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Differential Impacts of Water Privatization in Sub-Saharan Africa

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By
Asha Varma

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Abstract

Countries in Africa have historically struggled with access to safe water. Over the past three decades, the World Bank has promoted the privatization of water systems through contracts with foreign companies as the solution to the water crisis. However, only a handful of privatization efforts in Africa have succeeded, with most governments taking back control of their water supplies after only a few years. Furthermore, recent evidence suggests that expanded water access resulting from privatization only occurs in wealthier communities, however this has not yet been confirmed. This thesis examines the relationship between functional water access points in Tanzania, Ghana, Mozambique, and Nigeria and the income levels of the neighborhoods in which they are located, analyzing how this relationship changes before and after privatization. This quantitative approach was accompanied by a qualitative analysis of the political, economic, and geographical features of each country. When combined, these two complementary avenues of analysis demonstrate that privatization did not significantly increase water access but there was insufficient evidence to make definitive conclusions about privatization's effect on inequalities. This thesis argues that certain models of privatization should not be promoted as primary solutions to water access because they do not appear to increase water access. Furthermore, it demonstrates the inefficacy of a 'one-size-fits-all' approach to expanding water access and indicates the need for solutions that are adapted to local situations.

Introduction

Ensuring that people have access to clean and affordable water is an ongoing global problem. In 2010, the UN General Assembly declared that access to water and sanitation is a human right (UN-water 2020). The World Bank has promoted the privatization of countries' water systems, specifically through Public-Private Partnerships (PPPs), as a solution to improving water infrastructure. A PPP is a structure that was designed with the goal to expand access to utilities and, according to the World Bank, they can improve efficiency when they are well-designed and well-regulated. The World Bank defines PPPs as "a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility" (World Bank 2018). The World Bank has been a vocal proponent of privatization as a solution to water access, arguing that it promotes efficiency and innovation. However, current literature suggests that privatization

can cause increased prices and decreased water quality and that these negative effects disproportionately impact poorer communities and people in rural areas.

This thesis investigates water access before and after privatization in Tanzania, Mozambique, and Ghana, all of which have privatized their water system in the past twenty years. It also examines Nigeria, which has almost implemented privatization on multiple occasions times since 1990, as a control case study. The success of privatization was measured by assessing the percentage of homes connected to or with easy access to safe water before and after privatization, both at the country level and broken down across different income levels in urban areas. The link between the percentage of the population with easy access to running water and the income level of neighborhoods was then examined. The political and socio-economic context of each country was considered with a discussion of the political climate, water infrastructure prior to privatization, economy, and population distribution of each country.

This paper draws on two principal sources for demographic data. First, it uses household surveys from the USAID Demographic and Health Surveys (DHS), which are conducted in developing countries across the world every two to three years. These surveys provide information on household water access, which will be used to analyze the effects of water privatization. The same criteria are used for the DHS household surveys across all countries, making the data useful for cross-country comparisons. The UN-Water SDG 6 Data Portal was also used to assess the impact of water privatization. This dataset was compiled through UN-Water collaborations with countries, specifically from government census reports, NGOs, and private entities. This data set provides information on water access in African countries every year from 2000 up to 2017 and breaks down water access by rural and urban areas and by income levels.

It is also important for the impact of privatization to be assessed within the appropriate social, political, and economic contexts. Too many studies focus on the impact of water privatization on countries, but national policies can impact individual communities differently. Additionally, the extensive legacies of colonialism of many countries in sub-Saharan Africa has significantly influenced their experiences with water privatization. Investigating the privatization of water systems while accounting for a wider range of factors is necessary to understand whether water privatization is a useful solution for expanding access to clean and safe water in developing countries.

Literature Review

In 2010, the UN established access to safe and clean drinking water as a sustainable development goal, yet, as of 2019, only 24% of people in Sub-Saharan Africa have access to clean water. Expanding access to safe water is a priority for many countries in Africa, especially as climate change increases the strain on water sources globally. When a person lacks access to clean water, they can also suffer from malnutrition and become unable to attend school or work. Over 25% of the population in Sub-Saharan Africa spends over half an hour per trip to obtain water and this burden often disproportionately falls on women, making them less likely to go to school (UN-water 2020). In urban areas in Sub-Saharan Africa, poor communities often lack proper water infrastructure, forcing them to obtain their water from tanker trucks. This is a much more inefficient process, which causes the water bills for poor communities to be 10-20 times more expensive than those of the wealthier urban population (Bakker 2003). However, poorer people usually must collect water from a well or access point and pay for water per container, which is more expensive and takes much more time to access (The Private 2006).

There are three main forms of that water privatization can take. The first is a management contract, where a private company is only responsible for managing the water system while the investment and ownership of the system is under public control. Under this system, the private entity is responsible for maintaining water treatment plants, regulating water distribution, and monitoring water quality and tariff collection is a shared responsibility between the public and private entities. The private company is paid a fixed fee and they are appointed for a certain amount of time. The second form of water privatization is a lease, in which the private sector is also responsible for managing the managing and maintaining water infrastructure as well as for tariff collection. The responsibility for infrastructure financing and investment remains with the government. The private party pays a fixed fee to the government and makes money through water bills. The third and final type of water privatization is a concession, where the private entity is responsible for all aspects of the water system, including tariff collection, infrastructure investment, and the management of water quality. There are four types of concessions: Build-operate-transfer (BOT) contracts, build-own-operate (BOO), build-own-operate-transfer (BOOT), and build-operate-train-transfer (BOTT). BOT contracts are for a fixed amount of time and involve a guarantee of revenue that makes the government share responsibility with the private entity. At the end of the fixed period, control of the water system is returned to the government. BOO contracts are identical to BOT contracts except that the private company is given specific obligations and remains responsible for the water system until they fulfill those obligations. BOOT contracts require the private entity to construct, build, and operate water infrastructure for a given amount of time, after which they return the ownership to the government. BOTT contracts are identical to BOTTs except that the private entity promises to train the government so that there is a smooth transfer at the end of the contract. Other forms of

water management include a joint venture, where two or more entities take responsibility for the water system, and public limited companies, which are companies that are formed by the federal or local government (National Research Council 2002).

The first example of water privatization in Africa was Cote d'Ivoire in 1960, through a contract with SODECI, a branch of the French water company SUAR. From then until 1997, all water privatization contracts in Africa were in Francophone countries and with French companies, which was likely due to remaining French influence from the colonial era. In the late 20th and early 21st century, the World Bank emphasized privatization as the solution to public sector failings and has been vocal in its criticisms of public sector reform in developing countries. In 1983, the World Bank published the Berg Report, which emphasized the underperformance of governments in Africa and initiated the focus on privatization on the continent. Since then, the International Monetary Fund (IMF) and the World Bank have collaborated to incentivize privatization and will often only offer loans to African countries on the condition that they privatize certain sectors. In order to qualify for one of the most common loan programs—the Heavily Indebted Poor Countries (HIPC)—initiative, countries must show plans to privatize relevant sectors (Bayliss 2002).

This forced privatization can create several problems. Often, this will cause countries to rush the process of finding a company to help them privatize so that they can receive a loan as quickly as possible. This can cause countries to select the most immediate candidate and distract government attention from the main goal of trying to improve access to utilities. The main arguments that the World Bank presents in favor of privatization are that it can increase efficiency and encourage investment, which will in turn spur growth and development (Bayliss 2002). However, the World Bank's assumptions about privatization are not based on

privatization in developing countries. Privatization only really works when there is sufficient government regulation to prevent attempts by companies to eliminate competition and maximize profits. Water is very expensive to transport and it requires extensive infrastructure, which makes it difficult for multiple entities to control the water supply of a single country or region. As a result, arguments in favor of utility privatization that are based on competition cannot really be applied to the water sector because control of the water supply is usually monopolized (Jerome 2011).

Another argument the World Bank makes in favor of privatization is that it will allow under-funded governments to focus their efforts on other areas, such as education and healthcare. However, investors only want to invest in places where they are sure that they will get a financial return and they are not interested in social welfare. As a result, they will often invest in the services that will produce a short-term profit and not in longer-term projects, such as infrastructure (Jerome 2011). For example, in Guinea, a private company took ownership of billing citizens for their water but left the maintenance of the country's water infrastructure up to the government. As a result, water access declined because there was insufficient investment in the existing infrastructure. The fact that private companies also want to maximize their profits means that they will focus their efforts on areas that will be able to pay their water bills. Privatization will often cause an increase in water prices and private companies will avoid extending their services to low-income sections of cities and to rural areas (Robinson 2016).

There is significant evidence to suggest that privatization does not work; however, there is still very little information about *how* it fails to improve water access. This paper investigates one aspect of why water privatization is so often unsuccessful in various countries in Sub-Saharan Africa, identifying common themes between case studies to demonstrate how public-

private partnerships fail to improve a country's water supply. Additionally, the World Bank still promotes privatization as one of the major methods of improving water access in developing countries. This paper will demonstrate why the World Bank's position is detrimental and will propose an improved criterion for determining whether water privatization will be beneficial.

