WATER RESOURCES PROFILE SERIES

The Water Resources Profile Series synthesizes information on water resources, water quality, the water-related dimensions of climate change, and water governance and provides an overview of the most critical water resources challenges and stress factors within USAID Water for the World Act High Priority Countries. The profile includes: a summary of available surface and groundwater resources; analysis of surface and groundwater availability and quality challenges related to water and land use practices; discussion of climate change risks; and synthesis of governance issues affecting water resources management institutions and service providers.

Ethiopia Water Resources Profile Overview

Ethiopia has abundant water resources and contains the headwaters of numerous transboundary rivers, including the Nile. Key water stress metrics suggest Ethiopia is water stressed. Total annual renewable water resources per person are 1,162 m^3, which is below the Falkenmark Water Stress Index[i] threshold for water stress and just above the water scarcity threshold. The ratio of water withdrawals to supply is 32 percent, which exceeds the SDG 6.4.2[ii] threshold for water stress. Water stress is most evident at the sub-national level and seasonally in some locations.

Water supply is concentrated in western Ethiopia (Abay Basin) and water stress is highest in the east (especially Awash Basin) due to low supply and high demand. Sedimentation has reduced storage capacity in many reservoirs in the Awash Basin. The reservoirs are important for mitigating drought impacts on water availability.

Dams are critical for hydropower and water storage, however, concerns have been raised about downstream impacts. The Grand Ethiopian Renaissance Dam (GERD) in the Abay Basin has generated concern about potential impacts to Sudan and Egypt. Currently, there is no international framework to govern dam operations. The Gibe III Hydropower Dam on the Omo River has impacted downstream flood-recession agriculture.

Severe levels of chromium pollution and high biological oxygen demand (BOD) have been attributed to tanneries and textile factories around Addis Ababa. Artisanal gold mining has also degraded watersheds throughout Ethiopia. Widespread eutrophication caused by agricultural runoff has threatened biodiversity in most reservoirs, lakes, and wetlands. Runoff and untreated effluent from urban areas also pose environmental and public health risks.

Groundwater resources are not well understood. Natural contamination from fluoride is present throughout the Great Rift Valley (Afar-Denakil, Awash, Omo-Gibe, and Rift Valley Basins) and poses the most significant health risk.

Climate change will increase the frequency and severity of flooding and drought risks. The Ogaden, Wabi-Shebele, Awash, Afar-Denakil, Mereb, and Aysha Basins are already vulnerable to drought, which have caused widespread loss of livestock and crops, increased poverty and malnutrition, and several major famines.

Ethiopia is committed to Integrated Water Resources Management (IWRM). Policies, strategies, and programs are being revised to reflect the government's decision to centralize the water sector. Greater emphasis is needed on improving sector financing; increasing staffing and technical capacity; strengthening water quality monitoring, water use and pollution permitting and enforcement; and establishing Basins Development Agency (BDA) branch offices.

[i] The Falkenmark Water Stress Index measures water scarcity as the amount of renewable freshwater that is available for each person each year. A country is said to be experiencing water stress when water availability is below 1,700 m^3 per person per year; below 1,000 m^3 is considered water scarcity; and below 500 m^3 is absolute or severe water scarcity.

[ii] SDG 6.4.2 measures water stress as the percentage of freshwater withdrawals against total renewable freshwater resources. The water stress thresholds are: no stress <25%, low 25%-50%, medium 50%-75%, high 75%-100%, and critical >100%.

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Water Resources Availability

KEY TAKEAWAYS

- The Abay, Baro-Akobo, Mereb, and Setit-Tekeze/Atbara Basins are part of the transboundary Nile Basin, which contains most of Ethiopia's renewable surface water.
- Most basins throughout the east are very dry and many locations only have ephemeral surface water.
- Groundwater access is limited in the south and southeast by low water tables. Volcanic and alluvial aquifers in highland areas are often high yielding and accessible drinking water sources.

This section summarizes key characteristics of surface and groundwater resources. Table 1 summarizes key water resources data and Figure 1 presents key surface water resources, wetlands, and dams.

