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Business development in Africa's water sector: Strategies, growth opportunities, and challenges

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Abstract
Globally, water is necessary for life, the environment, and development. Yet, most African countries still experience water challenges due to infrastructure deficits, financial constraints, regulatory and policy issues, environmental and climatic factors, and technological limitations. This problem will continue to increase drastically due to economic activities in the industrial and agricultural sectors unless appropriate policies are implemented. Public-private partnerships (PPP), investment and financing models, technological innovation and adoption, capacity building and skills development, and community engagement and stakeholder collaboration are the strategies and opportunities suitable for business development in the African water sector. The government, international organizations, and private sectors have a vital role in facilitating growth and development in the water sector. The government should retain its operations by creating a suitable environment and regulations with empowerment and decentralization, providing a radical shift from top-down to centralized implementation and administration. The international organization provides the financial resources, technical guidance, and capacity building to ensure sustainable management practices in utilizing water resources and the development of infrastructure. At the same time, the private sector has a role in rendering management at the slightest level and establishing institutional arrangements allowing full participation of stakeholders.

Keywords: African countries, water sector, public-private partnerships, investment, financing models, technological, innovation, adoption, government, policies, infrastructure

Introduction

Secure and reliable water resources remain a challenge in the African continent even after the existence of the Sustainable Development Goals (SDGs), which aim to protect the planet, end poverty, and ensure prosperity for all people by 2030. Rapid urbanization, climate change, and inadequate infrastructure have exacerbated water scarcity, particularly in rural areas. The primary objective of this paper is to analyze the current state of the water sector, identify the key challenges, and explore strategies for faster sustainable business development. By focusing on Public-Private Partnerships, innovative financing models, technological advancements, and stakeholder collaboration, this paper aims to provide a roadmap for driving growth in the sector. The introduction sets the stage for a comprehensive discussion on how these strategies can be effectively implemented to address Africa's water challenges.

1. Africa's Current Water Status

At a glance, most African countries seem to be endowed with abundant water resources**.** The continent has vast wetlands, big rivers, large lakes, artificial reservoirs, floodplains, and limited but widespread groundwater. According to a study, 75% of the African population access rivers and large lakes as primary water sources, while 15% use groundwater resources (Mutschinski & Coles, 2021) [18]. The continent continues to face water scarcity due to the low conversion factor of precipitation and high evaporation rates. According to McNally *et al*. (2023) [16], four billion Africans are currently facing water scarcity, and by 2030, the population will have reached 9 billion. The demands on agricultural, industrial, and domestic water needs are also expected to increase significantly by approximately 40%. Current climate projections indicate that high temperatures will lead to more frequent weather extremes, which change the rainfall distribution and patterns and increase the frequency and intensity of storms, floods, rainfall, and even more persistent and extensive droughts. Moreover, the changing climate continues to exacerbate hydrologic variability and water stress, especially in arid and semi-arid areas in Southern Africa (Nhemachena *et al*., 2020) [20]. Consequently, the large lakes of East and Central Africa, such as Lake Malawi, Victoria, and Tanganyika, are still icons of the continent's most significant water resources, yet climate change has valuable sentinels and variability effects. For example, rainfall over Lake Victoria is 30% more than in the surrounding land regions because the evaporation always returns to the lake directly due to precipitation (Papa *et al*., 2023) [22]. The current synchronous variations in the three most extensive lake water levels in the Rift region are explained by climate mechanisms related to oscillations of cold and warm phases of El Niño and the Indian Ocean Dipole (IOD).

Comparative Analysis

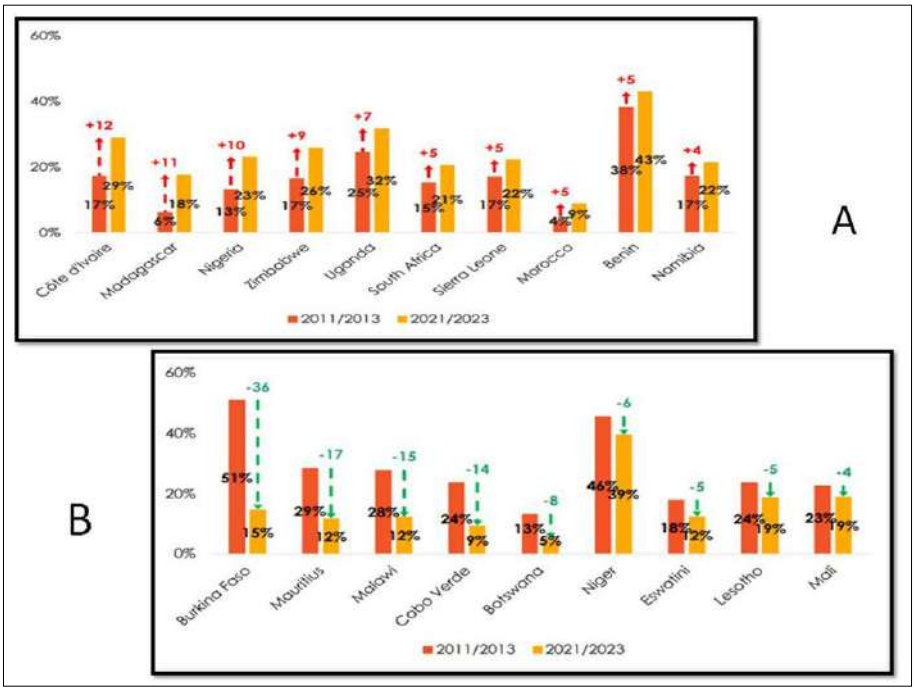

Fig 1: a) Increase in water supply prioritization in 10 countries between 2011-2023 b) Decrease in water supply prioritization in 9 countries between 2011-2023

