33º Congreso
Internacional del CIRIEC
Valencia, 13 – 15 junio
de 2022

Nuevas dinámicas mundiales
en la era post-Covid; desafíos para
la economía pública, social
y cooperativa

Water availability, access, and utilization assessment in Kebridahar district in the somali region of Ethiopia

P. Karthika
Associate Professor, College of Business & Economics,
Kebri Dehar University, Ethiopia

M. Karthikeyan
College of Business & Economics,
Wollo University, Ethiopia

CIRIEC España
CIRIEC International
GENERALITAT VALENCIANA
Conselleria d'Educació, Cultura i Esport

Abstract

KebriDahar is a district in Somali Region, Ethiopia and the population is 363,000. The only perennial river in KebriDahar is the Fafen. About 25.8% of the total population has access to drinking water. The purpose of the research paper was to assess water availability, access, and utilization in the district. Mixed approach was adopted but with more of qualitative in nature. Relevant studies and report related to the study were reviewed. Primary data was collected through public/beneficiaries consultation and field observation. Secondary data was obtained from district and kebele offices. Consultations were also conducted with key stakeholders and local community representatives. 200 dwellers as respondents and all 12 kebeles were considered and conducted 37 key informant interviews (KIIs) comprising district water development bureau head (1), kebele water board heads (12) community committee members (12), community leaders (12), and Focus Group Discussion (FGD) among domestic water users (5 full groups). KIIs were guided using checklist delivered through face-to-face interview that used and open data kit (ODK), and hand-held mobile devices for data collection. Simple descriptive statistics and narrations were given. The result shows that with the most prevalent sources of water being 9 boreholes followed by 9 unprotected well; and 4 reservoirs made up a very low proportion of respondents' sources for accessing water. Respondents reported a total of 9 boreholes also specifying that 6 were functioning among which 2 were converted into 4 reservoirs for domestic water purpose and daily supply 150,000 liters to 1500 households who has water connection. 3 boreholes are used for truck water supply; and one by university. Respondents revealed that on an average 8L per day per person water consumption which shows that there is water shortage. This is significantly below Sphere Standard recommendation of 15L. It is recommended that as water access remains below Sphere Standards, water asset rehabilitation should be prioritized in order to reduce the number of households reliant on unprotected and unsafe water sources and to increase overall supply of water by increasing boreholes; water supply activities should also be coupled with hygiene promotion activities such as clean water storage and treatment through chlorination plants.

Keywords: Access, Assessment, Availability, Utilization, Water Shortage.

1. Introduction

1.1 Background of the Study

Every year, four billion people nearly two-thirds of the world's population face severe water scarcity for at least one month. Over two billion people live in countries with insufficient water supply. By 2025, half of the world's population could be living in water-stressed areas. By 2030, 700 million people could be displaced due to severe water scarcity. By 2040, approximately one in every four children worldwide will be living in areas of extreme water stress. Poverty is a way of life for these people.

Africa's water issue is anticipated to become a disaster three years from now. Water scarcity is a serious problem in Africa, and it is only becoming worse. As Africa's population grows and climate change continues to deplete the continent's precious resource, close to 230 million Africans are expected to face water scarcity by 2025, with up to 460 million living in water-stressed areas. The year 2025 is only three years away, and that period of time will pass in the blink of an eye. (Khanyi Mlaba, 2022). Ethiopia is Source for up to 80% of the Nile River's water. It is, however, difficult to provide enough potable water to everyone in the country who requires it. According to the Barcelona-based We Are Water Foundation, 42 million Ethiopians out of a population of more than 100 million do not have access to safe drinking water (Dagim Terefe, 2019). Ethiopia's water scarcity has exacerbated a humanitarian crisis, according to recent International Rescue Committee (IRC) assessments. As food and water prices rise, more people are going hungry, community members are selling their property at lower prices or being forced to leave their homes, more livestock are dying due to a lack of pasture, and more children are dropping out of school.

