A Water, Sanitation, And Hygiene Revolution In Africa Using Smart Technologies

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Clean drinking water, sanitation, and hygiene (WASH) are crucial to human health and well-being. Safe water and sanitation are not the only prerequisites to healthy living but contribute towards meaningful livelihoods and dignity. They also help create resilient communities living in healthy environments. That is why the United Nation's Sustainable Development Goal (UN's SDG) Number 6 aspires for clean water and sanitation provisions across the globe, including the African continent. Furthermore, the AU's Agenda 2063, Aspiration 1, Goal 2, aspires for inclusive growth and sustainable development that can warrant Africans a high standard of living and quality of life. As such, African countries aspire to provide their citizenry with the necessities of life such as clean water and sanitation, among others.

Poor sanitation leads to high-risk hygiene that can retain poor populations in a vicious cycle of poor health, environmental degradation, malnutrition, reduced productivity, and loss of income. Even though several African countries have reached progressive milestones towards enabling access to clean drinking water and adequate sanitation, there is still more work ahead. For instance, millions of Africans across the continent still lack WASH basic services. Most specifically, it has been reported that

approximately 115 people in Africa die every hour from waterborne diseases that are linked to poor sanitation, poor hygiene, and contaminated water.

In Africa, poverty is one of the great barriers to accessing clean water supply and proper sanitation. Other factors that exacerbate the limited access to clean water and sanitation crisis in Africa include continual natural disasters, growing pollution, wars, and limited access to water resources. Numerous communities have limited access to adequate sanitation facilities that can safely separate human waste from human contact. Some communities have limited access to safe toilets and practice open defecation. Unfortunately, the exposed human faecal waste may be transferred back into people's food and water resources and subsequently cause waterborne diseases. Outbreaks of waterborne diseases such as cholera, typhoid and dysentery are thus common with contaminated water bodies in Africa.

The African population has been rapidly growing over the past 25 years. However, access to sanitation and clean portable water has remained minimal for numerous African communities across the continent. There have been some efforts by some African governments and non-governmental organisations towards improving access to clean water and sewage infrastructure. But more efforts are needed to address the huge numbers of Africans that remain without the necessary WASH infrastructure. This includes availing WASH infrastructure to increase the supply of water even during disasters such as droughts.

African countries such as Zambia are no exception when considering WASH challenges. For example, approximately 4.8 million Zambians have limited access to clean water. In addition, approximately 6.6 million Zambians lack adequate access to proper sanitation facilities. Consequently, poor water and sanitation have been cited as major causes of Zambia's high rates of childhood malnutrition and waterborne diseases. Fundamentally, waterborne diseases are the most leading causes of death of children under the age of 5 in Zambia. Unfortunately, 90% of households in urban areas have access to safe drinking water, compared to approximately 53% of households in rural areas.

The challenges that most African countries face towards achieving adequate clean water supply and security include water storage, water usage monitoring, and water contamination. To address water contamination challenges, the African Union High Level Panel on Innovation and Emerging Technologies (APET) urges African countries to continue using and upscaling several conventional water treatment technologies such as filtration, flocculation, coagulation, ozonation, and chlorination. However, to supplement these conventional treatment methods, African countries can consider using cost-effective membrane filtration and adsorption-desorption technologies enhanced by nanotechnology to perform better water treatment efforts. However, water treatment may not adequately address water shortages as some African communities lack the basic infrastructure necessary for efficient water treatment methods. As such,

smart water management systems are imperative to avoid water wastages and increase water supply and security.