Surface Water Resources

Ethiopia manages its surface water through 12 basins which are part of four transboundary basins: the Nile, Rift Valley, Shebelle-Juba, and North East Coast.[2,3] With the exception of the Nile Basin, all river basins experience water shortages. Almost no perennial rivers can be found below 1,500 meters, leaving much of eastern Ethiopia without reliable surface water.[2]

The western Abay (Blue Nile), Baro-Akobo, Mereb, and Setit-Tekeze/Atbara Basins are part of the Nile Basin, which generates 70 percent of the country's renewable surface water, mostly through the Abay Basin.[2,4] Collectively, these basins provide 86 percent of the Nile's annual flow.[5] The central and northeastern Afar-Denakil, Awash, Omo-Gibe, and Rift Valley Basins account for over 20 percent of surface water resources and are part of the Rift Valley Basin, which spans much of East Africa. Water supply is concentrated in the southern Omo-Gibe and Rift Valley Basins. Four percent of the national supply is in the Awash Basin and water availability is negligible in the northernmost Afar-Denakil Basin. The Awash Basin has limited supply and high demand, with low average annual precipitation.[1] The eastern Wabi-Shebelle and Genale-Dawa Basins are part of the Shebelle-Juba Basin and contain eight percent of Ethiopia's surface water.4 The North East Coast Basin encompasses the Ogaden and Aysha, but they are considered dry basins with rivers that only flow after rainfall.[2]

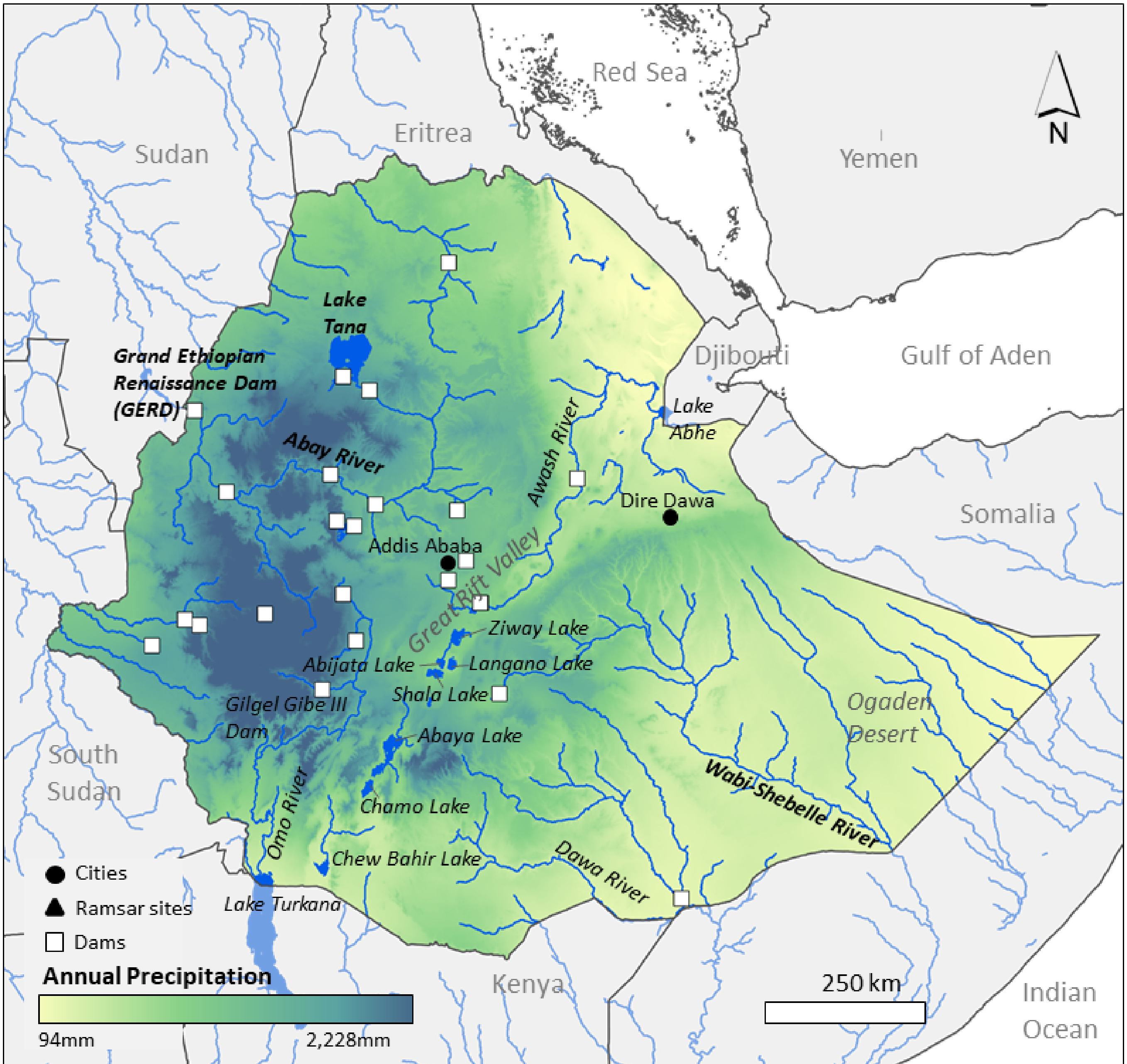
Ethiopia has 22 lakes. Lake Tana (Abay Basin) is the largest and is a critical water source for the Nile River. There are also numerous large lakes in the Rift Valley Basin,[2,4] although most are saline. Ethiopia also has 1.8 million hectares of wetlands and floodplains, which are concentrated in the Nile and Rift Valley Basins.[2] Ethiopia has not ratified the Ramsar Convention on Wetlands.[6]

