

CHALLENGES TO REGULAR URBAN POTABLE WATER SUPPLY IN AFRICA: A STUDY OF ENUGU METROPOLIS IN SOUTHEAST NIGERIA

Onyenekenwa C. Eneh* and Precious A. Nnaji

*Institute for Development Studies, Enugu Campus
University of Nigeria, Nsukka*

* Corresponding author, Mobile: +234-803-338-7472,
Email: onyenekenwa.eneh@unn.edu.ng

ABSTRACT

Efforts by the Enugu State Government of Nigeria to prioritize pipe-borne water supply to Enugu metropolis has not abated the irregularity of potable water supply therein. The study is, therefore, aimed at identifying the challenges that hinder the Enugu State Water Corporation from supplying potable water on a regular basis to residents in Enugu metropolis, with a view to proffering solutions. Questionnaire was administered to 611 staff of the Enugu State Water Corporation to elicit information, which were analysed statistically for answers to the research questions. Findings showed the challenges to regular supply of pipe-borne water in Enugu metropolis were, among others, consumer unwillingness to pay water rates, operational constraints, inadequate funding, increasing population, political interference, irregular payment of staff salaries of Water Corporation, corrupt practice among staff of the Corporation, and lack of strategies for improving the supply of pipe-borne

water in Enugu metropolis. Recommendations include, among others, adoption of Public Private Partnership (PPP) model.

INTRODUCTION

Water is intertwined with, and a primary building block of, human life. A resource without substitute, it is paramount to health, food security, energy, ecosystem and future (Transparency International, 2008).

No meaningful socio-economic development can occur without determined effort to improve the supply of water to citizens. Eneh and Eneh (2014) reported that 40% of Africans lack improved water supply and 20.7% of African countries had less than 50% of their population with access to potable water in 2004. Lack of access to potable water exacerbates poverty and dictates health and economic crises in Africa. The health issues are miscarriages, birth defects, and infantile health challenges, such as methaemoglobinemia and dehydration, among others. People suffering from illnesses related to poor sanitation occupy 50% of hospital beds in sub-Sahara Africa. These illnesses account for 12% of the health budget. Corruption and poor governance in water sector are contributory factors to poor access and management of potable water in African countries. Up to 50% water is wasted to leakages in pipes and canals and illegal connections.

Recognizing access to safe drinking water as extremely important, the Millennium Development Goals (MDGs) targetted, among others, to “halve by 2015 the proportion of people without sustainable access to safe drinking water and sanitation” (Akpor and Muchie, 2011). Nigerian National Water Supply Policy prescribes water for all with 120 liters per capita per day for urban and peri-urban and 60 liters for rural areas by 2020 (National Bureau of Statistics, 2005).

In Nigeria, the public water sector is responsible for the provision of safe drinking water (piped-borne water) to households, institutions, businesses and industries. This is obtained from treated water sources,

untreated groundwater sources, shallow boreholes, wells, ponds, springs, lakes, rivers, and streams (Nwankwoala, 2011).

Ojibo (2009) reported that only about 30% of the population of Enugu metropolis has access to potable water supply. Enugu State Water Corporation has been deterred from regular supply of potable water to Enugu metropolis by many impediments. In alternative, residents buy water from mobile water suppliers, paying fifty Naira (N50) for 25-litre gallon of safe drinking water, two thousand Naira (N2,000) for a tank of five hundred gallons and four thousand Naira (N4,000) for a tank of one thousand gallons. Households also complement their water needs with water from contaminated rivers, hand-dug wells and boreholes for bathing, washing and even cooking. This results in poor welfare of people, preventable water-related diseases and deaths, increased spending on mobile water supplies, poor quality of the environment and more (Khatri and Vairavamoorthy, 2007).

Enugu State Government has long considered the provision of pipe-borne water as a priority project and has made significant investments in recent years. But, the success of the efforts to provide sustainable access to potable water have been limited. The study is, therefore, aimed at identifying the challenges that hinder the Enugu State Water Corporation from supplying potable water on a regular basis to residents in Enugu metropolis, with a view to proffering solutions to the identified challenges.

Some research questions guided the study. Questionnaire and interview were the instruments for eliciting information. The data were analysed statistically and null hypotheses were tested at the end of the investigation to address the research questions.

METHODOLOGY

The population of the study is made up of 611 staff of the Enugu State Water Corporation as distributed in Table 8.3.1.

