INVESTING IN WATER INFRASTRUCTURE DEVELOPMENT FOR ACHIEVING SUSTAINABLE DEVELOPMENT GOAL 6

Shikha Vyas-Doorgapersad

ABSTRACT

Objective: The objective of this article is to examine and address the implementation status of the Public-Private Partnerships (PPPs) in improving urban water infrastructure in Africa.

Theoretical Framework: Public-private partnerships can play a significant role in enhancing water infrastructure and achieving SDG 6’s goal of providing communities with safe drinking water. How these concepts can be used to enhance peoples’ quality of life is investigated in the article.

Method: The study is qualitative and offers desktop analysis of data available in public domain. The data is compiled through literature and document reviews, and further analysed using document and conceptual analysis.

Research Implications: The study identifies various challenges related to water infrastructure development (focus) in African context (locus). The study suggests African governments to partner with private sectors for meeting the needs of delivering water by using proper and maintained infrastructure and able to accommodate the growing population.

Originality/Value: The study contributes by suggesting varied resources required by PPPs to implement effective urban water infrastructure in Africa.

Keywords: Africa, public private partnership, qualitative, Sustainable Development Goal (SDG), SDG 6, water.

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INVESTIR NO DESENVOLVIMENTO DE INFRAESTRUTURAS HÍDRICAS PARA ATINGIR O OBJETIVO DE DESENVOLVIMENTO SUSTENTÁVEL 6

RESUMO

Objetivo: O objetivo deste artigo é examinar e abordar o estado de implementação das Parcerias Público-Privadas (PPP) na melhoria das infra-estruturas urbanas de água em África.

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Enquadramento teórico: As parcerias público-privadas podem desempenhar um papel significativo na melhoria das infra-estruturas hídricas e na concretização do objetivo do ODS 6 de fornecer água potável às comunidades. O artigo investiga a forma como estes conceitos podem ser utilizados para melhorar a qualidade de vida das pessoas.

Método: O estudo é qualitativo e oferece uma análise documental dos dados disponíveis no domínio público. Os dados são compilados através de revisões da literatura e de documentos, e posteriormente analisados através de análise documental e conceitual.

Implicações da investigação: O estudo identifica vários desafios relacionados com o desenvolvimento de infra-estruturas hídricas (foco) no contexto africano (locus). O estudo sugere que os governos africanos estabelecem parcerias com o sector privado para satisfazer as necessidades de abastecimento de água através da utilização de infra-estruturas adequadas e mantidas e capazes de acomodar a população em crescimento.

Originalidade/Valor: O estudo contribui ao sugerir recursos variados necessários às PPP para implementar infra-estruturas de água urbanas eficazes em África.

Palavras-chave: África, parceria público-privada, qualitativa, Objetivo de Desenvolvimento Sustentável (ODS), ODS 6, água.

INVERTIR EN EL DESARROLLO DE INFRAESTRUCTURA HÍDRICA PARA ALCANZAR EL OBJETIVO DE DESARROLLO SOSTENIBLE 6

RESUMEN

Objetivo: El objetivo de este artículo es examinar y abordar el estado de aplicación de las Asociaciones Público-Privadas (APP) en la mejora de las infraestructuras hídricas urbanas en África.

Marco teórico: Las asociaciones público-privadas pueden desempeñar un papel importante en la mejora de las infraestructuras hídricas y en la consecución de la meta del ODS 6 de suministrar agua potable a las comunidades. En el artículo se investiga cómo pueden utilizarse estos conceptos para mejorar la calidad de vida de las personas.

Método: El estudio es cualitativo y ofrece un análisis documental de los datos disponibles en el dominio público. Los datos se recopilan mediante revisiones bibliográficas y documentales, y se analizan mediante análisis documental y conceptual.

Implicaciones de la investigación: El estudio identifica varios retos relacionados con el desarrollo de infraestructuras hídricas (foco) en el contexto africano (locus). El estudio sugiere a los gobiernos africanos que se asocien con el sector privado para satisfacer las necesidades de suministro de agua mediante el uso de infraestructuras adecuadas y mantenidas, y capaces de dar cabida a la creciente población.

Originalidad/Valor: El estudio contribuye sugiriendo los diversos recursos que necesitan las APP para implantar infraestructuras hídricas urbanas eficaces en África.

