

EVALUATING SERVICE DELIVERY PERFORMANCE OF WATER UTILITIES IN KADUNA STATE WATER BOARD, NIGERIA

BY

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES AHMADU BELLO UNIVERSITY, ZARIA IN PARTIAL FULFILMENT FOR THE AWARD OF DOCTOR OF PHILOSOPHY IN WATER RESOURCES AND ENVIRONMENTAL ENGINEERING

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FEBRUARY, 2013

DECLARATION

I declare that the work in the dissertation entitled **'Evaluating Service Delivery Performance of Water Utilities In Kaduna State Water Board, Nigeria'** has been performed by me in the Department of Water Resources and Environmental Engineering under the supervision of **Professor O.J. Mudiare, Dr. J. A. Otun and Dr. A. Ismail**

The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this dissertation was previously presented for another degree or diploma at any university.

AJIBOLA MORUFU AJIBIKE	**Signature**	**Date**

CERTIFICATION

This thesis entitled: "**EVALUATING SERVICE DELIVERY PERFORMANCE OF WATER UTILITIES IN KADUNA STATE WATER BOARD, NIGERIA**" by Ajibola Morufu Ajibike meets the regulations governing the award of the degree of Doctor of Philosophy in Water Resources and Environmental Engineering of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

With all humility and gratitude I dedicate this work to Allah who has been my help and succour in life.

AKNOWLEDGEMENT

All praises and thanks be to Allah, Subhanahu wa ta'ala, the Lord of the A'alameen (mankind, Jinn and all that exists) and peace be upon the Master of all the Messengers, Prophet Muhammad (SAW), may the blessings and peace of Allah be upon him. This thesis would have been impossible to complete without the help of lots of people over the years. It is a real pleasure to acknowledge them here. I wish to express my deep gratitude and sincere thanks to my supervisors; Prof. O.J. Mudiare, Prof. C.A. Okuofu, Dr. J. A. Otun, Dr. Ismail Abubakar and Dr. D.B. Adie for their invaluable guidance and constant support through out the period of this work. I am grateful to all members of staff of the Department of Water Resources and Environmental Engineering for their moral supports, may God bless you all. I am also grateful to all the staff of Kaduna State Ministry of Water Resources, Kaduna State Water Board and agencies contacted during the field work.

I wish to sincerely thank my very beloved wife, Mrs. Ajibike Bunmi for her encouragement in this work, and also my lovely children; Ibraheem, Maryam, Abdulmalik, Aishat, Daud and Faridat may God bless you all and reward you for every labour and prayers during the period of this work.

My sincere appreciation and gratitude also go to the following people for their unquantifiable assistance and encouragement given to me and my family especially during the period of study: Dr. Giwa Abdulraheem, Engr. Annafi Babatunde, Prof. K.J. Osinubi, Dr. S.B. Igboro, Engr. Ogunlowo Akin and to many others whose efforts I equally appreciate. Finally, I would like to thank the authorities of the Ahmadu Bello University, Zaria for their support.

ABSTRACT

This study assesses the operational management and efficiency of water supply schemes in Kaduna State using a performance indicator called "Service Standard Performance Metrics (SPEM)"and SWOT analysis. The three water treatment plants in Kaduna metropolis were visited. Detailed evaluations were carried out for the schemes using some aspects of technical, financial, human resources and institutional performance indicators. The benchmarking approach was used for the evaluation of the service delivery performance and the results obtained for the performance were compared with other developed countries. The results clearly show that unaccounted for water, billing efficiency and cash operating ratio are still the major problem of these schemes. Averagely, the service coverage for the entire state is 27%, which is very low and the average service coverage for the Kaduna metropolis is 71%. The average unaccounted for water for the entire state is 47% and 52% for the three schemes in the Kaduna metropolis. This indicates that more than 40% of the water treated is being lost either through illegal connection or through pipe burst. The duration of supply is less than 24hrs. The cost recovery for the metropolis is 22% at ₦21/m^3 as against production cost of ₦93.50/m^3. Involvement of the private sector participation was suggested in the study for effective performance of the service delivery.

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ABBREVIATION

AWWA	-	American Water Works Association
GOWU	-	Government Owned Water Utilities
WUP	-	Water Utility Partnership
TARWR	-	Total Actual Renewable Water Resources
SWAs	-	State Water Agencies
WHO	-	World Health Organization
UNICEF	-	The United Nations Children Educational Fund
RBDA	-	River Basin Development Authority
UFW	-	Unaccounted for Water
WEDC	-	Water Engineering and Development Centre
KSWUB	-	Kaduna State Water Utility Board
IFAD	-	International Fund for Agricultural Development
UN	-	United Nations
PEST	-	Political, Economic, Social and Technological
SWOT	-	Strength, Weaknesses, Opportunities and Threat
PWV	-	Private Water Vendor
NRW	-	Non – Revenue Water
KPI	-	Key Performance Indicators
DCF	-	Discounted Cash Flow
NGO	-	Non Governmental Organization
WSS	-	Water Supply and Sanitation
CSWA	-	Commercialized State Water Agency
NRRI	-	National Regulatory Research Institute

GLOSSARY OF TERMS

Working Ratio: This is a parameter use to determine the financial and efficiency of a service provider by comparing annual operating costs and operating revenue.

Institution: An organization which is responsible for providing services in either urban or rural areas. The institution may be either an urban utility or the rural worker department of a government ministry.

Institutional Assessment: A systematic procedure for assessing the performance of an institution based upon the use of standards or performance indicators. The final output of an institutional assessment is a profile of institutional strengths and weaknesses which have been analyzed by major category of institutional function.

Output Measures: Specific measurable elements related to the actual current performance of the institution in delivering its product (the provision of water). Output measures relate to the qualitative and quantitative results of the product, and also to the final results of delivering that product.

Performance Indicators: A set of specific measurable behaviors or procedures related to a performance category which, when analyzed together, indicate the degree to which competency standards are met in a performance category.

SYMBOLS

%	-	Percentage
M^3/d	-	cubic metre per day
l	-	litre
m	-	metre
Km	-	kilometer
Lpcd	-	Litre per capital per day
C_{rec}	-	Cost Recovery
T_{aope}	-	Total Annual Operating Expenses
T_{aopr}	-	Total Annual Operating Revenue
q	-	Water Supplied to Distribution line
t	-	Number of days in month that water is supplied
Q_{11}	-	Total Water Supplied
X	-	Total Water supply Coverage
Y	-	Total Population
q_1	-	Non – Revenue Water
q_2	-	Total Water Produced
q_3	-	Total Water Sold
m	-	Numbered of Metered Connections
m_1	-	Numbered of Metered Direct Service
m_2	-	Numbered of metered Public Standposts
m_3	-	Numbered of Direct Service Connections

m_4	-	Total number of Public Standposts
S_c	-	Total Number of Water Samples Received Complaint per Month
S_s	-	Total number of samples that meet the standard in the Month
q_w	-	Quality of Water Supply
C_{ef}	-	Collection Efficiency
C_{rev}	-	Current Revenue Collected in the year
T_{oprev}	-	Total Operating Revenue Billed during the year

CHAPTER ONE

INTRODUCTION

1.1 **PREAMBLE**

Water utilities are implemented to construct, operate and maintain water supply systems. In the past the basic function of these water utilities was to obtain water from a source, treat it to an acceptable quality, and deliver the desired quantity at the desired time. Over the years in most developing nations, the situational analysis of the water provided by most of the Government Owned Water Utilities (GOWU) has been seriously characterized with poor water quality, incessant intermittent flow to non availability. The steps to evaluate the performance of these utilities have been well spelt out by some international organization such as American Water Works Association (Kayaga, et al., 2006).

In most developing Nations, water utilities are generally developed for urban water supply. Presently, most of these public water utilities are faced with enormous challenges in meeting the water needs of their growing populations (Kayaga, et al., 2006). Many of the challenges are as a result of poor utility management practices, lack of a commercial oriented culture to drive performance improvements (WUP, 2006a). A number of options have been tried in an attempt to address these problems. The most notable one is private sector participation – which has included contracting multinational water companies to run water utilities (World Bank, 2003). The developed countries considered privatization as the most viable option (Lam and Chan, 1998), but in Nigeria and other African countries, private sector participation had a limited success due to government interference. There is growing pessimism about the scale of performance improvement to be expected from private sector involvement (Budds and McGranaham, 2003).

On the other hand, there is optimism that public water utilities in developing countries can improve their own performance by applying commercial management principles (Zuleta et al., 2005). One principle that utilities can adapt is evaluating the utilities, which is traditionally viewed as setting a long-term direction based on sound predictions, analysis of options, and key decisions about the future of an organization (Kayaga et al., 2006). Regrettably, water utilities in Nigeria, traditionally dominated by the Engineering Profession, often lack the necessary tools and capabilities to carry out evaluation performance of the utilities.

Undoubtedly, there is a growing skepticism among various stakeholders, including policy makers and water sector professionals on how to extensively improve the performance of public utilities. This position has compelled the major players in the water sector to seek alternative approaches to improving utility management and performance in developing countries. Such alternative approaches include regular measure of performance level and finding means of improving areas of low performance as a scientific approach to improve their operations and management and thus improving the overall performance of their utility.

There is a strong call for efficiency and good quality of service. The improvement of performance in terms of organizational and management procedures, aimed at satisfying both public needs and expectations and the environmental policy goal is therefore a major medium- term target. The development and use of performance indicators is a hot topic in the water industry agenda world wide. In fact, the use of standardized performance assessment procedures is a key leverage factor for an enhanced performance, able to identify what activities can be improved upon to introduce some artificial competition

which can help in establishing contractual agreements that protect the consumer's interest (Mays, 2004).

Public urban water schemes in developing countries, especially in Africa, face enormous challenges in meeting the water needs of their growing urban populations. Many of the challenges are as a result of poor utility management policies and a lack of a commercially-oriented culture to drive performance improvements. A number of options have been tried in an attempt to address these problems. The most notable one is private sector participation, which has included contracting multinational water companies to run water schemes in Africa (Mays, 2004).

The successes of any water utilities to satisfy their customers hinge around the efficient operation and proper maintenance of water utilities systems quantitatively and qualitatively with the highest level of consumers' satisfaction. The key elements which contribute towards the efficiency of the water utilities of any country are shared vision, values and mission, strategic planning, human resources development, programme development management system, organizational culture, governance, legal/fiscal, compliance, monitoring and evaluation accountability (Islam-UI Haq, 2007).

1.1.1 Overview of Water Services Delivery in Nigeria

Nigeria is one of the largest countries in Africa (1,924,000sq.km. in area) and the most populous. The population at present is estimated at about 140 million (2006 Population Census) with annual growth rate of 3.2%. At this growth, the population will be about 202 million in the year 2020. The inadequate amount of water is arising from the temporal and spatial distribution of rainfall (about 4000mm in the South to less than 500mm in the North (Handidu, 1990). Towards this end, it is important to put in proper perspective the water

supply situation in both the urban and rural areas of Nigeria. Currently the supply of water is not more than 50% and 30% of its effective demand for the urban and rural areas respectively. The consequent lack of adequate sanitation due to severe shortage of safe potable water has precipitated severe public health problems. World Health Organization and United Children Education Fund, (2002) studied shows that poorer communities and group, particularly women, suffer excessively due to longer hours needed to fetch water.

In spite of the abundant natural water resources, proliferation of water works in the country coupled with a robust policy that spells out strategies and attainable targets, the water situation in Nigeria could best be described as precarious. Over the years, improvement in domestic water supply has not been impressive. For example, in 1990, 47% of Nigerians have access to improved water. This percentage increased slightly to 53% in 1991 due to increase in percentage of water coverage. Displaying similar growth rate, only 58% access was recorded in 2008 (WHO/UNICEF JMP, 2010). In rural areas, where the majority of Nigerians live, only 58% had access in 2008 (WHO/UNICEF JMP, 2010). The absurdity in water supply situation in Nigeria is further revealed by the fact that urban domestic water supply has been on decline since 1990. For example in 1990, 79% of the urban dwellers had access. This decreased to 47% and 45% in 2000 and 2008 respectively (WHO/UNICEF JMP, 2010). In literature, piped water is often equated to safe water since improved sources could still contain some harmful substances (Sulllivan et al, 2003). Therefore, access to piped water is regarded as a measure of access to safe water. It is pathetic to observe that access to piped water among Nigerians has decreased extensively from 14% in 1990 to 6% in 2008 (WHO/UNICEF JMP, 2010).

In the developing countries where the development of water is mostly government-driven, failure to develop efficient water supply systems has been established as a product of the interplay of several factors. Among them, securing finances to build, maintain and expand the systems is perhaps the most important (UNEP, 2002; Hall, 2006). The availability of finance especially for day-to-day operations and maintenance is significant in view of the low level of public finances for urban development, including water supply (World Bank, 1994; Urban Age, 1993). In general, water supply in these countries is undertaken by government parastatals that have the dual objectives of providing a social service while generating revenue to offset cost. Ironically, most of these parastatals do not recover their operating expenses from their own revenues, and remain dependent on state governments for subsidies (Hall, 2006). Studies have also confirmed that about half the water in drinking water supply systems in the developing world is lost to leakage, illegal hook-ups and vandalism (UN, 2002; Hall, 2006). In addition, lack of clear institutional objectives, low wages and poor equipment and supplies have been widely cited as the typical institutional characteristics of water supply agencies in the developing countries (World Bank, 1994; Franceys, 1993). Performance assessments of these institutions typically reveal weaknesses including low output performance, ineffective delivery systems and poor financial portfolio.

Water supply in Nigeria most vividly reflects the above scenario. The country has 37 SWAs and 12 River Basin Development Authorities (RBDAs). Several of these water agencies and Authorities depend on obsolete water equipments. This has been largely due to poor investments by government and private sector organizations in the water sector in

the last ten years in Nigeria compared to other sectors such as oil and gas, energy, housing among others (Adoga, 2006). These agencies lack capacity in technical and financial resources; they are finding it difficult to meet the existing demand for safe water within their respective areas of jurisdiction (Hall, 2006). The problem of funding is a global bane on the development of the water sector. However, the situation in Nigeria is deplorable considering the high level of poverty, inadequate government funding, and weak private participation (Adoga, 2006). The financial portfolio of these agencies is further worsened by the low proportion of water users that pay for water services. For example, in Lagos, Nigeria, only 4% of water users pay their bills (Hall, 2006). In addition, leakage rates are estimated to be about 50% of water produced, while the proportion lost to wastage and illegal connections is actually rising (Hall, 2006). Extensive areas in many cities in the country do not have any network connections. Further, the bane of the Nigerian water sector could be traced to demographic and economic antecedents. Nigeria's' population continue to increase every year making it difficult for government to cope with the huge financial resources required for system maintenance and expansion. Thus, adequate public funds are no longer available for extending the water coverage service or service levels in terms of per capita use.