The literature also suggests that, while privatization does sometimes increase water access for rural populations, this increase is mostly due to its impact on wealthier communities, and privatization fails to expand water access in poorer communities. This paper will seek to substantiate this claim with further evidence about how exactly poor communities, specifically in urban areas are disproportionately impacted by water privatization. It can be easy for the World Bank and private water companies to claim that privatization was successful because there was an overall increase in water access. However, this expanded access frequently only occurs in affluent communities and it is important to recognize how privatization disproportionately impacts the communities of different economic levels.

Ghana

History

In 1992 Ghana created a constitution that established a president, parliament, cabinet, council of state, and independent judiciary. Jerry Rawlings, who had been in control of the government under a military state prior to 1992, was elected as the first president in 1993 (Editorial 2011). He was then succeeded by John Kufuor in 2001, which was the first peaceful transfer of power since 1957 (Editorial 2011). Since that election, Ghana's transfers of power have all been peaceful, however, years of coups, corruption, and food shortages had left the country poor and in debt.

Economy

For years, Ghana has struggled with a lack of access to food and water and a lot of the government's policies have focused on public health. After the establishment of a democratic government, Ghana's economic growth rate stabilized. Its rate of growth rose from 5.4% in 2000 to 6.3% in 2008. By 2015, it was able to achieve middle-income status. For years Ghana's economy was dominated by cocoa, and agriculture comprised 75% of export earnings, but was mostly small-scale and based on rainfall, with many inefficiencies. Agricultural reform that resulted in increased production was largely responsible for Ghana's consistent decline in poverty. A dramatic increase in population has accompanied the economic growth that Ghana experienced in the last two decades. As a result of the increase, there has been a large migration of people from rural to urban areas and the percentage of the population residing in urban areas increased from 36% in 1990 to 55% in 2016. As a result, the percentage of people working in agriculture decreased from 62% in 1991 to 42% in 2015. In 2010, Ghana started to build up its oil industry, which has contributed the most to economic growth in the last decade (Editorial 2011).

Water

As of 2003, approximately 80% of diseases in Ghana are caused by contaminated water and only 13% of the population have access to safe water. Difficulty accessing safe water is much more prevalent in rural areas than in urban areas. As of 2011, about 90% of residents in Ghana's capital Accra had access to piped water, but only 30% had water that was piped directly to their homes. Many people must purchase water for their bathrooms from private water tankers and buy their drinking water from private entities, which is usually only possible for the wealthy. This problem is largely caused by the fact that large cities in Ghana have undergone rapid

expansion and population growth since the 1990s (Hechter). However, expansion has been unplanned and minimally regulated, meaning that the expansion of water services has been difficult and unregulated. This growth in urban housing has been prompted by freer trade, increased investments, increased demand for housing, and a lack of regulations on home construction. All these factors have contributed to an expansion in homes without the corresponding expansion in utility services (Daley 2020).

Ghana was one of the first countries to be targeted for privatization and, in the 1980s, the World Bank and the IMF provided loans to Ghana on the condition that they take control of the restructuring of Ghana's economy. In terms of reforms to the water sector, they mainly fired staff from Ghana's public water entity, the Ghana Water and Sewage Corporation (GWSC), and focused on cost-recovery. However, the reforms directed by the World Bank and the IMF did not actually focus on increasing access to safe water in Ghana. In 1999, the state-owned Ghana Water Company Ltd. replaced GWSC, but it did not control rural water or sewage disposal. That year, the New Patriotic Party replaced the National Democratic Congress in the government and were much more interested in World Bank-directed reforms. As a result, by 2001 they had nine potential international water companies lined up for a public-private partnership contract. This development led to the formation of the National Coalition Against the Privatization of Water in 2001 (Amanthis 2012).

In 2005, the World Bank finalized the privatization plan that they advertised as the solution to the water crisis in Ghana and a public-private partnership model was initiated in 2006 (Amanthis 2012). The privatization was in the form of a management contract, which allowed the government to remain in control of the rural water supply and of the sewage system while the urban water supply was given to the Dutch South African water company Aqua Vitens Rand Ltd

(Weissman 2002). Additionally, responsibility for extending the pipes remained a government responsibility. However, in 2011, Ghana did not renew its contract with Aqua Vitens Rand Ltd. The National Coalition Against the Privatization of Water had organized protests since 2001 and gained the support of several NGOs that originally supported privatization as Aqua Vitens Rand Ltd had not improved water access in any way. They had not improved non-revenue water (water the company provides that is not paid for because water bills are not paid; there are leaks in pipes; or the water is supplied illegally) and they did not increase water bill collection or service delivery. When the government did not renew their contract with Aqua Vitens Rand Ltd, Ghana Water Company Ltd regained control of the water sector (Amanthis 2012).

Mozambique

History

Colonized by Portugal in 1505, Mozambique has an incredibly long history of having been exploited for its mineral and agricultural products until attaining independence in 1975. Mozambique gained independence much later than the other countries in this study, which has meant the direct effects of colonialism have been more recently felt. During colonial rule, the people of Mozambique were subject to forced labor, high taxes, and poor wages and were prevented from owning the most profitable lands. In 1962, a group of Mozambican politicians formed the Mozambique Liberation Front, which promoted a socialist regime and was led by Eduardo Mondlane. In 1974, they led a series of coups which eventually led to independence in 1975. Initially, the Mozambique Liberation Front instituted socialist policies and closed the country to foreign influence, but they soon reverted to government regulation of markets and services. In 1984, Mozambique became a part of the World Bank and the IMF, as such, it adhered to their structural-adjustment program to privatize the Mozambican economy. However,

an opposition party, the Mozambique National Resistance, emerged around the same time, sparking years of conflict until the first free elections were held in 1994. The UN provided military support to ensure that these elections were peaceful, and the Mozambique Liberation Front candidate Joaquim Chissano was elected (Sheldon 2021).

Even though Mozambique suffered from a drought and an earthquake in the early 21st century, its economy was stimulated by economic reforms. Although the government initiated a debt relief program and there was an influx of foreign investors, the economic benefits did not extend to everyone and there was a significant gap between the wealthy and the poor (Sheldon 2021). The country's economic and political situation remained relatively stable until 2013, when tensions between the two leading political parties (the Mozambique National Resistance and the Mozambique Liberation Front) resurfaced.

In the late 1980s and the 1990s, influence from the IMF and the World Bank led to the privatization of many utilities in Mozambique. In 1995, the World Bank and IMF allowed Mozambique to qualify for its debt relief program only if it reformed its water system. In the same year, the government utilized the World Bank-assisted National Water Policy, which encouraged private sector participation in the water supply. In 1998, the government created the agency Conselho de Regulação do Abastecimento de Água (CRA) to oversee the proposed public-private partnership and in 1999, they established a public-private partnership for their water utilities in five major cities: Maputo, Beira, Nampula, Quelimane, and Pemba. The contract established a joint venture and was signed with Aguas de Mozambique (AdeM), which was partially owned by the French company Société d'Aménagement Urbain et Rural (SUAR) and the Portuguese company Aguas de Portugal (AdP). In 2000, a disastrous flood caused AdeM to increase their water prices and SUAR ceded control of AdeM to AdP. In 2008, AdP left Beira,

Nampula, Quelimane, and Pemba; they finally left Maputo in 2010 due to a lack of profit (Kishimoto 2015).

Tanzania

History and Economy

Modern-day Tanzania has largely been shaped by its colonization by Germany in the late 19th century. In the 1912, Germany completed the construction of a railway across Tanzania, which facilitated the growth of the coffee and rubber economies. However, there was heavy resistance to German rule, with the first major uprising occurring in 1905. Germany lost control of the country after World War I, which dramatically disrupted Tanzania's administration and economy. Control of the country was then transferred to the British and many people in the country reverted to subsistence farming. In the 1920s and 30s, the British government set up set up local systems of government and extended the railway system. After World War II, Britain placed Tanzania under United Nations trusteeship and again tried to build up the political scene in the country. In 1953, Julius Nyerere was elected president of the Tanganyika African National Union (TANU), which became the primary group that advocated for independence. In the election of 1960, members of the TANU were overwhelmingly elected to the government and Nyerere was elected as prime minister, solidifying Tanzania's independence. The TANU remained in control of the government for several decades and Tanzania sought aid from China over Britain for development loans (Ingham).