Palabras clave: África, asociación público-privada, cualitativa, Objetivo de Desarrollo Sostenible (ODS), ODS 6, agua.
1 INTRODUCTION

The current population of 7.6 billion people is predicted to grow to 8.6 billion in 2030, 9.8 billion in 2050, and 11.2 billion in 2100, according to the United Nations (UN) (2023) report, which will raise the need for water infrastructure in tandem, as stated by Mutandwa and Vyas-Doorgapersad (2023a). Since over half of the world's population lives in cities, access to clean water is a necessity for all of them. The management and design of water becomes an increasingly important part of integrated urban infrastructure management and planning as more people move to urban areas in search of better opportunities, opined by Loucks and van Beek (2017). It is further emphasised by Loucks and van Beek (2017) that urban areas are experiencing an increase in demand for these services. Furthermore, strengthening urban water systems' resistance to climate change is becoming more and more important. All of this points to the necessity of including urban water management into overall urban planning. To guarantee that everyone has access to this essential resource, the government must provide water services, which is a fundamental right. To enable sustainable socio-economic growth and advance environmental wellbeing, water services are also essential for businesses, industries, and the agricultural sector. Because of environmental degradation, droughts, and deteriorating water infrastructure, the world's water resources are becoming increasingly scarce. People are moving into cities in search of better employment opportunities, which is making it more difficult for governments to provide basic services like water. This problem is exacerbated by urbanisation. When governments lack the ability, know-how, and technical and technological resources to meet the increasing demand for water for residential and commercial use, the situation becomes concerning. In this context, public-private partnerships (PPPs) offer governments a way to manage public services and provide efficient water infrastructure. A multitude of factors, including insufficient funding, capacity, technology, socio-economic and political obstacles, etc., may impede the development of water infrastructure, thereby adversely affecting the attainment of Sustainable Development Goal 6. Many African cities are dealing with growing water-related problems made worse by the anticipated population increase. Present demographic trends, current water delivery infrastructure, and present governance and financial structures may not be able to keep up with the enormous increase in demand and rising dangers associated with water. The findings explore the implementation gaps in the
water sector, that is linked to SDG 6. Investigating the obstacles to SDG 6 realisation is the goal of this study, which also seeks to provide resources and support to help policymakers overcome these obstacles. The study suggests PPPs as a substitute approach to enhancing Africa's urban water infrastructure.

Below are the sections that make up the rest of the article. In the section that follows, the challenges of water in Africa are further examined in the regional context. Subsequently, the content presents a discussion, and the final section presents findings, suggestions, and guidelines for future research.

2 THEORETICAL FRAMEWORK

Mutandwa (2023, in Vyas-Doorgapersad 2023a) stated that SDG6 was made specifically about water in a 2014 UN-Water recommendation. The goal is divided into five target areas: waste management, water quality, water governance, water resources, and water-related disasters. Water that is sufficient and clean is becoming increasingly scarce worldwide, particularly in urban areas of Africa. The urban water infrastructures of today face numerous challenges due to a multitude of factors that are exerting significant pressure on them. Among these difficulties are issues like natural disasters, migration from rural to urban areas, institutional capacities, skills, human resources shortages, and climate change. Consequently, governments all over the African continent find it difficult to fulfill their constitutional obligations to provide their respective areas of jurisdiction with adequate and safe water as well as sanitary facilities. Several academics have studied the same issues in their research projects—discussed in this section.

