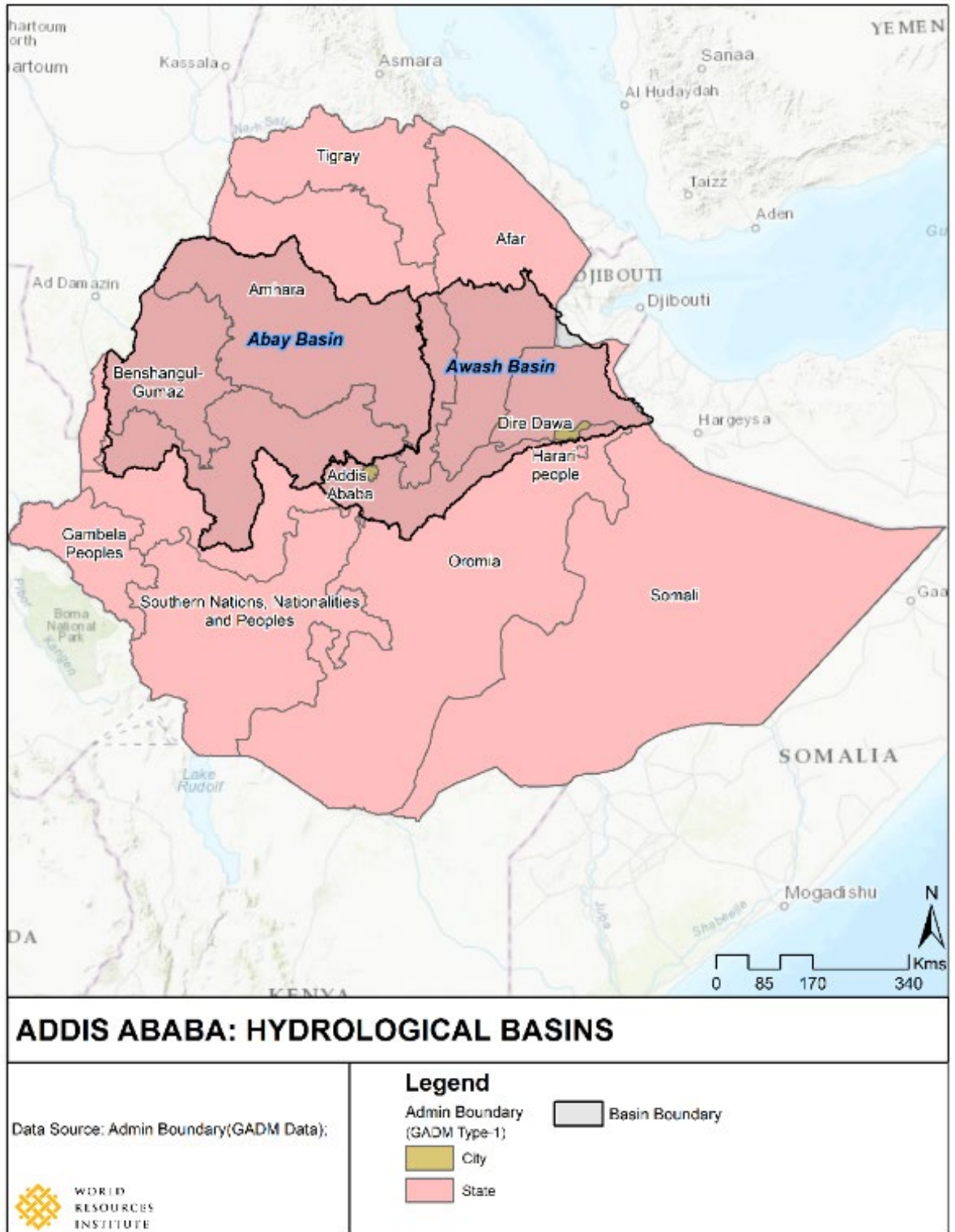
The Awash Basin Authority is mandated to administer and regulate the water resources within the basin as per the directions of the Council. Wide ranging responsibilities related to the management of Awash basin water resources are given to the Authority, which includes knowledge building, information exchange, networking, coordination, regulation of water uses, issuance of permits and collection of fees and charges. The Basin Authority had in the past been using an outdated plan prepared in 1989 despite the changes in socio-political landscape and the environmental conditions, while several feasibility and environmental assessment studies were conducted in parallel. Moreover, mandate analysis and governance studies were conducted to identify the water governance gap and outlined recommendations for good governance in the basin.