Post-independence, Tanzania's economy suffered from both a lack of export markets that had existed (never developed during colonization) and from internal and external political conflicts. Conflict with Uganda's president in 1978 led to a brief war and strained eastern African economic relations. In 1985, Ali Hassan Mwinyi took over as president and struggled to

revive Tanzania's economy, which was suffering due to a lack of resources and inefficient management. Mwinyi opened the country to foreign aid and accepted loans from the IMF to revive the economy and address a food shortage in the country. From 1990 to 2000, Tanzania's food shortage was exacerbated by the influx of refugees from Burundi, Rwanda, and the Democratic Republic of Congo. Tanzania also suffered from violent demonstrations and government unrest in the early 2000s and, since 2005, every presidential election has been tumultuous and plagued by allegations of corruption. In 2005, the East African Community Customs Union was established to encourage economic exchange in East Africa, but the effects were not sufficient to revive Tanzania's economy (Ingham).

Water

In 1967, Nyere published the Arusha Declaration, which called for socialism and nationalization (Ingham). Even though his nationalization attempt failed, and the economy suffered, the socialist agenda did have positive effects on sanitation as the national public education campaign facilitated the construction of latrines in many homes ("Water Supply and Sanitation," 2015). However, the socialist government lacked the capacity to regulate water supplies, which led to waste and a lack of investment in water infrastructure ("Water Supply and Sanitation", 2015). Between 1967 and 1999 in Dar es Salaam, the number of homes with piped water decreased significantly, which was largely the result of a lack of maintenance and new infrastructure despite an increasing population (Beuving 2008). During this time, the National Urban Water Authority (NUWA) that had been in charge of managing the water supply ran out of money to maintain its pipes and pay its staff (Beuving 2008). As a result, people received fake bills, bypassed their water meters, and created illegal connections (Beuving 2008).

In 1991, Tanzania passed the National Water Policy, which created urban water utilities and charges for users (“Water Supply and Sanitation”, 2015). The World Bank also provided a \$105 billion loan to the Urban Sector Rehabilitation Project (USRP) to help with water access that was set to disburse from 1996 to 2000. In 1997 the Dar es Salaam Water Supply and Sewage Authority (DAWASA) was created but it did not do a much better job than its predecessor and, by the end of 1998, the Ministry of Water and the World Bank had both agreed on the need to privatize DAWASA. In 2000, the World Bank provided a loan to Tanzania on the condition that they privatize DAWASA. City Water Services Ltd (CWS), an organization run by British, German, and Tanzanian companies, was given control of DAWASA in 2003 under a 10-year lease. In 2003, 98,000 out of 2.5 million homes had piped water and only 26% of water was billed. However, City Water failed to meet many of the standards that it had agreed to meet when it was given control and consistently clashed with DAWASA employees. In 2005, only two years after it had taken control, the Tanzanian Minister of Water terminated their contract with City Water and control of the water supply was returned to DAWASA (WaterAid 2008).

Nigeria

History

Nigeria’s economy and infrastructure have been impacted by its long history of exploitation, even prior to formal colonization. The British began interfering in the country in the early 19th century when they extended the slave trade to Nigeria. Throughout the 19th century, Nigeria was exploited for the economic benefit of European countries, such as Britain and France. 1914, Nigeria officially became a British colony, under the control of a governor general in the capital city of Lagos (Falola 2020). Nigeria was technically governed by indirect rule, meaning that Nigerian officials were in charge but themselves operated under British guidance.

British colonial rule instituted a two-tiered system of government, with both central and local levels (Falola 2020). Throughout the colonial period, Nigerians led a series of protests focused on issues such as water rates and political representation. In the 1920s, pan-Africanism and Nigerian nationalism exploded, and independence movements started to take off (Falola 2020). In an attempt to appease Nigerians, the British created a new, more decentralized system of government in 1954 (Falola 2020). It featured five regions: the Federal Territory of Lagos, the Southern Cameroons, the South, Central Nigeria, and the North (Falola 2020). The central government with a governor, House of Representatives, and Senate still existed but each region had its own regional governor and legislative body (Falola 2020).

In the 1960s, Nigeria gained its independence and became a republic with a federal government and a president. However, conflict between the three dominant ethnic groups coupled with North-South tensions resulted in a period of political instability and, from 1969 to 1976, a series of military leaders controlled the country. In 1979, Nigerians elected their first president under a second constitution, Shehu Shagari. However, dissatisfaction with his attempts to revive the Nigerian economy led to a military coup in 1983 in which resulted in a very brief military regime by Muhammed Buhari. Buhari was quickly overthrown by Ibrahim Babangida, who attempted to suppress the reinstatement of a democratic government and maintained control until 1993. Despite winning the election in 1993, Babangida was immediately overthrown by Sani Abacha, who established a violent and oppressive military regime. Democratic rule was finally reestablished in 1999 with the election of Olusegun Obasanjo; this helped to recover Nigeria's international image. However, ethnic tensions and conflicts between Muslims and Christians persisted and from 2002-2008 Nigeria dealt with a border dispute with Cameroon over an oil-rich area. Boko Haram, an Islamic group that wanted to establish Shari'ah law became

more visible in 2009, when it began to attack the police and government officials. The group continued a campaign of violence for many years and in 2014 they kidnapped 275 girls from a boarding school, bringing international awareness to the issue. In the election of 2015, Buhari, the former military leader, was elected but he struggled with the 2016 economic recession and the continuing conflict with Boko Haram (Falola 2020).

Nigeria has one of the strongest economies in Africa, centered largely around oil. It started to expand in 1973, when oil prices increased due to OPEC's oil embargo, leading to the expansion of transportation, manufacturing, and government services. The growth of the oil industry led to a rapid decline in the agricultural sector, causing Nigeria to become dependent on imported food and other products. Since their economy was vulnerable to fluctuations in the oil industry, the government has had to rely on foreign support whenever the industry is not doing as well. In the 1990s, there was a big push from the government to privatize several utilities; as a result, public transportation, power, and communications were all privatized. In the early 2000s, the economy was suffering because of a decline in oil prices, which caused Nigeria to seek international loans. Government corruption and the need to pay off debts plagued the government until they were able to pay off their loans to various foreign countries in 2006. In 2016, another crash in the oil industry brought Nigeria into a recession and its recovery since then has progressed slowly (Falola 2020).

Water

Nigeria has a wealth of water resources, collecting 215 cubic kilometers of surface water every year. However, in 2017, only 67% of Nigerians had access to non-drinking water and 19% had access to safe drinking water. Nigeria's population is roughly 50% urban and 50% rural, and its two largest cities are Lagos and Abuja. In the past 20 years, it has experienced dramatic

decreases in infant mortality, which has caused a significant rise in population. As a result, despite the fact that Nigeria has abundant water resources, it has struggled to expand water access to keep up with population growth (Falola 2020).

Nigeria has a long history of foreign influence over its water systems. In 1910, the Lagos Water Corporation (LWC) was established by the British to centralize the control of water systems (Falola 2020). The LWC initiated the Iju Waterworks project, which created tanks, pipes, and fire hydrants (Falola 2020). However, political instability after independence resulted in economic challenges and a lack of regulation of water systems. The Nigerian government brought the Lagos Water Corporation (LWC) under the control of the government in 1970 (Chiori 2018). In the 1980s, British ambassadors in Nigeria heavily influenced the Nigerian government's attitude towards privatization, encouraging them to partner with European businesses to improve 'efficiency' and minimize corruption. The Nigerian government created the Structural Adjustment Program (SAP) in 1988, which promoted private intervention in Nigeria's industries to address inefficiencies in government agencies (Igbuzor 2003).

In the 1990s, the Nigerian government collaborated with the World Bank to discuss potential approaches to reforming the water sector. Throughout the late 1990s, the government shifted its policy priorities towards decentralizing the water sector and utilizing foreign loans to improve infrastructure (Igbuzor 2003). In 1999, the World Bank's International Finance Corporation (IFC) proposed to increase Lagos's water supply through collaboration with French and British water companies (Chiori 2018). However, the head of LWC rejected this plan, arguing that it was impractical and too expensive (Chiori 2018).

Summary

Ghana, Tanzania, and Mozambique all privatized the management of their water systems at some point between 2000 and 2011. Nigeria, although it has consistently had a government that favors privatization, has not privatized its water system, and therefore serves as a control case study. Water privatization in Ghana, Tanzania, and Mozambique was not national and only occurred in large cities. Private control of the water supply was the most widespread in Ghana, as all of its major cities were privatized. In Mozambique, privatization occurred in five major cities and in Tanzania privatization only applied to its capital, Dar es Salaam. Privatization in all three countries was prompted by strong influence from the World Bank and the IMF, who both made privatization a condition for receiving debt relief and loans that would help with development. Additionally, all of the companies that were given a control over urban water resources were European companies who had formerly colonized nations in Sub-Saharan Africa. This similarity indicates that privatization was possibly used to allow European companies to continue to benefit from countries in Africa even after decolonization. Ghana, Mozambique, Tanzania, and Nigeria all have extensive histories with colonialism, which continue to influence their political and economic situations. As a result, privatization in these countries did not have the same results as it has often had in developed countries.

