

The Use of On-site Solutions in Developing Countries in Sub-Sahara Africa.

Focus on the Use of On-site Solutions in Warri, Delta State, Nigeria.

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Abstract: Safe, reliable and affordable drinking water forms a solid block for social stability, growth and development. In Sub-Sahara African countries with high population, there exist great challenges for federal governments, provincial/state authorities, local-run water utilities and corporations to provide safe drinking water to its people within their jurisdiction due to financial, technical and institutional/political problems just as the case is in Nigeria. These problems however affects the performances of water supply utilities which are characterized with huge water supply deficits thus prompting local residents and small/medium scale industries to invest in the construction of private boreholes to meet their domestic and commercial demands. Nonetheless, the use of private boreholes for water supply does have their benefits and challenges.

INTRODUCTION

The Sub-Sahara African countries are a perfect blend of culture, religion and people blessed with vast natural resources but are also faced with political, social and infrastructural challenges characterized mostly by the inabilities of most countries to providing basic amenities like water supply, sanitation and health (WASH) to a vast majority of its population living in rural, semi-urban and mega cities. The provision of portable drinking water with appropriate sanitation measures would increase immensely the quality and longevity of lives in the region.

It is arguably said that some of the challenges faced by most Sub-Sahara African countries are pinned to unstable economic growth, volatile political environments, inefficient and unresponsive institutions plagued with lack of financial investments into water, sanitation and public health sectors. In countries where there are somewhat investments in water supply, sanitation and health, they lack concrete action plans for sustainable development and economic growth.

Before the turn of the millennium, the UN initiated a global initiative called the Millennium Development Goals (MDGs) with eight development agendas to achieve before the end of 2015. WHO/UNICEF (2005) Water for Life report states the importance of water supply and sanitation as fundamentals to achieving the MDGs by putting forward that:

“...improved water and sanitation will speed the achievement of all eight Millennium Development Goals (MDGs), helping to: eradicate extreme poverty and hunger; achieve universal primary education; promote gender equality and empower women; reduce child mortality; improve maternal health; combat HIV/AIDS, malaria and other diseases; ensure environmental sustainability; and develop a global partnership for development”.

From this context, it is obvious to suggest that the provision and access to safe, reliable and affordable drinking water is of great importance to the Sub-Sahara African countries.

PUBLIC WATER SECTOR IN SUB-SAHARA AFRICA: THE NIGERIAN CASE

Nigeria is made up 36 states and 774 local government authorities both of which are subordinates to the federal government. The federal government which operates under a federal constitution has functional arms of operation through various ministries which formulates policies, objectives and guidelines. The Nigerian public water sector is headed by the Federal Ministry of Water Resources (FMWR) which directs the management of water resources in states through the State Water Authority (SWA) which in turn handle the affairs of water supply of local authorities through the Local Government Water Authorities (LGWAs). These instituted agencies have the mandates to protect, manage and provide drinking water for domestic, industrial, irrigation/agriculture, commercial and other uses.

PROBLEMS OF WATER SUPPLY AND SANITATION IN NIGERIA

The provision of drinking water to an estimated population of over 140 million people, with over 250 ethnic groups with different languages of more than 400 dialects is a very difficult task considering the daily requirements and water needs for domestic consumption with a vast cultural diversity where each ethnic group has its own water consumption rate based on religion, occupation and geographical location. Water supply through state-run centralized water utilities in the six geo-political zones of Nigeria are characterized by very low delivery capacities, inefficient, unreliable with under-funded technical infrastructures in the presence of growing population, urbanization and increased water demands. Thus there is a high rate of water poverty index in Nigeria due to the challenges faced by Nigerian water supply utilities.

The water poverty index (WPI) is a new designed holistic water management tool which captures the whole range of issues that relates to water resources availability and its impact on people of any local community, municipal and district level measures the impact of water scarcity and water provision on human populations for a given country (Sullivan, 2005). WPI is a number between 0 and 100, where a low score indicates water poverty and a high score indicates good water provision. The Nigerian water poverty index was 44¹ in 2002 according to the Natural Environment Research Council, thus suggesting that more than half of Nigeria's population does not have the capacity and access to make good use of water resources in their immediate environments.