However, studies indicated that there are overlapping mandates and conflicting roles between the Awash Basin which is a supra-regional organization and the Regional States that are given a self-governing mandate to ensure decentralization. This is also evident between the Awash Basin Authority and Addis AAWSA. The Awash Basin has limitations in coordinating and ensuring the implementation of integrated water resource management (IWRM) in the basin, and its role has been mainly confined to collection of fees for the use of water from large-scale farms.¹⁰⁶ The fragmentation of planning frameworks and the narrow focus of sector-based projects has been affecting the implementation of IWRM. Large scale state and commercial farms have been expanding driven by developmental state doctrine and free riding problems as excessive use of water and pollution is continued while increasing water stress is exhibited at the basin level. The centralization of mandates which undermine the power of regional states and local institutions compounded with the lack of collaborative institutional arrangements that consider the complex socio-political setting are key implementation challenges of IWRM at basin level.

(105) Hailu et al., 2018

(106) Hailu et al, 2017

Figure 26. Awash River basin and regional states (Source: WRI, 2020 based on GADM, GAP basin data, FAO river network, JRC global, and ESRI)



5.5 LEGAL FRAMEWORK, PLANS AND PROGRAMS

The Ethiopian **water resource management** proclamation (proclamation no. 197/2000) and regulation (regulation no. 115/2005) are key legislative frameworks. According to proclamation no. 197/2000 article 5 “all water resources of the country are common property of Ethiopian people and the state”. The mandates of planning, management, utilization, and protection of water resources, including issuance of permit for water use and discharge, collection of water charge, delimiting the boundaries and protection of riverbanks are stipulated to Ministry of Water, Irrigation and Energy (MoWIE) or any organ delegated by the Ministry. Additionally, proclamation no. 534/2007 delegated the mandates of implementation of integrated water resource management (IWRM) to the Basin High Council and Authorities and regulation no. 156/2008 specifically stipulated the establishment of Awash Basin High Council and Awash Basin Authority (which is now recently named as Awash Basin Development Office) and delegated the above mentioned mandates specific to the Awash Basin.

In addition to the above mentioned legislative frameworks **environmental impact** assessment (EIA) proclamation (proclamation no. 299/2002), and environmental pollution control proclamation (proclamation no. 300/2002) are legislative frameworks at national level. Based on these proclamations any projects including water and sanitation projects should pass EIA procedure and impacts (including the trans-regional effects) should be assessed and appropriate mitigating measures and strategies are supposedly devised, approved, implemented, and audited.

Urban planning proclamation (proclamation no. 574/2008), urban land lease holding proclamation (proclamation no. 721/2011), building proclamation (proclamation no. 624/2009) and regulation (regulation no. 243/2011) are also additional layers of the national level legislative framework. Urban development scheme, regional urban development plan and urban plans (structure plan and local development plan) are stipulated as hierarchy of plans under proclamation no. 574/2008, while the latter ones are specified as statutory binding plans. Proclamation no. 721/2011 specified the two modalities of urban land leasehold and transfer i.e. tender and allotment, and gives the power to issue and terminate leasehold right to the Addis Ababa city administration. Proclamation no. 624/2009 and regulation no. 243/2011 specified building, construction, and building level water and sanitation standards.

6

ONGOING AND PLANNED RESILIENCE ACTIVITIES

There are different initiatives related to the urban water resilience in Addis Ababa outlined on the following pages.