In figure 1 a, between 2011/2013 and 2021/ 2023, 10 African countries indicated a significant increase in need of water led by Cote d'Ivoire, Madagascar, Nigeria, Zimbabwe, Uganda, South Africa, Sierra Leone, Morocco, Benin, and Namibia. These statistics indicate a high degree of water challenge in the presented countries. On the other hand, figure 1 b) shows those African countries that prioritize water supply as one of their essential problems have reduced in 9 countries led by Burkina Faso, Mauritius, Malawi, Cape Verde, Botswana, Niger, Eswatini, Lesotho, and Mali.

2. Economic Importance of Water Management and Supply

Water management is a cornerstone of economic development in Africa, driving key sectors such as agriculture, energy, and industry. Effective water management ensures the availability of water for irrigation, which is crucial for agriculture—the main economic activity in many African countries.

3. Social Importance of Water Management and Supply

Socially, water management and supply have improved people's lives through enhancing healthy living. Due to proper sanitation, various parts of Africa have evaded infectious diseases and viruses. For instance, during the COVID-19 pandemic, Africans depended on sufficient water supply to constantly wash their hands to prevent and reduce the spread and infection of the deadly virus. It has also reduced poverty by allowing individuals to engage in agricultural activities such as fishing, farming, and even extracting non-living things from water bodies for economic purposes. Through agriculture, Africans have acquired employment, exported farm products, and reduced crimes caused by high levels of unemployment, hence decreasing poverty rates.

"Water and sanitation are among the most powerful preventative

measures available to governments to reduce infectious disease."

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measures available to governments to reduce infectious disease."

4. Environmental Importance of Water Management and Supply

Plants and animals depend on water for life and growth as it allows the transfer of nutrients in animals and plants. An adequate supply of water in farms fosters healthy and high-quality farm products. Animals also depend on clean water for drinking and survival. Consequently, water is also vital in ecosystems as various animals and plants live and reproduce in water.

5. Historical and Recent Developments in the Water Sector

For the last 20 years, African water sector governance has drastically evolved by implementing new initiatives, institutional establishments, and declarations, which has caused many countries to rise against the challenges. There has been a political commitment to and increased awareness of integrated water resources management (IWRM). For instance, the African Ministerial Council of Water (AMCOW) was established to give water political significance and foster the operationalization of AWV 2025 goals. Indeed, AMCOW gained political importance, and by 2017, all its structures and organs had been effectively integrated into the AUC (the African Union Commission) (Mutschinski & Coles, 2021) [18]. Furthermore, there has been a thrust towards water sector financial sustainability and a realization of the benefit of treating water as a critical economic good.

Challenges in the African Water Sector

1. Infrastructure deficits

Most developing African countries' governments and relevant policymakers have failed to build sustainable water infrastructure for water storage and flood management. Some countries' deteriorating or aging water infrastructure systems contribute to insecurity (Katko & Hukka, 2019) [10]. For instance, in Sub-Saharan Africa (SSA), water access is inadequate due to rapid urbanization and population growth that outstripped the inadequate infrastructure. Moreover, according to a study, "In the case of piped water and flush toilets, coverage levels in urban areas in the early 2000s are significantly below what they were in the early 1990s: 39 percent versus 50 percent for piped water, and 27 percent versus 32 per cent for flush toilets" (Banerjee *et al*., p.2) The African Development Bank and the World Bank directed development aid during the "Water Decade" to finance water infrastructures in SSA countries. However, the relevant authorities failed to develop the infrastructure and extend water access due to a "gross mismatch between the sophisticated and expensive technology being transferred to many parts of the developing world, and the pre-industrial and semi-industrialized settings in which it was expected to function" (Adams *et al*., 2019) [1]. Hence, SSA still experiences infrastructure deficits, causing water shortages.

Consequently, Tanzania Dar es Salaam continues to face water shortages due to poor infrastructure despite public utilities partnering with community-based organizations to make water accessible. Community-based organizations and public utilities are constructing and maintaining secondary pipes to connect private water vendors and households to access water at a fee to address this issue directly (Adams *et al*., 2019) [1]. However, the organizations face conflicts in jurisdiction areas.

2. Financial Constraints

Most African countries are experiencing difficulties achieving sustainable and substantial finances for investing in water supply, irrigation, sanitation, and hydropower and restoring, developing, and protecting transboundary and national water resources. The lower GDP of African countries than other continents explains the financial constraints.

