AN ASSESSMENT OF FINANCIAL VIABILITY AND ECONOMIC EFFICIENCY OF WATER SUPPLY IN NASARAWA STATE - NIGERIA

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ABSTRACT
In Nigeria, there is an urgent need, to manage water resources, especially the aspects of development and supply, with a policy that aims at financial viability and economic efficiency. Four Local Government Areas (LGAS) were sampled and used for this study because of the current operations of the Nasarawa State's Water Board; each LGA is residentially structured into four zones which coincide with the socio-economic strata in the LGAs. 13 specific water consumption rates were examined using standards of measurements. The average water use rate in each stratum was then compared with the present water rates, to highlight the wide gap between amount of water used and the amount charged by the government. The study observed that, the ideal necessity for optimal water pricing in Nasarawa State is to resort to metering every water-using unit in the state. In such a case, prices will be based on amount of water actually used by a household or unit, or individuals; this can only be achieved if pipe connections have been extended to the houses in the unplanned indigenous areas. The study concludes that, water must be exploited economically. The running cost should be borne by revenue from water rates. The present water tariff is grossly unrealistic and requires upward review.

Keywords: Water Supply, Water Tarrif, Water per Capita, Keffi,

INTRODUCTION

Changing population patterns and lifestyles will have important consequences for water and sanitation provision as well as for water resource management (World Bank, 2000; 2006; Marin, 2010). In 2050 the world will be home to somewhere between 8.5 and 11 billion people. Together with rising standards of living in many parts of the world, this will lead to unprecedented demand for and pressures on water resources. To secure water for all, such situation will require more investment and a far more efficient use of water than what we see today.

Most of the population increase will take place in the poorest part of the world, where the brunt of the world's population without access to improved water and sanitation already live today (Maxwell, 2003; UNDP, 2006; AMCOW, 2006; WHO, 2007 and Graham, *et al*., 2009). Will the poverty-water nexus be as manifest in 2050 as it is today? Another prominent demographic pattern is the rural-to-urban migration, which challenges the flexibility of water supply and sanitation systems in cities. A recent trend is the growth in secondary cities, which often have less water management capacity compared to mega cities. Population density is also increasing globally in coastal zones, putting them under particular stress.

Over the past 20 years, Sub-Sahara Africa has made significant progress in extending access to improved water supply and sanitation (WSP, 2000). This has contributed to the Millennium Development Goals on environment, health, education, food security, gender equality, and poverty alleviation. Access to water supply and sanitation directly impacts labour productivity, illness, school attendance – it should be noted here that, lack of water supply made the students of the Nasarawa State University on rioting which led to the closure of the university on 25th February, 2013, and women's personal security. Reducing health care costs, increasing school attendance, freeing time for productive activity, and ensuring safety for women have notable economic benefits.

For these reasons, the African Ministers Council on Water (AMCOW) commissioned the production of a second round Country Status Overviews (CSOs) on water supply and sanitation, to shed light on the political, institutional, and financial factors which underpin progress in the sector. The World Bank, Water and Sanitation Program (WSP), and the African Development Bank implemented this task in close partnership with UNICEF, WHO, and the governments of 32 countries in Sub-Saharan Africa.

In Nigeria, there is an urgent need, to manage water resources, especially the aspects of development and supply, with a policy that aims at financial viability and economic efficiency. One of the greatest handicaps, confronting all public water producing and supplying bodies in Nigeria, is shortage of fund (Iyer, 2005; World Bank, 2008; World Bank 2009; Banerjee, 2008; and WHO/UNICEF, 2010). It has been suggested that to remove the financial hindrance realistic price should be charged for water output, so that funds may be available for expanding existing supply and to install new schemes. Unfortunately, the Nasarawa State Water Board is reluctant to charge water rates commensurate with the cost of production and distribution. This unwilling had led to the inefficiency and failure of the Board to provide water regularly. The current water rates charged per taxable domestic, commercial and Industrial activity in the State is ₦ 800 to ₦ 3400 per month and ₦ 40,000 per month respectively, these costs are far less if sustainable cost recovery is to be reached. It was also reported that the economists insist that charges should be made which are based on the cost of the last most expensive built. It is therefore, difficult to understand why after about 12 years of indifference water rates are still so unrealistic in nearly all the Local Governments. Water is an economic good. Even though water pricing cannot be based purely on the cost-benefit criteria, however, a water purely producing body should be able to meet its running cost by adopting marginal pricing policy. Is the current water pricing in Nasarawa State meet the Water Board's production cost?