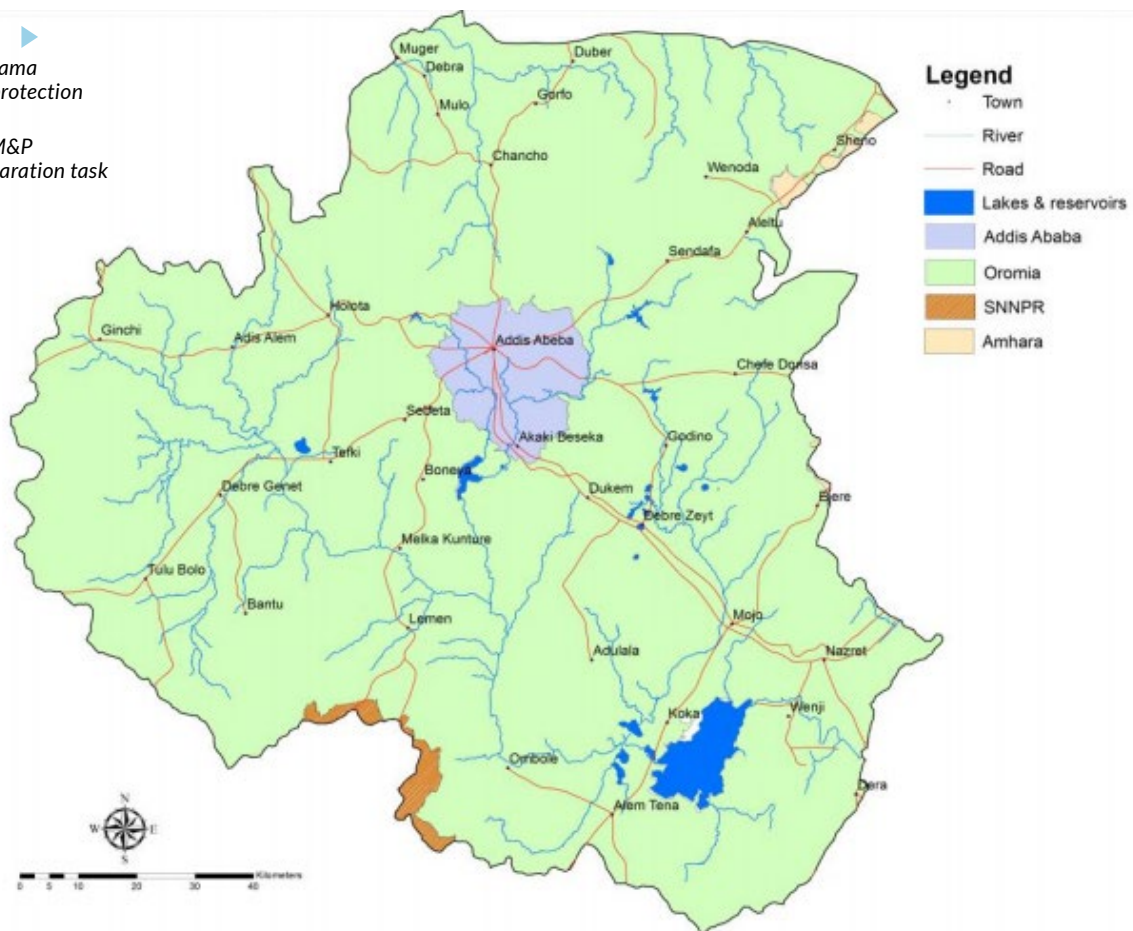
SOURCE TO TAP AND BACK (S2TAB)

S2TAB is a project which introduces innovative stakeholders and a capacity development approach for improved financial and environmental sustainability of water services in the Metropolitan Region of Addis Ababa and Adama. The project focuses on identifying water security issues and developing a framework

for water security in collaboration with key stakeholders in the Addis Ababa-Adama region. The project aims to address water security in a more holistic and integrated manner.¹⁰⁷