Water utilities in many states of Nigeria differ greatly in terms of size, organizational culture and operating environments. However, a number of shared management problems have been identified in water utilities (Kayaga et al., 2007). First, the inefficiencies of water utilities are a major cause of poor access to water services in many states in Nigeria. In many of these water utility systems, as much as one third of production is lost through pipe leakages, bursts and illegal connections. This makes revenues insufficient to cover

operating costs let alone to expand service coverage (World Bank, 2004). Indeed, for water utilities in Nigeria, reduction of unaccounted water remains one of the major challenges facing water utilities. These problems are made worse with the general lack of a commercial orientation in utility management and inappropriate government set tariff regimes (Kayaga et al., 2006). With the growing urban population reported in many states, managers of water utilities need to quickly adopt robust plans and strategic actions to improve operational efficiency and reduce the service gap (Kayaga et al., 2006).

Secondly, many utilities in Nigeria lack effective management information systems to allow adequate monitoring and evaluation. Many of the states utilities rarely collect data systematically to assess their performance in order to design operational improvements (WUP, 2000). Consequently, those responsible for service delivery, and those willing to support them lack the necessary information to design measures and investments to improve service delivery (Kayaga et al., 2006).The third problem facing water utilities in Nigeria relates to generic utility management issues such as lack of clarity in mandate and mission, lack of sound management structures and effective delegation, poor customer service and lack of human resources capacity to enable the water utilities fulfil their objectives.

With aforementioned challenges, governments of the developing countries have sought the support of developed countries to implement policy, regulatory and institutional reforms to make water utilities more efficient. Water utilities should change their structure and strategy for the reform to be effective.

Table 1.1 shows the performance indicators of some water utilities in Nigeria carried out by Handidu in 1994.

Table 1.1: Indicators of Management Performance of Some Water Utilities in Nigeria

S/N	State	Unaccounted for water (%)	Efficiency of revenue collection (%)	Cash operating ratio (%)
1	Adamawa	55.0	31.0	2.0
2	Akwa Ibom	28.0	28.0	NA
3	Anambra	45.0	86.0	77.0
4	Bauchi	40.0	83.0	61.0
5	Benue	45.0	86.7	11.9
6	Borno	65.0	65.0	64.0
7	Cross River	45.0	7.0	17.0
8	Enugu	45.0	N/A	69.2
9	FCT	35.0	N/A	N/A
10	Gombe	50.0	0.6	19.6
11	Imo	45.0	54.0	N/A
12	Jigawa	42.0	77.7	7.0
13	Kaduna	41.0	87.8	85.0
14	Kano	35.0	82.0	N/A
15	Katsina	19.0	78.3	47.6
16	Kebbi	75.0	4.7	5.9
17	Kogi	60.0	32.0	17.0
18	Niger	43.0	67.0	24.0
19	Lagos	33.9	N/A	N/A
20	Ogun	26.1	63.6	59.6
21	Osun	48.0	36.7	14.9
22	Oyo	28.0	63.0	35.0
23	Plateau	40.0	72.0	57.0
24	Sokoto	29.7	60.8	25.4
25	Taraba	50.0	29.0	2.8
26	Zamfara	54.0	32.0	37.0

Source: Handidu, 1994

1.1.2 State of Water Supply in Nigeria

In Nigeria, the Federal Government develops the policy governing the provision of water while State Governments are responsible for the provision of water to the public. Most of them set up agencies, which operate under resource constraints occasioned by lack of independence in decision making, inadequate budgetary allocation, and severe political

interference. Most water utilities in Nigeria lack ability or willingness to fix tariffs and prosecute those engaged in illegal connections. All these result in unsatisfactory performance, especially with respect to poor service delivery and waste on the part of customers. Hence, most SWAs are not commercially viable.

Recent developments have blurred distinct delineation of duties whereby all tiers, Federal, State and Local Governments are now involved in the provision of potable water. But, the demand-gap keeps increasing due to, amongst other things, overlapping functions and massive wastes in public expenditure, in the face of rapid growth of communities and population. Today, majority of Nigeria's population is not connected to large-scale system of water supply. They rely on 'traditional' forms of supply (from streams or wells) or boreholes sunk by governments, individuals or through communal effort.

1.1.3 Legal and Regulatory framework for SWAs

The Water Resources Decree (FGN, Decree 101.1993), is the main control and guiding law in water resources. The decree currently under review, is aimed at promoting the optimum planning, development and use of water resources; ensuring the co-ordination of activities likely to influence the quality, quantity, distribution, use and management of water; and ensuring the application of appropriate standards and techniques for the investigation, use, control, protection, management and administration of water resources. The Minister in charge of water resources is given the power to exercise the said controls. Here too, no specific attention is given to Water Supply and Sanitation to the urban poor except that it ensures that water taken by individuals for domestic use from the source declared as belonging to the federal government are not charged and no permission is needed.

State Water Supply Edicts and Laws empower the state to establish water supply agency to supply water at adequate quantity and quality for domestic, industrial and commercial uses. Most of the water supply agencies operate in the urban areas in their states. Presently, there is no federal legislation regulating the production and distribution of urban water supply for domestic, commercial and industrial uses in Nigeria. The constitution is silent on who is responsible for regulating and producing public water supply. The general understanding is that water supply is within the concurrent legislative list; which means that all the levels of government (Federal, State and Local Governments) can make laws regarding water supply within their areas of jurisdiction.

1.1.4 Institutional Arrangement for SWAs

Urban water supply Schemes are mainly owned and managed by state governments through the State Ministry of Water Resources which acts as the supervising ministry to any State Water Agencies (SWAs). The SWAs operate fully as a government owned enterprise; its Board members are selected by the state government. At present there is no regulatory mechanism in Nigeria to check the activities of state water agencies.

1.1.5 Financial Arrangements for SWAs

The State Government provides money for capital or intervention projects (investment project) either through budget or loans. The SWAs are, however, responsible for generating funds for the smooth running of their WSS. Till date there is no substantial cost recovery in the operation of SWAs in Nigeria. This is because the tariffs are inadequate and operational efficiency is very low. Instead the schemes usually receive subventions from State Government for operation and maintenance activities of the water utilities.

1.2 AIMS AND OBJECTIVES

The general objective of the study is to investigate the performance of the service delivery of the Kaduna State Water Board and the implication of including community water based enterprise in the service delivery of the Water Board. This is with a view to drawing pertinent lessons on the suitability of private sector participation in the service delivery of SWAs in Nigeria as a basis for establishing a robust service delivery process in water supply system in the country as a whole. The specific objectives are to:

1) Investigate the status of the service delivery of the study area.

2) Determine the performance indicators of the water board.

3) Assess the feasibility of de – bundling the service delivery aspect of the water supply in the state.

4) Establish the short term and long term effect of including community water based in the service delivery, and

5) Make recommendations and advice the management of the SWAs in the country on the way forward.

1.3 Statement of the Problem

Close examination of the water schemes revealed that most of the utilities in the state are operating at less than initial design or installed capacities and the physical structures and facilities are decaying due to lack of maintenance and management programme to effectively enhance the service delivery of these schemes. Poor billing, collection efficiency, high operating costs and high unaccounted for water (UFW) or non-revenue

water, inadequate funding are some of the major challenges being faced by these schemes. The consequence of the problems mentioned above is that these schemes would not be able to meet up with the water demand need of the population. Hence, there is a need for a proper improvement plans for sustainable operation and maintenance.

In Kaduna State of Nigeria, where this study is based, the drive towards private sector participation in service delivery and commercializing urban water supply under the National Urban Water Supply Reform Programme is currently progressing most speedily. Although not yet fully implemented, a policy blueprint similar to the one in Lagos state is being outlined towards embarking on full commercial operations by the water board with or without privatization. Signals towards this have for some time been sent out by the Kaduna State Government (although an enabling legislation is yet to be passed). This can be seen in some of its recent policies on water supply tariff and management as well as the various initiatives the Kaduna State Water Board has been involved recently on fully commercializing urban water supply. Kaduna State Water Board is also making moves towards involving private sector participation in its management and service delivery aspect of the water board.

1.4 JUSTIFICATION OF THE STUDY

Many states water utilities in Nigeria cannot meet up the water demand of their people due to poor service delivery of the utilities, population increase, political instability, poor billing, poor collection, increase in water loss, lack of adequate funds and insecurity. Therefore, there is need to have a proper evaluation of service delivery performance of

water utilities and come up with workable strategies that will make the utilities viable. The benefits expected from the study can be summarized as follows:

1. The field investigation will establish the benchmark for the performance studies of the SWAs in the country. The findings of the study will contribute additional information on the subject as it concerns Nigerian cities in view of the National Policy on Water Supply and Sanitation which is hinged largely on the principle of commercializing the service.
2. In Nigeria majority of the SWAs are not fully operated on the principle of including community water based enterprise in their service delivery, apart from Lagos State Water Corporation and to some extent Kaduna water Board.
3. This study will provide a much needed pathfinder on the basis of incorporating private water vendor for urban water service delivery.
4. It will also facilitates the implementation of benchmarking routines in which water utilities in the country can be adopted and this will serve as a comparison basis for the performance of the State Water Agencies in the country.
5. De - bundling of the service reservoirs into various units, to be managed by the community water based enterprise to enhance performance of the water service delivery in the state.
6. It will provide key monitoring tools and a guide to water managers in their managerial tasks of ensuring good performance and sustainable development.

1.5 Scope of study and Limitations

The scope of the study does not cover much of the cost – benefit analysis of the water supply as a component of urban water supply, in the financial analysis to determine the feasibility of including private sector in the service delivery of the water board.

The study also evaluate service delivery performance of water utilities in Nigeria using Kaduna State Water Board as a case study over a period of six years (2000-2006) using some developed evaluation techniques. The aspect covered in this study involves the evaluation of the technical, financial, human resources and institutional capacity of these water utilities.

The technical aspects of the evaluation assessed the system capacity, capacity utilization, volume of water produced, duration of supply, number of metered connections, and percentage coverage of service area. The aspect of evaluating the financial capacity of the SWAs assessed the billing efficiency and revenue collection efficiency, debt recovery, cash operating ratio, tariff and unit cost of production. The human resources capacity evaluated issues relating to training and development of staff (capacity building), technical assistance and customer relationship. The limitations include the following:

1) There are no comprehensive historical data on most of the performance indicators to be determined.
2) The data given were scanty.
3) Non cooperation from the staff.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Access to clean and healthy water is one basic problem that has remained unsolved in Nigeria for several decades. It is common to see people conveying water from streams, wells and public or commercial borehole facilities in buckets, jerry cans, and other containers by hand, on head, on motorcycles and vehicles. The Agencies or corporations tasked with provision of water in many states are not functional. The bodies responsible for providing drinking water are essentially states water agencies. The States Water Agencies are State Water Boards/Corporations, which mostly serve urban areas greater than 20,000 inhabitants, small water town agencies, which mostly serve semi – urban areas with population between 5,000 to 20,000 inhabitants, and Rural Water Supply and Sanitation Agencies, which operate in rural areas and usually serve communities of 500 to 5,000 inhabitants (Areola et al. 1997).

In Nigeria, sustainable delivery of water and sanitation services is one of the most challenging issues in meeting basic needs and a critical link in successfully achieving poverty reduction strategies (Areola et al. 1997). More than 90% of urban water supply in developing countries has been provided by public utilities for many years (UNDP, 2003). However, most of these public managed utilities in the developing countries have been inefficient (Onjali, 2002; WUP, 2001), thus prompting a need for proper evaluation and broad reforms in the public sector in many African countries. The evaluation and reform have been driven by a combination of economic, social and political factors and this have

generated the search for efficiency and cost reduction in public service delivery. There is no ironclad definition of utility, otherwise referred to as infrastructure; it refers to all basic inputs into and requirements for proper functioning of the economy and those that enhance the standard of living of the people (Berg, 2004). There are two generally accepted categories of utility; namely economic and social. The former, mostly referred to as economic utility, is at a given point in time part of an economy's capital stock to facilitate economic production or serve as inputs to production such as electricity, roads, and telecommunication. The latter group is social utility which encompasses services such as health, education, recreation, water and sanitation which have direct and interactive impact on the quality of life. Collectively, both categories affect the level of productivity of the economy. In fact, the basic utility sectors typically account for 7.1 to 11.0 percent of Gross Domestic Product (World Bank, 1994). The impact of such utility on human development and enhanced quality of life is also apparent.

There is a poor manpower and weakness in the policy, financial and institutional frameworks within which state water agencies have to operate. The dismal manpower situation is obvious in the very small proportion of personnel with tertiary level technical and engineering qualifications. The impact of the shortage of qualified personnel is most felt in the operational field, especially in the area (district) offices. The weak financial structures position of the water agencies are poor emolument structures which made it difficult for them to attract and retain highly qualified professionals particularly engineers (Areola *et al.*, 1997).

Poor performance of public water utilities in developing countries is well documented (Klein and Irwin, 1996; Onjali, 2002). In Southern African region for example, many of

the existing bulk and retail water supply schemes in all countries are characterized by inadequate operation and maintenance, high levels of unaccounted for water (UFW), inappropriate tariffs as well as poor billing and collection systems (Robert and Macy, 2001). There is a wide optimism that the private sector would resolve much of the performance problems of public utilities and mobilize scarce financing to sustain growth and expand coverage (Baietti et al., 2006). Tynan and Kingdom (2002) stated that a well - run utility needs adequate funding to pay for its capital investments, and meet its operational costs. Failure of any water utility to recover costs leads to under investment in assets and deterioration of infrastructure, which in turn result in weakened operation and decline service quality (Samson et al., 1997).

In low and middle – income countries many water utilities fail to serve as many as 50 to 80 per cent of the people living in their urban areas (WEDC, 2004). The challenge of improving water services in developing countries has two main aspects:

1) Improvement of current service levels for all consumer groups; and
2) Provide adequate water for the rapid increase in the urban population.

The data compiled by the Water Supply Collaborative Council in 2000 showed a large service gap in developing countries (WEDC, 2004). In Africa, a continent with an estimated population of 784 million people, only 62 per cent have access to improved water supply and 60 per cent have accessed to improved sanitation in the year 2002 (WHO/UNICEF, 2000). Table 2.1 shows the level of water service levels in various African countries

Table 2.1: **Service levels of Water Utilities in Selected African Countries**

Common service level	Uganda	Tansania	Guinea	Mauritania	Benin	Burkina Faso	Mali
Source of water for household use (percentage of households)							
• In house connection	36	31	29	19	27	23	17
• Stand pipe water fetched by household	5	0	3	30	0	49	19
• Independent providers/traditional sources	59	69	68	51	73	28	64

Source:Collignon and Vezina (2000).

It was observed that the less well –off urban dwellers spent more time and energy obtaining water from standpipes, independent providers or traditional sources (Collignon and Vezina, 2000). WHO/UNICEF (2000), estimated that additional 210 million urban dwellers in developing countries have to be served with adequate water supply to meet the 2015 Millenium Development Goals. Table 2.2 shows the ranking of countries by GDP, their access to improved drinking water, Household water connection and access to improved sanitation and Table 2.3 shows the urban water supply coverage in some African countries. Figure 2.1 shows an interpretation of the genesis of poor performance among the State Water Agencies in Nigeria.