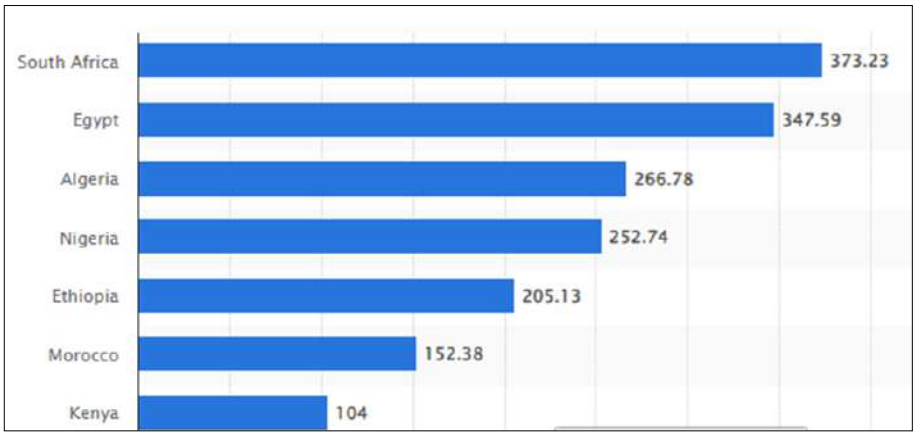


Fig 2: African Countries GDP (Statica.com)

3. Regulatory and Policy Issues

The African water sector continues to experience inappropriate governance and poor institutional arrangements. These have fostered weak adoption of effective regulations and policies necessary for the development and growth of the water sector. For instance, the African Union, the African Ministers' Council on Water (AMCOW), and the Africa Union Commission (AUC) have leveraged material, technical, and financial resources from various sources, including the private sector, and also leveraged a high political support promoting water sector Human Capacity Development (HCD) priorities yet there continue to be slow growth in water sector (Mbaziira, 2020) [13]. Another policy that has failed to accomplish its purpose is the Science, Technology, and Innovation (STI) Policy for the East African Community (EAC), drafted in 2019. The policy aimed at capacity building for STI Infrastructure and skills, innovation, research, entrepreneurship, partnerships, collaborations, resource mobilization, and creating an enabling environment for better enhancement of the water sector (Mbaziira, 2020) [13]. Yet the recent revelation of the African water sector indicates limited improvements.

There is also an inadequate legal framework surrounding the cross-border use, ownership, and resource management of water, presenting a considerable challenge to equitable governance and the ability to raise awareness of water value in communities (Mutschinski & Coles, 2021) [18]. Additionally, it is challenging to control wastewater discharges and illegal water withdrawals and protect water catchment areas due to the lack of appropriate regulations and policies. Consequently, the water sources are polluted and overexploited due to low reinforcement and inadequate management by the state due to inappropriate rules and guidelines.

Weak policies on bankability and offtake issues on water projects also contribute to ineffective water resource management. According to McCoy & Schwartz (2023) [15], "It is often repeated in development circles that the key to bridging the 'financing gap' in the water sector is through the creation of 'bankable' water projects (p. 19). However, there is a constant wide gap between market-oriented financiers and water sector technical professionals in understanding how bankability and offtake are operationalized.

4. Environmental and Climatic Factors

The major environmental factor posing challenges in the African water sector is climate variability/changes (temporal and spatial) leading to floods, storms, desertification, drought, and other pandemics. According to Mutschinski and Coles (2021) [18], climate changes also result in shifts in

precipitation and higher temperatures, posing a threat to economic security and water. For instance, according to a study, "By the beginning of the 21st century in some parts of Africa, for example, East Africa, with an average annual precipitation amount between 800 and 1,200 mm, there is sufficient rainfall available which could be accessed through the efficient use of rainwater harvesting" (Mutschinski and Coles 2021) [18]. Besides climate change, water security has been challenging in Africa due to geophysical such as biodiversity and soil landscapes. Human beings carry out activities such as life-supporting ecosystems (aquatic and terrestrial) that affect water bodies. Addressing this issue at the international and national level is vital for Africa's sustainable economic and social development.

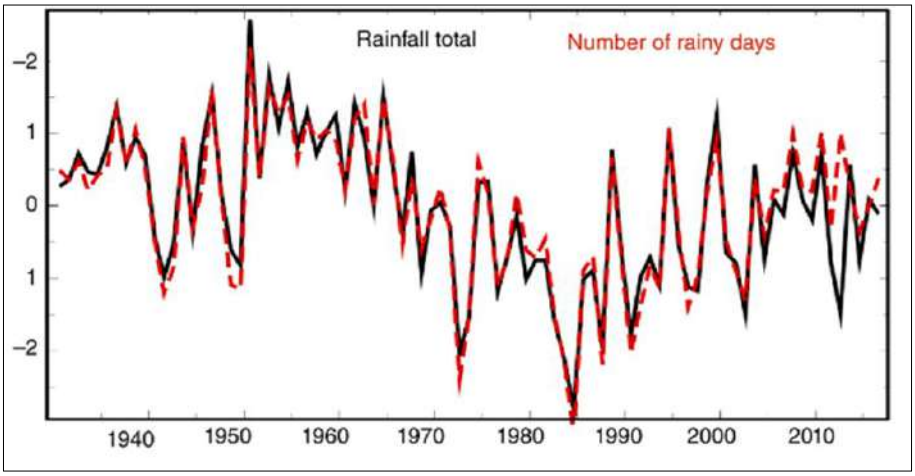


Fig 3: Variability in the rainy season between 1940-2010

5. Technological Limitations

The primary technological factor posing challenges in the African water sector is critical gaps in data. There is little or no information concerning surface water and ground knowledge. Moreover, many African countries experience high telephone charges, contributing to Internet inaccessibility, yet the Internet plays a significant role in accessing emerging trends, data, and information in the water sector. African countries also need to develop effective systems and capacity for water development and research and collect, assess, and disseminate information and data on water resources.