(107) AAWRM&P Framework Preparation task force, 2016

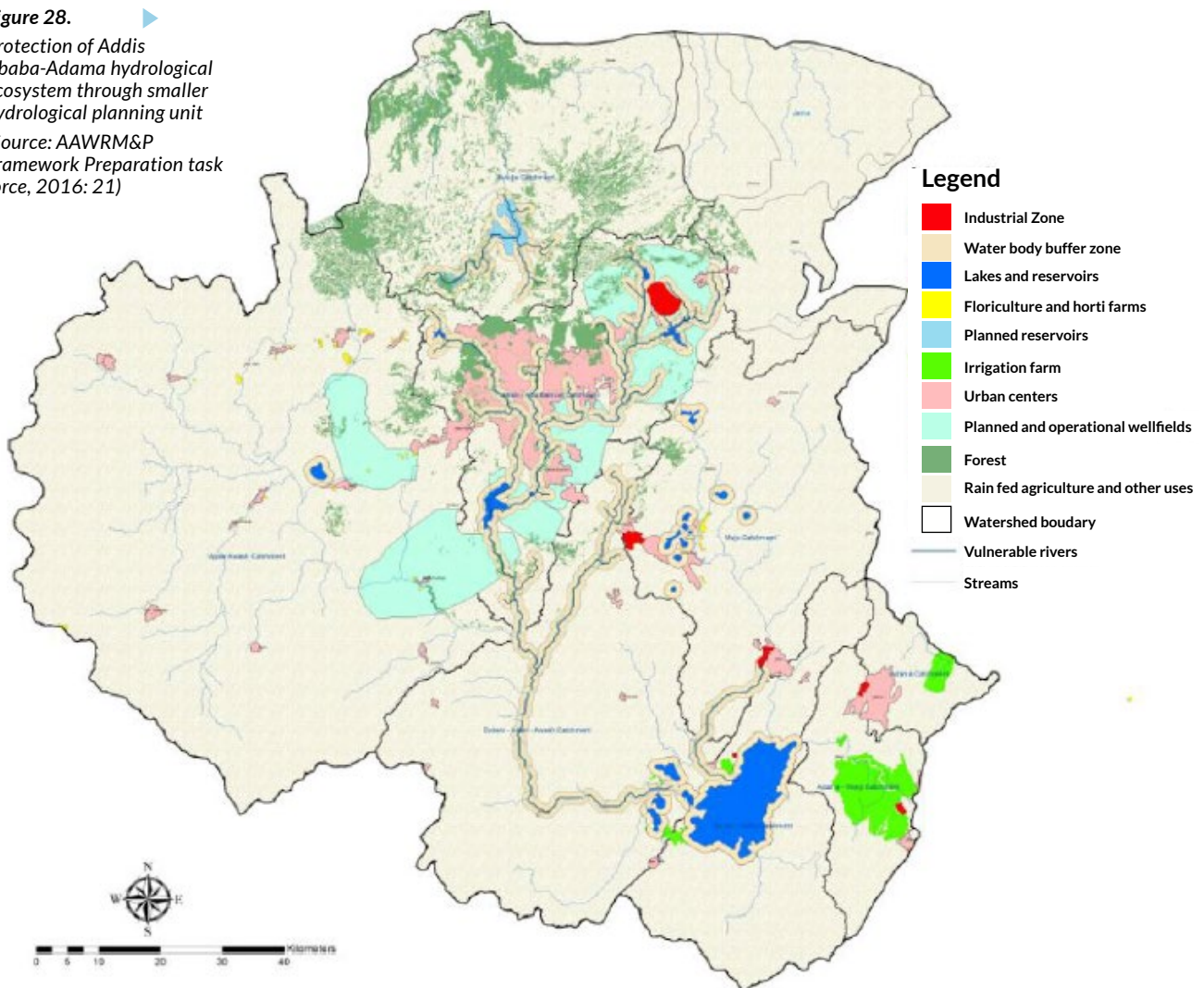
Figure 27.
Addis Ababa-Adama water resource protection framework area
(Source: AAWRM&P Framework Preparation task force, 2016: 7)



The following five priority action areas are identified through stakeholders' engagement and technical analysis:

- Institutional capacity building (including awareness creation, enforcement of laws, legal framework, and funding)
- Sustainability of water supply (including environmental degradation, watershed management, reuse)
- Water quality management (including WQ standards)
- Integrated development planning – water space planning, recharge zone, water recreation areas
- Coordination among actors (to include mandate clarity)

Figure 28. Protection of Addis Ababa-Adama hydrological ecosystem through smaller hydrological planning unit
(Source: AAWRM&P Framework Preparation task force, 2016: 21)



BEAUTIFYING SHEGER PROJECT

The three years' project, dubbed Beautifying Sheger (aka Addis Ababa), was initiated by the PM of Ethiopia, Dr Abiy Ahmad, to rehabilitate two tributaries of major rivers in Addis Ababa, Kurtime and Bentyiketu, the first stretching for 23.8 km and the second for 27.5 km through the city, running from Mount Entoto to River Akaki. The first phase of this project, launched in February 2019, covers 12 km from Mount Entoto to Bambis Bridge (the upper reach of Peacock Park). Beautifying Sheger aims to enhance the green coverage and beauty of the city, urban tourism, green economy and flood control. The project also envisions building parks, bicycle paths, walkways, planting of trees and development of urban farms. Even though it is applauded by many, it is already causing complaints, for prioritizing the development over people by the residents affected and the need for more nature based solution in landscape design.¹⁰⁸