MATERIAL AND METHODS

Nasarawa state came into existence on 1st October, 1996. Located on latitude 7^0 50' 00" N – 9^0 25' 00"N and longitude 6^0 58' 00"E – 9^0 33' 00"E. The state presently consisted of 13 constitutionally recognized Local Government Areas (LGA) with a total land area of about 26,666.02km^2, (Figure 1), its population is 1.87 million in the year 2006 (NPC, 2007). Each LGA has grown, in both physical size and population. The mean annual rainfall in the State is 1300mm; Nasarawa State enjoys high sunshine hours of 8-9 hours per day. Hence daytime lengths are on the average about 8.5 hours for most of the dry season; this may mean increase in evaporation.

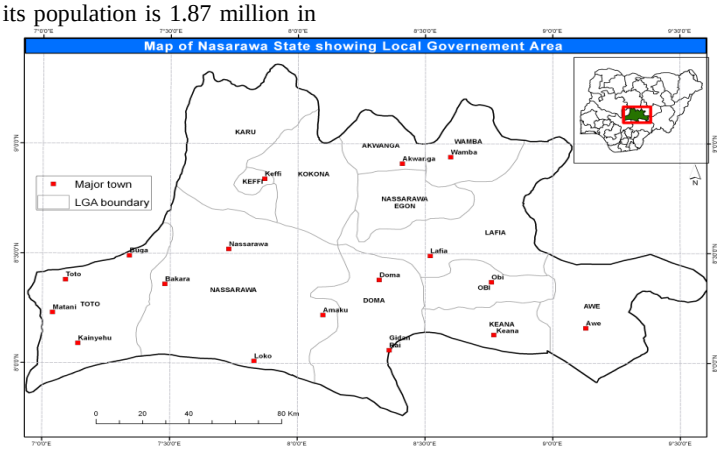

Figure 1: Map of Nasarawa State showing 13 LGAs

METHODOLOGY OF STUDY

Four LGAs (Keffi, Akwanga, Doma and Lafia were sampled and used for this study because of the current operations of the Nasarawa State's Water Board), each LGA is residentially structured into four zones, namely: The Government Reserve Area (GRA), mostly single housing units; the older or traditional areas, mostly family single housing units; the modern private layouts, mostly single units and flats; and urban fringe, mostly flats and single room tenancy.

The above model coincides with the socio-economic strata in the sampled LGAs. For the purpose of water pricing, the above socio-economic city stratification was used. An inventory was taken of the various avenues in which water is specifically required by the people in Nasarawa State. The various specific uses included: drinking; cooking; bathing; toilet flushing; car washing; medicinal mixtures; and ablution among others.

The procedure adopted in the course of this investigation was to study the present water pricing policy in Nasarawa State, and then to a field study, using each city residential area as a sample stratum. The average water use rate in each stratum was then compared with the present water rates, to highlight the wide gap between amount of water used and the amount Charged by the government.

Measurements and Analysis of Water Consumption Rate

Water consumption rate were carried out on what we considered the basic daily needs to which water is normally put. Of about 30 specific uses, 13 were examined. The standards of measurements were based on direct measurements with containers of known volume:

(a) One plastic bucket of 22 I capacity was the standard for bathing. The bucket takes 3½ min to fill on the average.

(b) One toilet flushing takes an average of 15 1.

(c) A shower bath takes about 10-15 min. It effluxes at the rate of 6 l/min on the average.