Opportunities for Business Development

The water sector has the ability and capability to create economic growth and wealth and to transform developing African countries. The African oceanic part, lakes, and rivers contain minerals and fish stocks that boost the development of appropriate capacity for the exploitation of the fish and mining industry. Hence, Africa can generate wealth and develop economically by harvesting living aquatic resources and extracting non-living things. Additionally, African countries have an opportunity for business development through agriculture. Agriculture provides food security while increasing Gross Domestic growth (GDP) and reducing poverty. Figure 2 shows the 2022 GDP contribution of 13 African countries as a result of fishing, forestry, and agriculture.

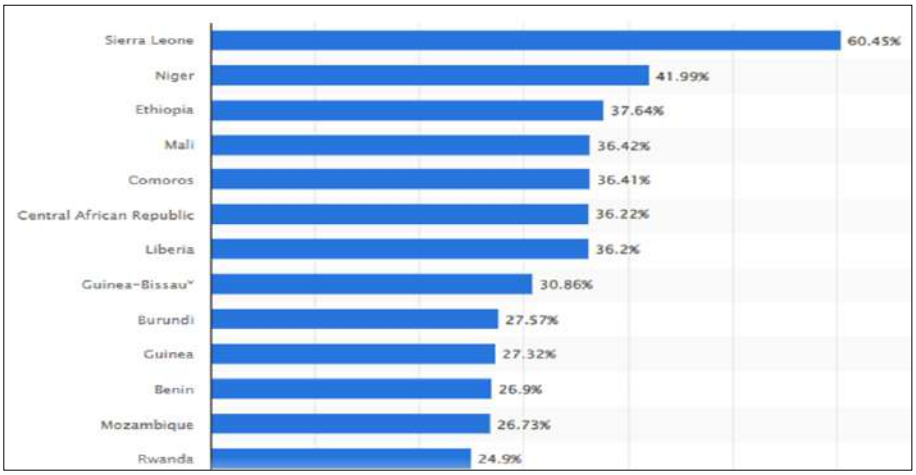


Fig 4: 2022 GDP contribution of 13 African countries as a result of fishing, forestry, and agriculture (Galal, 2024) [8]

People obtain employment through small- and large-scale agricultural activities that improve their living standards and the economy. Africa's agricultural products are exported to other continents, providing business development opportunities. Water is also an energy source, which plays a crucial role in running industrial activities. The following figure shows how agriculture creates an opportunity for business development in Africa. It also reveals the significant effects of executing the Comprehensive Africa Agriculture Development methods influenced by the water sector in six countries.

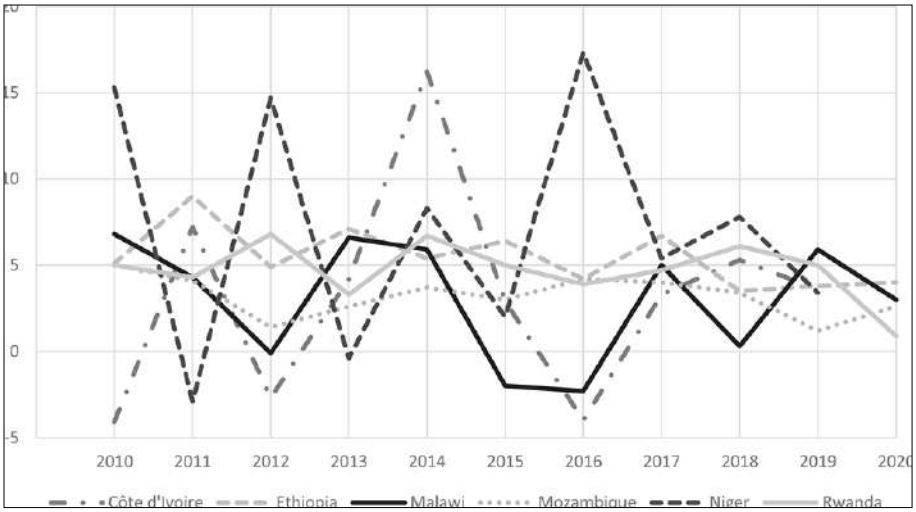
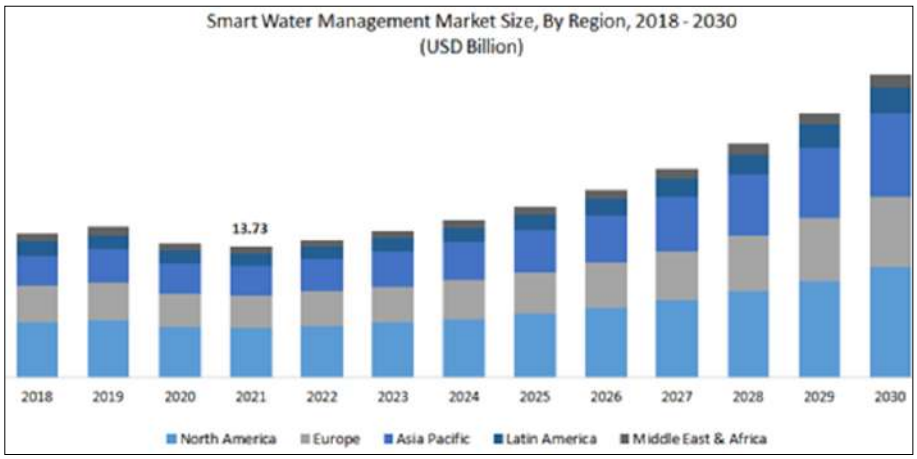


Fig 5: Agriculture value added growth (%) (Diallo & Wouterse, 2023) [5].