NATURE BASED SOLUTIONS FOR WATER RESOURCES INFRASTRUCTURE AND COMMUNITY RESILIENCE IN ETHIOPIA

The Nature-based solutions for water resources infrastructure and community resilience in Ethiopia intervention is a four year program that was launched in August 2020. The Initiative seeks to contribute to the sustainable management of the surrounding catchment areas of the selected hydropower dams through nature-based solutions. The proposed interventions are particularly relevant to both the resilience building and the green growth components of the nation's Climate Resilient Green Economy (CRGE) strategy. It aims at

improving the livelihood of local communities through temporary job creation, provision of energy-saving stoves and the provision of goods and services such as fruit, fodder and other non-timber forest products from trees. The interventions will also counteract the effects of deforestation and climate change and are in-line with the Prime Minister Dr. Abiy Ahmed's Green Legacy Initiative. The United Nations Economic Commission for Africa in collaboration with the Ministry of Water, Irrigation and Energy will be the principal implementers of the project. It will also forge a partnership with UNEP, zonal/ wereda natural resources department, local communities, development partners, and other relevant international organizations.¹⁰⁹

ADDIS ABABA RESILIENCE STRATEGY

The Addis Ababa Resilience Strategy was released in August 2020 and serves as a tactical roadmap for building resilience in the city. It is the result of two years of extensive research and stakeholder engagement building on 47 face-to-face interviews, 11 workshops, eight focus group discussions and a citywide door-to-door survey which gathered input from over 5,000 respondents, including poor and vulnerable residents. These inputs have shaped the city's resilience priorities and the specific initiatives for short-, medium-, and long-term implementation articulated in this document. The strategy identifies priorities and outlines 48 innovative and action-oriented initiatives based on a holistic assessment of shocks and stresses that will impact the city in the future including water scarcity, pollution and watershed degradation, and flooding. It identifies initiatives that will help the city to provide adequate safe and reliable water and sanitation service for all, to build a water resilient city through

(108) (Terrefe, 2020)

(109) <https://www.uneca.org/events/technology-climate-change-and-natural-resource-management-african-climate-policy-centre>

demand side interventions, such as water conservation, replacement of old and dilapidated infrastructure, increasing efficiency of the distribution system, awareness and targeted intervention to reduce high consumption level of consumers. It also recommends action to regulate and monitor the groundwater abstraction. Furthermore it outlines initiatives that focus on water sensitive development including implementing decentralized wastewater treatment solutions and enhancing of circular economy approaches (reuse of wastewater for non-potable purposes). To reduce pollution and improve public health the strategy also focuses on improving access to public sanitation services.

Furthermore the strategy acknowledges the need to strengthen AAWSA's capacity to manage the public water supply system more efficiently, and transform Addis Ababa into a water-smart city. The City Water Resilient Assessment and consequent action planning is set as priority in the strategy to establish a city water resilience profile and identify areas of intervention and to enhance the resilience of urban water system. The strategy further highlights the importance of mobilizing investment for the protection and restoration of river systems and watersheds, to improve water security, and to leverage long-term and cost-effective solutions that allow both the city and nature to thrive together. The initiatives outlined include the preparation of a feasibility study on establishing a water fund, in partnership with The Nature Conservancy.

ADDIS ABABA WATER FUND

The Nature Conservancy has been working for more than 10 years on developing and creating financial mechanisms for safeguarding watersheds. These mechanisms, better known as Water Funds, seek to protect and restore strategic ecosystems key to supplying water to cities across the globe. Water Funds are an innovative way of paying and compensating for the services that nature provides to humans. They draw capital contributions from large water users such as water supply companies, hydroelectric plants, beverage companies, irrigation districts, and agricultural associations, among others, in an organized and transparent manner, and adequately invest these resources in ecosystem conservation to maximize their return on investment. Together with the Resilient Cities Network, and the Addis Ababa Resilience Project Office TNC commissioned a Feasibility Study in 2020 to test eligibility by quickly and efficiently determining if there are water security challenges and a potential for a Water Fund to help. If the study concludes that a Water Fund can be a feasible solution to the City's challenges it will assess the feasibility of a Water Fund by more deeply understanding the situation and generally determining how a Water Fund could positively contribute to water security within the City and the region. The objective of the feasibility study will be to evaluate the technical, institutional, and financial feasibility of creating a Water Fund for Addis Ababa. The feasibility study on establishing a Water Fund is a body of work that is part of Addis Ababa's Resilience Strategy. The feasibility study report will be released in Q1 of 2021.