The problems faced by centralized state-run water supply utilities in Nigeria can be grouped into three broad categories: political/institutional, financial and technical problems. Due to unstable political environment since the past 20 years, the institution which are tasked with water supply have had duplicating roles and responsibilities thus reducing direct and committed financial investment into the water sector which in turn reduces capacities, performances and management of machineries needed for effective water supply. These problems however resulted into a situation where most rural and semi-urban and cities in Nigeria are faced with lack of access to safe drinking water.

In regards to my thesis work, I carried out a case study in the Warri region of southern Nigeria, a city boarding the Atlantic Ocean with an estimated population of over 1.5 million people with over 140, 000 housing units showed that, residents relied on the use of private boreholes for water supply due to the fact that the Warri waterworks only supplies 132,490 liters (35,000 gallons) of water to less than 5% of the population in the region. This supply however is not reliable, and lacks the standard measures of water treatment before delivery to end-users. The Warri waterworks is characterized by technical, financial and institutional problems with few experts and personnel; no effective recovery cost systems, and no broad pipeline network that connects all the corners of the region.

¹ The Water Poverty Index (WPI) uses five key components in calculating the WPI of any country; these components are resources, access, use, capacity, and environment.

Note: For this lecture, the motivation and criteria for the usage of on-site solutions (boreholes) will be discussed extensively by Mr. Helmut Jung. The motivations and criteria would however reveal how they fit almost perfectly into rural and urban water supply situations in Nigeria

Due to the ineffective and unresponsive public water sector in the Warri region, residents and consumers that were left un-served and unconnected to the pipeline network embarked on private initiatives and intervention measures to provide water for themselves through the use of private borehole water supply systems. At present there exists an estimate of over 60,000 private boreholes used for domestic water supply in the Warri region.

Boreholes are forms of on-site solutions which provide water to one point demand or residential homes or public buildings. Without the use of private boreholes for domestic need, the water deficit in the Warri region stands grossly at 179,868 million liters/day if all 1.5 million inhabitants are to be supplied 120 liters/day as recommended by the Federal Ministry of Water Resources for cities such as Warri city.

BENEFITS OF ON-SITE SOLUTIONS FOR DOMESTIC WATER SUPPLY

According to the Nigerian Federal Ministry of Water Resources, the daily water requirement for residents in urban cities is 120 liter/day/capita, 60 and 30 liter/day/capita are for small towns and rural communities respectively. As aforementioned, water utilities like the Warri waterworks are not reliable and efficient in the supply of portable drinking water that would meet domestic requirements in Nigeria due to already explained factors.

With the use of private boreholes, local residents have a sense of ownership and dealership of their own water supply means. To these local residents, the use of boreholes for their domestic needs eliminates the difficulties which centralized state-run water utilities poses. As such, the use of private boreholes gives residents proximity to a water supply source (on-site boreholes) in their residents. These on-site borehole sources are thereby reliable at any time of the day when needed and gives unlimited access to water used in their homes.

Other social benefits which on-site boreholes provides may include the shortened hours invested by women and girls to fetch water from water vending points at long distances. In addition, the water from on-site boreholes are somewhat safer than open and sometimes contaminated waters from streams, rivers and lakes and thus cuts down the possibilities of water-borne diseases like cholera, diarrhea, dysentery, typhoid fever, Hepatitis A and others.

Summary of benefits: Proximity, reliability, accessibility, convenience, sense of private ownership and investment, promotes gender equality, saves time needed for fetching water which could be invested into growth and development of rural economy and food production.

DISADVANTAGES OF ON-SITE SOLUTIONS FOR DOMESTIC WATER SUPPLY

The benefits which a private borehole gives could prompt a sense of reckless management attitudes by users in relation to water resources. In situations where on-site borehole owners are having the perception that *one* could use “*endlessly*” much water with no tariff implies that local residents in the Warri region do not regard water as an economic good and thus they lack the basic sustainability principles. In addition, residents in the Warri region like many in other urban cities in Nigeria who use private boreholes for water supply do not consider the safe siting and good construction criteria both which are important to the management and protection of groundwater resources.

In cases like the Warri region where there is an estimate of over 60,000 private boreholes in use, there exist the possibility of groundwater reduction due to many users which normally results into higher rates of “cone of depression²”. In the Nigeria, there are no loggings or registration systems or the issuance of permit for the construction and use of private boreholes and thus the control and monitoring of borehole usage against any possibilities of groundwater contamination from many users are therefore weak.

Summary of disadvantages: Low construction quality and unsafe siting consideration of on-site may result to low quality of water, possibilities of unsustainable use of water resources, groundwater reduction, possibilities of aquifer contamination from one or many users, lack of monitoring and control by government which lack best available technologies and practices (BATs and BAPs).