(d) An orange squash brittle of 1 l for estimating drinking water need.

(e) Mouth brushing often involves leaving tap running low for 2-5 minute, at the rate of 2.4 l/min.

Research Assistants were used for the field survey. Estimates of water use were carried out in various residential strata discussed above.

RESULTS AND DISCUSSION

Domestic Water Users

Table 1 shows the use of water in the different residential areas of Nasarawa State. One thing that is clear from the table is that two classes of scale of use are recognized and we have given these classes the diagnostic names of:

(a)High domestic users represented by the residential areas of GRA, Low-cost estate (single household units made up mainly of flats);

(b) Low domestic users, made up of residential areas including the indigenous areas; consisting mainly of houses with middle passages and room on either side of the passage. There is on average one tap in the compound.

Table 1: Residential areas- housing characteristics and use of water

	Area	No. of houses sampled	Housing type description	Average No. of tap faucets	Average No. of persons/households or per flat	Average water use l/person/day
1	GRA	40	Single housing unit	9	14/house	90
2	Low-cost I	20	Single housing unit	8	10/house	62
3	Low-cost II	30	Flats of average of 2 flat house	4	2flat	90
4	Low-cost III	2	Flats of average of 2 flat house	5	2flat	100
5	Tertiary/Semi tertiary hostels	4	Dethatched & semi-dethatched	40	Dethatched storey room	15
6	Indigenous areas	80	Family house single unit with several families	0-1	25 house	28
7	Other areas	20	Houses with middle passage and rooms facing each other	1-2	3/person/room	20
8	Stand pipes	4		1		

Table 2 is a further breakdown of the various uses to which water is put in the high domestic users area (the GRA represents this area) and the low users area (the indigenous wards represent this area). If the amount of water used per household is desired, the figures shown as average per capita use can be multiplied by 10 and 25 (average number of persons per household) for high domestic users and low domestic users, respectively.

Table 2: Various uses of water in residential areas of Nasarawa State

Uses (L/person/day)	Amount Used	
	GRA	**Indigenous Areas**
Drinking	2.1	2.0
Bathing	22.3	11.0
Cooking	5.2	1.0
Brushing teeth	0.8	0.08
Clothes washing	12.2	7.20
Dish washing	3.4	1.50
Floor scrubbing	9.5	0.80
Ablution (Muslim's pre-prayer cleaning)	0.2	2.40
Toilet flushing	13.6	1.00
Car washing	11.4	1.20
Flower watering	9.0	0.0
Average	**90***	**28^**

***** This figure can be multiplied by 10 to estimate the total household use of water per day

^ A house in the indigenous area has on the average about 25 persons,
So this figure can be multiplied by 25 to get the estimate for the whole household.

USE OF WATER BY UNMETERED SMALL-SCALE INDUSTRIES

The consumption of water was estimated for seven types of small scale industries namely: Bakeries, Iron casting, Photo studio, Block making, Printing press, Ice-block industries and Car washing. Table 3 gives the average use of water by each of the industries sampled.

Table 3: Small scale industries and water use

Industry	Average amount of water used per industry per day (1)	Monthly water use (1/28 day month)
Bakery	98	2744
Iron casting	33	924
Photo studio	73	2044
Black making	338	9464
Printing press	9	252
Ice block making	187	5236
Car washing	188 l/car or cars per day	52 649/month

This table shows the car washing industry as the leading consumer among the small scale industries followed by the block making industry. The printing industry uses the least water. This is because most of the printing works is done using chemicals; chemicals are even used for washing the machines. The estimation for the car washing industry has been done per unit vehicle and also for 10 unit vehicles per day.

ECONOMIC ASSESSMENT OF WATER PRICING IN NASARAWA STATE FOR FINANCIAL VIABILITY

The ideal necessity for optimal water pricing in any community is to resort metering every water-using unit in the community. In such a case, prices will be based on amount of water actually used by a household or unit, or individuals. In Nigerian cities, metering is almost impossible for most parts of the city, because they are unplanned. If pipe connections have to be extended to the houses in such unplanned areas, much damage would have to be done to existing structures. In the northern part of Nigeria, the cities often have a core, where the natives live, which often contains more than 90% of the population. Metering is not practicable within such core areas.