TABLE 1. WATER RESOURCES DATA	Year	Ethiopia	Sub-Saharan Africa (median)
Long-term average precipitation (mm/year)	2017	848	1,032
Total renewable freshwater resources (TRWR) (MCM/year)	2017	122,000	38,385
Falkenmark Index - TRWR per capita (m3/year)	2017	1,162	2,519
Total renewable surface water (MCM/year)	2017	120,000	36,920
Total renewable groundwater (MCM/year)	2017	20,000	7,470
Total freshwater withdrawal (TFWW) (MCM/year)	2002	10,550	649
Total dam capacity (MCM)	2015	31,480[iii]	1,777
Dependency ratio (%)	2017	0	22.78
Interannual variability	2013	1.8	1.55
Seasonal variability	2013	3.3	3.15
Environmental Flow Requirements (MCM/year)	2017	89,300	18,570
SDG 6.4.2 Water Stress (%)	2016	32.26	5.7

Source: FAO Aquastat

[iii]Does not include recently constructed dams, including the GERD, which began filling in 2020 and provides an additional 79,000 MCM in storage capacity.

FIGURE 1: MAP OF WATER RESOURCES



Source:
Cities: World Cities – ArcGIS Hub, **Country Borders:** GADM, **Dams:** FAO Aquastat Dams Database, **Ramsar Sites:** Ramsar Sites Information Service, **Lakes and Wetlands:** WWF - GLWD (Level 1), **Rivers:** WWF – HydroRivers, **Precipitation:** WorldClim, **Flood and Drought:** WRI Aqueduct 2019

Groundwater Resources

Groundwater is highly variable and aquifer systems are complex. Aquifers can be broadly characterized as volcanic, basement, sedimentary rock, or alluvial. Volcanic aquifers are the most common and are located in highland areas throughout central and western Ethiopia. Volcanic aquifers can be thick (500–1,000 meters), have moderate to high depths to groundwater (50-250 meters), and are among the highest yielding. Sedimentary rock aquifers are widespread in the lowland areas of eastern Ethiopia and have low to moderate productivity, low recharge (30 mm/year), and are among the deepest (200-400 meters).

Alluvial and basement aquifers are less common. Both are located in the southern and western regions. Basement aquifers are also located in the far north and alluvial aquifers in the northeast. Groundwater availability is lowest in basement aquifers and highest in alluvial aquifers, and both systems can be accessed at relatively shallow depths.[7,8]

Surface Water Outlook

KEY TAKEAWAYS

- The Awash Basin is one of the most water stressed in Ethiopia. Dam storage capacity has been significantly reduced by sedimentation.
- Hydropower generation is a key priority for the Government of Ethiopia, although several high profile dams have caused controversy and international disagreements, particularly with the GERD.
- Most lakes, reservoirs, and wetlands are threatened by eutrophication from agricultural encroachment, especially in the Great Rift Valley.
- Tanneries and textile factories are major sources of pollution in Addis Ababa. Inadequate sanitation systems have led to high concentrations of fecal coliforms that pose public health risks.

