Evaluating the Sustainability of Oferekpe Water Supply Scheme in Abakaliki

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Abstract: *This study aims at evaluating Oferekpe public water supply scheme in Ebonyi State. A rapid assessment of the scheme was primarily based on questionnaires. SWOT (Strength, Weaknesses, Opportunities, and Threats) analysis was also conducted for more detailed sustainability assessments. Evaluating result shows that availability of water is provided throughout the year, although only four hours per day to save operational and maintenance costs to the dissatisfaction of the users. SWOT analysis indicates provision of water with drinking water quality with high acceptance by users, as strength, uneven distribution of the water scheme as weakness, alternative as groundwater based scheme and potential for rural area as opportunity and finally, threat poses as instability in the operation and maintenance of the scheme due to lack of financial support by the community. In conclusion, proper operation and maintenance is a key to the good functioning of the scheme. It is therefore, recommended that policy on Ofereke water scheme be developed based on an integrated assessment that incorporates social, health, environmental, institutional and economic aspects which are as important as technical factors to achieve sustainable provision of water for communities in Abakiliki.*

Keywords: SWOT analysis, sustainability, Ofereke water supply scheme, treatment processes

INTRODUCTION: In the past, the entire population of Ebonyi state was served with water supply from Ezilo water scheme, built by the Chief Jim Nwobodo's administration in the old Anambra state of Nigeria. Later on, it become non-functional and stopped operation which led to perennial water scarcity in the state capital. In the year 2015, intervention of then Governor Dave Umahi led administration, stepped up to avert the terrible state of water supply in Ebonyi state with the completion of Oferekpe public water supply schemes that was started by the past administration of Governor Martin Elechi. The contract was awarded to Gilmor Engineering (Nigeria) limited in 2007 and was completed on 19th march 2015. The official hand over and taking over from Gilmor by Ebonyi State Government took place on the 7th June 2017 (The Nation, 2017).

Though, some governmental policies are in place to address sustainable management of water resources yet these are not yet applied locally, as it is evident that a good number of these community based projects in water and sanitation are not sustainable. However, for proper management of water resource systems, it is important to evaluate the sustainability of the existing project because constant and apparent shortfalls in public water supply have forced many family to fall back to water sources that are not potable(Balogun et al.,2017). This is a situation that occurred in Ndiogbu community in Izzi Local Government Area of the state, where the inhabitants resort to poor water sources like streams, rivers and dilapidated borehole. Report has it that contaminated drinking water from these sources led to an outbreak of cholera in which, at least, fifty people died. (Akpa, 2015).

Therefore, there is need to evaluate the sustainability of Oferekpe water supply scheme in Abakaliki in order to identifying limitations and opportunities for advancement presently and in future. In this study, a SWOT-analysis was conducted. This analysis is a management techniques used for assessing the strength, weakness, opportunities, and threats of a business. Recently, it is being applied in the management of natural resource (Mainali, 2011).

METHODS:

Area of Study

Abakaliki is the capital city of the present-day Ebonyi State in southeastern Nigeria, located on latitude and longitude coordinates of $6^0 19^l 29.46^{ll}N$, and $8^0 6^l 49.25^{ll}E$. Abakaliki lies at the intersection of the Enugu, Afikpo and Ogoja Roads. The capital city is also known for its local lead, zinc, salt and limestone quarrying and also a center of agricultural trade such as yams, cassava, rice,and both palm oil etc.
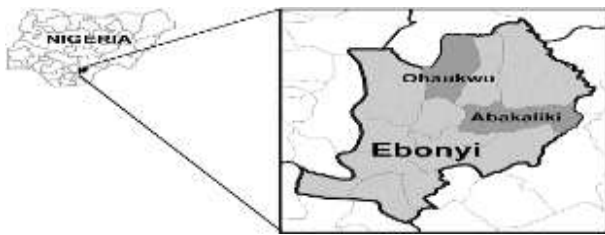
Fig 1:Map of Nigeria showing Abakiliki

Oferekpe Water Treatment Plant (OWTP) is situated at Oferekpe village, at Iyinmagu – Ikwo Local Government Area of Ebony State. It has a capacity of $100,000m^3$ per day. It is presently running at 5% capacity.

Collection of data:
Assessment of the sustainability of the Oferekpe water scheme was based on questionnaires and SWOT analysis. Data was collected by observing water supply facilities, interviewing water committees and water users and collecting documentation. Information related to the Oferekpe water supply and distribution was collected using questionnaire: a total of 100questionnaires were distributed to the inhabitants within Abakiliki. The questionnaire has 10 items. The mean and analysis of variance for each item were computed and presented. The data were scored on a 4-point scale namely agree, disagree, strongly agree, and strongly disagree (weighted 4 point). The questionnaire data were separated into two groups: male and female, after they were collected from the respondents. The general questionnaire was targeted at collecting information, especially non-technical aspect of the scheme.