The Somali region of Ethiopia is populated by Ethnic-Somalis, 80 percent of whom rely on livestock for survival. Water and grazing are the two main components on which the Somali pastoral society depends for survival. The rains help to sustain a fragile ecosystem and are essential for pasture regeneration as well as water supply for humans and animals. The first rains of the year (Deyr) usually fall between October and November, followed by a long dry season (Jilaal) that lasts from December to March/April. The main rainy season lasts from mid-March to mid-April. (ReliefWeb,2000). According to a recent report by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), approximately 2.1 million people across 74 Woredas in the Somali region require immediate assistance. The Kebri Dehar is a city in the eastern part of Ethiopia located in Somali region and the papulation is 363,000 The average

elevation in this woreda is 706 meters above sea level. The only perennial river in Kebri Dahar is the Fafen valley. Kebri Dahar has no all-weather gravel road nor any community roads; about 25.8% of the total population has access to drinking water. A report published on November 01, 2021 in a collaboration between the zonal administration and aid agencies, said that 95% of all kebeles are being supported by water trucks due to the dry up of water sources, a total of 47,215 livestock perished and 62,960 people are in need of immediate assistance. (Bileh Jelan, & Dereje Gonfa, 2021). Kebri dehar in somali region is facing Physical and Economic Water Scarcity. Symptoms of physical water scarcity are severe environmental degradation, declining groundwater, and water allocations that favour some groups over others. Access to water is always a major livelihood concern in lowland areas, for human consumption (drinking, cooking, washing), livestock consumption (watering animals), and crop production. This study investigated the availability, access, and utilization of water among residents of 12 Kebeles in Kebri Dehar and would propose a strategic plan to increase water availability and establish an effective water distribution system in Kebri Dehar.

1.2. Statement of the Problem

In the Somali Region, as a result of the successive poor rains, the water level declined significantly. Rivers, springs, and ponds dried earlier than usual and increased the frequency of non-functionality of water supply systems due to over-utilization of schemes and rain scarcity which led lack of safe drinking water. According to the 2016 meher (deyr) assessment, 26 per cent of the boreholes (85 boreholes), 36 per cent of the Haffier dams, 30 per cent of the Berkads, 12 per cent of river intake structures and 58 per cent of the improved hand dug wells (HDWs) were not functional in the Somali region at the end of 2016. Moreover, nearly 30 per cent of the boreholes were in critical stress. During this period, the Regional Water Bureau (RWB) requested water trucking in 35 priority woredas for 89,669 households. The severe water shortage propelled the Acute Watery Diarrhoea (AWD) outbreak which reached its peak in April-May 2017. The outbreak had its heaviest toll in the Somali region, and increased the risk of co-morbidity of SAM children. The outbreak has been largely under control since June 2017, but cases continue to be reported in Jijiga City and the IDP camps. From January to September 2017, 35,068 cases of AWD were reported in the Somali region (UN – CERF, 2017). Some water tankers have stopped, but continue to monitor the situation. Hygiene and sanitation are a priority. Access is proving an increased logistics challenge (UN-OCHA, 2006).

Kebridehar has a piped water supply system, which is managed by the Kebridehar town water utility. Less than a 10% of Houses has piped supply connection in the Kebridehar town as their main source of drinking water. Every house has Birka for storing water either they receive from pipe supply system or buy from tanker trick. While normally filled from the piped supply this birka has important consequences for water quality management. Some 90% of households depend on secondary water providers (tanker trucks or water vendors with carts). Functionality of the piped system is a critical issue. Out of the nine boreholes that supply the piped system, only six are functioning. The other three have been non-functional for over a year because of technical problems with the source (Discussion made with WWDB, 2022).

Unfortunately, recent resent research studies on Assessment of drinking water, availability and accessibility and utilization in kebri dehar town are not available, therefore specific evidence about the availability, accessibility and quality of water being provided to communities, households and institutions, and the safety of the drinking-water supply cannot be inferred. Existing surveys do not provide adequate information on the quality of water, either at the source or at the household level. There is, therefore, an urgent need to obtain independently verifiable water availability data, to support regional and national governments in their efforts to provide safe water to households. Such data would provide useful information about current conditions and the likely public-health burden related to an inadequate and unsafe water supply. The research study reveals the extent of major water quality problems and inform future investment priorities by addressing the issues: assessing the risk of using drinking water from Birka; availability and functionality of water points; container water availability and affordability by Kebri dehar town residents; household satisfaction level with water supply system; understand the water quality surveillance system and so on.

1.3. Research objectives

The general objective of the study is to assess the access, availability and utilization of drinking water in Kebridehar Town.