Table 8.3.1: Population of the study

S/No	Name of Department	No. of staff
1	Administration	106
2	Engineering, P&D, O&M, Enugu Metropolis Zone, Oji & B/Stations & Ajalli work stations	245
3	Finance and Supplies	53
4	Commercial and PIU	72
5	Nsukka Zone	54
6	Udi zone	12
7	9 th Mile zone	16
8	Staff deployed to EN-RUWASSA	29
9	Staff on contract	23
	Total	611

Source: Administrative Department, Enugu State Water Corporation

The sample size for this study was determined using the Taro Yammane formula (Onodugo et al, 2010):

$$n = \frac{N}{1 + (Ne^2)}$$

Where n = sample

N = population size,

E = error at 5% (standard value of 0.05) and '1' is the constant value.

Substituting in the formula,

$$n = \frac{611}{1 + 611(0.05^2)}$$

$$n = 241.74 \text{ or approximately } 242.$$

A sampling interval was obtained as the quotient of the sample size (611) and n (242). This is $611/242 = 2.5$ or 3. To determine the respondents, the first name was picked and then every 3rd person from an alphabetical list of the staff.

The questionnaire was prepared with answer options in a 4-point likert-scale of Strongly Agree (SA: 4 point), Agree (A: 3 point), Disagree (D: 2 point), and Strongly Disagree (SD: 1 point). It elicited information on social and demographic characteristics of respondents and the four (4) research questions. Detailed and guided interview was also be used to get necessary and basic information from key staff of the Enugu State Water Corporation involved in the supply of water.

Onwumere (2005: 69) defines validity as “the extent to which a measuring instrument on application performs the function for which it is designed”. To validate the instrument, a sample of the questionnaire was given to the supervisor of the study and the Head of Administration in Enugu State Water Corporation to scrutinize it in terms of content, format and its appropriateness in getting the desired results. Their views were accommodated in finalizing the instrument.

In analyzing the challenges of regular water supply by the Enugu State Water Corporation in Enugu Metropolis, the descriptive statistics were applied to achieve the objective of the study. Data were presented in frequency and percentage tables. The average mean score (AMS) technique was used to test the hypothesis. The decision value (DV) was obtained from the average of all the scale points (4, 3, 2, 1).

$$DV = \frac{4 + 3 + 2 + 1}{4} = \frac{10}{4} = 2.5$$

Using the formular (Osuala, 2007),

$$\text{Calculated value (CV)} = \frac{\sum Fx}{\sum F}$$

Where, F is the frequency
x is the scale point

The CV was later compared with the decision value (DV) of 2.5. If CV is greater than DV, then the answer was regarded as being in the positive, if it is less than DV then the answer was regarded as negative. Similarly, null hypotheses was rejected if CV was greater than DV, and accepted if CV was less than DV.

RESULTS AND DISCUSSION

A total of 242 questionnaires were administered, out of which 228 copies were correctly completely and returned by respondents. The calculated questionnaires return rate is thus 94% (Table 8.3.2).

Table 8.3.2: Questionnaire Return Rate

Number of questionnaires distributed	242
Number of questionnaires returned	228
Questionnaire return rate	94%

Source: Fieldwork 2015

Information was obtained on the social and demographic characteristics of the respondents. They are summarized in Table 8.3.3. Findings show that out of 228 respondents, 177 were male (78%) while 51 (22%) respondents were female. It is evident that there was more male staff than their female counterparts.

Table 8.3.3 shows that the bulk of the respondents 134 (59%) were married. Eighty-two (82) were singles (36%), while the remaining 12 (5%) were widows. This implies that majority of staff of the Corporation were married. Respondents below 30 years of age were 49 (22%), those

aged 31-35 were 114 (50%), those between ages of 46 and 55 were 53 (23%) and those aged 56-65 were 12 (5%). Therefore the mode age bracket was 31-45, belonging to the youth and the productive age of the Corporation.