Emerging Trends and Innovations that Foster Africa's Water Sector Business Development

Flash flood forecasting app is one of the trends and innovations established to ensure adequate water supply. The application provides predictions and flood warnings through state-of-the-art modeling techniques (Mvulirwenande & Wehn, 2020) [19]. In this case, Satellite data is interpreted into detailed rainfall information and data. An innovative algorithm creates rainfall forecasts that allow flood model input to provide flood maps on street level. This allows investors in the water sector to develop managerial and strategic plans for water harvesting depending on its demand in various regions. Hence, the integration of such digital technologies has been among the most significant and robust factors influencing emerging trends in Africa. Research indicates that the smart water management market is expected to grow by 10.3% by 2030 (Polaris Market Research, 2022) [23]. Its growth continues to provide significant insights into business development in the water sector. For instance, figure 2 suggests the graph to portray the Smart Water Management market size; every region is experiencing significant growth from the trend. Africa and the Middle East present the regions that experience significant growth, which portrays a considerable market opportunity that can be utilized, especially in Africa.



Source: Polaris Market Research

Fig 6: Trends in Smart Water Management Market Size (Polaris Market Research, 2022) [23]

Opportunities in Various Segments, such as Water Supply, Sanitation, Irrigation, and Water Treatment

1. Water Supply

Africa experiences a growing urban population, especially in major cities and towns in most countries. People demand reliable water access and infrastructure due to a surge in rural-urban migration (Adeyeye *et al*., 2020) [2]. The maintenance and development of pipelines, water treatment plants, and water pumping stations are among the leading investment opportunities. National Water and Sewerage Corporation (NWSC) in Uganda has utilized the growing urban population to invest in water infrastructure. Moreover, various companies such as Safaricom and Grundfos LIFELINK have formed a partnership in East Africa to enhance last-mile networks that allow vendors to access supply water to last-mile users. Safaricom helps Grundfos LIFELINK to operate mainly on mobile banking but with a high degree of user-friendly transfer system and transparency. This business model has had a socio-economic impact on African countries; for instance, in Kenya, the country of operation, communities have access to clean water, which has radically improved the health of adults and children.

2. Sanitation

Sewage treatment, development of sanitation infrastructure, and waste management are the critical sanitation areas where investment can be made. The inadequate sanitation

facilities and systems in Africa pose significant risks to people's health. One of the successful sanitation investment stories in low-income areas is the Sanergy project in Kenya, which deals with a complete sanitation value chain to ensure that water consumed in low-income areas is safe.

3. Irrigation

Irrigation in Africa is contextualized from the fundamental view of agriculture as the backbone of every African economy. The growing demand for efficient irrigation systems is pushed by the need to develop sustainable solutions to food security with climate variability. Among the available opportunities is the development of solar-powered pumps and drip irrigation systems to meet the needs of diverse populations.

4. Water Treatment

Water treatment is an opportunity in Africa that could be exploited by investing in rural and peri-urban areas by facilitating water recycling or reuse. The communities in these areas lack access to clean water amidst the rise of technological approaches like desalination. Businesses can use modern technology to purify used water and make it safe for the community to reuse. For instance, Lilongwe, Malawi, utilizes biological and physical treatments conducted at the wastewater treatment plants (WWTP) by stabilizing ponds. Initiatory treatments are carried out with equalization tanks, grit tanks, and screening bars. Primary sedimentation occurs in rectangular containers. Maturation ponds are the final and secondary stages of the process. According to Ravina *et al*. (2021) [24], "Sub-tropical climate provides favorable conditions for this type of secondary treatment due to its simplicity in construction, flexibility concerning the degree of treatment, low maintenance requirements, low energy consumption, and easiness of operation" (p. 12). The organic matter sediments and, after 21 days, the process is subjected to three stabilization ponds. The treated water is finally directed to the Lilongwe River. The water is used for agricultural purposes and is pure and of high quality. The WWTP also employs individuals in the community, improving living standards, reducing the level of crimes, and increasing the GDP.

5. Examples of Successful Business Models and Initiatives

One of the key examples of a successful business model is the Grundfos LiFELINK. This company partners with institutions like the Danish International Development Agency (Danida), UNICEF, the Red Cross, the Government of Kenya, the World Food Program, and private foundations (Safaricom) to "deliver sustainable water systems and associated infrastructure to low-income markets, combining existing water service technologies with innovation in business models and systems of payment and provision" (Wbcsd, 2011) [27]. The company produces at least 16 million pump units annually, fostering employment of approximately 18 0000 individuals in various African countries (Wbcsd, 2011) [27]. An advanced Global Revenue Management System was established to support the expansion of Grundfos LIFELINK as it operates mainly on mobile banking but with a high degree of user-friendly transfer system and transparency. This business model has had a socio-economic impact on African countries; for instance, in Kenya, the country of operation, communities have access to clean water, which has radically improved the health of adults and children. According to a survey by health facilities and community members, waterborne diseases are reduced by approximately 50% among children (Wbcsd, 2011) [27]. Also, the communities have benefited from the business model since they have been able to start income-generating activities of water distribution to households in the area. Other essential services include connecting small businesses to the strategic markets, financing them, and providing technical assistance and mentorship.

