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Intervention Impact and Performance Evaluation of Enugu State Water Corporation Over an Eight Year Period 2006 - 2013

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Abstract
In 2006 Enugu State Water Corporation (ENSWC) got a new leadership team and also became a beneficiary of the World Bank intervention program assisting some State Water Agencies (SWAs) in Nigeria. The study which was carried out in 2014 assesses ENSWC on performance efficiency and impact from 2006 to 2013 under the new team and within the intervention period. Secondary data were collected from ENSWC for eleven performance parameters: quantity of water delivered, number of staff, unaccounted for water, income, revenue generated, new customers, active connection, expenditure, cost recovery, operation and maintenance (O&M) and annual billing for eight years. Metric benchmarking and customer perception survey were used in evaluating performance on efficiency and impact. A set of questionnaire was used for the customers of ENSWC and water users to establish regularity of supply, actual coverage and user satisfaction. The questionnaire was distributed to 500 households in Enugu urban, and 430 copies of the questionnaires were collected and used for the study (86%). The study found that ENSWC improved in efficiency of service to their customers, revenue generation, billing and water production over the period. moreover, the World Bank Intervention objectives were partly realized as access to piped water increased and reliability improved. However, ENSWC is still performing below the benchmark performance level for developing countries. Some recommendations are made to enable it improve on service delivery.
Keywords; performance, service efficiency, impact, water supply., state water corporation.

1. Introduction

Urban water supply by utility providers has remained problematic in many Nigerian cities. In the past three decades, various governments (federal and state) and nongovernmental organizations invested in urban and rural water infrastructure with a view to improving water and sanitation in these areas. Till date, water supply especially water from State Water Agencies (SWAs) has remained elusive to many urban dwellers.

With the present economic recession being experienced in Nigeria caused by dwindling oil revenue, money that can be invested in public utilities are limited. Government establishments now more than before should be evaluated for their performance in terms of service delivery as they are run with tax payer's money. It is hoped that with additional investments the performance of public utilities will improve so that public funds can be maximally utilized. This make result based management the concern of all tiers of government. Thus the interest in performance evaluation. The evaluation of performance encourages government to compare and contrast the performance of various service providers. As stated by Nylian and Martin (1999), this comparison allows for best practices to be identified and used as bench mark for improving efficiency, quality and effectiveness of all government service providers. Performance evaluation of public utilities is used as an approach to determine the extent to which service provision meet target of quality and quantity output. It is also used to assess the progress and to know how far corporate objectives and targets are being achieved. It is used to promote accountability to public and stakeholders and identify opportunities for improvement. This will facilitate better understanding of the problems and challenges and help in providing the basis of intervention. The end result of any assessment is that performance is adjudged to be adequate or good, needs some improvement or has improved (Lusthaus 2002).

Enugu is the capital of Enugu Sate, Nigeria. It is located between latitude $6^0$21N and $6^0$30W and longitude $7^0$26 and $7^0$37 Greenwich meridian. In Enugu , water supply is undertaken by Enugu State Water Corporation(ENSWC). Established under Enugu State Water Corporation Law, CAP 76 in 1991, its main functions are data collection, planning and design of water schemes. It also has the function of hydrological surveys , supervision of water and sanitation programmes, regulation of private and public water supply , water provision and distribution to the public amongst other functions. Water resource for the city is from different sources; Ajalli-Owa River, boreholes in 9th Mile Corner, Oji (abstraction from the Oji River bed), and Iva . The Iva has its source from a valley situated in Milikin Hill and is distributed by gravity.

Prior to 2006, ENSWC had no formal business Plan and business decisions were conventionally taken by management. The operations of the corporation then could be said to be unfocussed and at that time, workers were in about 14 months arrears of salary with no capital project on water (Offordu 2013). In 2006 ENSWC became a beneficiary of the World Bank intervention program assisting some SWAs in Nigeria. The objectives of the intervention included, to increase access to piped water networks, to improve reliability and viability of service. By 2007 the corporation developed a Strategic Business Plan to help in piloting its affairs (ENSWC 2008) with the help of the World Bank intervention it was envisaged that by 2011, ENSWC will achieve a

breakeven state in terms of revenue generation. The World Bank intervention ended 30th June, 2013.