Table 8.3.3: The social and demographic characteristics of respondents

S/No	Subject		No. of Responses	% Score
1	Gender	Male	177	78%
		Female	51	22%
2	Marital Status	Married	134	59%
		Single	82	36%
		Widowed	12	5%
3	Age	Below 30 years	49	22%
		31- 45 years	114	50%
		46- 55 years	53	23%
		56- 65 years	12	5%
4	Religion	Christianity	226	99%
		Islam	0	0
		Traditional	1	0.5
		None	1	0.5
5	Level of Education	Primary	7	3%
		Junior Secondary	15	7%
		Senior Secondary	115	50%
		Tertiary	91	40%

Source: Fieldwork, 2015

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Christians dominated the Corporation with 99% (226). None belongs to the Islam, only one person is a traditionalist and the other one is an atheist. The total number of respondents with primary education was 7(3%). Fifteen (15) or 7% ended in junior secondary, 115 (50%) ended in senior secondary and lastly, 91(40%) attended tertiary institution.

Table 8.3.4 shows information on the challenges to regular water supply.

Table 8.3.4: Challenges to regular water supply

Parameter	Likert scale (x)				ΣF	ΣFX	CV	Remark	Decision
Unaffordable bill	4	3	2	1	228	240	1.1	CV< DV Answer is neg.	Accept null hypotheses (1)
Frequency (f)	0	0	12	216					
Fx	0	0	24	216					
Unwillingness to pay water rates					228	391	1.7	CV< DV Answer is neg.	Accept null hypotheses (1)
Frequency	0	33	97	98					
Fx	0	99	194	98					
Lack of competition					228	489	2.1	CV< DV Answer is neg.	Accept null hypotheses (1)
Frequency	6	58	127	37					
Fx	24	174	254	37					
Operational constraints					228	890	3.9	CV> DV Answer is positive.	Reject null hypotheses (1)
Frequency	206	22	0	0					
Fx	824	66	0	0					
Consumer uncooperative attitudes					228	438	1.9	CV< DV Answer is neg.	Accept null hypotheses (1)
Frequency	13	26	119	70					
Fx	52	78	238	70					
Vandalism					228	677	2.9	CV> DV Answer is positive.	Reject null hypotheses (1)
Frequency	63	95	70	0					
Fx	252	285	140	0					
Inadequate funding/subsidy					228	856	3.7	CV>DV Answer is positive.	Reject null hypotheses (1)
Frequency	202	16	0	0					
Fx	808	48	0	0					
Corrupt practices by officials					228	620	2.7	CV>DV Answer is positive.	Reject null hypotheses (1)
Frequency	53	104	25	46					
Fx	212	312	50	46					
Inadequate payment of workers salary					228	894	3.9	CV> DV Answer is positive.	Reject null hypotheses (1)
Frequency	210	18	0	0					
Fx	840	54	0	0					

Inefficiency due to political interference					228	721	3.1	CV> DV Answer is positive.	Reject null hypotheses (1)
Frequency	70	125	33	0					
Fx	280	375	66	0					
Increasing population					228	776	3.4	CV>DV Answer is positive.	Reject null hypotheses (1)
Frequency	98	124	6	0					
Fx	392	372	12	0					

Source: Field work, 2015

Water rates were considerate and very much affordable. None of the respondents strongly agreed that unwillingness to pay water rate by the consumers was a challenge to regular water supply, 99 agreed, 194 disagreed and 98 strongly disagreed.

Six (6) respondents strongly agreed that lack of competition was a challenge to regular water supply, 58 agreed, 127 disagreed and 37 strongly disagreed. Thus lack of competition was not a challenge. This is expected from suppliers.

Two hundred and six (206) respondents strongly agreed that operational constraints were a big challenge to regular water supply, 22 agreed, none disagreed and none strongly disagreed. This implies that operational constraints are a challenge to regular water supply.

Thirteen (13) respondents strongly agreed that customers do not co-operate, 26 agreed, 119 disagreed and 70 strongly disagreed that customers unco-operative attitude was a challenge to regular supply of safe water. Thus, consumer unco-operative attitude was not a challenge.

Sixty (60) respondents strongly agreed that vandalism was a challenge and 95 agreed. Seventy 70 respondents disagreed, and none strongly disagreed that vandalism was a challenge. Therefore, vandalism was a challenge.

Two hundred and two (202) respondents strongly agreed that inadequate funding was a major challenge to regular supply of water. Sixteen (16) agreed, none disagreed and none strongly disagreed that

inadequate funding was a challenge to regular supply of water. Thus, all agreed that inadequate funding was a challenge.

Fifty three (53) strongly agreed that corrupt practices by staff members was a challenge, 104 agreed, 25 disagreed and 46 strongly disagreed. Inadequate payment of staff salary has 210 respondents strongly agreeing to it since they were being owed since February, 2015 till date. Eighteen (18) agreed, none disagree and none strongly disagreed. Unpaid salaries demotivated staff and affected performance.