This section describes key sources of demand and uses of surface water, and associated challenges stemming from water availability and water quality challenges.

Irrigation is the largest source of demand for surface water. Approximately 85 percent (around 9,000 MCM per year) of all water withdrawals are for irrigation, mostly from surface water.[2] Only 10 percent of municipal and industrial withdrawals are from surface water.[7] Almost 2 million hectares (ha) are irrigated, mainly in the Omo-Gibe and Rift Valley Basins, although most irrigation is seasonal.[9,10]

The Awash Basin has low water supply, high demand, limited water storage capacity, and is vulnerable to drought. Approximately 19 million people reside in the Awash Basin, which features Ethiopia's largest cities, including Addis Ababa. Almost 200,000 hectares of irrigated farmland, two-thirds of national industries, and over 34 million livestock are also located in the Basin. The Aba Samuel, Gafarsa, Koka, Kessem, and Tendaho Dams provide water storage for municipal and agricultural use, as well as hydropower.[1] Additional storage is needed as sedimentation has reduced reservoir capacity.[12] Sedimentation has inhibited hydropower generation and reduced the capacity of Addis Ababa's largest and most important reservoir at Koka Dam (original capacity 1,900 MCM) to 40 percent of its original capacity since it was built in 1959.[11,13]

Reservoirs help regulate flooding and provide water for irrigation, hydropower, and drinking. They also create risks to downstream environmental systems and water users.[9] The recently completed 1,870 MW Gilgel Gibe III Dam (Omo River) doubled Ethiopia's electricity production[14] and mitigates potentially damaging floods.[15] However, the dam has also been labeled as one of the most controversial in Africa.[16] The Dam reduces the extent of key floods that approximately 200,000 downstream pastoralists depend on for flood-recession agriculture.[17,18] Flood regulation also diminishes the transport of sediment to downstream farmlands, reduces groundwater recharge, and may threaten unique riparian habit and biodiversity.[19] Two additional large dams- Gibe IV and Give V- are planned on the Omo River and pose similar risks and benefits.[20]

The GERD in the Abay Basin will be one of the largest hydropower dams in the world (79,000 MCM) with an installed capacity of around 5,150 MW.[21] Egypt and Sudan have expressed concerns that the GERD will significantly reduce the Nile's flow and negatively impact their economies.[22] The extent of the risks to downstream riverine ecosystems and water users will be determined by dam operation.[23] One analysis suggests that a 10 percent reduction in maximum outflow capacity could lead to a 0.4–0.75 meter decline in the Nile's downstream water level.[24] Other studies suggest the GERD will not have significant impacts to downstream countries.[21] The GERD began filling in 2020 and will fill over 5-7 years, which will temporarily reduce inflows to Egypt's reservoirs.[21,25] Sudan has less dam capacity and may be more susceptible to flow disruptions during the GERD's filling.[26]

Agricultural activity throughout the Rift Valley is causing sedimentation and eutrophication in downstream reservoirs, lakes, and wetlands. Agricultural clearing, natural steep topography, and high precipitation intensity causes almost 2 billion tons of soil erodes annually.[27,28] Croplands in highland areas deliver twice the sediment and nitrates as grasslands, which increases downstream turbidity and eutrophication risks at the Legedadi, Aba-Samuel, and Gilgel Gibe I Reservoirs.[29,30] Direct cultivation in wetlands also threaten biodiversity and water quality. The Shesher and Wallala wetlands around Lake Tana have become fragmented and smaller in size after teff cultivation, a cereal grain, increased.[31,32] Runoff from wetland agriculture has contributed to widespread eutrophication in lakes and caused fish populations to decline.[33] Increasing fertilizer application rates and livestock waste are key contributors to elevated concentrations of phosphorous and nitrogen in surface waters, which cause regular algal blooms.[28,35,36]