With the World Bank intervention and a focused ENSWC, residents of Enugu urban were to expect improved water service in terms of improved coverage, reliability, billing etc. However, domestic water for many residents was still got from various other sources. Therefore the need for assessment of the performance of ENSWC from 2006 to 2013. The study assesses ENSWC on efficiency and impact of performance from 2006 to 2013. The specific objectives are: 1. determine ENSWC efficiency in water provision and service to the public, and 2. ascertain their impact on customers in terms of satisfaction.

2. Literature Review

There are different ways of assessing the performance of establishments. Performance assessment can be comprehensive or more focused on specific issues, it can be both descriptive and normative. The size and scope, approaches and opportunities for application of the exercise vary (Lusthans 2002). Measurement is very important in performance assessment and different measurements may be required in assessing the performance of an establishment . Performance assessment involves a lot of indicators which may not be adequately exhausted in any given assessment . Waring and Morgan (2007) noted that the underlying model for undertaking a performance assessment involves first clarifying the objectives of the assessment. This involves determining whether the performance assessment is aimed at assessing the economy of the output use, the efficiency of program process or the effectiveness of program output and income i.e. the aspect of performance to be examined must be clearly stated. Each of the key element of performance is itself multi-dimensional and the specific indicators used in its measurement depends on nature of the problem being investigated and requiring solutions.

Van Theif and Leeuw (2002) noted that the objectives of performance assessment broadly can be twofold: to cut budget and improve the efficiency and effectiveness of government bureaucracies. Efficiency of utilization of human, financial and other resources and efficiency of performance in relation to achievement of the set objectives.

Different methods have been used by different scholars to assess performance of water utilities for example, Amit and Mukul (2010) evaluated efficiency in cost and assessed performance of 18 urban water supply utilities in the state of Madhya Pradesh, India, using stochastic frontier analysis (Cobb-Douglas cost frontier). They showed that 4 municipalities performed better and had high efficiency and 2 recorded very low in efficiency. They showed that the municipalities that scored low in efficiency would have to reduce their output cost by 35.84% to attain the level of more efficient utilities in the state. In a developed country, like US, Walch et al (2010) discussed the use of modified Capacity Management Operations and maintenance (CMOM) program by water division of Orange County utilities Department(OCUD) in Orlando which they called ‘water CMOM’ . Using this method, the division developed a methodology for determining the best way to allocate its resources by measuring gaps in performance. This they did by tailoring CMOM, scoring business practices, identifying performance gaps, linking performance with strategic priorities and aligning initiatives with the strategic framework. They noted that Water CMOM takes a broader approach than that of performance benchmarking programme. Its flexibility and usefulness makes the approach a valuable tool the adoption of which could benefit other water agencies in US. The approach though very useful cannot be easily applied in evaluation of performance of SWAs in Nigeria due to the paucity of data that will be required for its application.

A common method of evaluating water utilities is by the use of performance indicators (PIs). The use of PIs to study water supply utilities started in the early 1990s. To successfully use these PIs, benchmarks are used. Van den Berg and Danilenko (2011) gave two primary objectives of benchmarking 1. to use PIs to measure internal performance and provide managerial guidance and 2., enable organizations to compare its performance on Key Performance Indicators (KPIs) with those of other relevant organizations to identify areas of improvement (Van den Berg and Danilenko :2). Van den Berg and Danilenko (2011) also distinguishes two types of benchmarking; metric and process benchmarking. Metric benchmarking involves comparison of performance of one utility with that of other similar utilities and also tracking one utilities’ performance over time. Process benchmarking enables a utility to compare the effectiveness of its process and procedure for carrying out different functions to those of selected peers (Van den Berg and Danilenko :3). Water Operators Partnership (WOP)(2009) give rationale for performance assessment benchmarking and its usefulness. It also pointed out benchmarking that are useful (WOP 2009:31-32). Benchmarking is easier to use and the approach has been applied in evaluation of water utilities in Nigeria and other developing countries.

Ajibola (2013) assessed the operational management and efficiency of three water schemes in Kaduna state, Nigeria using service standard performance metrics (SPEM) and SWOT analysis. He evaluated their service delivery performance. His results showed that unaccounted for water, billing efficiency and cash operating ratio are major problems of the schemes. He found average service coverage of potable water for the state to be 27% and unaccounted for water 47% indicating that more than 40% of the water treated is lost.