Seventy (70) respondents strongly agreed that political interference was a challenge, 125 agreed, 33 disagreed and none strongly disagreed. Thus political interference was a challenge.

Ninety eight (98) respondents strongly disagreed that increasing population was a challenge to regular water supply, 124 agreed, 6 disagreed, and none strongly disagreed. Thus, increase in population was a challenge.

Table 8.3.5 shows the effects of the challenges of regular water supply on the performance of the Corporation. Fifty-six (56) respondents strongly agreed that low return from revenue collection was one of the effects the challenges had on the Corporation, 99 agreed, 61 disagreed and 12 strongly disagreed. Thus, low returns from revenue were an effect of the challenges.

Ninety eight (98) strongly agreed that one of the effects of the challenges on the Corporation was that they lose huge amount of money as bad debt, 117 agreed. Thirteen (13) disagreed and none strongly disagreed. This implies that the loss of revenue was the effect of the challenges.

Nine (9) strongly agreed that loss of professionals was one of the effects of the challenges on the Corporation, 85 agreed, 97 disagreed and 37 strongly disagreed. Thus, professional were not lost as a result of the challenge.

Ninety (90) strongly agreed that the challenges causes lack of motivation on the staff of the corporation, 99 agreed, 37 disagreed 2

respondents strongly disagreed. Thus, the staff are not motivated for improved performance.

Table 8.3.5: Effects of challenges to regular water supply

Parameter	Likert scale (x)				ΣF	ΣFX	CV	Remark	Decision
	4	3	2	1					
Low returns in revenue collection					228	655	2.8	CV>DV Answer is pos.	Reject null hypotheses (11)
Frequency	56	99	61	12					
Fx	224	297	122	12					
Loss of revenue (bad debt)					228	769	3.3	CV> DV Answer is positive.	Reject null hypotheses (11)
Frequency	98	117	13	0					
Fx	392	351	26	0					
Loss of professionals					228	522	2.2	CV<DV Answer is neg.	Accept null hypotheses (11)
Frequency	9	85	97	37					
Fx	36	255	194	37					
Lack motivation					228	733	3.2	CV>DV Answer is pos.	Reject null hypotheses (11)
Frequency	90	99	37	2					
Fx	360	297	74	2					
Encourages corrupt practices					228	633	2.7	CV> DV Answer is pos.	Reject null hypotheses (11)
Frequency	55	80	84	9					
Fx	220	240	164	9					
Pipe rusting and damaging					228	710	3.1	CV> DV Answer is pos.	Reject null hypotheses (11)
Frequency	75	104	49	0					
Fx	300	312	98	0					
Low labour productivity					228	796	3.4	CV> DV Answer is pos.	Reject null hypotheses (11)
Frequency	112	116	0	0					
Fx	448	348	0	0					

Source: Field work 2015

Fifty five (55) strongly agreed that the challenges encourages the staff to indulge in corrupt practices e.g bribery, 80 agreed, 84 disagreed and 9 strongly disagreed. Indulgence in corrupt practices was an effect of the challenges on workers performance.

Pipe rusting and damaging has 75 strongly agreeing to it, 104 agreed, 49 disagreed and none strongly disagreed. Thus, pipe rusting was an effect of the challenges.

Table 8.3.6 shows the efforts to ameliorate the challenges of regular water supply. None of the respondents strongly agreed that the

corporation embarks on staff training and retraining, 50 agreed; 94 disagreed and 84 strongly disagreed. Thus the Corporation does not train or retrain their staff members.