WRI (FORTHCOMING) FRAMING PAPER URBAN WATER RESILIENCE AFRICA¹¹⁰

The framing paper outlines key lessons, strategic actions and pathways for building urban water resilience in rapidly growing African cities like Addis Ababa. The following four key action areas are outlined as a pathway for building urban water resilience in African cities.

- Inclusive and secure water and sanitation access for households
- Risk informed land management and water sensitive urban development
- Innovative institutions and partnerships
- Financial investments aligned across sectors to build water resilience

The paper also defined water resilient city in African context, and taking this general definition it is advised to further develop specific and shared meaning of water resilient city in Addis Ababa context.

“A water resilient city ensures equitable access to safe, reliable and affordable water through water sensitive infrastructure and protects regional watersheds, enabled by governance, planning and finance systems that are continually adapting to climate change, incorporating local knowledge and context, and aligning city and regional development” (Habtemariam et al., forthcoming publication).

“A water resilient city ensures equitable access to safe, reliable and affordable water through water sensitive infrastructure and protects regional watersheds, enabled by governance, planning and finance systems that are continually adapting to climate change, incorporating local knowledge and context, and aligning city and regional development”

(Habtemariam et al., forthcoming publication).

(110) Habtemariam et al., forthcoming publication

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7

NEXT
STEPS

The findings of the City Characterization Report support that Addis Ababa and the water system it depends upon are vulnerable and impacted by many types of shocks and stresses, including man-made ones like economic transformation and rapid urbanizations. These shocks and stresses have the potential to halt and reverse years of socio-economic development gains. Addis Ababa together with its partners has to continue to take steps to address these shocks and stresses, to adapt to changing conditions and to ensure that it is able to provide basic services to its residents. It has to keep moving towards its long-term goals despite the challenges it faces today and it meets along the way. The findings highlight that there is still a lot to do to further identify and implement actions that complement the Addis Ababa City Administration's multifaceted approach in addressing critical urban challenges focusing more specifically on building water resilience. The COVID-19 global pandemic is a stark reminder of the need to accelerate resilience-building efforts. While the City continues to engage in combating and controlling the spread of the virus it has focus on maintaining critical services while at the same time designing livelihood interventions for highly vulnerable and at-risk groups, particularly homeless and low-income people, in order to reduce the impact of the pandemic.

The Water Resilience Assessment, which concludes its first step with the release of this report will help the city to further strengthen its response to the pandemic and ensure that the path forward is not a return to "business as usual", but one that leads to greater resilience to the current and unforeseen crises. The work is far from over. Political commitment ownership and support will be necessary to coordinate and leverage the work that is ongoing and has been conducted to target the action planning that follows the city resilience assessment towards enhancing the consolidated resilience values.

Even though there are a range of programs and projects related to urban water resilience in the city and the basin, and national economic progress has been achieved in the past, there is much to do to transform the city's trajectory towards nature based, inclusive and sustainable pathways. The lack of coordination, limited enforcement of existing water and environmental laws, participatory planning in its infancy as well as poorly designed and planned programs and projects pose a big challenge looking forward. Problems are compounded by fragmentation of planning frameworks and narrow and siloed focus of sector based projects. Even though a radical biophysical change is achieved through top-down initiatives and a state led mega project approach such as the river rehabilitation and green project, they could potentially offset institutional building and social learning, which are important cornerstones of long-term resilience building. Further sharpening the city resilience strategies related to water is also needed such as to identify priorities, to address inequalities and to strike a balance between grey infrastructure and nature based solution through stakeholder engagement and action planning.

Following the CWRA process the next step that follows the preparation of the City Characterization Report is the assessment of urban water resilience based on the City Water Resilience Framework. Over the coming weeks, we will conduct several multi-stakeholder workshops to inform the development of the City Water Resilience Profile and respective action planning that follows the assessments.

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