Sule and Okeola (2011) assessed the performance of River Ogun water project in Kwara state, Nigeria. The

performance indicators used for assessment include population serviced, extent of coverage, capacity available, production, service connection etc. They used a rating system to score the various indicators identified. They found performance of the scheme unsatisfactory. A shortcoming of their research is that they used cross sectional data for the evaluation.

Water Operators Partnership (WOP) and the World Bank carried out a number of assessment of water utilities in Africa and Nigeria. WOP (2009) carried out synthesis of self-assessment and benchmarking on 134 African utilities engaged in water and sanitation services. They confirmed the perilous state of the water sector in Africa. On the average, utilities provide water to only about 66% of the population within their respective areas of jurisdiction. It also showed that Non Revenue Water (NRW) is a major weakness for most utilities losing up to a third of their production. Utilities get revenue for only half of the water they produce. They also reported poor performance in revenue collection. A more recent study by Berta et al, on urban water supply in Nigeria, assessed the performance of water utilities using data toolkit of the International Benchmarking Network for Water and sanitation utilities (IBNET) the IBNET toolkit for data collection was provided to 35 participating SWAs in 2012, 2013 and 2014. Fifteen IBNET indicators were used and data were collected for 91 performance parameters for each SWA. They found that urban water supply is struggling to cope with continuing urbanization of Nigeria. They concluded that if the trend continues water coverage may drop below 30 % service (Berta et al, 2015).

Benchmarking using KPIs is the approach that can be used to assess the performance of ENSWC. It has been used by World Bank and other international organizations in assessing performance of utilities in countries where data are not recorded and kept all the time.

3. Method

Secondary and primary data were used for the study. Secondary data were collected from ENSWC for eleven performance parameters: quantity of water delivered, number of staff, unaccounted for water, income, revenue generated, new customers, active connection, expenditure, cost recovery, Operation and Maintenance and annual billing for eight years (2006 to 2013) (these are data available in ENSWC). These data were used to evaluate efficiency and impact of performance of the utility. Metric benchmarking (ratio) and customer perception survey were used for evaluating performance on efficiency and impact. The performance indicators (PIs) used were drawn and adapted from Alegre et al (2006). They are employee efficiency, service coverage, duration of supply, non revenue water, revenue recovery and working ratio. Primary data collected through a structured questionnaire was used to gather information for the research . A sets of questionnaire was used for customers of ENSWC and water users to establish regularity of supply, actual coverage and user satisfaction in Enugu urban. This was used to asses performance impact. The questionnaire was distributed to 500 households in Enugu urban. Neighbourhoods with pipe borne water connection were first listed. These neighbourhoods were then stratified into densities (high, medium and low). Simple random sampling was used to select 5 neighbourhoods , two from low, one from medium and two from high density . A total of 430 questionnaires were collected and used for the study (86%). SPSS ver. 20 was used for data analysis. The indicators evaluated include;

Extent of service = extent of population quantity of water produced can cover.

Capacity utilization = (Annual quantity of water produced/ Installed capacity of water supply equipments)x 100

Employee per active connection ratio = [employee for the year]/[number of active connections/1000]

Unaccounted for water = [total water sold for the year]/[total water produced] x 100

Revenue recovery = [(Annual revenue)/ (Annual expenditure)] x 100

Working ratio = [Annual O&M cost] / [Annual revenue]

Unit production cost in Naira per m^3 = [Annual O& M cost]/[total Annual production m^3]

4 Result And Discussion

4.1 Efficiency

Service coverage which is a key development indicator for water utilities witnessed a progressive increase from 2006 which peaked in 2013, though with a slight drop in 2010 to 2012 (Table 1.0). In 2007, with a new government in Enugu state and World Bank intervention, a business plan was developed for the corporation. The increase could be attributed to the World Bank intervention, which precipitated the development of a business plan by ENSWC in 2007. However, the level of improvement in service coverage still fell below the average level in Nigeria , put at 45% (Van den Berg and Danilenko 2011:104). Water Operators Partnership (2009) observed a drop in coverage for Nigeria from 48% to 45% 2006 to 2009. A more recent study by Berta et al, (2015) reported a drop in coverage from 42% to 40% from 2011 to 2014. These studies have shown gradual decrease in water coverage in the country (2006 to 2014). To achieve the Millennium Development Goal for water and sanitation it was necessary that service coverage reached at least 60%.