Table 6: Measures taken to ameliorate the challenges

Parameter	Likert scale (x)				ΣF	ΣFx	CV	Remark	Decision
Staff training/retraining	4	3	2	1	228	422	1.8	CV< DV Answer is neg.	Accept null hypotheses
Frequency (f)	0	50	94	84					
Fx	0	150	188	84					
High level of integrity					228	725	3.1	CV> DV Answer is neg.	Reject null hypotheses
Frequency	86	97	45	0					
Fx	344	291	90	0					
Orientation of employees					228	362	1.5	CV< DV Answer is neg.	Accept null hypotheses
Frequency	0	0	134	94					
Fx	0	0	268	94					
Specialist engagement					228	696	3.1	CV> DV Answer is pos.	Reject null hypotheses
Frequency	78	97	40	13					
Fx	312	291	80	13					
Proper management of fund					228	545	2.4	CV< DV Answer is neg.	Accept null hypotheses
Frequency	20	67	123	18					
Fx	80	201	246	18					
Adequate payment of salary					228	318	1.3	CV< DV Answer is neg.	Accept null hypotheses
Frequency	0	0	90	138					
Fx	0	0	180	138					
On the job training					228	405	1.7	CV< DV Answer is neg.	Accept null hypotheses
Frequency	0	40	97	91					
Fx	0	120	194	91					
Enforcement of water bills payment					228	749	3.2	CV> DV Answer is pos.	Reject null hypotheses
Frequency	97	99	32	0					
Fx	388	297	64	0					
Sanctioning defaulters					228	634	2.7	CV> DV Answer is pos.	Reject null hypotheses
Frequency	39	100	89	0					
Fx	156	300	178	0					

Source: Field work, 2015

Eighty six (86) strongly agreed that the Corporation's management has high level of integrity, 97 agreed, 45 disagreed and none disagreed. This indicates that the management of the Corporation are people of integrity.

None of the respondents strongly agreed that the management of the Corporation carries out orientation for new employees, none agreed, 134 disagreed and 94 strongly disagreed. This is negligence on the part of the management of the corporation because any new employee should be informed and educated on the work he/she is about to do together with the rules/regulations in the workplace.

Seventy eight (78) strongly agreed that the Corporation engages specialists, 97 agreed, 40 disagreed and 13 strongly disagreed. Thus the Corporation engages specialists.

Twenty (20) strongly agreed that the corporation manages their fund properly, 67 agreed, 123 disagreed and 18 strongly disagreed. Thus the management do not manage fund properly.

None strongly agreed on the adequacy of salary payment, none agreed, 90 disagreed and 138 strongly disagreed. The fact is that currently they have not been paid over six months.

None strongly agreed that there is on the job training for workers, 40 agreed, 97 disagreed and 91 strongly disagreed. The Corporation does not conduct on the job training for the staff.

On whether payment of bills was enforced on consumers, 97 strongly agreed, 99 agreed, 32 disagreed and none strongly disagreed. Thus the Corporation enforced the payment of water bills.

On whether the water rate payment defaulters were sanctioned the Corporation, 39 strongly agreed that the Corporation sanctions defaulters, 100 agreed, 89 disagreed and none strongly disagreed. Thus, there were no sanctions for defaulters.

Table 8.3.7 shows strategies that could be adopted by the Enugu State Water Corporation to ameliorate the challenges of regular water supply. Two hundred and twenty (220) respondents strongly agreed that there should be frequent maintenance of equipment, 8 agreed, none (0) disagreed and none strongly disagreed. Therefore, all the respondents

believe that if there are frequent maintenance on the equipments, the challenges will be minimized.

Table 8.3.7: Strategies to ameliorate the challenges

Parameter	Likert scale (x)				ΣF	ΣFx	CV	Remark	Decision
	4	3	2	1					
Frequent maintenance	4	3	2	1	228	904	3.9	CV> DV Answer is pos.	
Frequency (f)	220	8	0	0					
Fx	880	24	0	0					
Training and retraining of staff					228	912	4	CV> DV Answer is pos.	
Frequency	228	0	0	0					
Fx	912	0	0	0					
Adequate funding					228	912	4	CV> DV Answer is pos.	
Frequency	228	0	0	0					
Fx	912	0	0	0					
Proper security at equipment sites					228	751	3.2	CV> DV Answer is pos.	
Frequency	67	161	0	0					
Fx	268	483	0	0					
Adequate motivation of staff					228	782	3.4	CV> DV Answer is pos.	
Frequency	98	130	0	0					
Fx	392	390	0	0					
Proactive maintenance and preventive measures					228	774	3.3	CV> DV Answer is pos.	
Frequency	93	135	0	0					
Fx	372	405	0	0					
Engagement of effective distribution channels					228	703	3.0	CV> DV Answer is pos.	
Frequency	19	209	0	0					
Fx	76	627	0	0					
Service centre in each L.G.A.					228	695	3.0	CV> DV Answer is pos.	
Frequency	87	65	76	0					
Fx	348	195	152	0					
Improvement on the rate of revenue collection					228	747	3.2	CV> DV Answer is pos.	
Frequency	93	125	0	0					
Fx	372	375	0	0					
Engage PHCN Properly					228	899	3.9	CV> DV Answer is pos.	
Frequency	215	13	0	0					
Fx	860	39	0	0					
Privatization/commercialization					228	744	3.2	CV> DV Answer is pos.	
Frequency	380	294	70	0					
Fx									

Source: Field work, 2015

All the respondents, 228 strongly agreed that there should be training for staff members according to their areas of specialization. None agreed, none disagreed and none strongly agreed.