In Keffi, for example, the core area, or the indigenous area is not supplied with public stand taps, although the public distribution mains pass through some of the streets. However, the communities have supplied themselves with some taps, which are either maintained by the community or some well meaning individuals. Since more than 90% of the people live in the indigenous area, the government is thus losing a lot of revenue by not collecting enough water rates from this area, because of its inability to provide stand pipes. The policy of a flat water rate in the indigenous areas is the best alternative to metering. However, a flat rate can also be hostel on (a) use (b) population (c) number of taps per household among other factors. As a first step to a realistic water pricing policy the government should embark on a massive network lying of public stand pipes in the indigenous area, (The government stopped doing this immediately after the completion of most water supply projects). If any improvement of the standard of living of the people of a country or state is to be effected, it is essential that they be provided with a supply of good water. In addition, the following basic concepts must be considered.

a. Limited funds should be spread to give some water to as many of the people as possible rather than to give a perfect supply to a few, as it is being practiced in Nasarawa State.

b. Money spent on a supply must not be wasted. All work
c. supply, i. e., the planning horizon of the existing water supply schemes in Nasarawa State be expanded to meet the growing challenges of population increases and the rising standard of living.
d. Water supply should be self-financing in that its revenues should meet running costs and capital charges. Meanwhile, water pricing can be done on the basis of use and population. A water-use assessment form can he design for the purpose of water tax.

Cost to the government of water supply to Keffi

The estimate of cost to the government of water supply to Keffi town for example has been calculated as follows:

Current rate of water supply 75 000 000 1/day
Recurrent expenditure per annum ₦ 83 500 000.00
Capital expenditure ₦165160000.00
Recurrent and capital expenses ₦ 248660000.00
Last most expensive work built – Mada water works
₦ 119 900 000.00
Expected life span of project, 20 years
Cost of project spread over life span. ₦119 900 000.00
Annual Mada water works project cost ₦5 995 000.00
Recurrent and capital expenditure ₦248 660 000.00
Total cost = **₦ 254 655 000.00**
Daily cost estimate = ₦ 254 655 000/365 days
= ₦ 697 684. 923.00

This is the theoretical cost to the government of supplying 75 000 000 l of water per day to Keffi. The cost of producing 1l is: $\frac{₦\ 697684.92}{75\ 000\ 000}$ i.e. 9 kobo for 7.5 l of water

Minimum Charges to the People

Average per capita daily water use for bungalows and flats is 90 1/day or 2700 l/month. This is the average consumption for the modern areas of Keffi such as GRA, Low-cost, CRDP, Doctor's Quarters, Area Command/Millionaires Quarters in any part of the city.

Average per capita daily water use in the indigenous areas is 28 l/ day or 840 l/month.

The government provides water at a theoretical cost of ₦ 0.009/l. therefore the minimum levy for the average public water user in the indigenous area of Keffi is ₦ 0.009 × 840 litre per month, ₦ 7.56 (for a household, multiply by the total number of persons in the house, usually averaging 25). Also, the minimum levy for the average consumer in the modern residential area as outlined above is ₦ 0.009 × 2700 litre ₦24.30 (for a household or bungalow, multiply by 10 persons) (for a flat, multiply by 6 person) (for a single room family, multiply by 5 persons).

PRESENT WATER TARIFF IN KEFFI

The Nasarawa State government approved new rates and service charges for water consumption with effect from 1 September 2004.

Nasarawa Water Tariff

Seven categories of water consumers are recognized in the State vis-a-vis Keffi namely:

(a) Pay as you drink; (b) Profit making industries; (c) Commercial establishment; (d) Domestic consumers; (e) Water supply to institutions and schools; (f) Other establishments (petrol stations, clubs, saloons etc) and (g) Tanker supply.