Capacity utilization also witnessed progressive increase within the study period, from (12.5%) in 2006 to (29%) in 2013. Although for the eight years , capacity utilization for ENSWC was low. The reason for the low

capacity utilization might be due to unavailability of electricity which is very important for water supply. Water production improved from 5,906,733m^3 in 2006 to 9,951,159m^3 in 2009. Production dropped to 6,866209m^3 in 2012 and increased to 13,732418m^3 in 2013. The intervention of the World Bank and their business plan must have helped to improve water production from 2007. Even with the increase, maximum capacity utilization for the eight years was below 30%. This affected duration of service to customers which was less than 12 hours a day within the study period. Intermittent water supply is a major and significant factor in increasing depreciation of water system due to hydraulichammer effect. This destroys valve gates and pipes thus reducing supply. It also leads to artificial aging of water system(Berta et al, 2015:35). In Nigeria, Abuja and Cross River state were the only places reported by Berta et al (2015)as operating 24/7 in 2011 and 2012.

Employee per active connection which has a benchmark of 23 per 1000 was high within the study period. High staff number indicates low efficiency. This may be due to the fact that active connection within the study period was very low. By July 2013, only 50.5 percent of their connections were active. Some parts of the city are not connected to ENSWC service mains. With the aid of the World Bank, new water mains were laid and some old ones replaced or rehabilitated. New connections improved from 180 2007 to 7,750 in 2013 and active connections improved from 2,716 in 2006 to 8,603 in 2013. The process of reticulation and new connection is capital intensive and with dwindling economic resources of our government at various levels, increasing active connections may not be sustained.

ENSWC was able to recover 8 percent of their expenditure in 2006, this improved to 32.6 percent in 2013 which shows a progressive increase. This increase is still below the benchmark of 90% for developing countries. The reasons for non-recovery of expenditure are many and can be traced to both the attitude of the customers and the workers of the corporation. With low revenue recovery, the corporation was unable to carry out many of the tasks and function that would have helped it improve service to its customers. Working ratio depicts the financial health of a water utility. Working ratios of above one means that the corporation does not cover O&M costs. The year 2007 had the highest working ratio(13.21) while 2013 had the lowest (2.86). This show a marked improvement but ENSWC is still not financially healthy. In terms of revenue collection efficiency, 2010 had the highest revenue collection efficiency of 85 percent while 2006 had the lowest. This could be explained by the fact that by that time most of the arrears of salary owed workers had been cleared. As at July 2013, revenue collection efficiency was 37.66%, indicating that more than 65 percent of their water bills were not collected. Non revenue water(NRW) which results from inefficiencies in billing, illegal connection, theft, burst pipes etc. improved from 60% in 2006 to 40% in 2013. NRW is still quite high and it indicates poor management in the form of poor commercial practices by those in charge of revenue collection and poor infrastructure maintenance by the engineering department. Van den Berg and Danilenko (2011) average for Nigeria was 50%.

Different studies reported improvement in water supply by SWAs within this period which supports the findings in this study. Water Utility Partnership in Africa (2011) reported that in Sub-Saharan Africa, utility performance improved marginally in areas of operational efficiency and water supply capacity , but not enough additional households are covered at a rate to exceed population growth. Berta et al, (2015) reported an improvement for Nigerian SWAs which saw NRW drop from 40% to 32% . The unit cost of water production by ENSWC dropped significantly from over a hundred naira per m^3 of water to less than forty naira. This is an indication of improvement in efficiency of water production.