In Gambia, eWaterPay has transformed and enabled rural residents to access water on the pre-paid framework. The project was initiated in 2016, and taps were installed in the Gambia villages, including Jafai Koto, Jarreng, and Brikama. Following the proper implementation of the project, 100 taps were installed by June 2017 in more villages, including Jallenbarah, Brufut, Kerr Len, and Jappineh (GSMA, 2018) [9]. According to Africa Water Enterprises (AWE), the water project improved water accessibility for 9,000 individuals (GSMA, 2018) [9]. Water Bill was collected and managed via a contactless pay-per-use system connected to offline Near Field Communication (NFC) tags. Collected funds were utilized to maintain and finance repairs.

Effective Strategies for Business Development in this Sector

To successfully navigate the challenges in Africa's water sector, businesses must adopt various strategies that align with the local context and global best practices. Public-private partnerships (PPPs) have proven to be an effective model for infrastructure development, as seen in the Kigali Bulk Water Treatment Plant case. Additionally, businesses should explore innovative financing options, such as blended finance and impact investing, to mobilize the necessary capital. Technological innovation is another critical strategy, with advancements in water management technologies offering new solutions to old problems. Finally, stakeholder engagement is essential to ensure that projects meet the communities' needs and gain support from local and national governments.

1. Public-private partnerships (PPP)

Public and private investors are partnering to ensure that the public obtains necessary water services through sustainable water systems and integrating innovation with the existing water service programs. This ensures that public needs are met without compromising private profitability—for instance, Grundfos LIFELINK partners with Safaricom in East African countries like Kenya. Safaricom, M-PESA forms are a significant part of Grundfos LIFELINK payment system (Wbcsd, 2011) [27]. The payment system ensures that water service and maintenance fees are submitted in a closed account. Safaricom, as a private entity, obtains its profits through transaction costs while at the same time fostering Grundfos LIFELINK's goals and objectives of serving the community.

2. Case Study: Kigali Bulk Water Treatment Plant PPP

Another notable example of a successful business model in the African water sector is the Kigali Bulk Water Treatment Plant, which exemplifies the power of public-private

partnerships in addressing critical water supply challenges. The project was initiated to tackle the pressing issue of water scarcity in Rwanda's rapidly growing capital, Kigali. Faced with increasing demand for potable water due to urbanization and population growth, the Rwandan government recognized the need for a significant upgrade to the city's water infrastructure.

Structured as a Build-Operate-Transfer (BOT) model, the project involved the construction and operation of a water treatment facility with a capacity of 40,000 cubic meters per day, sourcing water from the Nyabarongo River. The consortium responsible for the project, led by Metito, a global leader in water management solutions, worked alongside several financial institutions, including the Emerging Africa Infrastructure Fund (EAIF), which provided long-term debt financing.

The Kigali Bulk Water Treatment Plant faced several challenges during its implementation, such as securing financing, navigating regulatory approvals, and managing the technical complexities associated with water treatment from the Nyabarongo River. These challenges were effectively mitigated through close collaboration between the public and private partners, the use of innovative engineering solutions, and the strong commitment of the Rwandan government to provide necessary regulatory support and expedite approvals.

The successful completion of the Kigali Bulk Water Treatment Plant has significantly improved the reliability and sustainability of Kigali's water supply. This project has not only met the immediate water needs of the city but also set a precedent for similar infrastructure projects across Africa. The success of this PPP highlights the potential for public-private collaborations to effectively address infrastructure deficits in the water sector, offering a model that can be replicated in other regions facing similar challenges.

Several key lessons emerge from the Kigali Bulk Water Treatment Plant experience. The active involvement and support of the Rwandan government were crucial in ensuring the project's success, particularly in terms of regulatory approvals and risk mitigation. The use of international financial institutions to provide long-term debt financing reduced the financial risks for the private sector, making the project more attractive to investors. Moreover, the project's emphasis on sustainability—both in its environmental impact and in ensuring a long-term, reliable water supply—demonstrates the importance of integrating sustainable practices into PPPs.

The Kigali Bulk Water Treatment Plant serves as a powerful example of how public-private partnerships can overcome significant challenges to deliver essential infrastructure, driving both social and economic development in the process. This case further illustrates the potential for PPPs to play a central role in addressing Africa's water challenges and developing the continent's water sector.

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3. Investment and Financing Models

The primary essence of investing in particular financing models is to attain sustainability in a business. The financing approaches also powerfully attract many people to invest in the water industry, thus widening the sector. Public and private funding as a blended model has spread the risk, reducing the burden of losses in the private sector. This motivates and attracts private investors to invest their resources in the watch industry. Other viable models include microfinancing and impact investing.

4. Technological Innovation and Adoption

Technology is a valuable tool for every business to set a competitive pace or navigate market dynamics. The company's modernization can be achieved in the water sector by developing the Internet of Things (IoT) to monitor water quality and ensure that consumers consume clean and sanitized water. In Kenya, telecommunication networks like Safaricom's M-PESA have enhanced the revolution of water utilities, making the business stand at a better chance for success.

Moreover, many African countries experience high telephone charges, contributing to Internet inaccessibility, yet the Internet plays a significant role in accessing emerging trends, data, and information in the water sector. Telecommunication companies should offer standardized charges and a stable network to allow developing countries to enter the water sector. African countries must also build effective systems and capacity for water development and research and collect, assess, and disseminate information and data on water resources.