1.3.1. Specific Objectives:

The specific objectives are:

- To explore the water distribution system prevailing in Kebridehar Town;
- To analyze the status of water access, availability and utilization by the residents of Kebridehar Town; and

- To examine the satisfaction level of respondents on the water supply / distribution system in the study area.

2. Literature Review

An article published by Adams.E.A., et.al (2019) synthesizes the literature on historical and emerging institutional arrangements for urban water supply in Sub-Saharan Africa to highlight successes, drawbacks, and opportunities for improving future water access. It traces the influence of decades-long global water initiatives on urban water-policy reforms in the region and reviews evidence on emerging community self-help and partnership models. Finally, it discusses the merits, targets and potential of Sustainable Development Goal 6 to improve urban water access in the region. The findings suggest that improving urban water supply in Sub-Saharan Africa requires innovative governance and institutional arrangements that blend the strengths of public, private and community-based water supply models.

With rising coverage figures and the advent of the Sustainable Development Goals, there is increasing attention given to assessing and monitoring the sustainability of water services. Previous efforts in the rural water supply sector have included the development of sustainability checks, while in the urban water supply sector, benchmarking of water services and the performance of utilities has become common practice. This paper argues that neither rural sustainability checks, nor urban benchmarking frameworks, are entirely suitable for monitoring small town water services. It presents a framework specifically developed and applied for assessing and monitoring small town water services. Application of the framework in seven small towns in Ethiopia shows significant discrepancies between the ideal and actual situations. It reveals specific challenges related to sustainable small town water service provision, including capacity at service provider (utility) level, asset management and regulation. The costs of sustainability checks and prospects for uptake as project and wider sector tools are discussed (Adank .M., et.al (2018)).

Research on water cooperation in the Eastern Nile Basin has focused on expanding policy and diplomacy tools for a better allocation of transboundary water resources confined to the river. Regional cooperation on water and related sectors such as energy and land expands the

bargaining and areas for mutual gain, and thus enhances cooperation perspectives. This paper looks at the contribution and the potential benefits of a regional cooperation approach to addressing the underlying challenges of water diplomacy, such as complexity and distrust. It also promotes the understanding of river basins as a “resource basin” of integrated and linked resource-use issues, not always related to the river flow. The paper provides an analysis of priority issues for water–energy–food nexus in regional cooperation in the Eastern Nile Basin. This basin represents an illustrative case for regional cooperation and increased integration due to multiple comparative advantages inherent in the uneven endowments of water, energy and arable land resources, and to varying levels of economic and technological advancement among the three riparian countries: Egypt, Sudan and Ethiopia. The paper also analyzes institutional arrangements on a regional scale, and elaborates on the inherent trade-offs associated with them (Al-Saidi.M., and A.Hefny, 2018). A study conducted by AKHMOUCH, A. and CLAVREUL, D. (2018) assessed advances in groundwater governance in the Netherlands, and a study on water governance in the Volta Basin was also conducted by Ampomah. B., and W.Andah (2016).

Bischoff-Mattson. Z et., al (2020) studied The interruption of essential water services in Cape Town, foreshadowed as ‘Day Zero,’ is one of several recent examples of urban water scarcity connected to the language of urgent climate change. Johannesburg, with its larger and growing population and deeply enmeshed water and power infrastructures, is currently regarded as one drought away from disaster. As a result, the lessons to be learned from Cape Town are under active debate in South Africa. We used Q method to examine the structure of perspectives on urban water scarcity among South African water management practitioners. Our results illustrate distinct viewpoints differentiated by focus on corruption and politics, supply and demand systems, and social justice concerns as well as a distinct cohort of pragmatic optimists. Our analysis underscores the significance of public trust and institutional effectiveness, regardless of otherwise sound policy or infrastructure tools. As practitioners explicitly connect domains of competency to solvable and critical problems, integrated systems approaches will require deliberate interventions. Furthermore, urban water crises exacerbate and are exacerbated by existing experiences of racial and economic inequality, but this effect is masked by focus on demand management of average per capita water consumption and characterization of water scarcity as ‘the new normal.’