Untreated effluent from tanneries and textile factories around Addis Ababa, as well as large scale gold mining in the south and artisanal gold mining nationwide degrade surface water quality. Treatment of industrial effluent is limited and causes widespread pollution around Addis Ababa. Textile factories use thousands of chemicals and lack adequate treatment systems for effluent, and have caused high BOD and suspended solids in surface water.[38] In one study, median chromium levels were found to be 50 times higher than the WHO guideline value for drinking water downstream of nearby tanneries in the Awash Basin.[37] Artisanal gold mining is also widespread and employs over one million people,[39] and poses risks from watershed degradation and increased turbidity.[40] One large gold mine in Southern Ethiopia has also been linked to high mercury levels in downstream water sources.[41]

Uncollected municipal waste and inadequate sanitation systems have increased fecal coliforms in surface water. Only a small portion of urban wastewater is collected and treated. Wastewater treatment facilities are often poorly managed, which results in direct discharge of wastewater into rivers.[42] Some reaches of the Akaki River (downstream of Addis Ababa) have high concentrations of fecal coliforms levels, posing public health risks and risks to agriculture as coliform levels exceed WHO guideline values for irrigation of certain crops classes.[43,44]

Groundwater Outlook

KEY TAKEAWAYS

- Most groundwater withdrawals are for domestic and municipal users, whereas abstractions for irrigated agriculture are more limited.
- More research is needed to better understand the sustainability of groundwater resources, particularly in Addis Ababa, where groundwater demand is highest and most concentrated.
- Groundwater in the Great Rift Valley has naturally high fluoride that threatens public health, while limited sanitation infrastructure poses pathogenic risks to groundwater quality in shallow wells in urban areas.

This section describes key sources of demand and uses of groundwater, and associated challenges stemming from water availability and water quality challenges.

Studies on groundwater sustainability and abstractions are generally limited. Groundwater accounts for 90 percent of domestic/municipal and industrial supply.[2,7] Around 70 percent of rural water supply is from groundwater,[2] with comparable usage rates (60 percent) in Addis Ababa.[45] Groundwater dependency is highest in the more arid Wabi-Shebelle and Ogaden Basins, although groundwater is not very accessible in some regions due to its depth.[46] Pastoralists in these basins also depend on groundwater for livestock watering and agriculture to complement ephemeral surface water sources. Groundwater use in irrigation is low.[4]

Naturally occurring fluoride is widespread in the Great Rift Valley and poses serious health risks. Around 30 percent of Ethiopia's groundwater has naturally high salinity and fluoride, mainly in the Great Rift Valley.[47] Concentrations of fluoride are nearly three times the WHO guideline value for fluoride in drinking water in approximately one-third of boreholes and one-half of shallow wells in the Great Rift Valley. The highest concentrations over 50 times the guideline value. High levels of salinity are found in volcanic aquifers throughout the Great Rift Valley, and in the sedimentary aquifers in the south, southeast, and northeast.[48] Other limited studies have identified arsenic in some parts of the Great Rift Valley.[49]

Inadequate sanitation systems contaminate groundwater in most urban areas. A recent national survey found that almost 30 percent of sampled wells in southern, central, and northern Ethiopia were contaminated with E. Coli.[50] In Addis Ababa, only 14 percent of the city is connected to a sewer system, with most households using on-site disposal systems such as latrines and septic tanks which can pollute shallow groundwater.[51] Shallow wells in Addis Ababa are more than twice as likely as deep wells to test positive for E. Coli.[52] Larger national studies are needed to better assess pathogenic pollution of groundwater.

Water Resources and Climate

KEY TAKEAWAYS

- Climate change will increase precipitation but lead to more frequent droughts. This will increase risks to food security and livelihoods among pastoralists and farmers throughout lowland areas in eastern Ethiopia.
- Lowland areas in Ethiopia are prone to extreme flooding due to high rainfall intensity and naturally steep terrain. Climate change will increase rainfall intensity and worsen flood risks.

This section covers climate variability and climate change, their impacts on water availability and water quality, and the risks they pose to local communities and their economies.