Africa is grappling with a plethora of issues that are detrimental to the general public's health. One of the largest obstacles is ensuring that Africans have access to clean water sources in both urban and rural areas, stresses Lewis (2024). Furthermore, according to Awuah, Nyarko, Owusu, & Osei-Bonsu (2009, in Lewis 2024), there aren’t enough water sources in Africa to supply all the continent's population with clean drinking water. Surface water sources are frequently extremely contaminated, and it would be too expensive to build the infrastructure needed to transport clean, fresh water from sources to arid regions. Although the urban areas have better water infrastructure as compared to rural areas, it has its own contextual challenges. People are rapidly migrating
to urban areas that is causing population growth in cities and leading to increased demand for water supply. The lifestyle in urban areas is also demanding as people prefer to have pools, water tanks, and water features for luxurious living. One the one side, this scenario is motivating for people to look for jobs in cities, but on the other hand may cause challenges to accommodate the increased population, and demands and supply. However, the challenges seem more due to lack of water supply, inadequate water infrastructure, inefficient capacity, under-developed water project management, and lack of capabilities from water authorities. There are various causes that put extra demand on water resources and water delivery infrastructure. This is also stressed by deborah.bensen (2022; Healing Waters 2024) that when there are insufficient resources to support the use or consumption of water in a given area, water scarcity arises. Everywhere in the world is affected by water scarcity in certain areas. Safe and clean drinking water is scarce in certain areas due to inadequate infrastructure. In some places, there is just a physical lack of water, usually because of unfavorable geographic circumstances or excessive water use. Droughts brought on by climate change can be added to because it also results in a shortage of water. It was already stressed by Banerjee, Skilling, Foster, Briceno-Garmendia, Morella and Chfadi (2008) that Sub-Saharan Africa has not kept up with other regions in terms of access to water resources; in countries such as Chad, Mali, Nigeria, and Sudan, boreholes and wells serve as the main sources of urban water supply. According to World Health Organisation (WHO) (2006, in Lewis 2024), in 2014, just 16% of sub-Saharan Africans had access to a tap in their home or yard for drinking water, leaving the remaining 84% without access to clean water or water at all. Over time, this number has grown. Out of the 7.78 billion people living in 186 countries, 5.52 billion are water insecure as of right now. Of these, 1.34 billion are Africans, making up over 90% of the total population on the continent (Nkatha 2024:1). This statistic is substantiated in a report authored by Twinoburyo, Henao, Dushime, Simkoko, Kassa, and Ndahiro (2019) under the auspices of the Sustainable Development Goals Center for Africa (SDGC/A) and reflected in Figure 1.
Only six African nations—Algeria, Tunisia, Seychelles, Libya, Egypt, and Mauritius—are above that cutoff, as the figure makes evident. Ethiopia and Uganda both have 39% of the population with access to a basic water service, while Eritrea's population only has 19.3% (Twinoburyo et. al. 2029). It is crucial to remember that, according to Salas (2024a), 700 million people still lack access to clean drinking water in 2022. Over 50% of them were based in Sub-Saharan Africa. Since the turn of the century, there have been an estimated 60 million more people in the region without access to clean drinking water. Over 15% of Sub-Saharan Africa's population depended on surface or unimproved water sources in 2022 (Salas 2024a). In Sub-Saharan Africa, the number of people without access to basic drinking water services increased from 349 million to 408 million between 2000 and 2022. In 2022, this contributed to over half of the world's population being without access to basic drinking water services, as further stated by Salas (2024b). Furthermore, in 2022, 8% of the world's population did not have access to even the most basic handwashing facilities at home. Once more, Sub-Saharan Africa was home to the majority of those impacted by the dearth of facilities providing soap and water. Togo had the lowest rate of handwashing facility coverage globally, with nearly 75% of the population lacking access to it, as further stressed by Salas (2024b). The reason was stated by Banerjee et. al. (2008) that utilities are under tremendous strain due to the rapid urbanisation and population growth. Utilities have been unable to expand their networks quickly enough, and most of the population growth has taken place in periurban...
impoverished neighborhoods. Banerjee et al. (2008) state that due to the global urbanisation trend and rapid population growth, there has been a notable decrease in the availability of piped water in certain parts of metropolitan Africa. Loucks and van Beek (2017) add that Water scarcity in certain regions of the world may be caused by a variety of factors, including poor infrastructure, excessive river flow withdrawals, pollution from industrial and agricultural activities, overfishing, and modifications to water and sediment flow patterns. Loucks and van Beek (2017) added that understanding the pertinent physical sciences and technologies is undoubtedly necessary for managing water resources. However, the numerous institutional, social, and political challenges that managers and planners of water resources face are just as significant, if not more so. Strategies and actions are needed to address these problems to improve water scarcity and infrastructure.

The delivery of basic services in Africa is known to be severely out of balance, with negative effects on water and sanitation systems, health systems, and other areas. Numerous factors, including human and socially induced water scarcity as well as natural water inadequacy, could be the cause of this, opined Chitonge (2020). Africa's low-income nations are particularly faced with this problem, as the rate of urban population growth has surpassed the ability of water service providers to provide for everyone at a level that is both sufficient and sustainable, as further opined by Chitonge (2020). The incapacity of water resource systems to meet the various water needs can be directly linked to government failures associated with water consumption exceeding availability, suggests Loucks and van Beek (2017). Statistics indicating an increase in the number of people without access to water in Sub-Saharan Africa are a result of the region's water problems. According to a World Health Organisation/United Nations Children's Fund (WHO/UNICEF) progress report, 387 million people in Sub-Saharan Africa lacked access to basic drinking water services in 2020, up from 350 million in 2000 (World Bank 2024).