5. Capacity Building and Skills Development

The water sector cannot succeed without integrating a skilled workforce to enhance the delivery of quality services. Businesses can only be successful if they invest resources in training their employees about management and new approaches to handling today's water systems and infrastructure. After identifying the needs of the water sector, it would be critical to establish a partnership initiative to develop a curriculum that would lead to the development of systems that would support the water industry.

6. Community Engagement and Stakeholder Collaboration

Water businesses cannot thrive without the active engagement of the community, which is the primary consumer of the products. The water projects must align with the surrounding community's needs, culture, and attitudes. At the same time, the development of sustainable solutions depends on how relevant the water business is to the community that makes up the market. One of the examples of community engagement is the "One Drop" initiative in Mali, which was initiated to integrate the community's needs. The essential advantage of this strategy is the development of sustainable interventions that are not only specific but widely accepted.

7. The Creation of 'Bankable' and Offtake Water Projects

A significant barrier to executing private investment in the water sector in Africa's developing countries is that most investors from private companies view emerging markets as not creditworthy. To address this issue and allow business development in the water sector, the OECD and World Bank have imitated a blended finance approach. The aim of the approach "is to take projects that are on the verge of

commercial viability and bring them, through a creative mixture of public and private money, to a state in which they are deemed 'bankable,' and, as such, able to access the large volume of commercial lenders that are potentially available to organizations in the water sector" (McCoy & Schwartz, 2023, p. 19) [15]. Consequently, offtake water projects generate massive amounts of profits that attract private investors; hence, this is an effective strategy for business development in the water sector.

The Role of Government Policies' Involvement in Addressing These Issues

Government policies should promote transparency and liberalize water markets to meet the basic needs of people experiencing poverty. According to Mutschinski & Coles (2021) [18], "It is envisaged that under the AWV 2025 water policy will be framed within a comprehensive and integrated approach to the development and management of water resources" (p. 23). Hence, more efforts should be put into implementing its goals. The national water policies, such as "the African space policy," "the African Development Bank human capital strategy for Africa," and "the science, technology, and innovation strategy for Africa 2024," should be adopted and implemented at a political level. The government should also retain its operations by creating an enabling environment and regulations with empowerment and decentralization, providing a radical shift from top-down to centralized implementation and administration.

The policies have to enhance capacity-building and development and implementation of institutional reforms at transboundary, national, and local water-basin levels. Government policies in the African context establish the foundation for sustainable management practices, the development of water resources, and a regulatory framework for distribution. Government policies in Africa also enhance water accessibility, regulating prices and costs while ensuring water safety (Foster *et al*., 2020) [6]. Integrated water resource management (IWRM) frameworks can establish approaches through which water can be utilized in various sectors, including agriculture, industry, and domestic.

The Role of International Aid Involvement in Addressing These Issues

International aid programs are vital in establishing an enabling environment for cooperation between nations sharing water basins. International aid is particularly significant as it provides the missing financial resources, technical guidance, and capacity building to ensure sustainable management practices in utilizing water resources and the development of infrastructure. Providing economic resources is among the most significant roles that international aid plays. The United Nations, in cooperation with other international bodies like the World Bank and the African Development Bank, can provide resources to facilitate the accessibility of water services and sanitation in both rural and urban settings (Fotio & Nguea, 2022) [7]. Training ensures enough technology transfer and knowledge sharing, a crucial capacity-building framework by international organizations for bridging the diverse gaps in sanitation and providing water as a resource.

Consequently, in the case of Grundfos LIFELINK, international organizations such as Danida, UNICEF, the Red Cross, the World Health Organization (WHO), and the World Food Program have integrated with it to offer financial aid. The partnership models are distinct from one organization to another, but they have a common goal of achieving sustainable water projects by utilizing the Grundfos LIFELINK system rather than other less traditional, sustainable options.

The Role of Private Sector Involvement in Addressing These Issues

The private sector has a role in management at the slightest level and in establishing institutional arrangements that allow the full participation of stakeholders. The private sector has played the most significant role in filling the investment gap in Africa's water industry (Sarvari *et al*., 2020) [26]. The sole funding from the local government is insufficient to address the existing gaps, from infrastructure development to diversifying the services to align with the challenges in water accessibility. An investment gap of about $64 billion should be made annually to resolve water challenges in Africa (Azolibe & Okonkwo, 2020) [3]. The best approach to accelerating development in Africa depends significantly on the ability of the private sector to bridge the investment gaps in infrastructural development. The innovative financing models are a sustainable solution to addressing the investment challenges experienced in Africa. Public and private partnerships are also vital to enhancing the operational efficiency of the water sector.

Importance of a Sustainable and Inclusive Approach to Business Development

The perspective of an inclusive approach is comprehensive, complicated, and multifaceted, yet it is among the sustainable frameworks for successful water investment. The inclusive approach entails the development of a strategy whereby all the community members are engaged in the business, reducing the marginalization of minority groups and ensuring that the water solutions can be adapted to the dynamic environment (McClain, 2023) [14]. Sustainability and inclusivity are complementary approaches in the water business, characterized by long-term business success and ensuring the company operates within a specific community.