Ching L (2015) in his research on a qualitative investigation of narratives: recycled drinking water found that recycled drinking water represents one of the most obvious and technologically reliable sources of urban water. Yet it is one of the least implemented solutions. Blame has often been laid on the emotional and psychological difficulties of persuading people that recycled drinking water is safe to drink. This 'yuck' factor has been empirically identified as a statistically significant variable. But how are such factors perceived? And more importantly – can these perceptions be changed? This study attempts a quantitative study of public perceptions and norm formation in recycled drinking water. Using the Q methodology, which reveals the subjective perceptions of key stakeholders, we uncover the following discourses: (1) technology can change current paradigms; (2) ensuring a safe water supply is a problem that has an economic cost; (3) environmental and global realities make it imperative to recycle water. These findings confound two prevailing views – that the debate in recycled drinking water is one of science over emotions, and more information can 'overcome' the apparently irrational norm formation. Instead, we find no new information in this case. Rather what was present was a new interpretative frame that allowed a new narrative enabling the bridging of two previously contradictory positions – in this instance, the pro- and anti-water reuse discourses.

Perusal of available literature on drinking water are mostly related to the study of general in nature, water governance, recycled drinking water and the like. Studies on water shortage covering the dimensions of water access, availability, and utilization along with studying satisfaction level of residents on water distribution system is lacking in particular reference to Kebridehar town. The research paper is a comprehensive approach to analyze the water access and availability of; and utilization by the residents of Kebridehar Town.

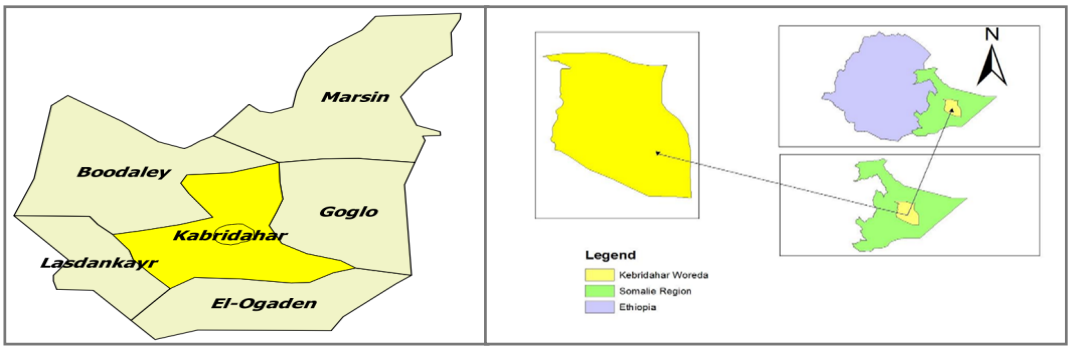
3. Research Methodology

This section of the paper presents the methodology adopted. The description of the study area, study design, sampling procedures, sources of data, data collection methods, and the methods of data analysis are discussed hereunder.

3.1. Description of the Study Area

Kebri Dahar (Somali: Qabridahare) is a woreda in Somali Region, Ethiopia. Part of the Korahe Zone, Kebri Dahar is bordered on the south by Debeweyin, on the west by the Gode Zone, on the northwest by Shekosh, on the north by the Degehabur Zone, on the east by the Werder Zone, and on the southeast by Shilavo. The major town in Kebri Dahar is Kebri Dahar and the population is 363,000. The average elevation in this woreda is 706 meters above sea level (Hailu Ejare Kene, 2008). The only perennial river in Kebri Dahar is the Fafen. As of 2008, Kebri Dahar has no all-weather gravel road nor any community roads; about 25.8% of the total population has access to drinking water (Hailu Ejare Kene, 2008). Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), this woreda has a total population of 136,142, of whom 77,685 are men and 58,457 women. While 29,241 or 21.48% are urban inhabitants, a further 50,361 or 36.99% are pastoralists. 98.73% of the population said they were Muslim (Census, 2007). This woreda is primarily inhabited by the Ogaden clan of the Somali people. The 1997 national census reported a total population for this woreda of 105,565, of whom 59,279 are men and 46,286 are women; 24,263 or 22.98% of its population were urban dwellers. The largest ethnic group reported in Debeweyin was the Somali (97.47%) (Census, 1994).

Figure 1: Map of Study Area



Source:

Kebridehar District Administration Office, 2022

3.2. Study Design

The purpose of the research paper is to assess water availability, access, and utilization in the Kebridehar Town. Survey method was adopted and mixed approach was used but with more of qualitative in nature.