3 METHODOLOGY

It is a qualitative study. Unlike psychology, which still tends to focus primarily on experiments and ignore anything that cannot be investigated by a particular methodology, qualitative research typically uses the subject of inquiry and the questions raised as a point
of reference for the selection and assessment of methodologies, as guided by Flick, Kardorff and Steinke (2004, in Hlongwane 2023). The data was gathered through a review of the literature, which is a step in the process of responding to research questions and identifying gaps and important arguments that call for additional investigation (Snyder 2019; Soga, 2022, in Vyas-Doorgapersad 2023c). While providing background information on theories and concepts that influence how a study's sections are organised, a literature review also helps readers understand those theories and concepts, as further guided by Dudovskiy (2021; Soga, 20220, in Vyas-Doorgapersad 2023c). Mogalakwe (2006) defines a document review as the examination of documents containing data regarding the phenomenon being studied. The information was analysed using conceptual and document analysis. Conceptual analysis, as adapted by Nhlapo (2020, in Vyas-Doorgapersad 2021), referred to as the process of creating the conceptual framework for an empirical study. Nhlapo (2020) also reviews the University of Southern California (2020) documents and advocates that understanding an idea or concept's meaning is the main goal of conceptual analysis. Determining how that notion or idea links to other philosophical issues is the second reason (cited in Vyas-Doorgapersad 2022). According to Bowen (2009, in Malesa 2023), document analysis is a type of qualitative research where documentary evidence is examined using a scientific method.

4 RESULTS AND DISCUSSIONS

There are various challenges that hamper the effective implementation of SDG 6. These challenges are discussed here.

Waterborne diseases such as cholera and typhoid are among the most common public health problems in Africa. Official statistics indicate that the most common illness associated with tainted food and water is diarrhea, but there are other risks as well. More than 251.4 million people needed preventive treatment in 2021 for schistosomiasis, an acute and chronic illness brought on by parasitic worms that are acquired through contact with contaminated water, according to the documents of the World Health Organisation (WHO 2023). Research conducted by Mutandwa (2023) highlights this situation in the context of Zimbabwe, that may be witnessed in many other Africa countries. The work explored that, for instance, the proportion of residents in urban areas with improved access to drinking water did not rise between 2005 and 2014 (Ahmed, Bardhan, Iqbal,
Mazumder, Khan, Islam, Siddique, & Cravioto (2011; Mutandwa 2023). During the Millennium Development Goal (MDG) era, there were numerous economic difficulties. For instance, the withdrawal of donors due to unilateral sanctions resulted in an unstable supply of water and sanitation, especially in urban areas, and the low water revenue that started to decline in the late 1990s and continued for more than ten years caused the infrastructure and services related to water and sanitation to collapse (Ahmed et. al. 2011; Mutandwa 2023).

Water treatment is challenging because of the erratic electricity supply needed for pumping plant operations, the scarcity of chemicals, and the collapsed infrastructure, as stressed by Cuneo, Sallom & Beyrer (2017: Mutandwa 2023). Another reason for this could be slums and overcrowding brought on by urban migration and underdeveloped settlement areas. It is also important to note that, according to the literature review, slums have contributed to inadequate wastewater treatment systems and uneven water distribution. Water bodies become contaminated when human waste flows unchecked, wastewater is accidentally used in irrigated agriculture, and contaminated water faces environmental issues because of the high concentration of pollutants present (refer to Martínez-Bravo & Martínez-del-Río 2019). Added information in this regard is that urban population growth is posing challenges, especially in terms of providing utilities like water and sanitation. There are substantial barriers to the delivery of water services in informal settlements since most residents lack access to clean water and service providers are severely constrained in their capacity to meet this growing demand (Chitonge 2020). This is a significant issue because urban overpopulation is a result of many people moving there in search of better living conditions, which puts an excessive amount of demand on the water infrastructure in cities. Due to the increased demand for water resources to support the cities' expanding populations, this resulted in shortages of water supply in those areas. An increase in population may also result in the creation of impoverished neighborhoods, where a lack of sanitary facilities, clean water, and other amenities may frequently cause disease outbreaks.