Table 2.2: **Ranking of Countries by GDP, Access to Improved drinking water, Household water connection and improved sanitation.**

GDP Rank	Country	Improved drinking water			Household water connection			Improved Sanitation		
		Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
1	U.S.	100	100	100	88	100	38	100	100	100
2	Japan	100	100	100	95	98	91	100	100	100
3	China	97	93	67	69	87	57	44	69	28
4	Germany	100	100	100	100	100	97	100	100	100
5	France	100	100	100	100	100	100	100	100	100
6	UK	100	100	100	100	100	98	100	100	100
7	Italy	100	100	100	100	100	96	100	100	100
8	Russia	97	100	88	82	93	52	67	93	70
9	Spain	100	100	100	100	100	98	100	100	100
10	Brazil	90	96	57	79	91	17	75	83	37
11	Canada	100	100	100	100	100	99	100	100	100
12	India	86	95	83	53	86	47	33	59	22
13	Mexico	97	100	64	90	96	52	79	91	41
14	Australia	100	100	100	100	100	100	100	100	100
15	South Korea	92	97	71	84	96	39	n.a	n.a	n.a
16	Netherland	100	100	100	100	100	100	100	100	100
17	Turkey	96	98	98	62	96	51	88	96	72
18	Poland	100	100	100	98	99	96	100	100	100
19	Indonesia	77	87	69	27	30	6	55	73	40
20	Belgium	100	100	100	100	100	90	100	100	100
21	Switzerland	100	100	100	100	100	99	100	100	100
22	Sweden	100	100	100	100	100	100	100	100	100
23	Saudi Arabia	90	97	63	89	97	60	n.a	n.a	n.a
24	Norway	100	100	100	100	100	100	100	100	100
25	Austria	100	100	100	100	100	100	100	100	100
26	Greece	n.a	n.a	n.a	84	91	73	n.a	n.a	n.a
27	Iran	94	99	84	84	96	69	83	86	78
28	Denmark	100	100	100	100	100	100	100	100	100
29	Argetina	96	98	80	69	83	45	91	92	83
30	Venezuela	83	85	79	81	84	61	68	71	48
31	South Africa	88	99	73	64	87	32	65	87	32
32	Finland	100	100	100	100	100	96	100	100	100
33	Ireland	100	100	100	98	99	96	100	100	100
34	Thailand	99	98	100	45	85	16	99	98	99
35	UAE	98	98	98	98	98	98	98	98	98
36	Portugal	100	100	100	72	97	50	n.a	n.a	n.a

GDP Rank	Country	Improved drinking water			Household water connection			Improved Sanitation		
		Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
37	Colombia	93	99	71	86	96	51	86	96	54
38	Malaysia	99	100	96	94	98	87	94	95	93
39	Czech Republic	100	100	100	95	97	91	100	100	100
40	Hong Kong	n.a	100	100	88	100	38	100	100	100
41	**Nigeria**	**50.9**	**72.8**	**39.6**	**9**	**15**	**8**	**44.8**	**29.7**	**4.7**
42	Isreal	100	100	100	100	100	100	100	100	100
43	Romania	57	91	16	49	79	13	n.a	n.a	n.a
44	Singapore	100	100	100	100	100	100	100	100	100
45	Ukraine	96	99	91	76	89	48	96	98	93
46	Chile	99	100	58	91	99	38	91	95	62
47	Philipines	85	87	82	45	58	23	72	80	59
48	Pakistan	91	96	89	27	49	15	59	92	41
49	Egypt	98	97	97	85	99	74	70	86	58
50	Algeria	85	88	80	49	74	58	92	99	82
51	Kuwait	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
52	Hungary	99	100	98	95	95	91	95	100	85
53	Kazakhstan	86	97	73	62	89	27	72	87	52
54	New Zealand	97	100	82	100	100	82	94	100	88
55	Peru	83	89	65	71	82	39	63	74	32
56	Qatar	100	100	100	100	100	100	100	100	100
57	Libya	71	72	68	54	54	55	97	96	96
58	Slovakia	100	100	100	96	99	89	99	100	98
59	Irag	100	100	100	100	100	98	100	100	98
60	Viet Nam	85	99	80	24	73	6	61	92	50

Source: WHO/UNICEF (2004)

Table 2.3: **Urban Water Supply Coverage in Africa Countries (2000)**

Country	**Total Population (Thousands)**	**Urban Population (Thousands)**	**% Urban Water Supply Coverage**
Algeria	31471	18969	98
Angola	12878	4404	34
Benin	6097	2577	74
Botswana	1622	815	100
Burkinafaso	11937	2204	84
Burundi	6695	600	96
Cameroon	15085	7379	82
CAR	3615	1489	80
Chad	7651	1820	31
Comoros	695	231	98
Congo	2944	1841	71
Cote' Dvoire	14786	6854	90
Congo DR	51655	15641	89
Egypt	68469	30954	96
E. Guinea	452	218	45
Eriteria	3851	722	63
Ethopia	62565	11042	77
Gabon	1226	998	73
Gambia	1306	424	80
Ghana	20213	7753	87
Guinea Bissau	1213	288	29
Kenya	30080	9957	87
Lesotho	2153	602	98
Liberia	3154	1416	

Source: Ma'aruf, Sani, (2005).

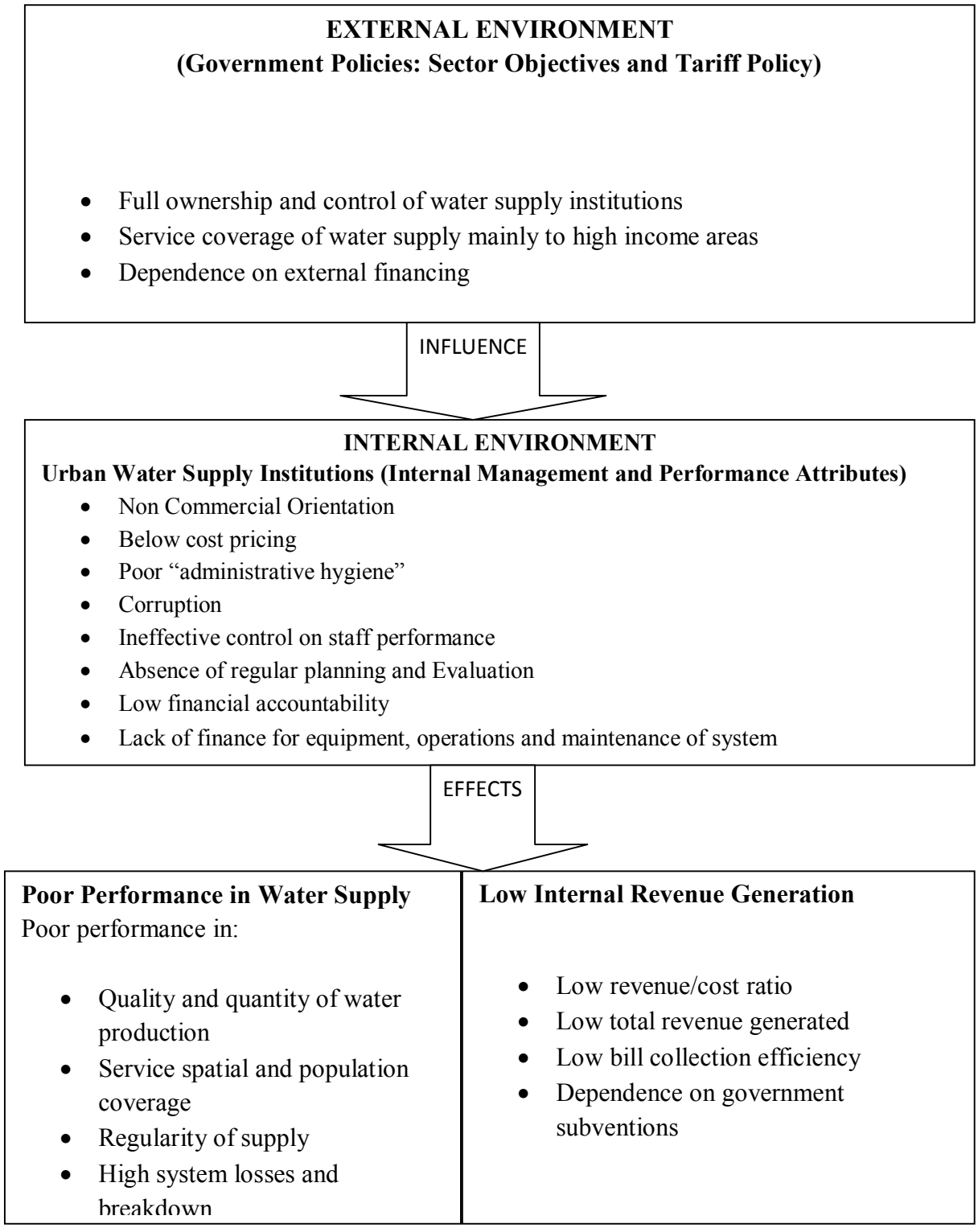


Figure 2.1: An Interpretation of the Genesis of Poor Performance among SWAs

2.2 HISTORY OF KADUNA STATE WATER BOARD

Kaduna State Water Board (KSWB) was established by Edict No. 2 of 1971 as a body Corporate with perpetual succession and common seal and has the power to sue and be sued in its corporate name. This edict was replaced with Kaduna State Water Board law this came into effect on July 1, 2004. The functions of KSWB include:

1) To control and manage all water works
2) To ensure that water is supplied to consumers at reasonable charges and in potable quality and adequate quantity.
3) To enter into agreement or delegate authority for the exercise of any of the functions performed or provided by the Board to increase coverage and quality of service, by encouraging participation of the private sector, communities and Non Governmental Organizations (NGOs) in project identification, planning, design, implementation, financing and management of its water supply systems.

2.2.1 Responsibilities of KSWB

The responsibilities of KSWB include:

1) To produce and distribute water to the people of Kaduna State for domestic, commercial and industrial purposes;
2) To maintain the distribution system;
3) To charge water fees and other services rendered by the Board, with the approval of the State Government, in such a way that the revenue for each year would be sufficient or as nearly as may be to pay for all working expenses.
4) To collect fees for water consumed by customers.

2.2.2 Organizational set up of KSWB

The law provides that the Board shall consist of a part – time Chairman and not less than Thirteen other members who are appointed by the Executive Governor of the State. The Board members include a representative each from Ministry of Water Resources and Finance, 2 or 3 members who have knowledge in water supply operations and at least 2 persons representing the interest of the consumers. The General Manager is the Chief Executive Officer of the Board. He is assisted by Assistant General Managers in Charge of Administration, Finance, Operation, Projects, Commercial, Corporate Planning, Chief Internal Auditor and Public Relations Manager. Figure 2.2 shows the organogram of KSWB.

2.2.3 Code of Practice of KSWB

2.2.3.1 *Water Quality:*

The code of practice for water quality in KSWB includes:

1) The drinking water quality standards shall conform to the WHO drinking water quality guidelines.
2) All waterworks serving 5,000 people and above to be equipped with a functional water quality laboratory of appropriate capacity.
3) Monitor and protect the quality of raw water sources for drinking.

2.2.3.2 *Water Consumption Standards:*

The code of practice for water consumption in KSWB includes:

1) Urban areas as 120litres per capital per day to be served by full reticulation and consumer premises connection.

2) Semi – urban areas as 90 litres per capital per day with reticulation and limited or full house connections.

3) Rural areas as 30 litres per capital per day from stand pipes preferably within 250 meters of the community and not exceeding 500meteres, serving about 250 persons.

4) Peri – urban areas as at least 60 litres per capital per day with reticulation limited or full house connections.

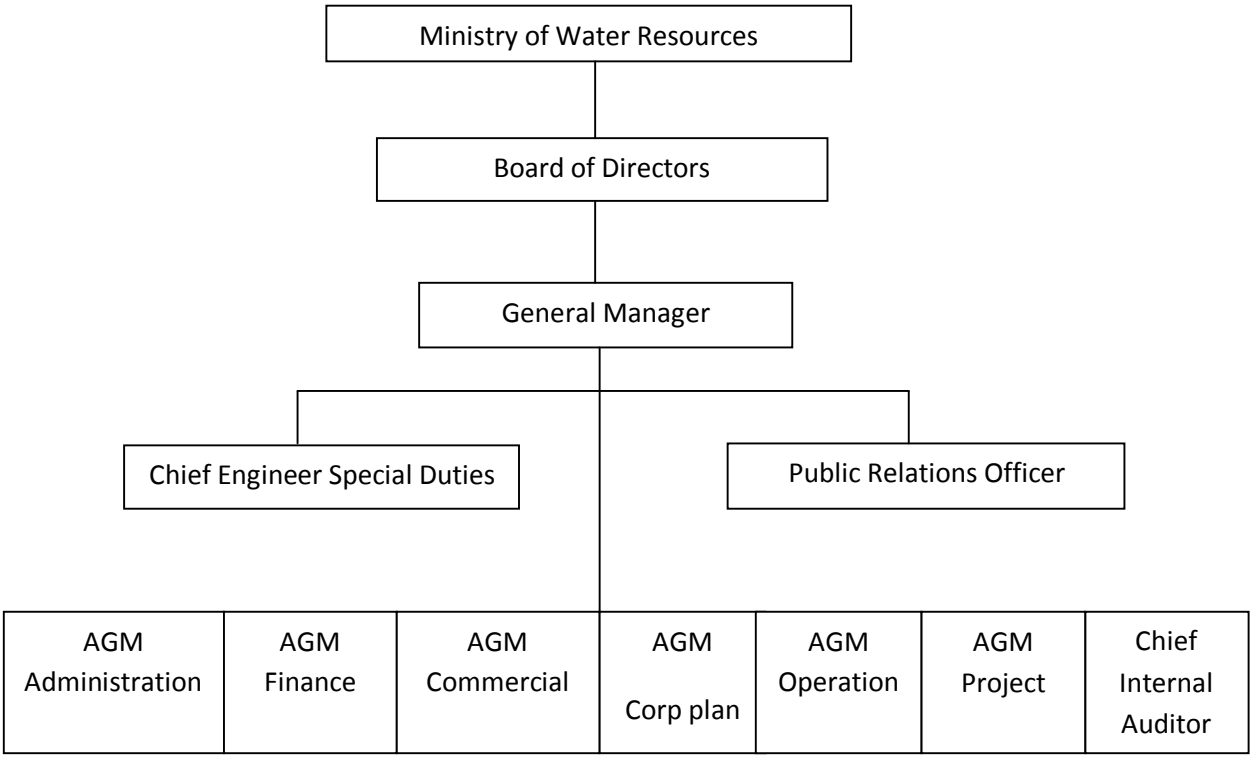


Figure 2.2: Organogram of KSWB

2.3 AN OVERVIEW OF WATER UTILITIES IN KADUNA STATE

Kaduna State Water Board (KSWB) was established in 1971 by Edict No. 2 of 1971 as an autonomous organization responsible for water supply in Kaduna State.

Its tariffs recover a part of the operating costs while Government provides subvention to cover the remaining part (about 43%). KSWB's also has foreign debts but loan repayment does not seem to be one of KSWB's main objectives. Recent Government policy indicates that subvention has been stopped and also, KSWB is to repay future loans. Operating costs are rising due to high cost of chemicals, electricity and fuel.

The poor performance of water utilities in Nigerian states cause water shortage problems in most towns and cities. Bukar (1994) attempted to give some reasons for the poor performance as follows; poor organizational structures, lack of spare parts, absence of career opportunities, inappropriate technology, lack of trained staff, insufficient funding, legal framework problems lack of motivation by sector personnel, lack of operation and maintenance culture, inadequate tariff and collection system and political interference or lack of autonomy to State Water Agencies.