3.3. Sampling Procedure

All 12 kebeles were considered, 200 households as domestic water users were randomly selected from 10 kebeles except kebele 11, and kebele 12 since they are independent in nature (Kebele 11 self-sufficient, and kebele 12 university). From each kebele 20 residents were randomly chosen totaling 200 respondents for household survey. In addition to the household respondents 37 key informant interviews (KIIs) comprising district water development bureau head (1), kebele water board heads (12) community committee members (12), community leaders (12), and Focus Group Discussions (FGDs) among domestic water users (5 full groups) were also be conducted.

Table 1: Sample Kebeles and Respondents

S.No	***Name of the Kebele***	***Sample***
1	Kebele 01	20
2	Kebele 02	20
3	Kebele 03	20
4	Kebele 04	20
5	Kebele 05	20
6	Kebele 06	20
7	Kebele 07	20
8	Kebele 08	20
9	Kebele 09	20
10	Kebele 10	20
11	Kebele 11	Excluded because of the reason mentioned above
12	Kebele 12	
	Total	***200***

Source: Kebri Dehar Woreda Office, 2022; and Kebele Bureaus concerned, 2022

The total population of the Kebridehar town is 363,000 and the number of households with water connection is 1500 in ten kebeles. Considering households with water connection by simple random sampling procedure the researchers selected 200 respondents.

3.4. Sources of Data

3.4.1. Primary Data Source

The researcher used both primary and secondary data sources to elicit necessary data for the research study proposed.

3.4.2. Secondary Data Source

Secondary data were obtained from district and kebele offices. Consultations was conducted with key stakeholders and local community representatives.

3.4. Data Collection Methods

Primary data were collected through public/beneficiaries consultation and field observation. Secondary data were obtained from district and kebele offices. The secondary data was collected through reports, and written materials. Consultations were also made with key stakeholders and local community representatives. KIIs were guided using checklist delivered through face-to-face interview that used and open data kit (ODK), mobile based application and hand-held mobile devices for data collection. Simple descriptive statistics and narrations were given.

3.5. Methods of Data Analysis

The data were analyzed by using both quantitative and qualitative approach. In addition, for further analysis to achieve the stated objectives specific data analysis such as descriptive statistics like frequency, percentage, mean and standard deviation were used and narrations were given to qualitative data. The first objective was analysed through descriptive statistics like frequency, and percentage. The second objective was analysed with descriptive statistics like frequency, percentage, and mean. The access, availability, and utilization were measured in terms of Liters per person per day / per household. The same was checked against the Sphere Standards for water consumption per person per day. The third objective on satisfaction level by respondents was analysed by considering scores for water source, access, availability, utilization, water shortage, water quality, health issues due to unsafe water supply and consumption. The scoring was categorized into not at all satisfied, somewhat dissatisfied, partially satisfied, satisfied, and highly satisfied based on the responses for the statements calculated. For each component the satisfaction level was identified and analysed. The composite overall satisfaction level i.e., the respondents' overall satisfaction level on water distribution system was also computed based on the total score arrived for each component

and interpretation was given. The results out of key Informants Interviews, FGD, and observation were given by narrations and supplemented to the survey results.

4. Major Findings

4.1. Water distribution system prevailing in Kebridehar Town

- Majority (52.6%) of the respondents revealed that the district administration by water board employees inspects whenever necessary the storage tanks, reservoirs or standpipes.
- The water board at the district level do chlorinate the drinking water particularly during rainy season when the water is muddy and not clean.
- 41% respondents reported that maintenance and repair has been done by the water bureau if complaint is registered followed by 35% reported that it is done by private agency, and the rest 24% respondents reported that it is done by households themselves.

4.2. The status of water access, availability and utilization by the residents of Kebridehar Town

The result shows that with the most prevalent sources of water being 9 boreholes followed by 9 unprotected well; and 4 reservoirs made up a very low proportion of respondents' sources for accessing water. Respondents reported a total of 9 boreholes also specifying that 6 were functioning among which 2 were converted into 4 reservoirs for domestic water purpose and daily supply 150,000 liters to 1500 households who has water connection. 3 boreholes are used for truck water supply; and one by university. Respondents revealed that on an average 8L per day per person water consumption which shows that there is water shortage. This is significantly below Sphere Standard recommendation of 15L.