Water resources are significantly strained by a variety of demographic factors, some of which include urbanisation and population growth. They directly affect the quality and quantity of water because of the pollution that results from water use and rising water demands. Water infrastructure is still deteriorating, despite the vital role that public infrastructure plays in achieving greater rates of social and economic advancement.
Urban water authorities face significant challenges in developing countries, particularly in Sub-Saharan Africa where most of the population lives in urban areas due to population growth and unemployment, as stressed by De Santos, Adams, Neville, Wada, Sherbinin, Bernhardt and Adamo (2018). It is also stressed by De Santos et. al. (2018) that concerns over the water crisis continue to be greater than those over climate change, extreme weather, food shortages, and social instability. There are other problems besides total water scarcity. Concerns over the distribution and use of water resources, water pollution, inadequate governance, weak institutions, and a lack of political will to address the region's increasing water scarcity are on the rise in sub-Saharan Africa. Furthermore, urban poverty exists throughout the African continent. The emergence of slums on the outskirts of African cities serves as evidence for this. The reason behind slums is that individuals who are unemployed cannot afford decent housing. For those in the workforce making salaries that are not much above minimum wages, proper housing in African cities may also be out of reach.

One more challenge facing urban African areas is inadequate management of infrastructure. Already in disrepair, most of the water infrastructure was built decades ago. Owing to political authorities and water management's inability to predict urban population growth, build infrastructure, and make appropriate plans, some of the technologies utilised have always been outdated (refer to Dithebe, Aigbavboa, Thwala & Oke 2019). The study conducted by Dithebe et. al. (2019) further explores that delivery of water infrastructure assets is being delayed by several significant issues, including poor project structuring, significant state budget deficits, limitations on cost recovery, high credit risk for private financing, and unreliable planning and procurement procedures. The municipal government is still in charge of providing water infrastructure, but it has little help from the private sector due to political and administrative unpredictability, ambiguous laws and policies, and low risk-adjusted returns. This statement can be substantiated by the works of other scholars stating that it is difficult to maintain urban water infrastructure as urban areas grow, and most sub-Saharan African nations fall behind in addressing water shortages (Van Rooijen, Kayaga & Smout 2011; Mutandwa 2023). Infrastructure's ultimate goal is to deliver long-term public services (Perez 2011:15; Mutandwa 2023:122). Urban water infrastructure projects require significant financial resources, take a long time to mature, and offer services that are frequently seen as necessities for society. These kinds of projects are usually location-specific, take a long
time to complete, and cannot be moved, removed or displaced (Brunchez 2014; Mutandwa 2023).

Scarcity and other water-related crises are caused by climate change. The ability of nature to sustain society is destroyed by climate change, which is linked to variations in regional environmental patterns. Due to insufficient rainfall, several African nations have been suffering from droughts. Africa will experience severe water scarcity if the region's rainfall deficit persists. The International Rescue Committee's (2023) reports, which emphasise that the drought has affected over 40 million people in East Africa, support this assertion. October 2020 marked the start of the drought that is affecting nations like Ethiopia, Kenya, and Somalia; hence rivers are running dry.

From this, it can be inferred that some of the factors considered to be contributing to Africa's water infrastructure challenges are urbanisation, overpopulation, and climate change. Because more people are moving to cities in search of better living conditions, there is an excessive strain on the region's limited water resources, making this challenge more evident there. In addition, inadequate water infrastructure and scarce financial resources put pressure on African governments to achieve a balanced supply-demand ratio. Water shortages are being caused by the inadequate provision of water services in planned and unplanned settlements, rural and urban townships, and residential and industrial areas.

The following suggestions can be implemented by organisations to ensure the accomplishment of SDG 6. From the government side, an overview of the performance of African countries in relation to the Goal 6 indicators is provided in Figure 2 (African Union (AU)/ United Nations Economic Commission for Africa (UNECA)/African Development Bank (AFDB)/United Nations Development Programme (UNDP) 2023).
However, according to the 2023 Africa Sustainable Development Report released by AU/UNECA/AFDB/UNDP (2023), it is significant to note that Africa has made uneven progress toward achieving Goal 6, and many nations need to step up their efforts to reach the targets by 2030. There hasn’t been much of an improvement in indicator 6.4.1 (change in water use efficiency) throughout the continent, especially in North Africa, where 80–90% of total water use is accounted for by the agricultural sector, as shown in figure 2. Thus, there is a need to increase funding for effective irrigation systems and strengthen the agricultural sector's ability to adjust to climate extremes like drought, suggests Rossi, Biancalani and Chocholata (2019; AU/UNECA/AFDB/UNDP 2023). Achieving target 6.4 by the 2030 deadline requires reversing current trends in many countries where indicator 6.4.2 (level of water stress: freshwater withdrawal as a proportion of available freshwater resources) has shown negative trends, a stressed in the reports of the AU/UNECA/AFDB/UNDP (2023). This is further explained in an Afrobarometer survey conducted by Saad, Kayanja and Ssevume (2024) covering a 39-country analysis that is based on 53,444 interviews. The report highlights that (Saad et. al. 2024) that water supply is ranked fourth on average among the 39 countries surveyed in terms of importance among issues that people believe their governments should solve. Water supply, mentioned by 22% of respondents as one of up to three priorities, is ranked