Hypothesis:
Ho: There is no significant difference between the opinion of male and female on the sustainability of the scheme.
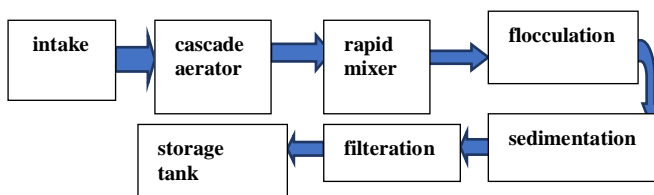
RESULT:

Fig 2: Flowchart of Ofereke treatment plant

Table 1: Mean value of public view on factors militating against sustainability (non-technical aspect) of Ofereke water supply scheme

	Items	Mean	Remark
1	There is no urgent need for water supply scheme in Ebonyi state	1.94	R
2	The quality of this scheme does not possess any form of health challenge to the community	3.31	A
3	The quality of this water scheme is not portable and palatable?	2.30	R
4	Government should be responsible for the repairing cost of water points of the scheme?	2.65	A
5	The water scheme satisfy the individual daily demand of the community	2.42	R
6	The water scheme supplies water 24hours in a day	2.14	R
7	There is no need for more water points of the water scheme presently and in future against population increase	1.70	R
8	This Oferekpe water scheme is reliable for the ten years	2.10	R
9	Not all household has a water point originated from this scheme	2.70	A
10	This Oferekpe water scheme is not a viable project to the community	1.81	R

Table 2: One-way ANOVA for difference between male and female opinion on the sustainability of Oferekpe water scheme.

1tem	Source of Variance	df	MS	F	P-value	F crit
1)	Between G	1	144.5	1.66861	0.243631	5.687978
	Within G	6	86.5833			
2)	Between G	1	200	136863	0.286214	5.987978
	Within G	6	146			
3)	Between G	1	170.6667	0.71366	0.445966	7.708647
	Within G	4	239.3333			
4)	Between G	1	96	3.86577	0.1207	7.708647
	Within G	4	24.8333			
5)	Between G	1	96	1.037838	0.365929	7.708647
	Within G	4	92.5			
6)	Between G	1	0.125	0.000526	0.982445	5.987378
	Within G	6	237.625			
7)	Between G	1	144.5	0.87797	0.384923	5.987378
	Within G	6	164.5833			
8)	Between G	1	144.5	2.066746	0.20058	5.987378
	Within G	6	69.91667			
9)	Between G	1	144.5	1.025429	0.350315	5.987378
	Within G	6	140.9167			
10)	Between G	1	144.5	0.542044	0.489359	5.98737
	Within G	6	266.5833			

Table 3:   Result of SWOT analysis

STRENGTH	WEAKNESS
• Constant water supply • High acceptance • Provision of water with drinking water quality • Alternative to direct abstraction of surface water	• Water quality and quantity is impacted by river water quality and variable river topography • External financial support is needed for expansion to rural areas
OPPORTUNITY	THREAT
• Potential for rural area • Alternative to groundwater supply • Revenue generation for the state	• Vulnerable in the distribution system • possible outcome relating to changes in members of water committees

DISCUSSION & CONCLUSIONS:
Discussion:
Figure 2 shows the Ofereke treatment processes.
The intake for Oferekpe water scheme is Cross River (a river in Cross River State) near the boundary between Ebonyi State and Cross River State. An intake structure used for collecting and conveying raw water to the water treatment plant is made of concrete. A low lift pipe with a diameter of 800mm lifts water from the river to the raw water tank at upper land. The first treatment stage is an aeration system made up of a cascade aerator. The high lift pumps, takes water through a 1000mm diameter pipe from the raw water tank to a cascade spreading step like basin in a falling manner. This is to enable the water undergo atmospheric exposure. It allows the water to react with oxygen, in order to remove odour.
Mixing Channel is the second stage of the treatment process. From the aeration chamber, the water moves to a rectangular channel where alum and lime is added to the water for coagulation and water softening.
The third stage is the rapid mixer which mixes the water rapidly, collecting the colloids together and taking them away from the water body through a medium known as the mud sucker. The fourth process is flocculation process whereby the destabilized particles are bound together by hydrogen bonding or Van Der Waal's forces to form larger particle flocs during which further particulate removal takes place by entrapment.

The next process occurs in a sedimentation tank which uses mud sucker instead of scraper bridge.

Here, water is allowed to settle at the bottom of the tank at a maximum time of one-hour. A layer of accumulated solids, called sludge, forms at the bottom of the tank and is removed from the system.
The final treatment unit is filtration with leopold drain system. At this point, the treated water has achieved a certain level of purification. This process entails the separations of solids from the water using a screen medium that allows the liquid to pass but not the solids. The fluid that passes through the filter is called the filtrate. After the water treatment process is completed, water is stored in an underground storage tank. From there, water is pumped to the reservoir with the help of the high lift pumps. The flow chart is shown in figure 2.