ON-SITE SOLUTIONS: LIMITS AND UNTILAZATION.

The uses of private borehole water supply systems as a form of on-site solutions are considered to be well utilized when the withdrawals of water from the underground aquifers tend not to exceed the recharge rate of water into the aquifers. However, amidst growing population and increased water demand, the balance ratio seemed very hard to achieve as any action or actions taken to explore water for domestic, agricultural or industrial purposes would create a natural imbalance that triggers the alteration of the natural hydrological regime, quality/quantity, ecological equilibrium and the environment.

The challenges posed by on-site boreholes that are being used for water supply are almost the same in developed or developing regions of the world. Whether in rural India or sub-urban American counties, remote towns/settlements in the alps of Austria or anywhere else in Central Europe, in busy districts of Rio de Jeneiro and other similar towns of Latin America or in rural and semi-urban communities from Cape Town to Cairo in Africa. Simply put, whenever there are needs for water, and actions to source water from aquifers are carried out, the natural hydrological regime has been altered. The questions that should be answered since human anthropogenic needs for water through the use of on-site solutions affects the water cycle are:

1. How can the water deficits of cities be met all over the world of where a greater part of the population that depends on on-site boreholes as means of water supply?
2. What other means should be considered instead of private boreholes as means of water supply in rural and urban cities around the world?
3. In situations where the use of on-site boreholes is the best option for a given community and location, how can on-site boreholes be utilized in an environmental friendly way?

In my view, the answer to these three chief questions lies in the principle of sustainability, which tries to posit that the use of a form of natural resources should meet the needs of the present

² Cone of depression is a drawdown of groundwater surrounding a well or large number of wells in the shape of an inverted cone created after heavy pumping from each well.

people without compromising the quality and quantity for future generations. The sustainability principle therefore looks into how present needs are met through an efficient manner using the best available practices and technologies with due consideration of the environment, society and economy factors.

On-site interventions through the use of boreholes should not be the first sought option but other means of water supply such as centralized and decentralized water schemes should be given much emphasis during decision making. One of the biggest challenges on-site interventions via boreholes poses is that large concentration of boreholes in a region are dangerous to groundwater quantity and quality. Owing to this and other factors, centralized and decentralized water schemes could replace the private boreholes either in large or small settlements depending on the population. It could be suggested that for a county/district where the houses are unevenly dispersed from each other, decentralized water schemes could be the best option because it could reduce the risk of groundwater contaminations which individual borehole drillings may pose and also could maintain equilibrium in water withdrawal from the underground aquifer.

INTERACTIVE SESSION: “BRAINSTORMING”

Scenario 1: Government run public water utilities are constantly faced with problems of decision makings due to political influence on the public water sector which results to underfunding of water corporations, low maintenances of water utilities and distribution pipelines, lack of expertise, and lack of purification techniques of water before distribution. All these mentioned factors put together thus created inefficient, unreliable and irregular supply of water from water utilities with huge water supply deficits to the people in their areas of jurisdiction.

Connecting factors: Water scarcity, unresponsive government, underperforming water utilities in near collapse situations, local residents constantly experience water scarcity amidst growing population.

Scenario 2: The public water sector could not meet the water demands on the basis of reliability, affordability to rural and urban residents. Rural and urban residents thereafter embarked on their sole pursuit to provide water supply and sanitation through drilling of private wells (boreholes) for the convenience and sustenance of their individual households and businesses. These boreholes were neither registered nor logged at the ministry of water resources, nor were drilling permissions sought on how and where to site them. Respectively, most boreholes are sited in areas that are close to landfills and along septic tanks axis.

Problems: The causal factors of *scenario 1* resulted into **scenario 2** which is characterized by uncontrolled and unmonitored usage of private borehole water supply systems that may lead to reduction of groundwater quality and quantity, occurrence of saline intrusion into groundwater aquifer, and increasing numbers of private boreholes usage in the region.

Overview: Considering scenarios 1 and 2 and the connecting factors, what measures, policies and actions would you suggest for effective government-run water utilities and private interventions to water supply for a growing population considering the problems stated above.

Goal: We would want to develop a “mock” sustainable policy with BAPs and BATs where no one is left worse for the betterment of others with the environment and water resources crucial factors for decision making.

We are looking forward to your inputs.

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