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<th>Indicator</th>
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<td>6.1.1 Safely managed drinking water services</td>
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Source: AU/UNECA/AFDB/UNDP 2023
after unemployment (33%), economic management (29%), health (29%) and connections to roads and infrastructure (22%) on the agenda of citizens' policies. Figure 3 illustrates how different countries' concerns regarding water supply are from one another. Water is one of the most significant issues facing Guinea, according to about half of its citizens (49%) but almost no Seychellois feel the same way. In Benin (43%) and Mozambique (37%), water is the most important issue at the national level. It ranks second in in Guinea, Niger, Congo-Brazzaville, Tanzania, Togo, Ethiopia, and Namibia, and third in Côte d'Ivoire and Uganda (Saad et. al. 2024).

**Figure 3**

*Water supply as a top priority | 39 countries | 2021/2023*

Source: Saad et. al. 2024
According to survey results, most African countries continue to face significant problems with water supply and sanitation, particularly for rural populations and low-income households. As the percentage of people experiencing water shortages continues to rise, ensuring a sufficient supply of clean water is high on the policy agenda for citizens (Saad et al. 2024). Long-term assistance from the public partner is crucial to overcoming this obstacle. Maintaining a fair tariff and keeping overall risk levels at a level that the private sector can handle are equally crucial. A range of funding sources are usually the foundation of successful water PPPs. Thus, the focus ought to be on forming a collaboration that adds public funds on top of the skills and expertise of the private sector. Enhancing system sustainability, bolstering financial viability, and elevating service quality could all result from this, as highlighted by the reports of the World Bank (2014).

The development of water infrastructure is bereft of adequate planning, planning design, project management, technical know-how, and research. Many governments have overlooked important factors that contribute to inadequate infrastructure and water shortages in their planning and design. African nations should thus think about enlisting the private sector to help with the development of their water infrastructure. Under a PPP arrangement, the public and private sectors' resources may be shared by the government and private sector. In the PPP process, it is important to look for ways to reduce waste of capital and financial resources as well as the application of skills and expertise. Then, both urban and rural communities, as well as those living in impoverished conditions and slums, may be able to afford this financially feasible water infrastructure. PPPs are extremely relevant to enhancing water infrastructure, which lends credence to this suggestion.

In many African nations, PPPs are now open to private sector investment. It is imperative to consider the requirement for financial support. Funding for the water and wastewater infrastructure still heavily depends on grants, subsidies, and related capital assistance from the government. Utilities and service providers can better manage their operations, equipment, and assets with this financial support and stable revenue stream. Quium (2011) highlighted that the government must step in and take various forms of intervention, as well as provide incentives or subsidies. Government funding is also justifiable in cases where a project can yield noteworthy external benefits that are not achievable or assessed by the project operator. Social welfare is increased through the implementation of such programmes with government funding. It is also imperative to
acknowledge that the government requires assistance from external stakeholders. Governments must establish partnerships and/or collaborations with the private sector under PPP arrangements to accommodate the increasing population living in communities ensuring access to safe water. To specify the various roles and responsibilities of both parties, governments and private companies may sign a contract. Figure 4 shows a general contract that can be amended and applied in country-specific contexts.

**Figure 4**  
Agreements in a typical PPP arrangement

![Diagram of PPP arrangements](source: Quium 2011)

However, note that the type of contracts may be different in different countries based on the social, economic, political and legal environment.