Kaduna town has the highest concentration of the KSWB's installations and offices within the state. The district offices in Kaduna Town are at: Makera, Barnawa, Doka, Tudun Wada, Rigasa and Kawo. The other district offices are in Zaria town, Kafanchan, Birnin Gwari, Saminaka, Ikara, Zonkwa and Kwoi. There are two treatment plants serving the water supply need of the populace in Kaduna metropolis. These are the Kaduna North Plant at Malali (New and Old plants) and the Kaduna South Plant located downstream of the railway bridge across river Kaduna. Table 2.4 shows the existing reservoirs in Kaduna metropolis and their present status.

Table 2.4: **Existing Water Reservoirs in Kaduna Township**

S/N	Location	Type of reservoirs	Capacity	Designed Capacity	Present Capacity	Date Commissioned	Present Status
1	Lugard Hall	Braithwaite	4,500m^3, 12,700m^3	4,500m^3, 12,700m^3	4,500m^3, 12,700m^3	1971	Functional
2	State House Kawo	Concrete	9,100m^3	9,100m^3	9,100m^3	1971	Functional
3	NDA	Braithwaite	4,800m^3	4,800m^3	4,800m^3	1975	Functional
4	Old Airport	Braithwaite	2,500m^3	2,500m^3	2,500m^3	1978	Functional
5	Mando	Concrete	2,500m^3	2,500m^3	2,500m^3	1984	Functional
6	Rigasa	Concrete	11000m^3	11,000m^3	11000m^3	1986	Functional
7	Tudun wada	Concrete	12300m^3	12,300m^3	12300m^3	1987	Functional
8	Kakuri	Concrete	63000m^3	63,000m^3	63000m^3	N/A	Functional
9	Barnawa	Braithwaite	2,500m^3	2,500m^3	2,500m^3	1978	Functional
10	Kamazo	Concrete	30000m^3	30,000m^3	30000m^3	1987	Functional
11	Ungwan Muazu	Braithwaite	2,500m^3	2,500m^3	2,500m^3	1985	Functional

Source: Kaduna State Water Utility Board (2007)

2.4 THE PROBLEM OF URBAN WATER SUPPLY AND THE PLIGHT OF THE LOW – INCOME

The incapacitation of SWAs in meeting the needs for the service delivery is a widespread phenomenon among urban areas in the developing countries. Even at this low level of

performance however, the situation is such that the low income earners are always worse off. This creates yet another dimension to the debacle – the question of access to water by the urban poor who in most cases constitute the bulk of the population. The unfolding contradiction is such that while more than two thirds of the urban population belongs to this group – living in informal settlements without adequate connections to the urban water supply systems, they actually pay exorbitant prices for sub – standard sources to meet their basic needs. Meanwhile, the affluent areas are supplied with adequate water for which the residents pay token amounts due to subsidization from the government.

"Poor people bear a disproportionate share of the impact of inefficient water supply. Fewer poor people are connected to a network. When they do have access, the installation has to be shared among many people and the prices they pay are among the highest, generally more than those paid by more affluent households connected to the piped systems. The price differential is partly a result of inefficiencies – the inequitable practice of subsidizing piped water, lack of scale economies for independent providers, or worse, providers taking advantage of poor people's lack of choice.

But some of the price differential can also reflect the flexibility and convenience of services offered by independent providers – no connection charges or access to quantities of water that are more affordable for poor people"(World Bank, 2004).

Service providers find themselves compelled to address the needs of a small group, on whose whims their own survival depends in a chain link that instead of linking them directly to the population being served is veered towards clientalist intervening forces that includes contractors, managers and staff of the utilities, who are implicated in the clientalist or based on political connections.

The most critical effect in this relationship is that of the mode of government intervention and its effect on accountability. Network externalities, collective action problems and distributional goals are the usual reasons for the government to be involved in public infrastructure and services in general. When government becomes directly involved by owning and running utility companies as the case of Water supply institutions shows, the arrangements for service delivery are no longer primarily between the consumer and the provider.

2.5 COST RECOVERY IN SERVICE DELIVERY

A major concern for sustainability of urban water supply and water resources management in general is the inability of most SWAs to recover costs on existing supplies, which itself is the outcome of the interaction of other factors as examined earlier. The capacity to recover costs may be described as the most important ingredient for the sustainability of any service and is the main indicator of the financial health of the institution providing the service. Cost recovery in urban water supply is basically about recovering all aspects of costs of providing water, including operations and maintenance (salaries of staff, supplies of inputs, power, distribution, maintenance of plants etc) as well as capital costs (depreciation of major equipment and facilities, distribution network etc).

2.6 COVERAGE OF WATER SUPPLY CONNECTIONS

This is total number of households in the service area that are connected to the water supply network with direct service connections. Service coverage is a key development indicator. All service coverage indicators are being affected by data on the population and

the household sizes. The need to estimate population served by public water points affects the confidence placed on the water coverage measure.

For this, $$X = \left(\frac{Q_1}{Y}\right) \times 100 \quad (2.1)$$

Where;

X represents the total water supply coverage

Y represents the total population

Q_1 represents the population with access to water service

The minimum level of acceptable standard for water supply service is the level of a household level water supply connection, that is, a direct piped connection for water supply within the household. Water provision to households (urban or rural), at common public standposts is not an acceptable long – term permanent service provision standard. The benchmark value for this indicator is 100 percent.

2.7 WATER CONSUMPTION AND PRODUCTION

Water production is the total water supplies to the distribution system (including purchased water. The most accurate water consumption indicator is expressed in terms of litres/person/day. This indicator presents data problems, however, notably lack of accurate total water consumption data either from universal metering and poor quality or outdated census data. The accuracy of the service population figures also needs some improvement and the utilities should have the total number of connections in their system. Water production data are more reliable than water consumption data (Onjali, J.2002).

$$Q1 = \left(\frac{q}{t}\right)/Y \qquad (2.2)$$

Where;

Q_1 is per capital water supplied

q is total water supplied to the distribution system

t is the number of days in month that water is supplied

Y is total number of population served

This performance indicator provides an overall indication of the adequacy of the water supply. Per capital water consumed or supplied, expressed in lpcd, indicates the adequacy of the municipal water supply system to be able to source, treat water to potable standards and supply it into the distribution system. This indicator is very important and therefore, should be periodically measured and monitored. The benchmark value for this indicator is 135lpcd**.**

2.8 NON - REVENUE WATER

Nonrevenue water represents water that has been produced but is either "lost" before it reaches the customer through leaks or theft. This indicator highlights the extent of water produced which does not earn the utility any revenue. This is computed as the difference between the total water produced (ex – treatment plant) and the total water sold expressed as a percentage of the total water produced. The International Water Association (IWA) distinguished between non - revenue water (percent) and unaccounted – for water, this is

unpaid usage and this is measured in cubic meters per connection per day. Nonrevenue water comprises of the following:

1) Consumption which is authorized but not billed (public standposts).

2) Apparent losses such as illegal water connections, water theft and metering inaccuracies.

3) Real losses these are leakages in the transmission and distribution networks.

$$Q2 = \left[\frac{q2-q3}{q2}\right] X100 \qquad (2.3)$$

Where;

Q2 is the Non – Revenue Water

q_2 is the total water produced

q_3 is the total water sold

The reduction in NRW to acceptable level is vital for the financial sustainability of the water utility. The reduction of NRW is desirable not just from a financial standpoint, but also from the economic and environmental benefits' point of view. The benchmark value for NRW is considered suitable at 20 percent.

2.9 METERS

Metering customers' water use is considered good practice. It allows customers the opportunity to manage their water use effectively and provides utilities with tools and information that allow them to manage their water supply systems.

$$M = \left[\frac{m1-m2}{m3-m4}\right] X\ 100$$

(2.4)

Where;

M is the number of metered connections

m_1 is the number of metered direct service connections

m_2 is the number of metered public standposts

m_3 is the total number of direct service connections

m_4 is the total number of public standposts

Water is a basic need, the supply of potable water to citizens at their doorstep involves significant costs in building, operating and maintaining the system. In water supply system, the quantum of service provided to citizens is directly measurable, and therefore, it is necessary that all the water supplied to all categories of consumers should be metered. Adequate metering induces efficiency in the use of water and reveals physical and administrative leakages in the system. It also enables high – end consumers to be charged for consuming more. The benchmark value for this indicator should be 100 percent.

2.10 NETWORK PERFORMANCE

The number of pipe breaks is relative to the scale of the system; this indicates the ability of the pipe network to provide service to customers. The rate of water – pipe breaks serves as a surrogate for the general condition of the network. This also reflects operation and

maintenance practices as well as physical conditions of the network. The total number of pipe breaks per year is expressed in per kilometer of the total water distribution network.

2.11 CONTINUITY OF WATER SUPPLY

Continuity of supply is measured as the average number of hours of pressurized water supply per day. It is desirable for the citizens to have round – the clock water supply daily, as this will eliminate the need to provide and manage household/establishment level storage, and other resultant inconveniences. Water utilities in most Nigerian cities provide intermittent and limited number of hours of supply, as a means to manage inadequate supply. The benchmark value for this indicator should be 24 hours.

2.12 QUALITY OF WATER SUPPLIED

This is the percentage of samples tested for residual chlorine that passed the relevant standard. The quality of water supplied is an important indicator in water service delivery. The quality of water supplied should be conformed to relevant standard such as Federal Environmental Protection Agency (FEPA) and WHO standards

$$Qw = \left(\frac{S_S}{S_C}\right) X\ 100 \qquad (2.5)$$

Where;

Qw is the quality of water supply

S_s is the number of samples that meet the standard in the month

S_c is the total number of water supply received complaint per month

The quality of water supplied is an important indicator to be determined in service delivery. Poor water quality posed serious public health hazards. The performance indicator for water quality should be monitored regularly to ascertain the source of the disease. The benchmark value for this indicator is 100 percent.

2.13 COST RECOVERY IN WATER SUPPLY SERVICES

The total operating revenues expressed as a percentage of the total operating expenses incurred in the corresponding time period. To determine this indicator, only income and expenditure of the revenue account is considered, while income and expenditure are excluded in the capital account.

$$Crec = \left(\frac{T_{aope}}{T_{aopr}}\right) X\ 100 \qquad (2.6)$$

Where;

Crec Type equation here.is the Cost recovery

T_{aope} is the total annual operating expenses

Taopr is the total annual operating revenues

Financial sustainability is a very important indicator for all basic urban water services. In services such as water supply, benefits received by the consumers are more direct and can be quantified. Operating cost can be recovered from the combination of user charges, fees and taxes. Therefore, this indicator is critical for measuring overall cost recovery of the water utility services. The benchmark value for this indicator should be 100 percent.

2.14 EFFICIENCY IN COLLECTION OF WATER SUPPLY RELATED CHARGES

Efficiency in collection is defined as current year revenues collected, expressed as a percentage of the total operating revenues for the corresponding period. Collection efficiency is an indicator that assists the utility to know how many areas are being built up. To calculate this indicator, only the current revenues are to be used.

$$Cef = \left(\frac{C_{rev}}{T_{oprev}}\right) X\ 100 \qquad (2.7)$$

Where;

Cef is the Collection efficiency

C_{rev} is the Current revenues collected in the year

T_{oprev} is the total operating revenues billed during the year

It is not enough to have an appropriate tariff structure that will enable full cost recovery of the utility, but efficient collection of revenues that are due to water utility. It is important that the revenues are collected in the same financial year. It is critical to monitor this indicator. The benchmark value for the collection efficiency should be 90 percent.

2.15 WATER SERVICE DELIVERY SYSTEMS

Municipal water delivery systems is used to transport potable water from a water treatment plant to residential consumers, for use as drinking, cooking, sanitary conditions, and other water uses in a domestic environment. Water supply is essential for business and industry to operate in a municipal

environment. Municipal water systems also may need to provide water for special services that include street cleaning, the selling of water to contractors for erecting buildings, parks and recreation, and miscellaneous uses.

A water system has two primary requirements: First, it needs to deliver adequate amounts of water to meet consumer consumption requirements plus needed fire flow requirements. Second, the water system needs to be reliable; the required amount of water needs to be available 24 hours a day, 365 days a year.

The provision of water service delivery is a costly and vexing problem for the State governments and Federal government of Nigeria. In many states of Nigeria, water service delivery coverage is low, resulting in the people patronizing water vendors. Moreover, substantial inefficiencies are typically observed. The provision of urban water service delivery in Nigeria is an essential service which provides a basic good that is critical to life. Urban water services are capital-intensive natural monopolies in Nigeria. Since industrialization, water is typically being provided by the state, till today 95 per cent of water service provision still remains in public hands (Onjali, 2002). In recent times, urban water service provision has developed a cross-border dimension and global governance has penetrated the water sector.

One solution commonly proposed is to contract water service delivery system of the utilities to the private sector with the belief that service efficiency, high coverage of the water delivery and people's health could be improved.

2.16 ACCESS TO WATER SERVICE

Broad definitions of access to water overestimate the percentage of households with access to water services systems of water and sanitation. Table 2.2 shows the ranking of countries by GDP, access to improved drinking water, household water connection and improved

sanitation in the World. While public systems represent the majority of connections, a percentage of access is provided through alternative systems and strategies. Efforts by international organizations, such as (Pan American Health Organization (PAHO), Inter-American Development Bank (IDB), UNICEF, and USAID) to provide adequate water to the people coincide with the objective of 2001 Census (INE, 2001).

2.17 QUALITY OF WATER SERVICES

Quantitative indicators that measure access to urban water services have the potential of masking the quality of service being provided to homes in Nigeria. Despite low coverage rates, the quality of water services throughout the country continues to decline and is one of the major reasons that diarrhea and intestinal illnesses are the second leading cause of infant mortality and the leading cause of child mortality in both urban and rural areas, registering rates three times as high as other Latin American countries (Berg et al, 2004). In terms of uninterrupted access to water supply, most households in many states of Nigeria receive rationed service and some go more than one day without water service, even if they are connected to the public network. Access to a 24-hour water supply does not exist for customers in the study areas. Widespread intermittent or irregular service provision has forced the urban population to adopt a variety of storage and accumulation strategies. Given this reality, a more realistic parameter for measuring acceptable domestic water supply is daily service with a minimum of 12 hours combined with hygienic storage.

2.18 EFFICIENCY OF WATER SERVICES

The efficient operation and maintenance of water service systems on the one hand and the

simultaneous pursuit of universal, safe access to these basic services on the other are often incompatible for systems relied upon by a large percentage of low-income customers. In Nigeria, water services face additional constraints caused by poorly performing financial markets that offer few financing mechanisms at high interest rates and a lack of credible enforcement mechanisms to deal with delinquent customers. Even with the benefit of a coherent policy framework, economically viable tariff regimes and a functioning regulatory entity, an enabling environment can still be hampered by a weak national economy, a predominantly low-income customer base and poorly functioning financial markets.

Due to lack of historical data, the operational performance of the system in this analysis is limited to 2002 – 2006. The lack of available historical data again suggests the need for greater efforts in systematic data collection and performance monitoring.