Table 4 is a summary of water tariff in Nasarawa State (present tariff and the suggested new economic tariff). The production and distribution of water in Nasarawa State is heavily subsidized by the government. For example the expected revenue from water charges in the state in the year 2004 is about ₦9.3 million. However, the recurrent done should fit into the overall plan of development of the expenditure for the same period is about ₦83.5 million, whist the capital project is expected to be ₦ 165.2 million.

For domestic consumption, pricing of water is a Hat rule of between ₦800.00 and ₦1400.00 for employees and it is deducted every month from their salary. Metered households pay ₦ 1400 .00 per 4540 l, i.e. ₦3 for 454 l. This is too low and unrealistic.

Each flat in an unmetered house is charged only ₦800.00 per monthly. Each floor of a multi-storey building is also charged ₦1400.00 per month.

WATER TARIFF REVIEW FOR NASARAWA STATE

In light of the findings of this investigation a review of the present water tariff in Nasarawa State has become necessary to make water supply and development economically viable. Table 4 sets out the prevailing tariff and the suggested new minimum pricing.

Water supply to other parts of the State

The Nasarawa State Government is the most committed in making water available to its rural population. There are about 150 boreholes in the state and hundreds of wells were dug in various parts of the state. Table 5 shows rate at which water is supplied to some towns in Nasarawa State from government constructed water projects.

Minimum tariff for domestic consumers in Keffi

This study has shown that in the indigenous area in Keffi, water consumption was between 27 and 35 l/person/day, whilst in the modern areas of the city the rate of consumption of water was between 80 and 100 l/person/day. Using the minimum consumption in both the indigenous and modern areas an estimate of monthly revenue from water rate can be made.

The State government is therefore capable of realizing up to ₦31, 236, 000.00 million annually as water revenue from Keffi alone, as against the expected revenue of ₦21 million for the whole State per annum. This will be enough for both running cost and capital project development.

MACHINERY FOR OBTAINING THE DESIRED RESULT

The following are some suggestions which the state government can consider in order to reach the objective of a financially viable water body.

Installation of public stand-pipes

Stand-pipes will for a number of years be the major source of water for most consumers. It has been suggested that stand-pipes should be sited so that no consumers will have to walk more than approximately 100m. Each stand-pipe should serve about 350 persons. The indigenous area of Keffi needs these stand-pipes as a matter of urgency. There are about 48 000m of motorable road in the indigenous area. This means that about 480 stand-pipes are the minimum required, each stand-pipe will be serving about 250 people, and then 958 stand-pipes will be required for an estimated population of 250 000. Stand-pipes must be tall enough to discourage waste by children.

A water revenue collection department

A water revenue collection department should be opened in the Nasarawa State Water Corporation charged mainly with assessment of people's or institutional use of water. Assessment should be done twice a year. Every house and flat should fill a card and have a record with the department. Every civil servant in the state should also till a card for a biannual assessment. This may have a manpower implication.