The essence of water challenges and suggesting the use of PPPs in African context is highlighted by Vyas-Doorgapersad (2023b) in a precise manner. The scholar suggested that Africa needs to catch up when it comes to fixing issues with urban water infrastructure. Water service authorities have nevertheless provided strategies, plans, and solutions that have been put into practice in several communities and have occasionally had an effect. To address the issue of urban water infrastructure, government officials in
a few African nations also established legal measures. The annual water service action plan is developed and implemented, and each year lawmakers present an open report on it. To develop, carry out, and supervise national policies regarding urban water infrastructure, legislators in many nations are expected to enable laws and legislative measures to gather and store data. African countries’ urban water infrastructure still faces difficulties despite multiple attempts by the government and water service organisations (Vyas-Doorgapersad 2023b). PPPs should be made into laws to overcome these obstacles and establish legislative frameworks for mandatory collaboration with governments to upgrade water infrastructure. Then, it will establish a favorable atmosphere and a formal agreement for the public and private sectors to collaborate for mutual gain. By lowering risks using tools like guarantees, governments may be able to promote private involvement in PPPs in this way. To fulfill specific obligations under an underlying contract or to shield the beneficiary from specific losses under certain circumstances, government guarantees are a sovereign obligation under a binding or potentially binding written document (such as a contract or comfort letter), as suggested by Lu, Chao & Sheppard (2019).

The 1990s saw several national governments undertake bold reforms to their urban water supply and sanitation (WSS) services, which is when water PPPs first emerged globally (Marin, 2009; Vyas-Doorgapersad & Mutandwa 2023). Additionally, Marin (2009; Vyas-Doorgapersad & Mutandwa 2023) asserts that over 260 contracts for the management of water and sanitation were given to private contractors in developing nations in 1990. It is noteworthy that many of these projects used build, operate, and transfer (BOT) models. Marin (2009) further explains that water supplied by private operators benefited over 94 million people in 2000. Additionally, by the end of 2007, 160 million people had benefited from the provision of water services by the private sector, meaning that water PPPs in both developed and developing nations had increased. Several nations have extensive partnerships with private water operators, including Algeria, China, Russia, Malaysia, and China. Since the 1980s, PPP agreements have been used to provide water infrastructure in nations like the United Kingdom (UK), Chile, and New Zealand. This method was justified by the idea that private companies are more effective than public ones since they are driven by profit and their contracts have clear, consistent goals, as opposed to state-owned utilities, which frequently have conflicting or multiple goals (Harris, 2003; Vyas-Doorgapersad & Mutandwa 2023). PPPs are also successful in
the African setting. Governments turn to PPPs to bring new innovations and technologies when traditional resources are scarce, such as in desalination and water reuse. To guarantee that their backlogs in water infrastructure are cleared, nations like South Africa are compelled to take innovative approaches into consideration, such as PPP models (Ruiters & Matji 2016). The backlog in water infrastructure provision and the limited access to services for underprivileged communities have compelled governments, businesses, financiers, and other stakeholders to adopt a new strategy. Infrastructure will ultimately cost much more if there are delays. To guarantee that their backlogs in water infrastructure are eliminated, nations like South Africa are forced to consider novel strategies, like public-private partnerships (PPP) models, as stressed by Ruiters and Matji (2016). One noteworthy example of how the Ministry of Water's infrastructure modernisation efforts can encourage the growth of a residential water market is the creation of small-scale water PPPs in Uganda. The World Bank provided funding for the construction of small-town water infrastructure, while the Water and Sanitation Programme (WSP) offered advisory and stakeholder coordination support during the upstream reform phase. The government started by implementing one-year area performance contracts (APCs) in small towns, which paid local managers according to performance (World Bank 2014). The New Cairo wastewater plant in Egypt is another illustration. In New Cairo City, a satellite town of larger Cairo, the project involved the design, financing, building, operation, and maintenance of a new wastewater treatment plant with a capacity of 250,000m3 per day. The city is being marketed as a new travel destination to ease the congestion in Cairo's downtown. By 2029, the 550,000 residents of New Cairo should number close to three million. The International Finance Corporation (IFC) provided support for the transaction structuring (World Bank 2014). Fall, Marin, Locussol and Verspyck (2009) argue that most prosperous public-private partnerships (PPPs) in Western and Central Africa have a track record of enhancing the quality and dependability of water services, including giving homes direct access to piped water. Fall et. al. (2009) further highlighted that two sizable French water distribution companies, SAUR International (in Côte d'Ivoire, Guinea, Senegal, Mali, CAR) and Veolia (in Burkina Faso, Niger, Chad, Gabon), were involved in many PPPs in the region. These two respectable water professional operators have been linked to both PPPs that failed quickly (Mali, Chad) or eventually (Guinea, CAR) as well as successes (Côte d'Ivoire, Senegal, Burkina Faso, Niger, and Gabon). With the entry of experienced
operators from Portugal, the Netherlands, South Africa, and Morocco, the number of foreign partners participating in PPPs in Western and Central Africa has increased recently. Furthermore, PPPs have benefited Rwanda as well. As was completed in 2020, the large-scale water treatment plant known as the Kigali Bulk Water Project in Rwanda's capital city was aimed to generate 40 megaliters of clean water per day—one-third of the city's total supply. Up to 500,000 residential, commercial, and industrial consumers can receive clean water after it is extracted from the Nyabarongo River and treated (Cattaneo 2018). For more case studies (Malaysia, Romania, and Zimbabwe) that have adopted PPPs and have success stories to confirm improvements in the water infrastructure, refer to Vyas-Doorgapersad (2023b).