Methods

To examine the relationship between water privatization and water access in Sub-Saharan Africa, this project used both qualitative and quantitative methods. Ultimately, this project investigates whether privatization addressed the problem of unequal access to water among households of different income levels in urban areas. This paper specifically examines whether privatization disproportionately affected water access in low-income areas in four sub-Saharan nations. Ghana, Tanzania, and Mozambique all privatized the management of their water

systems at some point between 2000 and 2017, which makes them suitable case studies for cross-country comparison.

The UN-Water SDG 6 Data Portal

The UN-Water SDG 6 Data Portal provides information about national trends in water access, which is a useful additional level of analysis for examining individual countries. Data is split into ‘urban’, ‘rural’, and ‘national’ data. The dataset also breaks down levels of wealth by ‘poorest’, ‘poor’, ‘middle’, ‘rich’, and ‘richest’ and these categories are determined by censuses from each country’s government. This project graphs trends in improved access to drinking water in urban areas for all the income brackets from 2000-2017. Improved drinking water refers to a source that protects the water from external contamination. Examples of improved drinking water sources include water piped into a home, public taps, boreholes, protected wells, protected springs, and rainwater. Unimproved sources of water include unprotected wells/springs, surface water, and tanker truck water. The data for household connection to drinking water was also plotted for urban areas in each income bracket from 2000-2017.

USAID Demographic and Health Surveys

The USAID Demographic and Health Surveys (DHS) provide a more detailed analysis of trends in water access in the countries of interest. For each country, there were datasets every two to three years from 1990 to 2016 and, since the data was collected with uniform metrics, the datasets for all four countries contain almost identical variables. Every dataset contained three variables: ‘region’, ‘place of residence’, and ‘type of place of residence’. The ‘region’ variable contained the options ‘urban’ and ‘rural’. The ‘place of residence’ variable contained options for

all the cities/towns/regions in which the surveys were conducted (this varied from country to country). The ‘type of place of residence’ variable contained the options ‘capital/large city’, ‘small city’, ‘town’, and ‘countryside’. For each country, the dataset in SPSS was split so that all analysis broke individual household data into the categories that corresponded with the variable. The variable (‘region’, ‘place of residence’, or ‘type of place of residence’) that was selected for the analysis varied from county to country due to a lack of consistent data. However, the reliability of these variables was not uniform across years or countries. After the datasets were split by urban/rural, type of place, or city/region, the main variable of interest was ‘source of drinking water’. Figure 1 demonstrates what the questionnaire that was used in all four countries looks like.

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
101 (5)	What is the main source of drinking water for members of your household?	<p>PIPED WATER</p> <p>PIPED INTO DWELLING 11</p> <p>PIPED TO YARD/PLOT 12</p> <p>PIPED TO NEIGHBOR 13</p> <p>PUBLIC TAP/STANDPIPE 14</p> <p>TUBE WELL OR BOREHOLE 21</p> <p>DUG WELL</p> <p>PROTECTED WELL 31</p> <p>UNPROTECTED WELL 32</p> <p>WATER FROM SPRING</p> <p>PROTECTED SPRING 41</p> <p>UNPROTECTED SPRING 42</p> <p>RAINWATER 51</p> <p>TANKER TRUCK 61</p> <p>CART WITH SMALL TANK 71</p> <p>SURFACE WATER (RIVER/DAM/ LAKE/POND/STREAM/CANAL/ IRRIGATION CHANNEL) 81</p> <p>BOTTLED WATER 91</p> <p>OTHER 96</p> <p style="text-align: center;">(SPECIFY)</p>	<p>→ 106</p> <p>→ 103</p> <p>→ 103</p>

Figure 1: DHS question about the main source of drinking water for households. The coding categories column contains the response options.

However, even though a uniform questionnaire was used, there are variations in what the data looks like in each country because some options never showed up, such as ‘sachet water’, which only appeared in Ghana. Additionally, some options had to be combined for certain countries because there was a lack of consistent data across all the years of interest. For example, in Mozambique, the questionnaires did not specify if a well was protected or unprotected until the 2009 survey. The options that consistently had reliable data across all years and countries were ‘piped into dwelling’, ‘piped into yard/plot’, ‘public tap’, and ‘surface water’, making them the most useful for comparisons between countries. Another variable of interest was ‘time to water source’, which was an open-ended response (see figure 2). However, since this question was open ended, there were a wide range of responses and many data sets had extreme outliers. To simplify the analysis and to make it more reliable, only the number of households that recorded ‘on the premises/zero minutes’ or 1-5 minutes were examined. The data sets for each country were analyzed from at least three years before and after privatization and for as many years during privatization as possible.

104	How long does it take to go there, get water, and come back?	MINUTES <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/> <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/>
		DONT KNOW 998

Figure 2: DHS question regarding the round-trip time required to obtain drinking water

Qualitative Research

There are many factors that can influence whether water privatization is successful in a country and therefore it is crucial that the analysis of the datasets is accompanied by an investigation of potential confounding factors. Additionally, the inconsistent variables in the data

across countries and the slightly small sample sizes means that qualitative data is an essential supplement to the data analysis. The findings from the analysis of the two data sets were contextualized with investigations into the political, social, and economic situations in the countries during the periods surrounding water privatization. For each country, trends in population and GDP growth were considered, since these are factors that could influence how easy it was to expand water access in urban areas.

The database LexisNexis was used to identify any significant political events from the three years before and after privatization and for the years during privatization for each of the three countries. Specifically, the key words ‘elections’, ‘economy’, and ‘unrest’ accompanied by the relevant country were used. The words ‘elections and ‘unrest’ were used because they helped to identify any major political events that could have disrupted the progress of water bill collection or water infrastructure improvement. The word ‘economy’ was also used because dramatic crashes or increases in a country’s economy could cause changes in the number of people who were able to afford access to water or the amount of progress that was made in terms of improving access to water. It was necessary to evaluate the findings from the data with respect to factors such as GDP, percentage of the population living in rural and urban areas, and overall political stability during the relevant time periods to form accurate conclusions about the success of water privatization.

Results

Ghana

Privatization in Ghana lasted from 2006-2011, so it was necessary to analyze data from 2003-2014. From the UN-Water SDG 6 Data Portal, data from the years 2003, 2006, 2008, 2011, 2013, and 2014 were used. Figure 3 demonstrates that, although water access increased for all

income brackets during the first few years of privatization, it decreased for the poorest income bracket by the last year of privatization. Figure 4 illustrates trends in the primary source of drinking water for urban households in Ghana. For all income levels, a decrease in household access to drinking water began at the time of privatization (in 2006) and ended in 2011, when privatization ended.

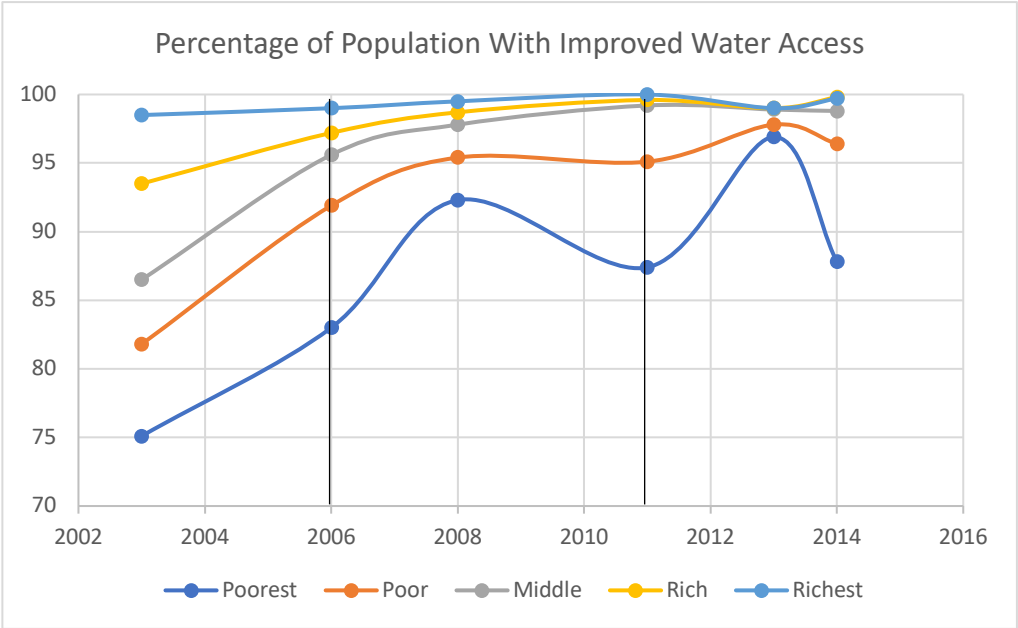


Figure 3: Percentage of population with improved water access in urban areas in Ghana from 2003 to 2014. Black lines indicate the beginning and end of privatization.