All the respondents, 228 strongly agreed that adequate funding of the corporation should be put in place. None agreed, none disagreed and none strongly disagreed. Thus, adequate funding was necessary for optimal performance of the Corporation.

Sixty seven (67) strongly agreed that proper security at the equipments site is necessary, 161 agreed, none disagreed and none strongly disagreed. Thus, proper security is highly needed to avert vandalism.

Ninety eight (98) strongly agreed that adequate motivation of staff should be put in place, 130 agreed, none disagreed and none (0) strongly disagreed. Thus, the workers should be motivated for optimal performance.

Ninety three (93) strongly agreed that there should be proactive maintenance and preventive measures, e.g., proper handling of machines, 135 agreed, none disagreed and none (0) strongly disagreed. Thus, proactive measures will prevent damages and failures of machines and equipments.

Nineteen (19) strongly agreed that effective distribution channels should be put in place, 209 agreed; none (0) disagreed and none strongly disagreed. Thus, effective distribution channels will enhance the performance of the Corporation.

Eighty seven (87) strongly agreed that service centers should be located at each Local Government Area (L.G.A.) to ensure immediate response and action to customer's complaints, 65 agreed, 76 disagreed and none strongly disagreed. Thus, the service centers will help the Corporation attend to complaints and emergencies in time.

Ninety three (93) strongly agreed that there should be improvement on the Corporation's effort in revenue collection to improve on the

funding of the corporation, 125 agreed; none (0) disagreed and none strongly disagreed.

Two hundred and fifteen (215) strongly agreed that PHCN should be properly engaged to ensure uninterrupted power supply. Thirteen agreed, none disagreed and none strongly disagreed. The Corporation cannot pump/distribute water effectively without an uninterrupted power supply; therefore, the PHCN must ensure an uninterrupted power supply.

On privatization and commercialization, 95 respondents strongly agreed that there should be privatization of the water sector, 98 agreed; 35, disagreed and none strongly disagreed. Thus, privatization was necessary for improved performance since the Government alone cannot maintain effective and efficient service delivery.

Research question 1 probed the factors that challenge the regular supply of water. From Table 8.3.1, the CV (2.8) was greater than DV (2.5).

Table 8.3.1: Challenges to regular supply of water to Enugu metropolis

Response	Scale, x	Frequency, F	Fx	Percentage
SA	4	84	336	36.9
A	3	57	171	24.8
D	2	45	90	19.6
SD	1	42	42	18.7
Total		228	639	100

$$\text{Calculated value (CV)} = \frac{\sum Fx}{\sum F} = \frac{639}{228} = 2.8$$

Therefore, the null hypothesis was rejected for the alternate hypothesis: About 61.7% of respondents agreed that there are significant challenges to regular supply of pipe-borne water in Enugu metropolis. Questions 2-12 of Section B of the questionnaire investigated 11 parameters of challenges to regular water supply.

Research question 2 probed the effects of the challenges on the workers performance. From Table 8.3.2, the CV (3.1) was greater than DV (2.5). Therefore, the null hypothesis was rejected for the alternate hypothesis: Challenges to regular supply of pipe-borne water in Enugu metropolis have significant effects on staff performance (74.92%). Questions 2-8 of Section C of the questionnaire investigated 7 parameters of challenges to regular water supply.

Table 8.3.2: Effects of the challenges to regular water supply on workers performance

Response	Scale, x	Frequency, F	Fx	Percentage
SA	4	71	284	31.02
A	3	100	300	43.9
D	2	49	98	21.3
SD	1	8	8	3.8
Total		228	700	100

$$\text{Calculated value (CV)} = \frac{\sum Fx}{\sum F} = \frac{689}{228} = 3.1$$

Research question 3 probed the measures taken by the ENSWC to ameliorate the inadequate supply of water. From Table 8.3.3, the CV (2.4) was less than DV (2.5).