Climate change will increase rainfall and rainfall intensity, although hotter temperatures will also increase evaporation. Ethiopia has naturally high inter-seasonal rainfall variability. The driest regions in the east also have high interannual variability.[53] Precipitation ranges from 2,700 mm/year in highland areas in the southwest and can be as low as 100 mm/year in the Afar Lowlands in the northeast.[9,54] Between 50 and 80 percent of rainfall occurs from June to September.[55] Climate change will increase average temperature 1.9- 3.7°C and increase precipitation between 29 and 117 mm/year, with most gains occurring between September and December. However, higher evaporation losses will offset most of these gains.[56]

Climate change is increasing the frequency, magnitude, and scale of droughts, raising the risk of famine and major economic losses, especially in eastern Ethiopia.[57] Drought risks are high in most eastern basins[58] and almost 90 percent of drought prone regions are in lowland areas.[53] Over the past 30 years, Ethiopia has had seven major droughts which resulted in five famines.[57] Prolonged drought between 1983-1985, coupled with political instability and conflict, caused Ethiopia's worst famine in a century and led to the deaths of over one million people.[59] The 2015 drought was one of the worst in recent history, with precipitation being 65 percent below average in the northeastern and central regions.[60] By 2016, over 10 million people required emergency assistance, as one million livestock and 75 percent of croplands were lost in the most affected areas.[61]

Climate change will lead to heavier rainfall and increase flood risks, particularly in the Awash and Wabi-Shebelle Basins, and in parts of the Great Rift Valley. Flood impacts are already severe, especially in lowland areas, due to naturally high rainfall intensity and steep topography, as well as upper basin land use changes and deforestation.[57,62] Between 1991 and 2019, floods resulted in 3,000 deaths, displaced 1.3 million people, and the loss of 250,000 cattle and half a million hectares of cropland.[63] Climate change is increasing rainfall intensity, which will accentuate flood risks.[56]

FIGURE 2: DROUGHT RISK

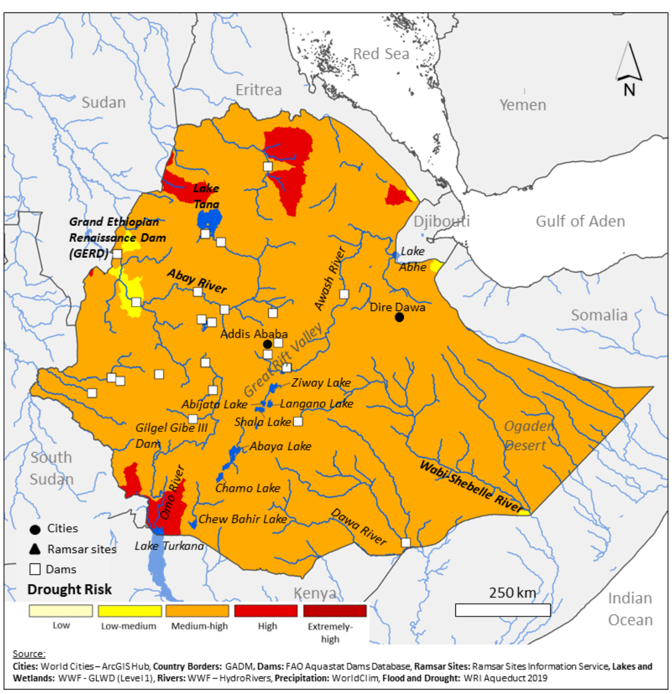
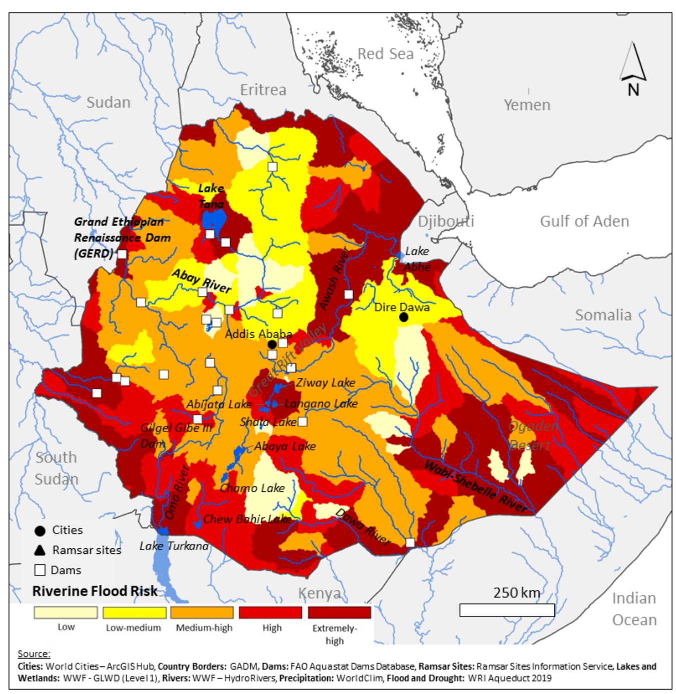