Table 4: Present Tariff and the Suggested New Economic Minimum Tariff

Classes of consumer	Characteristics	Present tariff	Suggested new tariff (minimum)
Civil servants	Direct deduction based on information supplied on water assessment form, especially number of persons in his household.	₦400.00	₦1000.00 – ₦1400.00
Other domestic consumers	Based on minimum consumption	₦800.00/45401	₦1850/45401 (1000 gals)
) Metered household	and number of people.	₦800/month/per house	
) Unmetered household	Affluent	or flat	
	Bungalow		₦3500/month
	Flats	"	₦2100/month/flat
	Indigenous area	''	
	Family household of average 25 persons	₦800/month/per house or flat	
	Storey building of one room tenancy at average of person/rooms	"	₦2510/house ₦1850/room
Institutions	Based on individuals daily use	₦65 per student per term	₦150.00 per student per month
) University and higher schools boarding			
) Non- boarding			
) Private clinic/hospitals	Based on number of tap faucets or Population 30 l/day for 50 patients/month	₦25, 000.00/month	₦60, 000.00/month
) Ministries/Departments			₦1400.00/staff month
	For toilet purposes	₦400.00/month	₦1400.00/staff month
) Banks		₦800.00/month	₦1400.00/staff month
Enclosed car parks or garages	Contains shops and food canteens	₦400.00/month	
Industries			
) Large scale 50 persons) e.g. Building company Sugar company Tobacco company Big construction companies	Large commercial establishments Are usually metered for estimate of water Heavy consumers	₦15, 000.00/45401	₦45, 000.00/45401 or ₦60, 0000.00/month Whichever is higher
) Small scale industries 50 persons)	Unmetered	₦3000.00/month	₦4500.00/month
e.g. (i) Bakery	Unmetered	₦3000.00/month	₦4800.00/month
(ii)Photo studio	Unmetered	₦3000.00/month	₦5500.00/month
(iii)Ice-block making	At minimum of 2 cars/day	₦3500.00/month	₦7800.00/month
(iv) Car washing		₦3000/month	₦6300.00/month
(v) Block making		₦3000/month	₦4800.00/month
(vi) Printing			
Public stand pipe	Built and maintain by community or Well meaning individuals very common	₦2000.00/month	₦3500.00/month for 106 persons or ₦3.5k per person
Private stand pipes	Presently in the indigenous areas Serves a single or very few houses	₦2000.00/month	₦3500/month for 30 persons or ₦15/ person
Commercial Establishments And Service Centers	Heavy water users for all classes of Hotels	₦1000/rooms per month	₦2200.00/room/month
(a) Hotels	Charge based on 20 day occupation per month, and minimum water use per middle class to upper class Users (90 × 20) per month		
(b)Club Houses With Catering Services	50 guests charged for toilet use and cooking use at 27 l/guest	₦1500.00/month	₦3600.00/month
(c) Club houses without catering	50 customers at 22 l/customers		₦4500.00/month
(d) Canteens, Bukas	58 l/day	₦1500.00/month	₦31000.00/month
(e) Hairdressing	3 customers/day at 22 l/customer	₦1500.00/month	₦3300.00/month
(f) slaughter slabs	380 l for cleaning an animal	₦3500.00/month	₦15000/month of 1/dy
		₦1500.00/9080 l	₦2700/9080 plus 20k/km
(a)Water supply by tankers	Corporation	₦1500.00/9080 l	₦2700/9080 l
(b)Consumer owned tanker			

Table 5: Water supply to some towns in Nasarawa State

Towns	Rate of supply (l/capita)	Suggested minimum Tariff (per/capita/month)
Karu	98	₦1850.00
Lafia	195	₦2100.00
Obi	39	₦1400.00
Doma	54	₦1400.00
Kokona	41	₦1400.00
Akwanga	75	₦1850.00
Awe	45	₦1400.00
Nasarawa-Eggon	55	₦1400.00
Nasarawa	67	₦1850.00

Table 6: Estimated monthly revenue from water tariff in Keffi

	Indigenous Areas	**Modern Areas**
Population	250 000	65 000
Water consumption/capita	28 litres/day or 840 litres/month	90 liters/day or
	840 litres/month will cost about ₦1500.00/capita	2700 litres/month will cost about ₦35,000.00 per capita

Revenue ₦1,750,000 + ₦853,000 = ₦2, 603, 000 million per month

Bye-laws and regulations

The work of those in charge of Water supplies should be adequately covered by legislation; for the control and use of natural waters; the collection of approved rates and charges and bye-laws for the prevention of waste and pollution.