Table 8.3.3: Measures taken to against the challenges to regular supply

Response	Scale, x	Frequency, F	Fx	Percentage
SA	4	36	144	15.6
A	3	61	183	26.8
D	2	83	166	36.3
SD	1	48	48	21.3
Total		228	541	100

$$\text{Calculated value (CV)} = \frac{\sum Fx}{\sum F} = \frac{541}{228} = 2.4$$

Therefore, the null hypothesis was accepted: ENSWC was taking no measures against the challenges to regular supply of pipe-borne water in Enugu metropolis (57.6%). Questions 2-9 of Section D of the questionnaire investigated 8 parameters of measures against to regular water supply.

Research question 4 probed the strategies to improve the supply of water. From Table 8.3.4, the CV (2.8) was greater than DV (2.5).

Table 8.3.4: Strategies to improve water supply in Enugu metropolis

Response	Scale, x	Frequency, F	Fx	Percentage
SA	4	69	276	30.26
A	3	84	252	36.84
D	2	34	68	14.91
SD	1	41	41	17.98
Total		228	637	100

$$\text{Calculated value (CV)} = \frac{\sum Fx}{\sum F} = \frac{637}{228} = 2.8$$

Therefore, the null hypothesis was rejected for the alternate hypothesis: There are strategies that can be adopted to improve the supply of pipe-borne water in Enugu metropolis (67.1%). Questions 2-12 of Section E of the questionnaire investigated 11 parameters of strategies to be adopted for regular water supply.

Table 8.3.5 shows a summary of data on research questions.

Table 8.3.5: Summary of data on research questions

Subject matter	Null hypotheses	CV	Decision	Answer to research question
Challenges of regular water supply	There are no significant challenges to regular supply of pipe-borne water in Enugu metropolis	2.8	Reject null hypotheses	There are significant challenges to regular supply (61.7%).
Effects of the challenges on the Corporation's performance	Challenges of regular water supply have no significant effects on the Water Corporation's performance	3.02	Reject null hypotheses	Challenges of regular water supply have significant effects on the Water Corporation's performance (74.92%).
Measures taken to ameliorate inadequate supply	There are no significant measures against the challenges to irregular safe water supply in Enugu metropolis	2.4	Accept null hypotheses	There are no significant measures against the challenges (57.6%)..
Strategies to be adopted for improved water supply	There are no strategies to be adopted to improve safe water supply in Enugu metropolis	2.8	Reject null hypothesis	There are strategies that can be adopted to improve safe water supply in Enugu metropolis (67.1%).

Challenges to regular water supply

The major problems facing the corporation are operational constraints, ageing infrastructure, vandalism, inadequate funding, political interference, inadequate payment of salaries, corrupt practices and increasing population. In Enugu Water Corporation, the pumps in various plants had outlived the efficiency of their designs. This affected the distribution network, which consists mainly of old and weak asbestos cement pipeline that no longer sustained the hydraulic pressure in many sections of the system. This is evident from the frequent cases of pipe burst and leakage all over the city. Therefore the water board incurs huge maintenance costs to keep them functioning. The pump stations at the Water Corporation had a few working pumps, while a number of them were obsolete.

This finding agrees with the earlier report by Ajadi (2010) that obsolete equipment hindered regular potable water supply in Ilorin metropolis of Kwara State in North Central Nigeria. The finding also agrees with earlier report by Makwara and Tavuyango (2012) that ageing infrastructure was a big challenge to regular potable water supply in urban areas in Zimbabwe, despite effort to upgrade facilities, which were not keeping pace with the rate of urbanization. In Enugu metropolis and Zimbabwe, rapid sand filters/machines were not functional and many more equipment were either decommissioned due to old age or were in a bad state of disrepair.

Another serious challenge the Enugu State Water Corporation faced was the lack of water treatment chemicals (such as alum, HTO, TOH, etc.). This has hampered their performance since they cannot supply untreated water to avoid contamination of water borne diseases and other serious health problems to the consumers.

Loss of professionals was not a challenge to Enugu State Water Corporation. Adequate skilled and unskilled labour hands were available. This finding differs from the report by Makwara and Tavuyango (2012) on Zimbabwe which experienced a massive exodus of skilled and semi-skilled manpower for greener pasture. Enugu metropolis rather benefitted from internal brain-gain. Its population continually increased, as many rural dwellers relocate to the metropolis in search of greener pastures. The Water Annual Report of 2011-2012 asserts that Nigerians are increasingly choosing to live in urban communities. Rural-urban migration has increased from 30% in 1990 to 49% in 2008 and continues to increase. With rapid urbanization comes the attendant challenge of inadequate basic social infrastructure including safe drinking water and improved sanitation. This finding corroborates the report by World Bank Joint Monitoring Project (JMP) that access to water supply and sanitation, though better than the situation in rural areas, are on the decline in urban areas of Nigeria. Expansion of services in urban centres in Nigeria is not keeping pace with the rapid urban growth.