The heart of efficiency of water delivery system is the ability of water service providers to account for the production and delivery of water supply. While leakage and unaccounted for water will never be eliminated altogether, management mechanisms to quantify production and identify losses can be introduced. A billing-to-production ratio comparing the volume billed over the volume produced provides one effective indicator to determine the extent of losses that each water supply system must subsidize.

2.19 BILLING VERSUS COLLECTION

The tariff-collection capacity of water service providers helps to measure the commercial efficiency of the water utility operation. In Honduras, the billing systems of two providers, decentralized water service providers and centralized water service providers were compared and found out that the billing of the decentralized have a distinct advantage over

the centralized water service providers (Pearse-Oroz, 2006).

2.20 WORKING RATIO OF WATER SERVICES

According to Tynan and Kingdom (2002) a simple measure of cost recovery is the working ratio (WR), which is the ratio of total annual operational expenses, excluding depreciation and debt, to total annual pretax collections from billing and subsidies. Working ratio of less than 1.0 means that the utility were able to recover all their operating costs and some capital costs. Working ratio (WR) is a parameter use to determine the financial and efficiency of a service provider comparing annual operating costs (excluding depreciation and interest payments) and operating revenues (tariffs, connection fees, arrears). Working ratio alone can not guarantee the efficiency of service delivery, but, it helps to identify systems functionality without operational deficits.

In addition to these financial management tools for tracking costs and revenues, locally managed systems have strong built-in political incentives for maintaining broad fiscal discipline. Simply stated, local services operate within a more closed or limited financial system. The lack of opportunities to cover cost overruns creates pressure on managers to operate services within their revenue ceilings or face the difficult decision of subsidizing overruns from local income destined for other services. For example, if the water system's deficit is covered by funds budgeted for teachers' salaries or street maintenance, locally elected officials will still be held accountable for diminished service provision. In addition, these rates are competitive with some other systems worldwide such as Seoul (0.75), Sa˜o Paulo (0.49) and Manila (0.52) (TWUWS, 1996), demonstrating successful financial management of decentralized services even in a low-income developing country such as Honduras. In large part, this should be attributed to clarity in the management of financial

accounts as well as a strong political incentive of accountability to constituents.

2.21 REVENUE GENERATION AND COLLECTION

The ability of a State water agency to be self sustaining through its revenue collection is still a far cry. Due to the faulty premise of our national and by extension state policy on water as a social commodity, the main focus of the management of SWAs has been on the production of water with little or no attention paid to the development of good customer relationship, effective billing and revenue collection systems. With the present scarcity of funds where too many equally important social needs compete for attention, state governments have now realized that the SWAs should at least cater for their overhead costs with little or no subvention from government to augment for the operating costs of water schemes.

Most of the state governments are in a state of dilemma as to how to change the status quo and charge appropriate tariffs. A study on the impact of charging reasonable prices for water on consumers shows that there is willingness on the part of consumers to pay adequate prices for water provided that the supply is also adequate for their needs. This fact is evident from the common knowledge that many privileged Nigerians can readily pay up to ₦40.00 for 1 liter of patent (bottled) safe water.

In quantifying the chargeable amount paid or to be paid by consumers of water to SWAs, the words appropriate, reasonable and adequate have variously been used. The price or tariff varies from state to state. The inability of SWAs to generate reasonable revenue is not only as a result of its not charging appropriate tariff but also the lack of will on the part of its management to set up effective revenue collection mechanisms, because most of the SWAs rely on government for monthly subventions.

2.22 SUSTAINABILITY OF WATER SERVICES

Many states water service providers in Nigeria are ill-equipped. For service delivery to be sustainable, the management tools guiding the water utility must be strictly adhered to. In most of the water utilities in Nigerian states, production is not monitored with lack of financial indicators. This is also coupled with poor management practices.

2.23 EFFECTS OF POOR WATER SERVICE DELIVERY SYSTEM IN NIGERIA

In many states in Nigeria utilities have inadequate funds to invest in the required expansion of water supply infrastructure, because they have failed to charge reasonable tariffs over a long period. Also, as a result of insufficient pipe – borne water and infrastructure, the rich and powerful tend to be favoured in the allocation of limited resources and neglect the poor. The consequences of poor water services is that many people invest their time and money in accessing, collecting and storing water from alternative sources and this can be termed coping costs. Added to these coping costs are the indirect costs of both the loss of productive time due to water – related diseases and the costs of medicine to treat them. Also, higher income consumers incur additional expenditure when they invest in their own well, borehole, pumps and storage tank. During water shortages, the rationing of water affects the poor most adversely as their storage facilities are usually very limited.

2.24 WHO IS RESPONSIBLE FOR WATER SERVICE DELIVERY?

Water service delivery is provided by private companies and state government but the latter retains responsibility for the water service delivery to the populace. State government remains responsible to ensure that water service is provided, and that it meets the required standards in terms of reliability, efficiency and customer relations.

2.25 PRIVATE SECTOR PARTICIPATION IN WATER SERVICE DELIVERY SYSTEM

This is the principle of decentralizing and specializing in the development and management of water resources and water supply. This would allow decentralization of authority in the development of water resources on the one hand, and on the other, the distribution of water (both potable and untreated) to water users. Decree 25 of 1976 allows the local, state, Federal and private participation in the decision making in the development and management of water resources and water supply in Nigeria. River Basin Development Authorities had among other duties the construction of dams, dykes, polders, wells, boreholes, irrigation and drainage systems in addition to the provision of water from dam reservoirs and lakes for urban and rural water supply while the state edicts vested the SWAs with the power to equally construct, operate and maintain water works for the purpose of providing, distributing and conserving in the state water for public, domestic, industrial and commercial uses.

The principal reason for privatizing water service delivery is to bring in private sector to invest and to improve operational efficiency of the water services delivery of the water utility. Water service delivery in most developing countries does not satisfy the full demand of the consumers in urban areas. In the poorest countries, the water service

delivery sometimes reaches only 30 to 55% of the urban population. In the better – organized middle income countries, water service delivery reaches the largest percentage of the populace. Water has since the 1970s been a focus of United Nations (UN) and other public institutions. The 1990s heralded an increasing interest in the role of private-sector involvement in water services. A remarkable 7,300 per cent increase on 1974–1990 private-sector investment levels in water services occurred between 1990 and 1997 (Kayaga, 2006). The global water market is still growing, albeit more slowly than in the 1990s.

Private-sector participation from outside national borders in the provision of basic goods makes urban water services a fascinating case study for exploring the potential ambit of what scholars have provocatively called 'global administrative law'. The political and legal struggle over this growing trend engages one of the central strands of administrative law traditionally understood: the question of participation in decision-making processes that affect vital individual interests. If one interprets the phrase 'global administrative law' by analogy with understandings of its national sibling, it conjures images of a world state and the legal principles governing the exercise of power by that state's bureaucrats. Urban water service delivery generates different images: hybrid blends of public and private actors linked in routines of both formal and informal participation at multiple levels of governance. Such images are central to an understanding of the emergence and limits of global administrative law, and are distilled in four brief vignettes, sketched in this preamble, to capture the concrete dynamics of urban water service delivery in ways that will help link them to the abstractions of global administrative law (Kayaga et al., 2006).

2.25.1 Keys to Successful Private Sector Participation in Water Service Delivery

Keys to successful private sector involvement in water service delivery systems are as follows:

1) It creates contestable markets.
2) It establishes an appropriate regulatory framework and operation standards for contractors.
3) It strengthens states and Federal governments' capacity to negotiate contracts and monitor performance.

2.26 GOVERNMENT ROLES IN WATER SERVICE

In Nigeria Federal Government promotes the policy while State Governments, which constitute the second tier of government in a three-tier federal structure, are primarily responsible for the provision of water. Most of them set up agencies, which operate under resource constraints occasioned by lack of independence in decision-making, inadequate budgetary allocation, and severe political interference.

Water utilities lack ability and willingness to fix and collect tariffs, nor can they prosecute those engaged in illegal connections. All these result in unsatisfactory performance, especially with respect to poor service delivery. Hence, most water utilities are not commercially viable. However, recent developments have blurred distinct delineation of duties whereby all the tiers, Federal, State and Local Governments are now involved in the provision of water. Yet, the demand-gap keeps increasing due to, among other things, overlapping functions and massive wastes in public expenditure, in the face of rapid growth of communities and population. Till date, majority of Nigeria's population is not connected to large-scale systems of water supply. Rather, it relies on 'traditional' forms of supply (from streams or wells) or boreholes sunk by governments, individuals or through communal efforts.

2.27 POLICY ON WATER SERVICES IN NIGERIA

It is envisaged that an appropriate national water reform could not be achieved without the existence and due observance of the provision of a national policy. Hence, information on this policy will help chart an appropriate course of action on water sector reform.

According to the Federal Ministry of Water Resources (2000), the objectives of Nigeria's National Water Policy are as follows:

1) Increase service coverage for water supply nation - wide to meet the level of social economic demand of the nation.
2) Ensure good water quality.
3) Ensure affordability of water supply for the citizens.
4) Guarantee affordable access for the poor to basic human need level of water supply.
5) Enhance national capacity in the operation and management of water supply.
6) Privatise water supply (where feasible) with adequate protection for the poor.
7) Monitor the performance of the sector for sound policy adjustment and development for water supply.

2.28 CHALLENGES FACING SERVICE DELIVERY IN DEVELOPING COUNTRIES

Urbanization is enlarging the areas and number of people un-served water by public water utilities. This results in more people, especially the poor who live in urban slums being

forced to buy water from non-state providers (NSPs), usually at a price between 20 - 100% higher than that charged by the government - owned utility (SANAA, 2003). In Sub-Sharan Africa, it is estimated that between 30-60% of the urban population is unconnected to the public water supply system, and are served by NSPs.

In developing countries the public sector carries the primary responsibility for water service delivery in the urban areas. Public utilities currently serve up to 95% of the population through piped network systems. The levels of water service delivery vary for the house connections; house taps and community water stand points.

Public utilities, under government control, have had poor performance records, and are in need of reforms. Urban water supply services in the low-income countries and in increasing numbers of middle income countries suffer from intermittent interruptions with increasing frequency and lengthening duration. Most of the public utilities in developing countries fail to serve the poor. Many of them are saddled with commercial debts, and many fail to meet even their operating and maintenance costs from the income generated.

Fixing of tariffs and subsidies are the challenges facing water utilities, high tariff and poor subsides will prevent the poor from having adequate access to quality and adequate quantity water supply and this may have health implication for the community resorting to other sources of water supply.

2.29 MISCONCEPTION OF WATER AS A SOCIAL COMMODITY

The difficulties experienced nationwide in the water sector emanated from the colonial era. They believed that the provision of certain social amenities such as roads and water supply is the sole responsibility of the government. They believed that since the citizens paid their

taxes regularly, they were no longer expected to contribute in the provision of these amenities. Water is also considered as one of such social commodities with little or no price attached to it.

Nigeria today is ranked among the poorest nations in the world and 70 per cent of Nigerians hardly boast of two square meals daily, this shows the level of poverty in the country (Okeke et al, 2000). Therefore, most people in the country can not avoid the water bill. So for one to still believe in the ability of government alone to provide most basic social amenities free of charge at this period of our nation's history, such a person must be living in a delusion.

In the light of our present situation, the provision of any social amenity by the state or federal government should be subjected to a through economic analysis with a clear vision of the opportunity cost in embarking on such a project.

2.30 COMMERCIALIZATION OF SWAS

The need to have Commercialized State Water Agency (CSWA) has become imperative for reasons of efficient management of water resources, enhanced consumer satisfaction and adequate generation of revenue from water supply.

Features of CSWA are as follows:

1) An organizational structure borne out of procedural convenience, such that the decision making process is a collective affair involving all segments of the organization.
2) Statutory functions and empowerment to determine and fix appropriate prices for water and an administrative machinery to collect as much as possible all

collectable water bills from consumers.

3) A responsible management that is capable of taking decisions on matter bordering on staff recruitment, promotion and discipline without recourse to civil service bureaucracy.
4) Commercial orientation in all its activities and approaches to the problem and relationship to consumers.

2.31 WILLINGNESS TO PAY

Ma'ruf (2005) revealed that 76% of the populace in Kaduna State were willing to pay more for water supply, 18% indicated otherwise and 3% were undecided. For full water household connections the average monthly water bill willing to pay per household in the state is ₦1230.20. Inclusion of community based water service enterprise is based on the conviction that a substantial capacity exists for internal revenue generation from full user charge if only there is a favourable disposition towards its exploitation. Many researched has been carried out in water supply and sanitation sectors to investigate, the willingness of households to pay for service delivery as compared to its full cost recovery (Whittington et al, 1989; 1993; Altaf, 1994; UNICEF, 2000, Stoveland Consult, 2000).

In view of these factors, inclusion of community - based water enterprise is also projected as a necessary tool for the achievement of efficiency in resource allocation (Kayaga and Franceys, 1998) and demand management by reducing wastages, since consumption is strictly in response to effective demand for the services. These consideration has informed much of the thinking on appropriate policies for sustainable urban services provisions in recent times, making community based water enterprise to be rationalized as an economic (accountability in service delivery, cost recovery, efficacy of resource allocation) as well as

a strategic (long term sustainability, resource conservation) necessity. The policy entails major institutional reforms enabling the management of the provision of services like a business, not a bureaucracy, opening the way for different management options including a wide range of public – private partnership frameworks. Table 2.5 shows the opinion of the consumers on the water tariffs in Kaduna State.

Table 2.5: **Opinion of Water Consumers in Kaduna State on Existing Water Tariff**

Neighbourhood	Expressed Opinion on Tariff Levels by Household Heads (%)			
	Low	Moderate	High	No Response
Kwarbai	13	67	13	7
Kaura	70	10	20	0
Iya	0	7	86	7
Juma	0	67	33	0
Gyallesu	0	57	43	0
Tundun Wada	7	53	40	0
Tudun Jukun	18	45	18	18
Wusasa	0	0	0	0
Sabon Gari	8	75	17	0
Muchia	0	43	57	0
GRA	5	40	45	0
Kwangila	0	36	36	27
Palladan	0	79	21	0
Zango	17	61	11	6
Samaru	14	43	14	29
Hayin Dogo	0	100	0	0
Total	**10**	**46**	**29**	**15**

Source: Ma'ruf, S. (2005).

2.32 THE CASE FOR SUSTAINABILITY THROUGH DE – BUNDLING

Incessant failure of attempts to improve the situation of urban water service delivery has led to the general realization of the futility of simply injecting more funds into the system. Structural reform and a repositioning of the SWAs are increasingly being recognized as the palliative necessary for effecting positive changes. This can be seen as a direct fall out of global development since the 1990s in which the major dicta for development issues are

woven around the question of sustainability as it concerns economic, environmental gender and public affairs (government) ramifications.

For the urban water supply sector, the question of sustainability on the basis of those concerns has equally been paramount. Financial sustainability has in particular become a subject of discussion at a number of both local and international forums for effective financial sustainability of State Water Agencies, with a resounding endorsement of the principles of cost recovery through commercial operations. The shift in policy indicates the desire for a remedy against persistent financial incapacity among institutions providing urban water supply to cope with rising demand. A number of developments have given impetus to the drive towards de – bundling, commercialization and even outright privatization of urban water supply (Kayaga et al., 2006).