In Table 1, mean value of the respondent's views is calculated with respect to the questionnaire. The cutoff point was obtained by sum of the weighing of the response categories (1,2,3and4) and dividing by the number(4). The remark on the mean depends on the cutoff point computed. Therefore, all those items with 2.5 and above are ACCEPTED (A) while those below are REJECTED (R).These rejected items are factors militating against the sustainability of the scheme.
The table was prepared based on four non-technical aspects (health and safety, economic, social and institutional) that could be important for sustainability of the scheme and the summary result is discussed below:

Health aspects
In general, emphasis on health safety aspects in the evaluated Ofereke water supply scheme was poor and comprised only physicochemical analysis and not microbiological analysis of the water. There could be risks related to faecal-oral transmission of pathogenic agents to users during supply to the consumer through the drinking water distribution network (pipes, storage tanks) because there is no disinfection unit in the treatment process. However, the water requires disinfection by chlorination. This is important because the chemical (chorine) will be able to produce residual that will provide an additional protective measure against any post treatment contamination resulting from faults in the distribution system. For example, a respondent reported of an incident three years ago when water distribution pipe that was exposed by erosion along Udensi quarters Abakiliki was burst by passerby. Inflows of contaminated water during distribution are major sources of waterborne pathogens and thus cause of waterborne diseases.

Social aspect
The study has shown that the water scheme has gained widespread acceptance for drinking and domestic purposes, because it is the best option for water supply. The main problem mentioned by 60% of the respondents is the small number of hours (4hours) involved in water delivery. Users fill their private tanks in time and use this water for the rest of the day. Another problem is that repairs of any faulty water point are made depending on how fast payment is made by users.

Economic aspect
The Oferekpe and Ukawu projects were both awarded to Israeli firms with the estimated cost of about N9billion. Each was designed to produce 100 million cubic litres of water per day.. Payment of water fee from household has not yet being fully implemented. Occasionally, water charges are being collected from the users, but no regular pattern of payment is established.. Other means of revenue generation is from money charged for installation of water points in every user's premise. At the time of this research, there is no arrangement for recovery of operation costs.

Institutional aspects
The main institutions involved are Ebony state water corporation agency, water committee and Ebony state rural water agency responsible for water delivery to the public and Ministry of Water Resources, Abakaliki are responsible for monitoring the water quality, operation and maintenance. The water scheme is included in the state budget and so its operation and maintenance is affected by budget execution procedure. This causes delay in releasing fund used for procuring of diesel needed for pumping water and most often puts the consumers into water stress for some days and this poses as a risk for the future.

In Table 2 above, it can be seen that there is no variation in the opinion of males and females in all the ten items relating to sustainability of the scheme, because F < F critical. Therefore null hypothesis is accepted.

SWOT Analysis
Strength
The main benefit of the water scheme compared to the direct abstraction of surface water is a significant removal of some percentage of bacteria and turbidity. Sufficient water to cover the domestic demand was provided, though water is only provided four hours per day to minimized cost of energy. Users filled their private tanks in this time and use this water the rest of the day. SWOT analysis result shows that the water is well accepted by the majority of the users.

Weakness
There is uneven distribution of water points within Abakiliki town as some inhabitants are allowed to fetch water after owners of water points have filled all their containers. Again, proper operation and maintenance is a key to the good functioning of the scheme. To avoid delay in release of operational fund from state budget, continuous financial support from both committee and non-governmental organizations (NGOs) is necessary..

Opportunity
The Oereke water scheme has the opportunity of being expanded to meet the growing water demand of the rural areas. It is a great alternative to groundwater supply because of difficulty experience in installing a functional borehole because of the geographical location of Ebony state.

Threat
Deterioration of the water quality during transportation via distribution pipe and the quantity can be affected by seasonal variation through river water characteristics. Thus constant monitoring is required to ensure safe drinking water. Bad attitude or new job opportunities can also cause changes in the make-up of water committees and this poses a big challenge to the scheme.

Conclusion:
In Abakiliki, Ministry of Water Resources provides urban water services, but has limited recources to provide more than four hours service delivery to the public. This could be attributed to the agency incurring high operating and maintenance costs and little revenue generation.
Again, for easy accessibility of the water scheme by many users, there is need for increase in the water points within Abakiliki to overcome daily water demand of the population. It is therefore, recommended that policy on Ofereke water scheme be developed based on an integrated assessment that incorporates social, health, environmental, institutional and economic aspects which are as important as technical factors to achieve sustainable provision of water for communities in Abakiliki.

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