Water assessment form

The assessment of water should be properly carried out for everybody in the city, either directly or indirectly. The form will have different sections for different people to fill as listed below: a. House owner or occupier; b. Flat occupier; c. Institutions; d. Industries; e. Commercial houses; f. Civil Servants; and g. Room occupants;

The number of litres of water used by the various recognized users can then be assessed using Tables 1 as guide, since it costs the government ₦ 0.009 to produce 5.7 *l* of water per day. This factor should be used for multiplying the number of litres used per day or month as the case may be, to obtain the economically viable water rate, for each user. The government may feel reluctant to make water supply a revenue yielding project as in the Punjab region of India where about 50% of the Provincial Government revenue comes from water rate yet the government can at least charge an economically realist price.

CONCLUSIONS

There is enough water in Keffi to feed its population now and in the future, but it must be exploited economically. Nasarawa State is blessed with abundant water resources, but the development of new resources must be a joint undertaking of the people and the government. However, running cost should be borne by revenue from water rates. The present water tariff is grossly unrealistic. The flat rate levy should be done. On the basis of use and population as has been shown in this investigation. A minimum of ₦1400.00 per capita in the indigenous area and ₦2100.00 for the modern areas of Keffi is advocated. The Civil Servants and every other Water user should fill water assessment forms biannually, and pay as you drink charges should be based on such assessment. From Keffi alone, the Nasarawa State government can realize about ₦31.2 million as revenue annually as against the present ₦21 million for the whole state. However urgent infrastructural needs in Keffi include erection of 958 stand pipes and extending the distribution mains to cover an additional l28 km to bring the total pipeline network to about 300km from the present l21km. A new department charged solely with water revenue assessment: and collection of water rate is necessary. A rough estimate has shown that 93 collectors will be sufficient for the Keffi. The city can then be zoned and assigned to collectors, whose first duty would be to assess the number of houses or flats for their zones. The cost to government of 93 collectors (National Diploma certificate holders) is about ₦31000/month as salaries. Each collector should be located in his area of operation in a one room apartment used as office.

REFERENCES

African Ministerial Council on Water (2006): Getting Africa on Track to Meet the MDGs on water and Sanitation: A Status Overview of sixteen African Countries.

Graham, A., Guterstam, B., Sylwan, I., Claesson, H., Johanna, S. and Lovisa, L. (2009): Responding to Socio-economic and Demographic Changes. World Water Week in Stockholm, August 16-22, 2009. pp. 20 – 22.

Iyer, P. (2005): Rural Water Supply, Sanitation and Budget Support – Guidelines for Task Teams. Washington D. C.: World Bank.

Marin, P., M. Fall, and H. Ouibiga, (2010): 'Corporatizing a Water Utility. A Successful Case Using a Performance-Based Service Contract for ONEA in Burkina Faso'. Gridlines Note no. 53, Public-Private Infrastructure Advisory Facility.

Maxwell, S., (2003): Heaven or Hubris: Reelections on the New "New Poverty Agenda". Development Policy Review 21 (1) 5- 25. London: Overseas Development Institute.

United Nations Development Programme (2006): The Human Development Report, 2006: Beyond Scarcity: Power, Poverty and the Global Water Crisis.

World Health Organization (2007): Economic and Health Effects of Increasing Coverage of Low Cost Household Drinking Water Supply and Sanitation Interventions to Countries Off-Track to Meet MDG Target 10.

WHO/UNICEF (2010): Joint Monitoring Programme for Water Supply and Sanitation. 2010 Progress on Sanitation and Drinking Water, 2010 update.

World Bank, (2000): Rural Water Projects Lessons from OED Evaluations. Operations Evaluations Department. Washington, D. C.: World Bank.

World Bank, (2006): Rural Water Supply, Sanitation and Hygiene: A Review of 25 Years of World Bank Lending (1978-2003). Washington. D. C.: World Bank.

World Bank, (2008): Kaduna State Nigeria, Public Expenditure Review: Rural Water Supply and Sanitation Sector (Draft report).

World Bank (2009): Africa's Infrastructure: A Time for Transformation Flagship report, Africa infrastructure Country Diagnostic.

WSP, (2000): Linking Sustainability with Demand, Gender and Poverty: A Study in Community-Managed Water Supply Projects in 15 countries. Delhi, WSP.