2.33 REVIEW OF THEORIES AND TECHNIQUES USED FOR EVALUATING UTILITIES

2.33.1 Evaluation

Evaluation is more complicated than monitoring. Evaluation assesses the impact of the water utility on the people being served in order to find out whether the objectives of the utility are still realistic and worth implementation. It also gives credit for success to various factors or people, and helps with accountability (Green, 2003). Financial capacity problems of most water utilities can be attributed to lack of operating funds and access to capital funds.

As compared to traditional electricity supply, telecommunications, and gas utilities, many

water utilities in many states of Nigeria are financially fragile. Some states water utilities operated successfully in the past are being stressed by the current economic realities of the water supply industry.

The economics of water supply in many states of Nigeria are dominated by three external factors. These factors are:

1) The need to comply with regulatory provisions of the Safe Drinking Water Act (SDWA).
2) The need to replace and upgrade an aging infrastructure.
3) The need to meet water demand associated with population growth and economic development.

Evaluation of water utilities is important to know the economic viability of the utilities, the functionality of the infrastructures and performance of every aspect of the water utilities. Evaluations commonly seek to determine the efficiency, effectiveness, impact, sustainability and the relevance of the project or utilities' objectives. An evaluation should provide information that is credible and useful, offering concrete lessons learned to help partners and funding agencies of water utilities make decisions (IFAD, 2002).

Dziegielewski (1996) stated that in designing, implementation and evaluation of the water utilities require proper knowledge of present water utilities situation and understanding of a strategic methods to support evaluation of long - term and short - term demand management of the water utilities is required. Benefits of evaluating water utilities include the following:

1) It helps to identify if the water utility study is necessary or otherwise

2) It shows whether any changes need to be carried out by the utility
3) It enables one to learn from what went well and what could be have done better.
4) It enhances the purpose of accountability to stakeholders.

2.33.3 Types of Evaluation

There are three major types of evaluation as stated by Adeyemi (2002). They are as follows:

1) ***On - going Evaluation***: - This focuses on improving the performance of an on going project and it is expected to highlight the efficiency of the project implementation and cost over – runs. This is also known as monitoring evaluation.
2) ***Terminal Evaluation***: - This is the second type of evaluation which is expected to form the basis for the decision about the future action of the utility. Its findings and recommendations are used when a new phase of water utility is under consideration.
3) ***Ex- post - Evaluation***: - This kind of evaluation is considered after sufficient period of time has elapsed since water utility completion so that the impact of the product can be observed or measured. According to Adeyemi (2002), this will normally require a minimum period of two years after completion of the project.

2.34 TECHNIQUES USED TO EVALUATE WATER UTILITIES

Various techniques that have been used over the years in the water utility sector of the entire globe have been well summarized by Mays (2004). The broad

classifications of all existing water utilities performance evaluation include the following:

1. **International Water Association (IWA) Performance Indicator (PI) System:**

The IWA PI system is the reference system for timely management tool for water services undertakings. The work on the development of the PI started in 1997 and has since progressed through more than 20 scientific and technical meetings in Europe, South America and Africa. The final form of the PI, called Performance Indicators for water Services, has since 2000 been presented in an IWA manual of Best Practices Series (Alegre et al. 2001).

2. **The World Bank Benchmarking Toolkit:**

The Benchmarking Water and Sanitation Utilities (BWSU), designed primarily for developing regions, includes 27 indicators relating to three (3) factors related to water utilities size, range of service and extent of private sector involvement. BWSU aims at facilitating the sharing of cost and performance information between utilities and between countries by creating a network of linked web sites, through a global partnership. Table 2.6 shows the selected indicators of municipal water utilities in most African countries while Table 2.7 shows the performance indicators for Lesotho water utility from 2000 – 2004.

Table 2.6: **Moody's Selected Indicators of Municipal Performance of Water Utilities**

Financial Indicator	***Median Value (1988)***
Operating ratio	70.1%
Interest coverage	4.08
Debt service coverage	2.18
Debt ratio	33.1%

Source: Ammons, 1996.

Table 2.7: **Performance Indicators from 2000 – 2005**

Performance Indicators	**2000/01**	**2001/02**	**2002/03**	**2003/04**	**2004/05**	**Yardstick**
Working Ratio	1.00	1.00	0.51	0.57	0.63	0.68
Unaccounted for water	20%	15%	15%	10%	8%	15%
Commercial performance, collection period for payment(month)	2	1	1	1	1	<3
Service coverage(Urban)	98%	98%	98%	98%	98%	100%
Duration of service (hour/day)	24	24	24	24	24	24

Source:Tynan and Kingdom, 2002.

There are four types of benchmarking. They are as follows:

1) **Metric benchmarking** is defined as the quantitative measurement of performance in terms of inputs, outputs, outcomes and the relationship between them. There are

four classifications of metric Benchmarking, which are; (i) Total methods or spatial method (ratio), (ii) Frontier or non-frontier, (iii) Parametric or Non-parametric and (iv) Stochastic or deterministic.

2) **Process benchmarking** is defined as the mapping of one's own process and subsequent comparison of the process with those of other companies with exemplary performance in a similar process (Kingdom et al., 1996).
3) **Customer Perception Surveys**.
4) **Model Company Comparisons** (Engineering Models)

2.35 METHODS USED TO EVALUATE FINANCIAL CAPACITY OF WATER UTILITY

2.35.1 Ratio Analysis

Ratio analysis is a tool that has been used to evaluate water utility financial capacity. It can also be used to construct a model that can predict business failures. Ratio analysis simply attempts to provide insight into a firm's financial condition by comparison of a variety of financial relationships over time and to other similarly situated firms (David et al., 1997). David, et al (1997) model used financial ratios to measure profitability (two separate measures), liquidity, leverage, and profit trend, and compare growth and efficiency and efficiency and profitability. It is a well-known tool for financial evaluation in water utilities, but has some limitations particularly in small water utilities. Its limitations include its need for accurate historical data, and accommodate oddities in the data available, the difficulty involved in scaling ratios, and the relative sensitivity of the data used-all of which may be exaggerated in the case of small water utilities.

2.35.2 Discounted Cash Flow (DCF)

Discounted cash flow analysis is forward-looking, which makes it more appropriate for water utility financial evaluation than the ratio analysis. It is based on historical performance which requires comparable financial data. Regulators are primarily concerned, after all, with how the utility will perform in the future and whether it will continue to provide utility service. DCF analysis is also complementary to business planning, a current focus of water utility regulation.

2.36 REVIEW OF SITUATIONAL ANALYSIS IN WATER UTILITIES

Situational analysis is a management concept that helps water utility to address and prepare for both anticipated and unexpected problems. Situational analysis utilizes asset management to evaluate water utility's current physical situation, and it also evaluates utility systems financial and managerial situation.

It assists the utility to make fundamental decisions about the purpose, structure and functions of their water utilities systems.

In order to make situational analysis planning work, however, utilities need to collect the information that will allow them to make intelligent, informed decision about the purpose, structure and functions of their water utilities systems.

Situation analysis is a comprehensive audit of water utility using performance indicators which include: Water produced/year, unaccounted for water, water supply area(%),

customer base, metered connections(%), Average water supply, operating ratio and revenue collection efficiency**.**

2.36.1 SWOT Analysis

SWOT analysis is simply understood as the examination of an organization's internal strengths and weaknesses, and its environment, opportunities, and threats. It is a general tool designed to be used in the preliminary stages of decision – making and as a precursor to strategic planning in various kinds of application (Adepoju,et al. 2010).

SWOT is an acronym for **S**trengths, **W**eaknesses, **O**pportunities, and **T**hreats. A SWOT analysis identifies the organizational strengths, weaknesses, opportunities and threats. It enables the organization to determine the set of their key success factors. That is, those activities or areas in which it must be especially proficient to succeed by fully exploiting the opportunities available to the utility and the areas needed to combat the threats that endanger the utility (Boseman and Phatak, 1989).

A SWOT analysis measures a business unit, a proposition or idea. The SWOT analysis is an extremely useful tool for understanding and decision-making for all sorts of situations in business and organizations. The SWOT analysis headings provide a good framework for reviewing strategy, position and direction of a company or business proposition, or any other idea. SWOT analysis also works well in brainstorming meetings. SWOT analysis can also be used for business planning, strategic planning, competitor evaluation, marketing, business and product development and research reports. A SWOT analysis is a subjective assessment of data which is organized by the SWOT format into a logical order that helps understanding, presentation, discussion and decision -making.

The first step in a SWOT analysis is to make a worksheet by drawing a cross, creating four sectors, and one each for strengths, weaknesses, opportunities, and threats. An outline of a worksheet is shown in Tables 2.8 and 2.9 show the SWOT template.

Table 2.8: SWOT Analysis Worksheet.

Potential internal strengths	**Potential internal weaknesses**
1	1
2	2
3	3
4	4
S	W
O	T
Potential external opportunities	Potential external threats
1	1
2	2
3	3
4	4

Source: Adepoju, 2010

Table 2.9: **SWOT Analysis Template**

Strengths	Weaknesses
Advantages of proposition? Capabilities? Competitive advantages? Resources, Assets, People? Experience, knowledge, data? Financial reserves, likely returns? Marketing - reach, distribution, awareness? Location and geographical? Price, value, quality? Qualifications, certifications? Processes, systems, IT, communications? Cultural, attitudinal, behavioural? Management cover, succession?	Disadvantages of proposition? Gaps in capabilities? Lack of competitive strength? Reputation, presence and reach? Financials? Timescales, deadlines and pressures? Cash flow, start-up cash-drain? Continuity, supply chain robustness? Effects on core activities, distraction? Reliability of data, plan predictability? Morale, commitment, leadership? Accreditations, etc? Processes and systems, etc?
Opportunities	**Threats**
Market developments? Competitors' vulnerabilities? Industry or lifestyle trends? Technology development and innovation? Global influences? New markets, vertical, horizontal? Geographical, export, import? Business and product development? Information and research? Partnerships, agencies, distribution? Volumes, production, economies? Seasonal, weather, fashion influences?	Political effects? Legislative effects? Environmental effects? IT developments? Competitor intentions - various? Market demand? New technologies, services, ideas? Vital contracts and partners? Sustaining internal capabilities? Obstacles faced? Insurmountable weaknesses? Loss of key staff? Sustainable financial backing? Economy - home, abroad? Seasonality, weather effects?

Source:www.businessballs.com

Advantages of SWOT analysis

The following are the advantages of using SWOT analysis.

1) Easy to use

2) Works without much technical equipment

3) Raises awareness of opportunities, weaknesses and threats

4) Gives the possibility to respond to threats and weaknesses

5) Generates new ideas and strategies

Disadvantages of SWOT analysis

The following are the disadvantages of using SWOT analysis.

1) The SWOT analysis is subjective

2) There is a danger of oversimplifying

3) The SWOT analysis is often performed as a simple list and not reflected and analyzed thoroughly

2.36.2 PEST Analysis

PEST analysis is used to measure a business's market and potential according to external factors; **P**olitical, **E**conomic, **S**ocial and **T**echnological. It is good to complete PEST analysis before SWOT analysis. PEST helps to identify SWOT factors. PEST assesses a market, including competitors, from the standpoint of a particular proposition or a business. PEST becomes more useful and relevant the larger and more complex the business or proposition, but even for a very small local businesses a PEST analysis can still throw up one or two very significant issues that might otherwise be missed.

The macro – environment is the key to effective strategic marketing decision. It is important to take stock of the nature of the organization's environment in terms of how uncertain it is. It is necessary to determine whether the environment is simple or complex; and whether it is relatively static or dynamic. PEST analysis looks at the political,

government and legal forces; economic forces; social, cultural, and demographic forces; as well as the technological and environmental forces.

2.37 WATER UTILITY PERFORMANCE IMPROVEMENT PLAN

Water Utility Performance improvement plan is simply a road map used by the Water Utility to achieve stated objectives, and should be able to: (i) define the scope of the water utility's activities in terms of what it will do, and what it will not (ii) match the water utility's activities to the environment in which it operates, so that it optimizes opportunities and minimizes threats; and (iii) match the water utility's activities to its resources capacity such as staff, finance, infrastructure, and technology (Mugabi et al., 2007). Strategic planning framework can be used to develop a water utility Performance Improvement Plan (PIP).

CHAPTER THREE

MATERIALS AND METHODS

3.1 DESCRIPTION OF THE STUDY AREA

Kaduna state is located at the centre of Northern Nigeria. Kaduna State covers a land area of 5, 100 squared kilometers. It has a population of 6, 029,427 (Kaduna State Water Board, 2005) and comprises of 23 Local Government Areas. The capital of the state is Kaduna and has a land area covering some 14, 000hectares with an average density of about 75 persons per squared kilometer. Table 3.1 shows the general information about Kaduna State.

58 per cent of the population is served with water supply by Kaduna State Water Board. A State-Wide Water Resources Master plan is being developed to improve coverage to more than 70 per cent covering a projected population of 7.1 million by the year 2020. However, with the on-going awareness campaign being intensified for consumers to realize that fund for providing potable water must be generated from the volume of water sold, things are changing. As such Kaduna State Water Board (one of the 37 SWAs in the country) has been operating as a commercial entity, since 1993, paying for nearly all its operational expenses from internally generated revenue.

It has a political significance as the former administrative headquarters of the North Region during the colonial era. The state shares boundaries with Niger State to the west, Zamfara, Katsina and Kano states to the North, Bauchi and Plateau States to the East and FCT Abuja and Nassarawa state to the South. Figure 3.1 showing the map of Kaduna Metropolis, Kaduna State and Figure 3.2 is the Map of Nigeria showing Kaduna State.

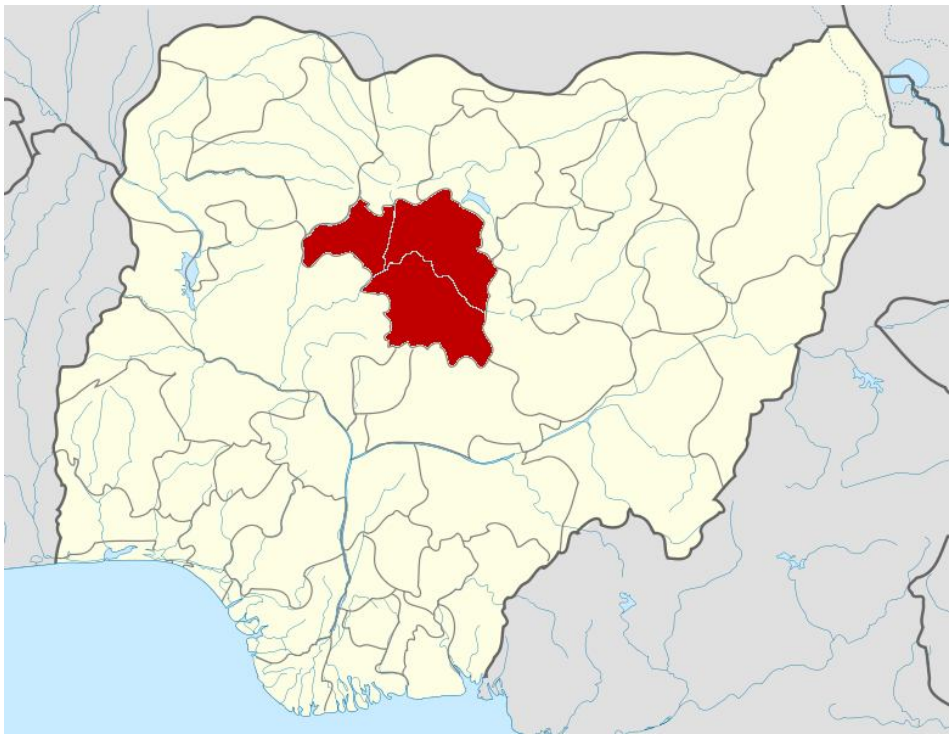


Fig. 3.2: Map of Nigeria showing Kaduna State

3.1.1 Climate, Vegetation of the Study Area

The area was noted to have two distinct seasons: the dry and wet seasons. The dry season normally starts from October and lasts till early March which is also characterized by the harmattan. The climate is caused or governed by the influence of the North-West trade winds from the dry continental Sahara desert between November and April. The South-West trade wind is from maritime air mass across the Atlantic Ocean, with warm and humid air, monsoon wind occurring between April and October.