It is imperative to consider that PPPs’ institutional status and capacity necessitate the establishment of new institutions and the delegation of suitable authority to oversee these kinds of partnerships. All new institutions should hire knowledgeable staff to start standard operating procedures and product manuals, train employees to carry out their new responsibilities, and create the resources needed to launch new initiatives in these kinds of collaborations, suggests Dube and Chigumira (2011; Mutandwa & Zinyama 2015; Mutandwa & Vyas-Doorgapersad 2023b). The issues pertaining to finance, economy, and commerce emphasise the need to reach an agreement with stakeholders regarding the advantages and economic balance of this sectoral reform. It is also preferable to create a realistic and commercially viable financial plan for PPPs that fits the market. Documenting and specifying the expected technical results for these kinds of partnerships, as well as choosing the appropriate metric for acquiring the investment, measuring and attaining the improvements and the documentation of the anticipated improvements that do not need major investments, are the technical elements (Xing, Li & Li, 2020; Mutandwa & Vyas-Doorgapersad 2023b). This concern will be explored in future publications exploring PPPs in various African countries, their performance and challenges; and lessons learnt to move forward with the adoption of PPPs to improve service delivery in various sectors including water.

5 CONCLUSION

To upgrade their water infrastructure, African nations must make sure they are willing to set up PPP agreements. Establishing appropriate institutions and institutional
frameworks, water Acts, and PPP policies and regulations are necessary for this. These frameworks give legally binding agreements that define roles, responsibilities, communication channels, and the sharing of necessary financial, human, technical, and technological resources for the government and private sectors. The goal of these frameworks needs to be to assist PPP procedures and processes. Together with institutional capacity, service providers' capabilities, and the availability of funding, the contractual agreement also stipulates the required political will to cooperate. Implementing specific monitoring and assessment procedures is necessary to guarantee the infrastructure process is implemented successfully. A proper performance management system that links key performance areas and indicators for individuals and processes, as well as checks and balance assessment tools, are necessary for this. Both parties must concur, in accordance with the terms of the contract, to put conflict resolution procedures in place to prevent disagreements. As a result, there may be protection for both sides and a cooperative atmosphere to work toward a common objective. Since the agreement needs to bind the relevant institutional and legal frameworks, appropriate reporting platforms and compliance measures need to be set up and followed. Platforms for public participation must be established wherever necessary to comprehend the scope of the problems communities face with water. With improved clarity and comprehension of the challenges related to water, this process may help the public and private sectors create a needs analysis document and subsequently plan out water-related projects. Because this is the only way that citizens may be happy with the services they are receiving from the government, it is crucial that PPPs receive more attention and backing. Ensuring that the right to adequate water and sanitation is fulfilled is the responsibility of the government. However, through appropriately regulated channels and the adoption of PPP arrangements, resources and services can be outsourced if the government lacks the means to meet the needs of its citizens.

The study intends to advance the disciplines of public management and water studies. The study's limitation stems from the absence of interview responses from relevant water authorities. Owing to the extensive nature of the study and its focus on the African continent, conducting interviews on such a large scale is not feasible. In addition, sufficient time and funding are needed for regional interviews. As a result, the study decided to consider desktop analysis of secondary sources and conducted an analysis to comprehend the context from a qualitative standpoint. Future research will also include
desktop analysis, with a focus on a few selected African nations, and one possible academic contribution is the creation of a comparative database on the development of water infrastructure.
REFERENCES