FIGURE 3. RIVERINE FLOOD RISK



Water Policy and Governance

KEY TAKEAWAYS

- Ethiopia's water sector policies, programs, and strategies are being revised and key sub-national basin management entities have recently been centralized.
- Lack of coordination among water sector actors with overlapping mandates impedes effective water resources management. Low sectoral funding and finance has delayed the opening BDA branch offices and development of master plans.
- Water quality monitoring is overseen by the MoWIE and the MEFCC in the Awash Basin; water quality monitoring is broadly lacking in all other basins.

This section provides an overview of key policies, institutions, and management challenges. Key laws, policies, and plans are summarized in Table 2 and the roles and responsibilities of select transboundary, national, and sub-national water management entities are summarized in Table 3.

TABLE 2. KEY LAWS, POLICIES, AND PLANS

Name	Year	Purpose
Environmental Policy of Ethiopia	1997	Establishes national policy related to water conservation, the environmental impact assessment process, water quality compliance monitoring, and wetland and forest rehabilitation and protection.
Water Resources Management Policy (EWRMP)	1999	Currently under revision, the EWRMP adopts basin and sub-basin management approaches, and outlines national goals, objectives, and guiding principles for water resources management by prioritizing water use for economic development and poverty alleviation.
Water Sector Strategy	2001	Currently under revision, the strategy outlines the national approach for irrigation, water and sanitation, and hydropower. The strategy also addresses transboundary water management and environmental mitigation for hydraulic infrastructure.
Water Resources Management Regulations	2005	Establishes rights and obligations of water users and government entities for water use and effluent discharge permitting, water works construction, and well installations.
River Basin Councils and Authorities Proclamation	2007	Outlines the establishment of River Basins High Councils and River Basins Authorities and defines their powers, structures, and duties, including data sharing, basin management planning, and water use permitting.
Powers and Duties of the Executive Organs Proclamation	2018	Redefines existing organizational structures and responsibilities for key ministries and institutions, including in the water sector. Transfers the rights and obligations of basin-level institutions to the central Basins Development Authority (BDA).

TABLE 3: WATER RESOURCES MANAGEMENT ENTITIES

Mandate	Institution	Roles and Responsibilities
Transboundary	Nile Basin Initiative (NBI)	International partnership consisting of 11 countries within the Nile Basin, which encompasses the Lake Victoria Basin as part of its upper watershed. Coordinates basin development through a Council of Ministers, Technical Advisory Committee, and Secretariat.
National	Ministry of Water, Irrigation and Energy (MoWIE)	Primary entity in charge of water resources management, water dispute resolution, designing water policy and legal frameworks, conducting basin studies, operating water infrastructure, and monitoring and regulating water quality. Oversees Water Development Commission, Basins Development Authority, Irrigation Development Commission, and the Great Renaissance Dam Coordination Project Office. The Hydrology and Water Quality Directorate is housed within MoWIE and leads water quality monitoring.
	Environment, Forest, and Climate Change Commission (EFCCC)	Coordinates and directs environmental sector objectives, develops policy and laws, and charged with establishing a cross sectoral environmental information system.
	Ministry of Environment, Forest, and Climate Change (MEFCC)	Collects water quality data, manages system for environmental impact assessments, and administration of environmental regulations related to forest management and water pollution.
	Water Development Commission	Oversees WDF and leads water and sanitation service delivery nationwide, in both rural and urban areas, through branch offices.
	Water Development Fund (WDF)	Semi-autonomous body accountable to the Water Development Commission. Provide loans for development of WASH infrastructure, credits to water user associations, and grants for sectoral capacity building initiatives.
	Basins Development Agency (BDA)	Executive organ of the central government that is accountable to MoWIE. Prepares basin Master Plans, issues water use permits and collects water use fees, and provides technical support to MoWIE regarding dispute resolution.
	National Basin High Council	Executive organ of the central government that approves basin plans and sets water use fees.
Sub-national	Regional Water Bureaus (RWB)	Plan and develop regional water supply projects and provide oversight and technical support to water service providers. Oversees sub-regional Woreda Water Office and Zonal Water Departments.
	Water Users Associations (WUA)	Local level organization in charge of irrigation and drinking water supply management.