Table 1.0 Performance Indicators

Indicator	2006	2007	2008	2009	2010	2011	2012	2013
Service coverage (%) 100%	11.9	12.2	12.7	19.1	17.4	13.6	12.3	23.8
Capacity utilization (%) 80%	12.5	13.2	13.7	21.02	19.26	15.95	14.5	29*
Duration of supply 24hrs	<12	<12	< 12	<12	< 12	< 12	< 12	< 12
Employee per active connection 23/1000	194	n/a	n/a	n/a	189	177	122	65 *
Unaccounted for water(%) 20%	n/a	60	60	45	40	40	40	40
Revenue recovery(%) 90%	8	7.6	8.9	12	13	10.6	16	32.6
Revenue collection efficiency (%) 100%	26.94	29.63	57.65	59.45	85.50	58.84	54.78	37.66*
Working ratio 1	12.4	13.21	11.26	8.28	7.6	9.40	6.18	2.86
Unit production cost ₦ per m^3	104.49	100.22	146.19	104.05	124.91	152.90	119.84	39.35

Source: ENSWC calculation by researchers
Note: * Information used was January to July 2013.
n/a (not available)

4.2 Impact

To ascertain the impact of ENSWC services, information on service delivery were asked respondents. Table 2.0

show that ENSWC water is piped to 53.3% of the respondents. Out of this number half are inactive meaning that the taps are perpetually dry. This may be the reason for piped water from ENSWC being the main source of water for only 32.6% of the respondents. More than 60% of the residents do not get water from ENSWC. This collaborates the secondary data that water produced can service only maximum of 23% of household in Enugu metropolis.

With low service coverage under 25% of the residents adjudged ENSWC performance on water supply as above average. Of the 53% of the residents connected to ENSWC slightly above half pay their water bill. Some of the reasons are: no bill, poor bill collection , poor water supply and residence in government quarters. This supports the secondary data collected on revenue recovery and revenue collection efficiency which were both below 40%. This collaborates the findings of Berta et al, (2015) and Van den Berg and Danilenko (2011) on low revenue recovery of SWAs in Nigeria. The low revenue recovery has many implications for the optimal functioning of the corporation.

Table 2.0 impact on customers

	Frequency	Percent (%)
Main source of water supply		
Enugu state water corporation (ENSWC)	140	32.6
Private/commercial well	179	41.6
Stream	15	3.5
Water vendors	94	21.9
No response	2	.47
Connection with ENSWC		
Yes	229	53.3
No	201	46.7
Rating of water supplied by ENSWC by customers		
Very high	18	7.9
High	34	14.85
Average	71	31
Low	52	22.7
Very low	34	14.85
No response	20	8.7
Payment of bill by customers		
Yes	130	58.8
No	99	41.2

With the World Bank intervention ending in 2013, ENSWC improved on its service efficiency to customers. Improvements were recorded in capacity utilization and new connections. Improvement in new connections did not improve active connections as some of the new connections were not served with water and population increase seems to be rising faster than rate of new connections. Working ratio also improved within this period though not enough to turn the utility into a healthy one. The intervention was also able to bring down the unit cost per m^3 of water due to increased water production and improved public power supply. Although ENSWC improved in the efficiency of service to their customers, revenue generation, billing and water production a lot still needs to be done. The World Bank Intervention objectives were partly realized as access to piped water increased, reliability and viability of water also improved. The objective of achieving a breakeven state in terms of revenue generation by 2011 was not achieved by ENSWC. With these improvements observed, the utility is still performing below the benchmark performance level for developing countries. When its service efficiency is compared to some other utility providers in the country, it still leaves much to be desired. With the end of the intervention of the World Bank, it is hoped that the progress made in production and service efficiency will continue and be improved upon.

5 Conclusion And Suggestions

This study evaluated the performance of ENSWC in terms of its efficiency and impact on their customers. The performance of ENSWC in terms of efficiency in water provision improved progressively during the study period though it is still low. It has not been able to achieve the minimum benchmark for the eight performance indicator used in this study for developing countries. ENSWC was also not able to achieve fully the objectives of the World Bank intervention and its strategic plan. Service coverage is low and also revenue collection efficiency. Many of their customers are not satisfied with their services and this affects payment of bills. To improve efficiency of ENSWC in service delivery, more effort should be put towards metering and bill collection to improve working ratio and revenue collection efficiency. The maintenance department (Engineering) has to improve on their efficiency to reduce NRW. Service coverage can be improved through increased water production and increased active connections. Alternative source of electricity such as solar should be looked into

as much of their problems are tied to low output due to poor electricity supply. Management and staff of ENSWC together with the public should form a common forum to find solution to the identified performance problems.

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