Vegetation is characterized by the Guinea Savannah during the wet seasons and grasses flourish forming thick vegetation but when dry season returns, the vegetation is now characterized by the drying up of the grasses leaving the area bare to erosion effects.

3.1.2 Land use Pattern, Relief and Drainage

The main usage is either for agricultural purpose or left as uncultivated savannah land. In addition there is a considerable grazing field for the predominant species of livestock of cattle, sheep, and goats. The relief pattern is characterized by an undulating terrain bearing low and gentle slopes towards the southern parts. The Guza stream and the Kaduna River are the two main sources of water supply coupled with some other small tributaries that contribute flow to the main sources.

3.1.3 Geology and Soil Formation

Kaduna is underlain by Precambrian rocks of the basement complex that consist of older granites and gneisses, meta-sediment such as quartzite, quartz and meta-sandstones. The

soil texture of the area is sandy loam with partly lateritic top soil making it relatively suitable for agricultural practices.

Table 3.1: **General Information of Kaduna State**

Geographical Location	**North Western Nigeria**
Area	7627.20 sq kilometers
Population growth rate	Average = 2.83%, Urban = 3.5 %, Rural = 2.1 %
Urbanisation (%)	41.2 %(1997)
Major Towns	Zaria, Kafanchan, Birnin-Gwari, Kwoi, Saminaka, Kachia,
Climate	Tropical
Political Structure	Democratic system of governments with 23 Local government councils
Capital	**Kaduna**
Number of Urban Centres2 (Population > 20,000)	Katere, Jere, Dutsinwai, Ikara, Damakasuwa, Kaura.
Incidence of poverty(1999)2	Living below poverty line = 67%, (only 30% of the poor and 5 % of the extremely poor live in the urban area
Life expectancy	45 years
GDP ($bn)3	32.53
Naira Exchange rate to US$	150
Population(in millions)	6,076562

Source: Restoring Urban Nigeria. (World Bank Nigeria Publication 2001-2007)

3.2 RESEARCH DESIGN

The central theme of the research consists of attempt to provide empirical backing to evaluate the performance of service delivery system of Kaduna State Water Board using the three schemes in Kaduna Township and also to evaluate the principle of de – bundling the service delivery of the study area. This is aimed at providing an early warning message

on the pros and cons of the policy of including community - based water enterprise in the service delivery.

The methodology used for institutional assessment is based upon team field investigation procedures which identify, define, and verify institutional performance using indicators which have been pre – identified.

The enquiries for the research involved field investigation based on household survey of the general population in addition to the secondary information from the Kaduna State Water Board, the institution responsible for the public water supply system in Kaduna Township and through a combination of literature review, interviews, observations and site inspection. Interviews were used primarily to seek opinions of key stakeholders such as Kaduna State Water Utility management and Kaduna State government representative and focused on the core ideas of evaluating the water service delivery performance, which are situational analysis of the utility, SWOT/PEST and improvement plan for the utility. The situational analysis of the utility were carried out using performance indicators which were measured using key indicators such as working ratio, revenue collection period, connection charges, unaccounted for water (UFW), water availability per day and affordability of water as suggested by Tynan and Kingdom (2002). Quantitative data was analyzed using a simple calculator.

The field survey addressed the population of the household as the users of the service to investigate their situation with respect to access to service delivery presently and to advice accordingly how the situation might be under the control of community based water enterprises for ease of accessibility to service delivery. The survey also addressed the

entire performance of the two water schemes using performance indicators and SWOT analysis.

By placing the findings in the research in the context of current developments nationally and globally, an insight was sought that would give a robust and workable means of enhancing the performance of the water sector delivery services as it pertains specifically to the study area and to other Nigerian cities at large.

3.3 PROCEDURE FOR DATA COLLECTION

3.3.1 Preliminary investigation

Published articles, national water policy documents as well as documents from Kaduna State Water Utility were studied, consultations with focus group, that is, customers served, water professionals and stake holders were made. The first segment of preliminary investigation was a structured interaction with professionals who had experience with the State water board since inception or who had carried out consultancy or construction projects in the area of service delivery of water services in the state. The advice of these professionals was used to provide direction for later stages of the study. The second component was the site visits to districts water treatment plants and the locations of service reservoirs in Kaduna metropolis. The oral interviews with the area managers and operators as well as stakeholders of these schemes were intended to provide some understanding of the mode of operations, record keeping and performance assessment in terms of service delivery at such scheme. Each of the components was intended to provide insight into the potential application of performance indicators in situational analysis of the scheme. Also,

it helped in carrying out the SWOT and PEST analysis for the scheme. The objectives of the preliminary investigation were as follows:

1) Gather information on the current status of the existing schemes.
2) Review the history, rationale and methodology of performance assessment and bench marking.
3) Collect evidence of the unique economic and operational characteristics of each water scheme that may contribute to the difficulties in the level of service delivery.
4) Provide information and the direction to explore to develop performance improvement plans for the scheme.

3.3.2 Consultation

The purpose of the consultation was to solicit opinions on the importance of performance indicators for evaluating service delivery performance of water utility. Comments and suggestions collected during the consultation were intended to provide guidance for other research components. The consultation process involved two step approaches.

The site visit component was intended to collect information from district water schemes staff members that could be used in the evaluation of service delivery performance of the water utility. Kaduna State Water Board Headquarters (KSWB HQ), State Rural Water Offices and Ministry of Water Resources in the state were visited in the study area. Schemes visited were as follows:

a) Kaduna North Treatment plant (Old and New Schemes)
b) Kaduna South Treatment plant

3.3.3 Site Visits

The site visit component was intended to collect information from plant managers, operators and member of staff at the treatment plant that could be used in the evaluation of water service delivery. Kaduna State Water Board Headquarters, State Ministry of Water Resources were visited in an attempt to schedule joint site visits. Site visits were done with the Technical Staff of the Water Board.

3.3.4 Oral Interview

Oral Interview was held with the core staff of the Water Board both at the treatment plants, KSWB HQ and with the staff of the State Ministry of Water Resources. Oral Interview was also held with the stakeholders in the state, that is, the customers, the Non Governmental Organizations (NGOs) and Professional bodies. Questionnaires were distributed to the staff of the Water Board and the households in the study area. The oral interview with the staff of the KSWB was used to carry out the SWOT analysis for the two water schemes in the study area.

3.4 KEY PERFORMANCE INDICATORS (KPI) FOR WATER SERVICE DELIVERY

The performance of water service delivery is divided into two segments. The first segment is the service performance and the second segment is the costs recovery of the service delivery (See Table 3.2).

The following parameters were used for the assessment of the water service delivery in the study area. These include:

1) Service Coverage

2) Water Consumption

3) Extent of metering water connections

4) Non – Revenue water (NRW)

5) Quality of Water Supplied

6) Cost recovery in Water supply services

7) Efficiency in collection of water – related charges

8) Operating Costs

9) Continuity of water supply

10) Billings

Table 3.2: **Indicators Used for Assessing the Public Water Supply System**

Service performance	**Cost Recovery Performance**
• Total and per capital provision of water • Service Coverage • Access of the population and spatial coverage of the system • Number of connections • Cost of production • Hours per day of service • System loses (UFW)	• Tariff structure • Billing efficiency • Collection efficiency • Amount of revenue generated and level cost recovery • Unit production cost

Source: Ma'ruf (2005)

3.5 DATA NEEDED FOR INDICATORS

The data needed to carry out performance indicators are as follows:

1. ***Extent of Service Coverage:*** To check the extent of the water service delivery coverage the following historical data were required:

   a) Total number of households in the service area

   b) Total number of households with direct water supply connection.

   Equation (2.1) was used to calculate the service coverage.

2. ***Water Consumption:*** To calculate the total water consumption for the study area, the following data were used:

   a) Total annual water consumed (litres)

   b) Total population served per day

   Equation 2.1 was used to calculate the total water consumed.

3. ***Extent of metering water connections:*** In calculating the extent of metering, the following data were used:

   a) Total number of direct service connections

   b) Total number of public standposts

   c) Number of metered direct service connections

   d) Number of metered public standposts

Equation 2.4 was used to estimate or calculate the extent of metering of the utility.

4. ***Non – Revenue water (NRW):*** The data required to calculate the Non – Revenue water are as follows:

   a) Total water produced and put into the transmission and distribution system

   b) Total water sold

   Equation 2.3 was used to calculate the Non – Revenue water

5. ***Quality of Water Supplied:*** To determine the quality of water supplied to the community, the following data were used:

   a) Total number of water supply – related complaints received per month

   b) Number of samples that meet the specified potable water standards in the month

   Equation 2.5 was used to calculate the indicator in percentage.

6. ***Cost recovery in Water Utility:*** To determine the cost recovery of the water utility, the following data were used:

   a) Total annual operating expenses

   b) Total annual operating revenues

   Equation 2.6 was used to calculate the cost recovery performance in percentage.

7. ***Efficiency in collection of water – related charges:*** The data required for the efficiency in collection of water related charges included:

a) Current revenues collected in the given year

b) Total operating revenues billed during the given year

Equation 2.7 was used to determine the efficiency in collection of water related charges.

8. ***Operating Costs:*** The data required to determine the unit operation cost of the water utility include the following:

a) Annual water service operational expenses (₦), and

b) Total annual volume of water produced (m^3)

$$Uopc = \left(\frac{W_{opes}}{V_{wprd}}\right) \quad (3.1)$$

Where;

Uopc is the unit operation cost

W_{opes} is the annual water service operational expenses

Vwprd is the total annual volume of water produced

9. ***Continuity of water supply :***Average hours of supply per day are used here to estimate the number of hours the water supply is per day. The unit is in hours.

10. Billings: This is operating revenues expressed by annual amount of water sold.

The data used to calculate the indicators for the utility performance were collected from the State Water Board Headquarters, district offices, State Ministry of Water Resources, the Kaduna North Treatment plants and Kaduna South Treatment plant. The historical data is provided in Appendices B, C and D.

3.2.2 SWOT Analysis for the Review of the Public Water Supply

SWOT analysis was carried out for the utility based on the information gathered from oral interview and data collected from site visits. The strengths, weaknesses, opportunities and the threats of the utility were analyzed. Table 2.8 shows the template used for the SWOT analysis.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 INTRODUCTION

This chapter presents the Information and data collected from Kaduna State Water Board, Kaduna State Ministry of Water Resources, Kaduna South Water works and Kaduna North water Works and relevant stakeholders. These were used as tool to establish the true position of water services delivery in Kaduna metropolis and Kaduna State as a whole. The field survey also assisted in knowing the condition of water service delivery in the state.

The oral interview conducted formed a very good guide in the findings of the water utility in the state and the impact of the water service delivery on the consumers. The interview of the consumers gave more insight in the activities of the water utility and the level of performance of service delivery.

4.1 Situational Analysis

For situational analysis, two criteria were used to analysis the current status of the utility; comprehensive audit using performance indicators and the **SWOT**. The results presented in this section are on the information and data collected from Kaduna North Water works (KNWW), Kaduna South Water works (KSWW) and Kaduna State water Board Headquarters.

4.1.1 Key Performance Indicators

The key performance indicators for Kaduna North water works (Old and New) and Kaduna South water works for seven years (2000 – 2006) is shown in Tables 4.1 – 4.3 respectively.

The average key performance indicators for Kaduna Metropolis and the entire state are shown in Table 4.4. The key performance indicators were estimated from the data collected from the three water works (Appendices B, C and D).

4.1.2 SWOT Analysis

Table 4.5 shows the SWOT analysis of the KSWB as at October 2009. It shows the Strengths of the KSWB, their Weaknesses, Opportunities available to the Water Board and the Threats confronted the Water Board.

Table 4.1: **Key Performance indicators for Kaduna North Water Works (Old and New) from 2000 – 2006**

Indicators	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Service coverage (%)	77	75	69	69	71	71	72
Capacity Utilization (%)	57	61	57	63	64	57	51
Unaccounted for Water (%)	28	54	35	38	43	52	68
Metering (%)	10	10	10	10	17	17	16
Billing efficiency (%)	72	46	65	62	57	48	32
Collection efficiency (%)	78	80	69	74	82	76	89
Working ratio (%)	0.73	0.80	0.68	0.19	0.24	0.76	0.32
Duration of supply (hr/day)	21	14	19	20	17	13	7
No of staff per 1000 connections	12	9	11	12	12	14	15

Table 4.2: **Key Performance indicators for Kaduna South Water Works from 2000 – 2006**

Indicators	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Service coverage (%)	69	71	71	73	65	66	68
Capacity Utilization (%)	63	64	57	51	76	76	67
Unaccounted for Water (%)	38	43	52	68	86	86	33
Metering (%)	10	10	17	16	16	16	16
Billing efficiency (%)	62	57	48	32	14	14	67
Collection efficiency (%)	74	82	76	89	89	100	95
Working ratio (%)	0.28	0.24	0.76	0.32	0.29	0.23	0.23
Duration of supply (hr/day)	20	17	13	7	7	7	5
No of staff per 1000 connections	12	12	15	15	15	15	17

Table 4.3: **Key Performance indicators for Kaduna State Water Utilities from 2000 – 2006**

Indicators	2000	2001	2002	2003	2004	2005	2006
Service coverage (%)	27	27	28	27	26	26	25
Capacity Utilization (%)	53	53	57	51	45	45	59
Unaccounted for Water (%)	41	39	38	51	68	68	21
Metering (%)	9	11	16	16	16	16	7
Billing efficiency (%)	41	39	38	51	68	68	21
Collection efficiency (%)	68	74	81	74	88	69	69
Working ratio (%)	0.97	1.01	1.00	1.17	1.02	1.43	1.65
Duration of supply (hr/day)	15	15	15	11	6	6	6
No of staff per 1000 connections	20	21	21	23	24	24	23

Table 4.4: **Average Key performance indicators (Kaduna metropolis and Kaduna State**

Indicators	Kaduna Metropolis	Kaduna State
Service coverage (%)	71	27
Capacity utilization (%)	62	52
Unaccounted for water (%)	52	47
Metering (%)	14	13
Billing efficiency (%)	48	47
Collection efficiency (%)	82	74
Working ratio (%)	0.44	1.18
Duration of supply (hr/day)	14	11
No of staff per 1000 connections	13	22

Table 4.5: **SWOT analysis of KSWB as at October 2009**

STRENGTH	**WEAKNESSES**
Well knowledge and learned HR	Lack of adequate management skills
Good objectives oriented planning	High Unaccounted for water
Willingness to change by senior management	Inadequate performance measurement
Willingness and ability to curb corruption	Imported technology
Better public image than other utilities	Poor maintenance culture
Mindset to achieve corporation goals	Low service coverage, especially to the poor
Income from water billed	Inadequate customer services
Sufficient technical information from the network	High level of illegal connections
Experienced and dedicated staff	Weak management procedure and system
OPPORTUNITIES	**THREATS**
Abundant raw water sources	Political interference
More donor confidence than other utilities	Corrupt operating environment
Population increase, hence service expansion opportunities	Lack of in – country manufacturing of hardware input
Economic liberation allows PSP	Low technological and innovative capacity
Subvention from State Government	Debt burden
Communication technology growing	High poverty level among customers
	Unstable power supply

4.2 DISCUSSION

4.2.1 **Financial Sustainability**

4.2.1.1 ***Working Ratio****:* The average working ratio of the three schemes in Kaduna metropolis is 0.44 and fall within the target for developing countries is 0.68 (Tynan and Kingdom, 2002), while for the entire state the average working ratio is 1.18 as presented in Table 4.4. It means that the three schemes in Kaduna metropolis were able to recovered all their operating costs from customers from 2000 – 2006. The entire water utilities in Kaduna state were unable to recover their operating cost from customers.