Power outages have been a great setback in rendering of service by the Corporation. Functional stand-by electric power generating set frequently lacked fuel and lubricants.

Effects of the identified challenges on the performance of the state water corporation

The effects of the challenges included loss of revenue, lack of motivation, aging and damaging pipes, and low labour productivity among others. A huge amount of revenue was tied down in the hands of consumers. Some

of it had become bad debts. In a similar study on Nairobi by Engel et al (2011), cost/revenue recovery for public water provision was a major problem in most cities. Incorporating infrastructure maintenance, provision and administrative costs into the water price would lead to better cost recovery, and thus generate needed resources for infrastructure improvements and other water management solutions.

The challenge also resulted to poor motivation. The finding was similar to the finding by Iliyas (2006) on Kano City Nigeria that challenges faced by public water supply institution led to, among others, poor attitude to work, poor motivation and irregular remuneration.

The challenges have also resulted to low productivity. The Water Corporation cannot meet the supply of water to the populace. They rationed water supply to areas. Many of the water schemes are not functioning. Inadequate maintenance fund has led to almost 50% of the water schemes reaching a state of malfunction and this resulted to low productivity.

Measures taken by the Enugu state water corporation to ameliorate the situation

The Enugu State Water Corporation has not taken proper measures to tackle the challenges. The 2012 project to improve water connection pipes to different households within the metropolis was yet to be completed owing to contractual issues and non-payment of the contractors. Yet, the Corporation raised water bills for private water vendors..

Strategies to be adopted to ameliorate the water supply challenge in Enugu state water corporation

Adopting certain strategies would improve potable water supply in Enugu metropolis. These include frequent maintenance of equipments, training and retraining of staff, adequate funding, proper security at equipment

sites, adequate motivation of staff, proactive maintenance and preventive measures, engagement of distribution channels among others.

CONCLUSION AND RECOMMENDATIONS

The challenges to regular supply pipe-borne water in Enugu metropolis are, among others, consumer unwillingness to pay water rates, operational constraints, inadequate funding, increasing population, political interference, irregular payment of salary of Water Corporation, corrupt practice among staff of the Corporation. They have significant effects on staff performance and manifest in low revenue returns, lack of motivation, encouragement of corruption, loss of professionals, rusting of pipes, and low labour productivity.

The Enugu State Water Corporation (ENSWC) was taking no measures against the challenges to regular supply of pipe-borne water in Enugu metropolis. Measures against these challenges, such as orientation programme for new employees, training or on-the-job training for workers, regular payment of staff salaries, maintenance culture for infrastructure, prudent management of fund, sanction for erring employees or defaulters, and reward for performers were not taken.

The Corporation also lacks in strategies that could be adopted to improve the supply of pipe-borne water in Enugu metropolis. For instance, it does not carry out orientation for their new employees, no training or on-the-job training for staff, the staff salaries are not paid as and when due, bill payment defaulters and erring employees are not sanctioned. The Government on the other hand has not carried out its responsibilities efficiently towards the Corporation. This is evident in the abandoned pipe laying project by the State Government and several water schemes in the state that were also abandoned. All these have negatively affected the regular supply of portable water to Enugu metropolis.

Based on these findings, the following recommendations are made:

1. The model of Public Private Partnership (PPP) should be adopted to avoid monopoly and implemented immediately.
2. The Government should speedy the project to improve water connection to households.
3. The government should improve funding for proper management, automated network surveillance for rapid response to system failures, and personnel training to cope with changing demands and technologies.
4. The Government should pay all the outstanding staff salaries and ensure regular payment subsequently.
5. Employ the media for aggressive public awareness and mobilisation of water consumers for effective participation in water matters, such as source, supply capacity or availability, and necessary treatment and distributions costs. An effective public information programme creates a sense of responsibility towards safeguarding water supply infrastructure among individual water users and communities as well as a voluntary commitment to achieving reductions in water supply challenges.

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