Low government funding and a lack of sustainable financing mechanisms have delayed the establishment of BDA branch offices and development of basin master plans. The 2018 Ethiopia Powers and Duties of the Executive Organs Proclamation initiated important changes to how the water sector is organized. The Proclamation transferred the rights and obligations of the previously autonomous River Basin Authorities (RBAs) to a national BDA and converted the Awash, Abay, and Rift Valley RBAs into branch offices of the BDA.[64,65] Due to funding shortfalls, the other nine basins did not have RBAs. Prior to the 2018 proclamation, efforts were underway to establish RBAs in Tekeze, Omo-Gibe, and Baro-Akobo, although it remains unclear if and when these organizations will be constituted as BDA branch offices.[65] The BDA is developing a National Integrated Water Resources Management Plan (NIWRMP), which may clarify the BDA's new approach to IWRM.[67]

There are eight water resources management master plans but they are over two decades old and require substantive updates.[28] Revisions of the basin master plans for the Awash, Abay, and Rift Valley Basins have been affected by technical capacity and financial constraints within the BDA branch offices.[28,68] The BDA is considering external and private sector financing as well as establishing a water resources management fund within the MoWIE to address budget deficits and finance basin development and conservation projects.[67] Water use and wastewater permitting can be an important financing tool for basin management initiatives, however, permit revenue only accounts for one percent of the Awash BDA's operational budget, the only BDA to issue permits to date.[28] Compliance monitoring (through inspections) is needed to ensure water users adhere to the terms of water use permits, but this occurs infrequently.[28]

Water management responsibilities and regulatory authority are distributed among several national and sub-national governmental entities, however, coordination is generally limited. The 2007 and 2018 proclamations called for the MoWIE to transfer water use and wastewater permitting responsibilities to the BDA, but the BDA is not yet operational in all the basins.[68] The MoWIE and the BDA are supposed to manage water use permits for medium and large-scale irrigation schemes, while small-scale irrigation (< 500 ha) permits are handled by regional governments.[28] Industrial abstraction permits are managed by regional governments based on land and industrial development licenses.[28] None of these permitting structures take into account water availability or sustainability, and are primarily for monitoring usage.[28]

The draft NIWRMP identifies opportunities to align water resources management functions across institutions.[68] The MEFCC and MoWIE share mandates for water quality monitoring and catchment management, however, the draft NIWRMP indicates that MoWIE's mandate is "contested" and that there is limited coordination between the two institutions. Similarly, the Ministry of Agriculture and MoWIE share responsibilities for catchment management, irrigation development, and the regulation of pesticides. The Ministry of Agriculture leads the development and management of small-scale irrigation schemes, while MoWIE assumes these responsibilities for larger irrigation projects. Finally, the draft NIWRMP notes that regional states, through their Regional Water Bureaus (RWBs), often license, build, and manage hydraulic development projects (such as municipal water supply, canals) without coordinating with the BDA to consider basin-wide impacts.

Water Quality Monitoring

Surface and groundwater quality monitoring is limited. The MEFCC and MoWIE, through the BDA branch offices, monitor water quality and maintain separate water quality monitoring networks in the same basins.[37] Systematic water quality monitoring only occurs in the Awash Basin but it is conducted independently by the MoWIE and the MEFCC37 and data is limited, especially for groundwater.[28] A National Groundwater Information System (NGIS) exists[69] but data is not effectively shared and used across institutions.[28,37] The MEFCC has yet to set ambient water quality criteria.[37]

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