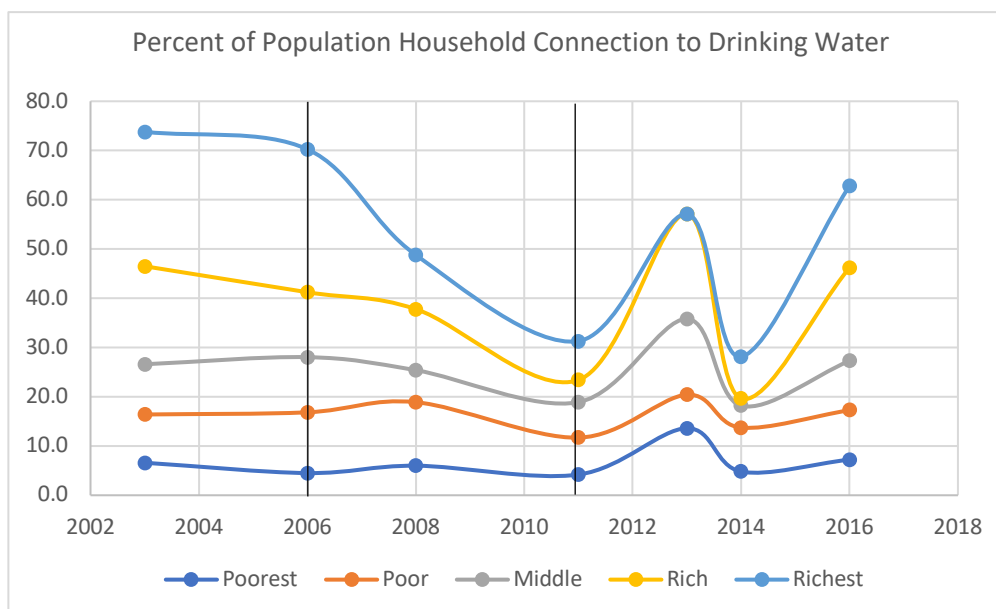


Figure 4: Percentage of population with household connection to drinking water in urban areas in Ghana from 2003 to 2016.

Additionally, the DHS datasets from the years 1998, 2003, 2007, 2008, 2014, and 2016 were analyzed. In Ghana, the water systems in seven of its eight largest cities (Accra, Kumasi, Sekondi-Takoradi, Sunyani, Tamale, Obuasi, Cape Coast) were privatized. The variable ‘region’ was used to split the data into ‘urban’ and ‘rural’ because it was the only variable that was consistent across the datasets from each year. Only the ‘urban’ data points were analyzed. Additionally, the datasets for each year contained the variable ‘wealth index’, which had the categories ‘poorest’, ‘poor’, ‘middle’, ‘rich’, and ‘richest’. This variable was not available across all years for Mozambique and Tanzania so trends in income levels could not be examined for those countries.

Poorest Wealth Quintile					
	1998	2003	2007	2008	2014
Piped into dwelling/yard	0	3.4	0	3.8	4.5
Public tap/standpipe	30.8	3.4	0	13.8	26.8
Tube well/Unprotected or Protected Well	15.4	72.4	61	61.3	56.2
River/dam/ponds/stream/canal/irrigation channel/spring/rainwater	53.9	20.7	39.1	18.8	10.9
Tanker truck	0	0	0	2.5	0
Bottled/Sachet water	0	0	0	0	1.7

Figure 5: Primary source of drinking water for urban households in the poorest income bracket in Ghana.

Second Wealth Quintile					
	1998	2003	2007	2008	2014
Piped into dwelling/yard	0	5.5	4.7	3.7	4.2
Public tap/standpipe	4.8	35.1		50.7	41.8
Tube well/Unprotected or Protected Well	48.4	42	48.6	35.4	40.8
River/dam/ponds/stream/canal/irrigation channel/spring/rainwater	45.1	16.3	13.7	8.8	9.9
Tanker truck	1.6	1.4	1.1	1.4	0.2
Bottled/Sachet water					3

Figure 6: Primary source of drinking water for urban households in the second income bracket in Ghana.

Middle Wealth Quintile					
	1998	2003	2007	2008	2014
Piped into dwelling/yard	8.2	11.2	10.3	8.4	9.1
Public tap/standpipe	49	53.1		60.5	42
Tube well/Unprotected or Protected Well	23	15.8	28.9	20.5	28.3
River/dam/ponds/stream/canal/irrigation channel/spring/rainwater	16.4	8.8	5.9	4.5	3.7
Tanker truck	2.9	1.1	2.1	6	0.4
Bottled/Sachet water			3.4		16.4

Figure 7: Primary source of drinking water for urban households in the middle-income bracket in Ghana.

Fourth Wealth Quintile					
	1998	2003	2007	2008	2014
Piped into dwelling/yard	23.7	20.9	73.2	23.3	19.6
Public tap/standpipe	63.3	49.9	0	49.5	27.8
Tube well/Unprotected or Protected Well	7	21.5	13.4	12.7	14.8
River/dam/ponds/stream/canal/irrigation channel/spring/rainwater	5.2	2.8	1.8	0.8	1.2
Tanker truck	0.9	3.3	1.6	1.5	0.6
Bottled/Sachet water	0	1.6	10	12.2	36

Figure 8: Primary source of drinking water for urban households in the fourth income bracket in Ghana.

Richest Wealth Quintile					
	1998	2003	2007	2008	2014
Piped into dwelling/yard	69.4	62.8	72.7	44	25.6
Public tap/standpipe	26.9	25.7	0	21.5	6.8
Tube well/Unprotected or Protected Well	2.6	4.5	6.5	4.9	4.8
River/dam/ponds/stream/canal/irrigation channel/spring/rainwater	0.4	0.3	0.1	0.1	0.3
Tanker truck	0.7	1.4	0	0.8	0.3
Bottled/Sachet water	0	5.2	20	28.5	62.3

Figure 9: Primary source of drinking water for urban households in the richest income bracket in Ghana.

For the poorest, second-, and middle-income brackets, there were no significant increases in water piped into households from 1998 to 2014. Water piped into households decreased slightly for both the fourth and richest income brackets and bottled/sachet water increased from 1998 to 2014. The number of households with ‘water on the premises’ for the variable ‘time to water source’ were also analyzed for each income level from 1998 to 2016 (Figure 10). The data indicates that the number of households with water on the premises increased slightly before and during privatization for the two wealthiest quintiles. Additionally, although the number of households with water on the premises increased for the poorest wealth quintiles, it increased at a slower rate than it did for the wealth quintiles.

<i>Wealth Quintile</i>	<i>1998</i>	<i>2003</i>	<i>2008</i>	<i>2014</i>	<i>2016</i>
<i>Poorest</i>	0	2.3	8.8	15.3	21.3
<i>Poorer</i>	4.8	3.7	9.2	14.3	34.8
<i>Middle</i>	7.3	3.5	14.8	27	43.9
<i>Richer</i>	5.8	5.2	33.5	50.9	60.8
<i>Richest</i>	14.8	25	66.9	75.4	81.6

Figure 10: Percentage of households with primary water on the premises from 1998-2016 for urban households in Ghana broken down by wealth quintiles

Tanzania

Dar es Salaam privatized its water from 2003 to 2005, however, the UN-Water SDG 6 Data Portal only contained data for Tanzania from 2004-2016, and since privatization only occurred for a brief period, it was not used as a data source. The variable ‘place of residence’ was used to split the DHS datasets for Tanzania and only data from ‘Dar es Salaam’ was examined, since it was the only city that had its water privatized. The main variable examined was the primary source of drinking water since it was the only consistent variable across all datasets. Figure 11 demonstrates that there was no significant change in water piped into dwelling across the time that Dar es Salaam’s water was privatized. However, from 2003 to 2007, there was an increase in the percentage of households that collected water from unprotected wells, as the percentage increased from 1.9% in 2003 to 10.4% in 2007. The sudden increase in pond/river/stream usage in 2003 is most likely due to a smaller sample size that year, which resulted in skewed data. In general, unprotected water use seemed to increase from 1999 to 2003 and it remained high up until 2010.