APET believes that African countries can leverage smart technologies to address their WASH challenges across the continent regarding water management of already existing clean water bodies. Thus, APET encourages African countries to consider utilising efficient water management system technologies that can improve strategic water usage monitoring systems and storage protocols. African countries should consider adopting smart technologies such as the internet of things empowered by blockchain and artificial intelligence technologies to enable smart water management systems. Smart water management systems can enable African governments, industries, and utilities across the continent to integrate digital technologies with traditional technologies to monitor water quality, water quantity, efficient irrigation, leak detection, pressure and flow, ecosystems, floods, droughts, and much more. For example, smart water management system infrastructure can incorporate sensors, monitors, geographic information system (GIS), satellite mapping, and other data sharing tools to improve water management frameworks. Hence, having such water management systems can offer real-time solutions implemented in broader networks and reduce Africa's water management challenges.

Furthermore, to address sanitation challenges, African countries can consider bio-digestion technologies suitable for water-scarce environments. For example, the Water and Sanitation Association of Zambia (WASAZA) has increased efforts towards supporting schools develop and build sanitation bio-latrines that utilises bio-digestion technology to process organic and faecal waste. APET believes that upscaling such bio-latrine facilities can potentially improve sanitation in African schools, even in water-scarce communities. Fortunately, the bio-latrines can also provide biogas energy to utilise in cooking food for various communities. Furthermore, the bio-latrine effluent can also be utilised as a nutrient-rich fertiliser for agricultural purposes.

Smartphone platforms can also enable sanitation notification messages and dissemination of information for local communities. For example, the Akros company has partnered with the Zambian Ministry of Local Government and Housing (MLGH) and United Nations Children's Fund (UNICEF) to adopt mobile-to-web applications that can facilitate innovative service delivery and monitoring systems referred to as the CLTS M2W. This CLTS M2W utilises smartphone applications to link automated data feedback loops and enable community leaders to monitor progress towards communities' sanitation goals. Consequently, the CLTS M2W has enabled an unprecedented sanitation uptake in Zambia. This platform has facilitated the creation of over 1,500,000 new users of sanitation in about 18 months.

APET is also encouraging countries to consider better water harvesting technologies that can increase water supply and security. Therefore, indigenous water harvesting

technologies and management practices can be adopted by African countries to address water availability for water-scarce regions. Such considerations can pursue surface water catchment systems and groundwater extraction management systems. Such water extracting and transporting technologies commonly used in Morocco, Spain, Syria, Iran, and Central and Eastern Asia can help water-scarce African communities acquire portable water for domestic and irrigation use, even in average rainfall with erratic patterns.

Furthermore, rainwater-harvesting practices such as constructed ponds allow runoff water to percolate sand reservoirs or artificial groundwater recharge, among other techniques. Most importantly, underground water storage networks can substantially reduce water evaporation and substantially improve water security for numerous water-scarce communities. However, to manage such systems, suitable smart water management technologies can be co-opted to these storage systems to prolong water storage capacity further.

Several African countries have successfully addressed their WASH challenges through various technologies. For example, the Rob Gebeye Solar Water Pumping Plant was launched in 2014 as part of the rural WASH solution in Ethiopia's extensive One WASH National Programme. This project improved the health and well-being of rural and urban communities by increasing sustainable access to water supplies and sanitation and the adoption of good hygiene practices. Furthermore, in rural northern Malawi, the Integrated Urban Water and Sanitation Project for the Mzimba Town project enhanced the community's access to potable water from 65% to 95%. In addition, this project improved sanitation from 45% to 97%. This WASH project subsequently created approximately 1,000 jobs and enabled the construction of primary school sanitation facilities. Such sanitation facilities included secured toilets to provide privacy and comfort to the pupils, more especially girls.

Finally, for Africa to achieve water security, APET encourages African countries to continue addressing sanitation and water shortage challenges by leveraging smart technologies. Thus, African countries can achieve universal access to adequate and sustainable water supply, sanitation, and hygiene solutions that can eliminate widespread open defecation and limited water sources. The adoption and adaptation of smart technologies can effectively address Africa's WASH challenges. In this way, African countries can accomplish the aspirations and goals of the UN's SDGs and AU's Agenda 2063: The Africa We Want.

https://www.nepad.org/blog/water-sanitation-and-hygiene-revolution-africa-using-smart-technologies