4.3. The satisfaction level of respondents on the water supply / distribution system in the study area

* As for satisfaction on the sources of water 89 (44.5%) respondents are somewhat dissatisfied followed by 65 (32.5%) are partially satisfied; 21 (10.5%) are satisfied, and 25 (12.5%) respondents are not at all satisfied.

* As for satisfaction on the availability of water 99 (49.5%) respondents are somewhat dissatisfied followed by 55 (27.5%) are partially satisfied; 18 (9.0%) are satisfied, and 28 (14.0%) respondents are not at all satisfied.

* As for satisfaction on the water access 94 (47.0%) respondents are somewhat dissatisfied followed by 61 (30.5%) are partially satisfied; 19 (9.5%) are satisfied, and 26 (13.0%) respondents are not at all satisfied.

* As for satisfaction on the utilization of water 96 (48.0%) respondents are somewhat dissatisfied followed by 59 (29.5%) are partially satisfied; 19 (9.5%) are satisfied, and 26 (13.0%) respondents are not at all satisfied.

* As for satisfaction on the water quality 90 (46.0%) respondents are somewhat dissatisfied followed by 61 (30.5%) are partially satisfied; 21 (10.5%) are satisfied, and 26 (13.0%) respondents are not at all satisfied.

* As for satisfaction on the health issues due to unsafe water supply and consumption 93 (46.5%) respondents are somewhat dissatisfied followed by 59 (29.5%) are partially satisfied; 22 (11.0%) are satisfied, and 27 (13.5%) respondents are not at all satisfied.

* As for satisfaction on the water distribution system in the town 96 (48.0%) respondents are somewhat dissatisfied followed by 57 (28.5%) are partially satisfied; 20 (10.0%) are satisfied, and 27 (13.5) respondents are not at all satisfied.

5. Conclusion

The district administration by water board employees inspects whenever necessary the storage tanks, reservoirs or standpipes. The water board at the district level do chlorinate the drinking water particularly during rainy season when the water is muddy and not clean. Maintenance and repair has been done by the water bureau if complaint is registered followed by private agency, and the by households themselves. The most prevalent sources of water are 9 boreholes followed by 9 unprotected well; and 4 reservoirs made up a very low proportion of respondents' sources for accessing water. Six boreholes are functioning among which 2 are converted into 4 reservoirs for domestic water purpose and daily supply 150,000 liters to 1500 households who has water connection. 3 boreholes are used for truck water supply; and one by university. On an average 8L per day per person water consumption which shows that there is water shortage and is significantly below Sphere Standard recommendation of 15L. As far as satisfaction level is concerned, majority of the respondent reported as somewhat dissatisfied and not at all satisfied and the overall satisfaction level on the water distribution system majority 123 (61.5%) are coming under dissatisfied and not at all satisfied category,

which resulted to low level of satisfaction. Focus group discussion and key informant interview also revealed the same results as shown by the survey results.

6. Recommendations

It is recommended that as water access remains below Sphere Standards, water asset rehabilitation should be prioritized in order to reduce the number of households reliant on unprotected and unsafe water sources and to increase overall supply of water by increasing boreholes; water supply activities should also be coupled with hygiene promotion activities such as clean water storage and treatment through chlorination plants.