		1992	1996	1999	2003	2004	2007	2010	2011
Protected	Piped into dwelling	80.7	31.3	12.9	13.6	12.7	10.2	5.5	10
	Piped into yard	1.4	2.1	64.2	29.6	1.6	7.1	6.3	8.6
	Public tap	13.2	49.7	5.5	4.3	52.7	45.3	39.2	43.9
	Protected dug well		11.6	0.7	6.5	5.2	5.7	7.2	10.6
	Borehole or tube well			3.3	12.7	4.3	9.1	15.4	10.9
	Protected spring			1.1	0.4				0.2
	Bottled water			0.7	2.8	4.3		7.3	5
	Total	95.3	94.7	88.4	69.9	80.8	77.4	80.9	89.2
Unprotected	Unprotected well			1.5	1.9	5.9	10.4	5.8	2.5
	Unprotected Spring	0.2	0.9	1.1	1.3				0.2
	Pond, River, Stream		0.1		26.3	0.6	0.6		0.4
	Tanker truck	0.9	2.6	8.9		12.7	11.5	13.4	7.7
	Total	1.1	3.6	11.5	29.5	19.2	22.5	19.2	10.8

Figure 11: Primary source of drinking water for households Dar es Salaam from 1992 to 2011. Data is in percentages of the total number households surveyed in Dar es Salaam.

Mozambique

In Mozambique, data from 1997-2011 were analyzed for the five cities with privatized water systems (Maputo, Beira, Nampula, Quelimane, Pemba). Privatization occurred in these cities from 2000 until 2008. From the UN-Water SDG 6 Data Portal, the variables ‘percentage of population with improved water access’ and ‘population with improved water access less than 30 minutes away’ were examined for urban areas from 2002 to 2016. Even though this data does not cover the first two years of privatization, it covers five years during privatization and eight years after. Figure 12 illustrates that there was virtually no increase in access to improved water sources for any income levels until privatization ended in 2008. After 2008, there was an increase in access for all wealth brackets except for the poorest. Figure 13 demonstrates that the percentage of the population that was more than 30 minutes away from an improved source of water increased for all income levels (except the richest which exhibited no change) until

privatization ended in 2008. After 2008, the percentage of the population that was more than 30 minutes away from an improved source of water dramatically decreased for all income levels. For the DHS data, the variable ‘type of place of residence’ was used to split the data and the categories ‘large city’ and ‘small city’ were examined. Trends were not broken down by income level because there was not consistent data across all the datasets. Figure 14 illustrates that there was a decrease in the percentage of households with water piped into their homes from 2003 until 2009, one year after privatization. Additionally, there was an increase in well usage, for both wells within a residence/neighbor’s residence and public wells. These trends both point to the idea that there was a decrease in home water access and an increased reliance on communal water sources that corresponds with when Mozambique’s water system in large cities were privatized.

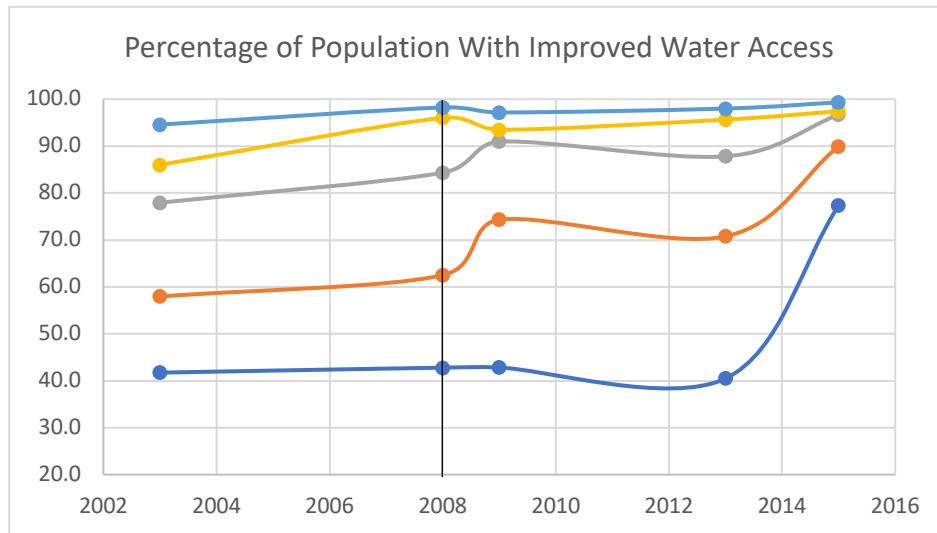


Figure 12: Percentage of population with improved water access in urban areas in Mozambique from 2003 to 2016.

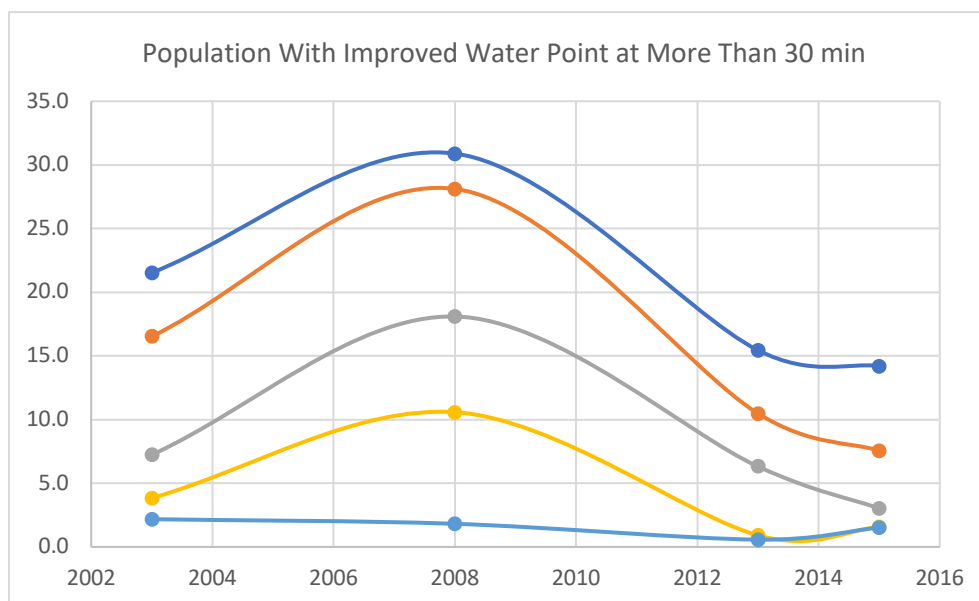


Figure 13: Percentage of population with improved water access less that 30 minutes away in urban areas in Mozambique from 2003 to 2016.

	1997	2003	2009	2011
Piped into own residence	22.6	23	6.9	11.1
Piped into neighbor' residence	27	22.9	16.3	18.4
Public tap	18.8	20.1	23.4	15.6
Well in residence/ neighbor's residence	14.22	8.83	15.6	30.1
Public well	14.3	17.5	31.5	20.7
Spring	0.7	0	1.6	
River/dam/lake/ponds/stream /canal/irrigation channel	2	3.5	3.4	2.2
Rainwater	0.3	0.41	0.1	0.2
Tanker Truck	0.04	1.6	0.1	0.2
Other			1.1	1.5

Figure 14: Primary source of drinking water for urban households Mozambique from 1997 to 2011.

Nigeria

Trends in water access in Nigeria were examined as a control study. Nigeria's water agency, Lagos Water Company, is mainly focused on Lagos and so only Lagos was examined from the DHS data. Data from the UN-Water SDG 6 Data Portal was analyzed from 2000-2010 because these were the years during which there was a strong privatization agenda. Additionally, these years overlap well with the other countries that were studied. Data from the UN-Water SDG 6 Data Portal was not used because there was not enough data available across the relevant time frame. For the poorest wealth quintile, there was an increase in access to improved water sources from 2003 to 2008, increasing from 11.48% to 33.79%. There was also an increase in access to improved drinking water sources from 2010 to 2013. However, the average trend from 2008 to 2015 showed very little improvement. The changes in water access for the poorest wealth quintile were largely due to an increase in the percentage of households that used boreholes or tube wells and a decrease in the percentage of households that were using ponds/rivers/streams and tanker trucks. An almost identical trend was observed for the second wealth quintile. The middle quintile also exhibited an increase in households with access to improved drinking water sources from 2003 to 2008 but then there was not much of an increase after that. The increase was mainly due to an increase in the percentage of households using boreholes or tube wells. The two wealthiest quintiles both experienced steady increases in access to improved drinking water sources and decreases in unimproved sources. Notably, the wealthiest quintile had a higher usage of bottled and sachet water. Overall, the trends in water access in Nigeria were much more consistent than they were for Tanzania, Ghana, and Mozambique.

Poorest Wealth Quintile					
	2003	2008	2010	2013	2015
Piped into dwelling				0.53	
Piped into yard		0.34			0.34
Public tap	9.84	2.73	1.92	2.93	2.7
Protected dug well		12.6	9.62	9.04	12.6
Borehole or tube well	1.64	17.1	16.3	32.2	17.1
Protected spring		1.02		0.53	1.02
Bottled/Sachet water					
Total	11.48	33.79	27.84	45.23	33.76
Unprotected well	31.1	36.9	49	15.2	36.9
Unprotected Spring	1.64	5.46	7.69	2.39	5.46
Pond, River, Stream	39.3	23.2	15.4	35.9	23.1
Tanker truck	14.8	0.68		1.33	0.68
Total	86.84	66.24	72.09	54.82	66.14

Figure 15: Primary source of drinking water for households in the poorest wealth quintile in urban areas in Nigeria from 2003 to 2015. Data is in percentages of the total number households surveyed in urban areas.