4.2.1.2 ***Revenue Collection:*** Table 4.4 shows the average revenue collection from water tariff for the two water schemes in Kaduna metropolis is 82% and the average revenue for the entire water utilities in Kaduna State is 74%. This indicates that the average collection in the state is higher than the 73% benchmark for the developing countries (Banerjee et al, 2008).

4.2.1.3 ***Efficiency of Utility Investment:*** From Table 4.4 the average unaccounted for water (UFW) is 52% for the water utilities in Kaduna Metropolis and the average unaccounted for water for the entire water utilities in the state is 47%. The level of unaccounted for water for the state is far above the benchmark of less than 23% for the developing countries as stipulated by Tynan and Kingdom (2002).

4.2.1.4 ***Efficiency of Operation and Maintenance:*** The average number of staff per 1000 connections for the three schemes in Kaduna metropolis was 13, while the average number of staff per 1000 connections for the entire water utilities in the state is 22 from Table 4.4, these results are above the best practice target of five or fewer staff per

1000 connections for developing countries suggested by Tynan and Kingdom (2002). This shows that the staff has low efficiency.

4.2.1.5 ***Cost Recovery:*** Tables 4.6 – 4.14 show the cost recovery analysis of Water Board from 2008, 2009 and 2010. Table 4.14 shows the total cost of production and the total water tariffs. The percentage of water tariffs to cost of production including cost of investments is 7%, while the percentage of water tariffs to cost of production excluding cost of investment is 22% respectively for the three water schemes in Kaduna metropolis. From 2008 to 2010, the sum of Forty- One billion, Two hundred and Seventy Five thousand Million, eight hundred and eight thousand naira only (₦41,275,808,000.00) was spent based on ₦300/m^3 of water produced for the three years record, while Twelve Billion, Eight Hundred and Sixty Three Million, Six Hundred and Sixty Nine Thousand, Six Hundred Naira (₦12,863,669,660.00) was spent based on ₦93.50/m^3 of water produced for the three years record and the total water tariffs generated for the three years record was only Two Billion, Eight Hundred and Eight Nine Million, One Hundred and Sixty Six Thousand, Five Hundred and Sixty Naira only (₦2,889,166,560.00) (Table 4.14). It therefore, means that the water charge was very low. Therefore, there can not be any expansion in the system.

4.3 NEED FOR PRIVATE SECTOR PARTICIPATION IN WATER SERVICE DELIVERY

Table 4.4 shows that the average unaccounted for water in Kaduna metropolis is 52% and for the entire Kaduna State is 47% which is higher than the recommended benchmark for the developing countries. This implies that almost 50% of treated water can not be accounted for and this is affecting the revenue being generated by the water utility. From Tables 4.6 – 4.14, the cost of production including investment is ₦300/m^3, while the cost of production excluding investment is ₦93.50/m^3 and the water tariff is ₦21/m^3 (KSWB, HQ). At water tariff of ₦21/m3 and at cost of production at ₦93.50/$m^3$the Water Board only recovered 22% and at ₦32/m3 the Water Board were able to recover only 34% of what they spent on production, if there are no water loss. This indicates that the water utility cost recovery is low, which is an indication that KSWB are unable to recover what was spent on both the staff salaries and for the maintenance of the systems. If the cost of production is at ₦300/m^3 plus investment cost and the water tariff remains, they can only recover 7% and 10% of what they spent on production, if there is no water lost.

For effective and adequate water service delivery in the metropolis, private sector participation should be encouraged in the water service delivery section of the Water Board. They will purchase treated water from government - owned treatment plants; deliver the treated water to their service reservoirs and booster stations through the mains. The private water vendors are to sell the water to customers at their respective areas at affordable price jointly agreed by the government, community and the private water vendors. The private water vendors are to manage the distribution lines by carrying out the routine repairs along the submains and lines in their respective locality.

4.4 Approach to De – bundling of Water Service Delivery in Kaduna Metropolis

In Kaduna metropolis, there are 11 service reservoirs (Appendices E and F). Tables 4.15 and 4.16 show the locations of reservoir, capacity, diameter of the transmission main and the pipes material. Tables 4.17 and 4.18 show the summary population of the reservoirs locality from 2005 to 2030. The water demand estimate from 2005 to 2030 is shown in Table 4.19.

De – bundling of water service delivery is an approach whereby the service delivery aspect of the water board is given to a private water vendor to manage. In Kaduna metropolis there are 11 service reservoirs serving the entire customers in Kaduna town. Out of these reservoirs, the reservoir at Lugard Hall is considered for de – bundling.

Table 4.16 shows that Lugard Hall reservoir is located at Longitude $10^0$31'59.6" and Latitude $7^0$26'19.6" at elevation of 638m. The capacity of the tank is 4,500m^3. The tank is serving the following localities in Kaduna metropolis; Hayin Banki, Ungwan Sarki, Ungwan Kanawa, Ungwan Shanu, Ungwan Rimi, kabala Doki, Mahuta, Sabon Gari and Kabala Costain. Table 4.19 shows the total population of the area as at 2010 is 409,997; the total water demand estimate is given as 49,199.64m^3/day based on 120lpcd.

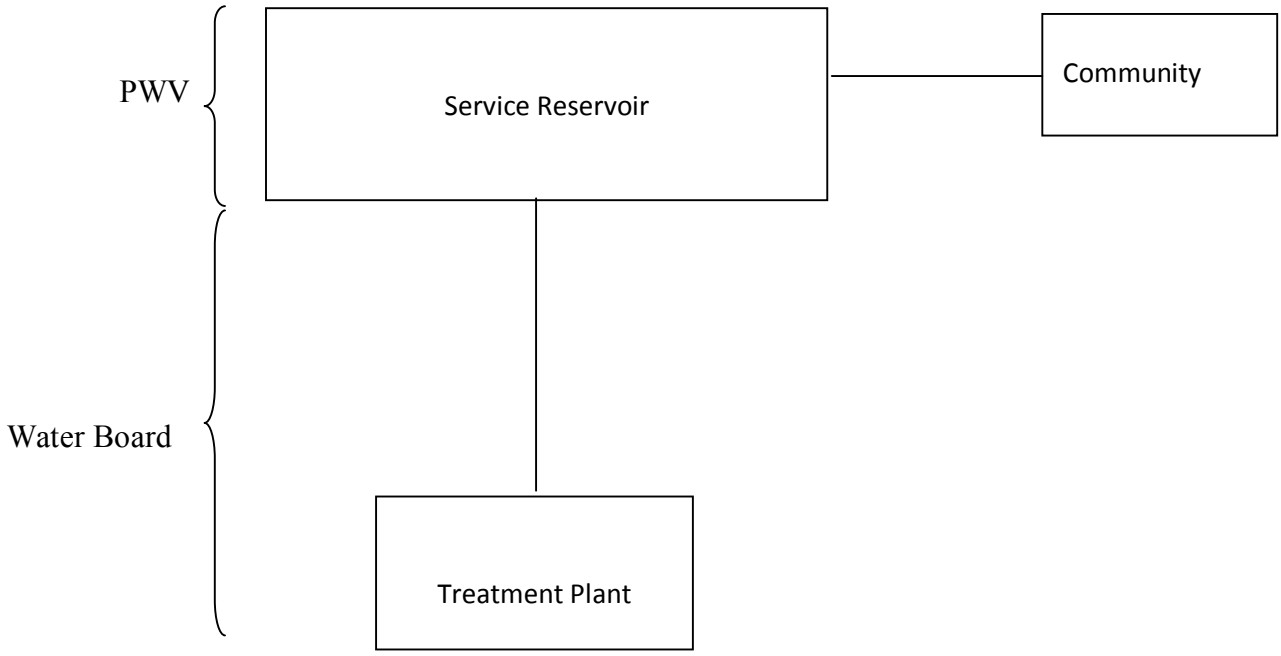


Figure 4.1: Schematic Diagram showing area to be handled by both PWV and Water Board

The Water Board will treat the raw water at the treatment plant and sold the treated water to the Private Water Vendor (PWV) through the transmission mains to the service reservoir. The Private Water Vendor then sales the water to the community through the distribution lines at affordable price. The Water Board would take care of the transmitting lines to the reservoir and maintenance of the treatment plant, while the Private Water Vendor takes care of the distribution lines, delivery pipes and the operation of the service reservoir (Fig. 4.2). The Water Board sales the treated water to the Private Water Vendor at a price not lowers than the unit cost of production. The cost of production before de – bundling is ₦93.50/m3 (KSWB, HQ) including other expenditure such as Overhead cost, operation and maintenance (Tables 4.6 to 4.14). If the distribution aspect of the scheme is given to the Private Sector, the population of the staff would reduce and the unit cost of production would be reduced. If the unit cost of production is reduced by 10 per cent. The

unit cost of production does not remain constant. The Private Water Vendor sales the water to the community at appropriate price to be fixed by the committee. The committee comprises of the representatives of the Government, the Private Water Vendor representative and the representative of the water user association in the community, NGOs and other Stakeholders in the State.

The Roles of the Water User Association in the Community are to:

i. Provide labourers to the water vendor
ii. Serve as a member of the price fixing committee
iii. Monitoring illegal connections

4.5 Viability of De – bundling Process

Elements and items of costing required in de – bundling process are as follows:

a. Revenue generated from water sales

b. Expenditure

   i. Cost of treated water to the PWV

   ii. Staff salaries (Overhead Cost)

   iii. Operation and Maintenance

De – bundling of the service delivery is viable; if the following are achieved:

1) The total revenue generated from water sales by the Water Board out weighs the operation cost.

2) The total revenue generated from water sales by the Private Water Vendor out weighs the cost of operation.

3) There is reduction in Non – Revenue Water.

Tables 4.31 and 4.32 show the revenue analysis and percentage loss from water sales by the Water Board for various water tariff scenarios from 2010 to 2020 before the introduction of Private Water Vendor. Table 4.33 shows the revenue analysis for Water Board from water sales to Private Water Vendors for various unit costs of production and Table 4.35 shows the revenue analysis of the Private sector and the expected profit.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

This work has attempted to provide a performance improvement plans framework and methodology for urban water utilities. The research has focused on developing countries, where there are dismal levels of access to safe water and water utilities have not performed as expected. The institutional set up of utilities in developing countries differs greatly from country to another. A number of shared management challenges were identified in the work, such as inefficiency in operations, high proportion of unaccounted for water, ineffective management information system, and general lack of a commercial orientation. Also, public water utilities operate in a constantly changing policy and institutional environment, with governments committed to implement reform aimed at making utilities more efficient, accountable and commercially oriented. For this reform to work utilities need to change their structure and strategy. Kaduna State Water Utility the case study of this work is subject to report on its performance to the state government but accountability mechanisms such as performance/agreements with the government and customers are non – existent making it difficult to fully hold the utility accountable. The utility had no customer charter or customer service agreements, lack customer care centre or call center and no customer consultative meeting have taken place since the inception of the utility. In addition the utility does not carry out regular service quality surveys on the customers.

On the issue of internal accountability, the employees are accountable to the management and in turn the management is accountable to the board for the results. The board is

accountable to the government (the owner). Some of Kaduna metropolis water utilities performance indicators from 2000 – 2006 fell within the yardstick of well performing water utilities of developing countries as defined by Tynan and Kingdom. But, some are far more than the yardstick of well performing water utilities in the developing countries as defined by Tynan and Kingdom, such as percentage of unaccounted for water, water coverage, number of staff per 1000 connections etc. For the performance results of the entire water utilities in Kaduna state most of the results are more than the yardstick of well performing water utilities of developing countries as defined by Tynan and Kingdom.

The cost of producing water including investment is ₦300/m^3 and cost of producing water excluding investment cost is ₦ 93.50/m^3. The water tariff in Kaduna State is ₦21/m^3 of water (KSWB, HQ). This shows that the cost of recovery in the state is very low.

An audit of the existing situation in KSWB shows important findings, this include:

1) The high population growth in the service areas is an opportunity for KSWB.

2) The depressed affordability to pay for services for most of the consumers poses financial and economic threats to sustainability.

3) The goodwill portrayed by the International donor community toward water project is an opportunity for KSWB to obtain capital funding for infrastructure improvements.

4) The dependence of KSWB on imported technology is a threat to innovative capacity of the organization.

In conclusion, a proposed performance improvement plans and de – bundling of service reservoirs were recommended for the study area. This would reduce the level of unaccounted for water, increase in recovery cost and increase in water coverage in the area.

5.2 RECOMMENDATIONS

Since situational analysis and institutional assessment process form a major part of any project cycle, there is, the need to obtain a standardized benchmarked tool for situational analysis and institutional assessment of the water utilities in all the states of Nigeria. It is with the aforesaid reasons that the following recommendations are put forward;

(a) Other technically important components of WSS should be included in the evaluation criteria, for example overall performance of treatment plant facilities.

(b) A mechanism by which the situational analysis approach can be automated should be developed.

(c) De – bundling of the service reservoirs and managed by the private sectors should be encouraged.

(d) Situational analysis and institutional assessment of the utilities should be encouraged in all the water utilities in Nigeria.

(e) The state Government and private sector should have a committee in place that will be fixing the water tariffs that will be acceptable by the general public. The water tariffs to be fixed should be more than the cost of production excluding investment cost.

(f) Water utility management should concentrate on the raw water and water treatment aspect and also the maintenance of the main line to the service reservoir should be under the water utility management.

(g) The service reservoirs should be given to the private sector to sell the water to the customers. This will discourage illegal connections and also it will reduce high percentage of unaccounted for water. The private sector will be responsible for the maintenance of the reservoir, the distribution lines, connections and water sale collections. This also will increase the performance level of water service delivery.

(h) For effective water service delivery, the strategies improvement plan Summarized in Tables 4.36 to 4.39 in Appendix A should be strictly adhered to by the Water Board.

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