References

- Adams, E.A., Sambu, D. and Smiley, S.L., 2019. Urban water supply in Sub-Saharan Africa: historical and emerging policies and institutional arrangements. *International Journal of Water Resources Development*, *35*(2), pp.240-263. doi: https://doi.org/10.1080/07900627.2017.1423282
- Adank, M., Godfrey, S., Butterworth, J. and Defere, E., 2018. Small town water services sustainability checks: development and application in Ethiopia. *Water Policy*, *20*(S1), pp.52-68. doi: https://doi.org/10.2166/wp.2018.004
- Akhmouch, A., Clavreul, D., 2018. *Assessing and monitoring groundwater governance.* In Villholth Karen G.; Lopez-Gunn, E.; Conti, K.; Garrido, A.; Van Der Gun, J. (Eds.). Advances in groundwater governance. Leiden, Netherlands: CRC Press. pp.247-265.
- Al-Saidi, M. and Hefny, A., 2018. Institutional arrangements for beneficial regional cooperation on water, energy and food priority issues in the Eastern Nile Basin. *Journal of Hydrology*, *562*, pp.821-831. doi: https://doi.org/10.1016/j.jhydrol.2018.05.009
- Ampomah, B., Andah, W. and Biney, C.A., 2016. Water governance in the Volta Basin. In *The Volta River Basin* (pp. 128-148). Routledge.
- Bileh Jelan, & Dereje Gonfa. (2021). *Addis Standard* . Analysis: Drought in Somali region hits hardest in Dawa zone, kills thousands of livestock, threaten a humanitarian crisis. Available at https://addisstandard.com/analysis-drought-in-somali-region-hits-hardest-in-dawa-zone-kills-thousands-of-livestock-threaten-a-humanitarian-crisis/. (Accessed: 03 February 2021)
- Bischoff-Mattson, Z., Maree, G., Vogel, C., Lynch, A., Olivier, D. and Terblanche, D., 2020. Shape of a water crisis: Practitioner perspectives on urban water scarcity and 'Day Zero'in South Africa. *Water Policy*, *22*(2), pp.193-210. https://doi.org/10.2166/wp.2020.233
- Census 2007 Tables: Somali Region (http://www.csa.gov.et/index.php?option=com_rubberdoc&view=doc&id=274&format=raw&Itemid=521) Archived

(https://web.archive.org/web/20121114110154/http://www.csa.gov.et/index.php?option=com_rubberdoc&view=doc& id=274&format=raw&Itemid=521) 2012-11-14 at the Wayback Machine, Tables 2.1, 2.4, 3.1 and 3.4.

- Ching, L., 2015. A quantitative investigation of narratives: recycled drinking water. *Water Policy*, *17*(5), pp.831-847. doi: https://doi.org/10.2166/wp.2015.125
- Dagim Terefe. (2019) *Reuters.* Faced with climate change and growth, Ethiopia's capital shores up its water supply. Available at https://www.reuters.com/article/us-ethiopia-water-climate-change-idUSKBN1WP0KP. (Accessed: 04 February 2021)
- Hailu Ejara Kene, Baseline Survey of 55 Weredas of PCDP Phase II, Part I (http://www.p cdp.org.et/Docs/baseline/pcdpII%20-%20One.pdf) Archived (https://web.archive.org/web/20110720151420/http://www.pcdp.org.et/Docs/baseline/pcdpII%20-%20One.pdf) 2011-07-20 at the Wayback Machine (Addis Ababa: August 2008), Annex 1 (Aaccessed 23 March 2009)
- Kene, H.E., Baseline Survey Of 55 Weredas Of Pcdp Phase Ii.
- Khanyi Mlaba (2022). *Water Scarcity In Africa: Everything You Need To Know.* Global Citizen. Available at https://www.globalcitizen.org/en/content/water-scarcity-in-africa-explainer-what-to-know/.(Accessed: 01 February 2021)
- Population and Housing Census of Ethiopia: Results for Somali Region. Available at: https://www.csa.gov.et/surveys/Population%20and%20Housing%20Census%201994/survey0/data/docs%5Creport%5CStatistical_Report%5Ck05%5Ck05.pdf. (Accessed: 02 February 2021)
- ReliefWeb. (2000). *Ethiopia: Emergency Humanitarian Intervention - Ogaden Region Korahai Zone - Ethiopia*. Available at https://reliefweb.int/report/ethiopia/ethiopia-emergency-humanitarian-intervention-ogaden-region-korahai-zone. (Accessed: 02 February 2021)
- UN-CERF (2017). Resident / Humanitarian Coordinator Report on the use of CERF funds Ethiopia Rapid Response Drought 2017.
- UN-OCHA (2006). SITUATION REPORT Drought Emergency in Somali and Oromiya Regions, Ethiopia 1 May, 2006.
- Water Scarcity | UNICEF. (n.d.). Water scarcity | UNICEF. Available at https://www.unicef.org/wash/water-scarcity#:~:text=Four%20billion%20people%20%E2%80%94%20almost%20two,by%20as%20early%20as%202025.. (Accessed: 02 February 2021)
- Williams, T.O., Mul, M., Biney, C.A. and Smakhtin, V. eds., 2016. *The Volta River Basin: Water for food, economic growth and environment*. Routledge.