Second Wealth Quintile					
	2003	2008	2010	2013	2015
Piped into dwelling	1.32			0.52	
Piped into yard		0.6		0.84	0.5
Public tap	13.8	9.32	3.7	6.92	7.78
Protected dug well	13.8	18.3	19.8	8.7	12.6
Borehole or tube well		22.6	25.9	41.1	18.9
Protected spring		0.79		0.63	1.02
Bottled/Sachet water		0.2	2.47	0.1	
Total	28.92	51.81	51.87	58.81	40.8
Unprotected well	29.6	36.1	32.1	9.12	36.9
Unprotected Spring	3.29	4.17	4.94	3.25	5.46
Pond, River, Stream	21.7	6.55	7.41	24.2	23.2
Tanker truck	16.4	1.39	3.7	4.61	0.68
Total	70.99	48.21	48.15	41.18	66.24

Figure 16: Primary source of drinking water for households in the second wealth quintile in urban areas in Nigeria from 2003 to 2015. Data is in percentages of the total number households surveyed in urban areas.

Middle Wealth Quintile					
	2003	2008	2010	2013	2015
Piped into dwelling	4.65	1.07	0.52	1.57	1.13
Piped into yard	2.44	1.12	1.55	1.26	1.18
Public tap	15.9	10.3	7.73	9.69	10.9
Protected dug well	19.6	19.6	18	15.4	20.7
Borehole or tube well	0	26.1	29.9	44.8	27.5
Protected spring	0	0.97	0.52	0.61	1.02
Bottled/Sachet water	0.24	0.51	1.55	1.8	0.54
Total	42.83	59.67	59.77	75.13	62.97
Unprotected well	25.2	12.9	21.6	7.77	13.6
Unprotected Spring	2.93	1.84	4.12	2.72	1.94
Pond, River, Stream	14.2	17.9	10.8	10.7	6.19
Tanker truck	14.9	2.55	3.61	3.64	2.89
Total	57.23	35.19	40.13	24.83	24.62

Figure 17: Primary source of drinking water for households in the middle wealth quintile in urban areas in Nigeria from 2003 to 2015. Data is in percentages of the total number households surveyed in urban areas.

Fourth Wealth Quintile					
	2003	2008	2010	2013	2015
Piped into dwelling	5.61	3.46	2.49	2.66	3.46
Piped into yard	6.43	2.95	2.87	1.64	2.95
Public tap	20.1	15.2	14	11.4	15.2
Protected dug well	21.3	19.1	11.9	16.1	19.1
Borehole or tube well	0	35.2	38.5	45.3	35.2
Protected spring	0	0.71	0	0.48	0.71
Bottled/Sachet water	0.7	2.48	5.56	8.79	2.48
Total	54.14	79.1	75.32	86.37	79.1
Unprotected well	22.6	5.61	7.85	3.64	5.61
Unprotected Spring	2.46	1.12	5.17	1.21	1.12
Pond, River, Stream	8.3	11.2	7.28	4.97	8.06
Tanker truck	12.5	2.95	4.41	3.84	2.95
Total	45.86	20.88	24.71	13.66	17.74

Figure 18: Primary source of drinking water for households in the fourth wealth quintile in urban areas in Nigeria from 2003 to 2015. Data is in percentages of the total number households surveyed in urban areas.

Wealthiest Wealth Quintile					
	2003	2008	2010	2013	2015
Piped into dwelling	10.7	8.34	8.41	6.97	8.34
Piped into yard	11.1	4.5	3.86	3.56	4.5
Public tap	15.5	11.7	12.9	10.3	11.7
Protected dug well	39.2	12.2	5.41	9.57	12.2
Borehole or tubewell	0	42.2	41.3	38.1	42.2
Protected spring	0	0.33	0.48	0.23	0.33
Bottled/Sachet water	4.99	10.3	17.8	25.1	10.3
Total	81.49	89.57	90.16	93.83	89.57
Unprotected well	7.56	1.11	1.35	0.92	1.11
Unprotected Spring	0.7	0.13	1.74	0.37	0.13
Pond, River, Stream	1.17	5.46	1.55	1.19	1.48
Tanker truck	9.12	3.84	5.22	3.75	3.84
Total	18.55	10.54	9.86	6.23	6.56

Figure 19: Primary source of drinking water for households in the wealthiest wealth quintile in urban areas in Nigeria from 2003 to 2015. Data is in percentages of the total number households surveyed in urban areas.

Discussion

In general, there was a lot of variability in the trends that were observed from the data.

Ghana

While the data from Ghana does not support any definitive conclusions, it does indicate that water privatization did not improve water access overall. Water piped into households did not improve for the lower income bracket and decreased for the wealthiest income brackets. The wealthier households were able to compensate for this decrease by shifting to bottled and sachet water for their drinking water. However, these options are more expensive and are therefore inaccessible to poorer households. As Ghana has had a relatively stable political situation since the 1993, the lack of expanded water access cannot be attributed to political instability. However, Ghana's urban areas have undergone rapid growth since 1990, which has increased the problem

of water access. Some may argue that this would make it more difficult for privatization to expand water access in urban areas, yet privatization was promoted as the *solution* to this problem. While the results from the analysis provided mixed results for trends in water access, they did not demonstrate a definitive expansion of water access, which is what would be expected if privatization had succeeded. The urban expansion Ghana has experienced is a common trend among countries in sub-Saharan Africa and the fact that privatization did not appear to improve water access under these conditions indicates that it may not be the best solution.

Since the end of colonial occupation, Ghana has remained economically dependent on the IMF and the World Bank (Daley 2020). The mixed results from privatization indicate that the problem is not one of the management of water resources, but of the financing of water infrastructure. Since 2010, Ghana's economy has grown due to the production of oil and it is still one of the primary gold and cocoa producers in the world. Many problems with financing water infrastructure could be resolved through increasing taxation on wealthy companies in these industries, which would help Ghana move away from relying on the World Bank. Another reason why privatization was not an effective intervention to increase water access is the difficulty with enforcing uniform water regulations and reforms across all of Ghana. A more effective intervention could be to decentralize the control of Ghana's water supply. Redistributing control to Ghana's city and district level governments would make control of water supplies more adaptive to local conditions and needs and would resolve inequalities in access to water (Daley 2020). This redistribution would also increase competition between water providers, which is absent in a system where one entity controls the water supply.

Tanzania

The analysis of the DHS datasets for Tanzania indicates that privatization did not lead to an increase household water access. Additionally, it indicates that the use of unprotected sources as primary drinking water sources increased during privatization. Not only did privatization fail to address water access problems in Dar es Salaam, but it also led to increased usage of less safe drinking water sources, such as unprotected wells. Tanzania has experienced significant political unrest since 2000, which may have also made it more difficult to improve water access.

However, the use of unprotected sources of drinking water has declined since 2011 while political instability has continued, indicating that improvements can be made despite tumultuous political situations. Additionally, Tanzania experienced its largest increase in population growth in the early 1990s and its growth rate was stable during the years in which privatization occurred, indicating that this did not significantly hinder the expansion of water access.

After privatization in 2005, the National Water Sector Development Strategy (NWSDS) was created, which brought in \$951 million from the World Bank, Germany, the Netherlands, France, the U.S., and the Government of Tanzania. Since then, water governance in rural areas has become more decentralized and local government authorities (LGAs) have taken control over water infrastructure. The national government remains responsible for developing policies and evaluating performance. Urban water supply authorities (UWSA) are private entities that rely on government subsidies and that control urban water supplies. Water supply in Dar es Salaam is managed by the Dar es Salaam Water and Sewerage Corporation (DAWASA). Access to the water supply in urban areas has struggled because it has not increased at the same rate as the population, which is largely due to a lack of available funding. The average ratio of operational

income to operational expenditure is 0.92, meaning that the current system of operation is costly (“Water Supply and Sanitation”, 2015).

Currently, over 50% of Tanzanians must travel over 30 minutes to access water and only 60% of all water access points are functional. Agriculture is one of the major sources of water use and contributes to 25% of Tanzania’s GDP and 85% of its exports. Tanzania has reliable water sources, with a major rivers and lakes and seasonal rainfall. Both rural and urban areas derive a significant amount of their water from groundwater. Although access to water has improved in recent years, the largest improvements have occurred among wealthier populations, with very little improvements in poorer communities. Many urban water authorities also do not have water permits and are not held accountable for their actions, which contributes to a lack of maintenance of the water supply. Furthermore, only 28% of the budget allocated for the maintenance of water resources is used, which is largely due to improper staffing of regulatory agencies (“No-one left behind”, 2019).