Driving Growth

The process of driving growth in Africa's water industry is specific and considers several factors as part of a road map. This is a definite procedure that could be followed to ensure that sustainable business is developed in Africa. The road map begins with:

1. **Assessment of the Market Needs:** In Africa, the water industry faces specific challenges, which vary from one country or region to another (McClain, 2023) [13]. For example, when places like Nairobi Kibera Slams face water and sanitation challenges, other regions like Namibia are experiencing a rain shortage. The assessment of the market needs leads to the identification of inclusive and sustainable sanitation and enhanced accessibility to sustainable water sources.

2. **Innovating by determining the local water Context:** In this step, the stakeholders consider water challenges as unique problems that vary from one place to another. Here, the products and services in the water industry are developed to utilize the available opportunities and address the unique challenges that are being faced.

3. **In step 3, the formulation of partnerships is vital:** It involves the collaboration of the government with other business entities and private bodies to share knowledge and experience. Partnerships are also critical for leveraging resources.

4. **Scale Successful Businesses:** If a business thrives in a particular environment, it is vital to scale and expand it. At the same time, replication is essential as it enhances business expansion.

5. **Ensure Sustainability:** Sustainability is another critical perspective in business. When establishing a water business, looking into how sustainable it would be in serving the local community and addressing the challenges would be essential.

The Potential Economic, Social, and Environmental Impacts of Successful Business Initiatives in this Sector

1. Economic

From an economic viewpoint, job creation is among the benefits of investing in the water sector. Other advantages could include increased agricultural production, which improves food security since agriculture is the backbone of the economy in most African countries. 23% of Africa's GDP is generated from farming activities. In comparison, about 60% of people work as small and large-scale farmers or laborers (Odusola, 2021) [21]. The ultimate benefit is the creation of employment, which increases people's living standards. Strategic policies to manage water resources are significant in realizing a country's increased productivity and economic growth.

Water is also a critical raw material and resource in energy production and enhancing industrial processes. In some regions, like Ethiopia, the government depends on water to generate more than 90% of the electricity used for industrial processes and create diverse jobs (Mekonnen *et al*., 2022) [17]. The revenues generated from hydropower and related business activities increase the revenue streams for the government, which is used to develop other sectors of the economy.

Social

The integral social benefits include improved health outcomes and sanitation. Most African countries with more prevalent waterborne diseases like cholera have been found to experience challenges with accessing clean, adequate water resources and sanitation (Matchawe *et al*., 2022) [12]. The significance of water has been realized in the recent past, especially in reducing disease transmission. During COVID-19, water was found to be an essential resource in enhancing hygienic practices like handwashing (Berendes *et al*., 2022) [4]. The provision of clean water creates employment opportunities whose benefits are to improve living standards and reduce poverty, especially in the rural settings of Africa where agriculture is the primary source of livelihood.

2. Environmental

The environmental impact of water includes better water conservation in areas surrounding human settlement. Ecosystems are crucial in the provision of fundamental services like clean water. Wetlands, rivers, and other water bodies support life in water. Proper waste management and sanitation protect the ecosystems and reduce some factors that may trigger climate change. The benefits of sustainability characterize the conservation of water resources (Li *et al*., 2022) [11]. Future generations will depend on the current water conservation measures in the diverse ecosystems within the African continent.

3. Metrics and Indicators for Measuring Growth and Success

The first metric for measuring business development in the water industry is the increased percentage of African people accessing sanitation and clean water in rural and urban areas. This is evident through Reduced waterborne diseases, including cholera, indicating better sanitation and water access. It is also apparent that the increase in the number of jobs and employment opportunities in the water sector has raised countries' GDP.

Conclusion

This study explores and analyzes Public-private partnerships (PPP), investment and financing models, technological innovation and adoption, capacity building and skills development, and community engagement and stakeholder collaboration as the strategies and opportunities for business development in the African water sector while addressing the challenges and providing actionable insights for driving growth. Besides infrastructure deficits, financial constraints, regulatory and policy issues, environmental and climatic factors, and technological limitations, Africa, as a continent, presents potential and great investment opportunities in the water sector. Some key areas that show significant business opportunities across most African countries include water supply, sanitation, irrigation, and establishing treatment facilities to purify water. Since water is a robust business adventure in Africa, PPP investment and financing models, technological innovation and adoption, capacity building, skills development, community engagement, and stakeholder collaboration are integral. The PPP approach is significant in spreading the risks and attracting private entities to invest in business opportunities. For instance, the Kigali Bulk Water Treatment Plant met the immediate water needs of the City but also set a precedent for similar infrastructure projects across Africa. Innovative financing models and adopting technology are also fundamental not only in driving growth but also in ensuring that businesses are sustainable. The significance of focusing on sustainability and inclusivity is to ensure that the company operates long enough, resulting in long-term success in enhancing accessibility to water resources. Utilizing and capitalizing on opportunities and handling water challenges involves concerted efforts from all players. Entrepreneurs, government bodies, private companies like telecommunication firms, and NGOs can collaborate and merge efforts to achieve success. The government should retain its operations by creating a suitable environment and regulations with empowerment and decentralization, providing a radical shift from top-down to centralized implementation and administration. The international organization offers the missing financial resources, technical guidance, and capacity building to ensure sustainable management practices in utilizing water resources and the development of infrastructure. Moreover, the private sector has a role in rendering management at the slightest level and establishing institutional arrangements allowing full participation of stakeholders.

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