Mozambique

The analyses for Mozambique from the UN-Water SDG 6 Data Portal and the DHS do not indicate that privatization improved water access in urban areas. Additionally, the data from the UN-Water SDG 6 Data Portal shows a slight increase in access to improved water sources in the year after privatization for the second- and middle-income brackets. The DHS data also shows that there was a decrease in access to water within households. Mozambique did not experience dramatic population growth during the years that its water system was privatized, so that was not a significant contributor to the failure of privatization. However, it is possible that some of these challenges were caused by several hurricanes that occurred from 2000-2005.

After privatization, the government of Mozambique took control of the water supply and it entered a non-profit partnership with VEI, a joint company of two Dutch water companies: Vitens and Evides. VEI helped to create independent water utilities in four small cities in Mozambique and expanded to eight more cities in 2009 (Kishimoto 2015). Since privatization ended, foreign companies have continued to be involved in the management of Mozambique's urban water supply. Additionally, two government-supervised asset-holding companies, FIPAG and AIAS control urban water infrastructure and supply. The two companies are regulated by a government agency called the CRA, which monitors prices, quality, and user feedback. Mozambique still struggles with restricting illegal connections and water meter vandalization (WSP 2011).

Nigeria

The data from the DHS datasets indicated that Nigeria experienced a general improvement in water access from 2003 to 2008 for all income levels. This large jump could be attributed to the fact that Nigeria was struggling economically in the early 2000s and finally began to recover in 2006. These financial struggles were brought on by the need to pay off many international loans. This challenge has resurfaced for Nigeria multiple times throughout the past few decades and one of the main reasons why the government has sought to privatize the control of the water sector. After 2008, access to improved water sources gradually increased for the wealthiest income brackets while it remained constant for the two lowest income brackets. The very slow improvement in water access in Lagos could be attributed to the political instability. For the past 20 years, Nigeria has been plagued by ethnic tensions and the rise of Boko Haram, which may have made it more difficult for the government to focus on improving the water infrastructure.

Since 1999, private companies have continued to vie for a contract that would grant them control of Nigeria's urban water system, but they have all failed to agree with LWC (Chiori 2018). In 2004, the LWC attempted to privatize the water system by passing the Lagos Water Law in 2004, which stated that private control was the best solution to the water situation. Since the 2000s, very strong anti-privatization activist organizations have played a large role in preventing the privatization of Lagos' water system. In 2010, LWC launched a 10-year plan to transform water access and infrastructure, which included pro-privatization initiatives (Igbuzor 2003). Still, activist groups remain the main force preventing progress on water privatization plans.

Summary

The analyses of the data that was used in this paper produced very mixed results. However, consistent and significant increases in water access during and after privatization are not present for any of the countries. In Ghana, privatization did not increase drinking water access among the poor, while access increased slightly among the rich. In Tanzania, there was an increase in unprotected sources of water and a decrease in protected sources. In Mozambique, slightly decreased during and after privatization. Nigeria, even though it never privatized the management of its urban water systems, experienced similar trends in water access to Ghana, with water access not improving for lower income levels and improving gradually for higher income levels. While the data from these case studies cannot be used to form definitive conclusions about the effects of privatization on water access and on disparities in water access between the rich and the poor, none of the case studies showed a significant overall improvement in water access. The data provides an indication that privatization in these countries was ineffective, but further research is needed to make more definitive conclusions. This research

could consist of geographical and historical studies on water infrastructure in these countries. However, the lack of reliable data on water access means that qualitative data may be the best source for more concrete conclusions about the effects of privatization.

There are several similarities between all four countries that could have contributed to their trends in water access and their experiences with privatization. For one thing, all the countries have extensive colonial legacies. As a result, they have all experienced periods of political instability as well as ethnic tensions, which have made it more difficult to have consistent management of water resources. Additionally, colonialism left all the countries impoverished and reliant on foreign countries to support their economies. As a result, they have all struggled with the tension between needing international loans to help their economic growth and falling too far into debt. It is also interesting to note that Mozambique, which was the last of the four countries to gain independence, had the worst results from water privatization. Tanzania, Ghana, Mozambique, and Nigeria have also all experienced rapid population growth and urban expansion in the past few decades. This, in combination with their political and economic struggles, has meant that they have not been able to improve their water infrastructure enough to keep up with their growing populations.

Given all these factors, it is unsurprising that privatization did not seem to improve water access in Tanzania, Ghana, and Mozambique and was opposed in Nigeria. Water privatization has been a way for European companies to continue to profit off and have influence over countries in Africa. Since the main goal of these companies is to make a profit, they do not invest time into the areas of water management that are not profitable. As a result, privatization in these countries did not address the issue of poor infrastructure, which is one of the largest contributors to a lack of access to improved drinking water sources.

The inability of privatization to improve water access in Ghana, Tanzania, and Mozambique may also have been due to the types of privatization that were used. In Ghana they used a management contract, in Tanzania they used a lease, and in Mozambique a joint venture was created. All these forms of privatization provide the least risk to private entities and the government still has a substantial responsibility for managing the water supply. Since the inability of governments to manage their water systems was a major reason why the World Bank incentivized privatization, it may have been more effective to have transferred complete control of the water systems to private entities. This could have been achieved if privatization was done as a concession, where the private company manages all aspects of the water system, including tariff collection, infrastructure investment, and the regulation of water quality. Since countries in Africa have long histories of exploitation by foreign countries, a concession that lasted for a shorter amount of time would be the most appropriate. Build-operate-train-transfer (BOTT), are a type of concession that require the private entity to construct, build, and operate water infrastructure for a given amount of time and then train the government so that they can take over the water system after the contract ends. These contracts could be a lot more effective for countries in Africa, as it would allow them to acquire knowledge from companies that specialize in water management while also ensuring that they were able to become self-sufficient.

Additionally, the explosion in the use of sachet water, which is a multi-billion-dollar industry in West Africa, is useful to examine. The DHS data did show an increase, albeit a small one, in sachet water use in Ghana over time. Sachet water was a private-sector innovation that evolved to address the gap in water infrastructure in Ghana. However, sachet water is far from a good solution for expanding water access. For one thing, the price of sachet water is very vulnerable to fluctuations in demand, which usually increases when piped water prices are

increased. The unpredictability in the price of sachet water means that it is only a reliable source of water for the upper classes. The quality of sachet water is also insufficiently regulated, and it was almost banned in Nigeria in 2004 over quality concerns. The only reason that it was not actually banned was because so many people in the country relied on it and could not afford bottled water, which was more expensive. Since then, Nigeria has attempted to improve the regulation of sachet water but, due to a lack of inspectors and the poor communication of regulations, they have not been very successful (Stoler 2017). Ghana has also attempted to regulate sachet water but has been consistently held back by the emergence of vendors without permits. Furthermore, the plastic waste that is produced from sachet water is a major environmental problem. Since many West African countries do not have good waste-collection systems, the sachet plastic will often end up clogging gutters or piling up in informal landfills. Given all these challenges, sachet water is a symptom of and not a solution to inadequate water infrastructure. At best, it can serve as a temporary way of expanding water access but improving water infrastructure is still the only long-term solution to the problem.

Conclusion

Access to safe drinking water is essential for public health and can contribute to economic growth and the reduction of poverty. As populations in many African countries continue to expand, they will face increased stress on their water systems and so it is essential to ensure that water resources are properly managed. For several decades, the World Bank has pushed privatization as the solution to improving water access in developing countries. However, the analyses in this paper did not show any strong improvements in water access in countries that implemented privatization. While the data had several flaws, including fairly small sample sizes

and varying reliability across countries, in all of the countries investigated, water privatization either produced no change or a slight decreased safe and convenient water access. The lack of consistent income data makes it difficult to make definitive conclusions about the impact of privatization on inequalities in water access between the rich and the poor. However, the qualitative data do suggest that the forms of privatization that were implemented in Ghana, Tanzania, and Mozambique did not improve water infrastructure, which is the most concrete solution to addressing inequalities in water access. Furthermore, given the wide range of political and economic backgrounds of these countries, it is unlikely that the lack of success was solely due to political instability or economic troubles.

The World Bank has based its support for privatization on the experiences of much wealthier developed countries that do not have long histories of being exploited. However, this paper demonstrates that privatization has only contributed to continued attempts by European companies to profit off African countries and to continue their influence in these regions. It is possible that if privatization was done as a concession instead of a management contract, lease, or joint venture, it might be more effective at expanding water access since concessions would make the private entity responsible for water infrastructure. Further research is needed into effective methods of expanding urban water access in sub-Saharan Africa. Recent efforts by Ghana to decentralize control of water systems to allow management to be more adapted to local conditions provides an example of a possible alternative solution. However, water is ultimately a local problem, and it is unlikely that there will be a 'one-size-fits-all' approach to expanding water access in sub-Saharan Africa.

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