Privatisation of water supply for efficient service delivery in Nigeria

J. A. Adelegan
Department of Civil Engineering, University of Ibadan, Ibadan, Oyo State, Nigeria.

Abstract

Over the years Government has made appreciable investment towards development and management of water for irrigation, drinking water and to a lesser extent recreation. For certain reasons, the demand for safe drinking water supply service continues to overwhelm the delivery.

It is against this background that the study simulates the privatisation of water supply in Nigeria with a view to improve and expand the delivery and coverage of water services, increase the efficiency of operation and transfer of financial responsibility in the provision of water services to the private sector while allowing them a fair rate of return.

The study sample cover ten Nigerian urban and semi-urban centers. Data for the study was largely obtained from the IBRD funded project. The Discounted Cash Flow (DCF) Principles including the Net Present Value method, the Internal Rate of Return method and the Discounted Pay back Period method constitute our major model for the study.

Data analysis using computer techniques (spreadsheet applications) gave a mean net present value, NPV_K of U.S $ 67224152.00, a mean internal rate of return, IRR of 28.35% and a mean discounted payback period, PBP of 4 years signifying that the return on investment in the Nigerian water supply sector is high enough to attract a private sector participant. Our results also indicates that more of Nigerian citizenry would have access to potable water with increase in per capita per day water consumption through private sector participant.

1 Introduction

Infrastructure forms the sinews of development. Efficient and adequate water supply underpin a competitive economy and improve peoples' health. Services such as water and sanitation -often called "hard infrastructure" -- are vital for economic growth and contribute directly to poverty reduction (DBSA [1]).

No region in the world is in greater need of new investment and more efficient operation of its infrastructure than Sub-saharan Africa. Sub-saharan Africa lags behind the rest of the world in harnessing the benefits of private participation in infrastructure, especially in the water and waste sectors. Of 1,161 private infrastructure projects concluded since 1984, Sub-saharan Africa has seen only 80, or about 7% (Kerf and Smith [2]). The almost universally poor quality of the regions infrastructure directly impacts on the living standards of its people and constrains private investment in other activities.

The public sector remains the dominant force in the Nigeria's economic life, and has largely contributed to inefficient development since the early 1980s' (African Review [3]). By 1986, the estimated number of public enterprises in Nigeria was 1,500 out of which 600 were under the Federal Government, and the rest owned by state and local governments (Obadan [4]). These accounts for about 67% of the Gross Domestic Product (GDP) (African Review [3]) and over 60 percent of modern sector employment (FRN [5]). Annually the state monopolies cost over U.S $2 billion in subsidies alone.

In the drinking water supply sector, over 1000 urban and semi-urban water supply schemes existed by 1990, which were all in poor condition and deteriorating rapidly. The various state water agencies responsible for the provision of water supply services were at the lower level of development, characterised by poor funding and organisation, under passive and inadequate legal framework, and operating with little or no visible operational guidelines (FMWRRD [6]). The effect was the fast decline of urban/semi-urban water supply delivery which if not arrested was heading to unacceptable level of about 8 litre per capita per day. The WHO/UNICEF Water Supply and Sanitation Sector Monitoring Reports for 1996 has the water supply coverage for Nigeria as 39%.

By the late 1970's, the public enterprises accounted for one-third of all international borrowing by developing countries. This became a major source of concern for the principal international lending agencies. The World Bank thus came to see privatization as an important policy instrument for reducing the drag of public enterprises on national budgets. This became evident in the bank's lending conditionality in the later part of the 1980's (World Bank [7]).

Like most other Sub-saharan African countries, Nigeria adopted the policy of privatization in 1986 as an integral part of a larger reform Structural Adjustment Programme (SAP) propagated by the World Bank and the International Monetary Fund (IMF) as a set of conditionalities for external debt relief.

In this connection, the government established a Technical Committee for Privatisation and Commercialisation in 1988 and launched a formal privatization and commercialization programme of state owned enterprises, which has already transferred a number of state-owned enterprises to private operations. However, because these privatized enterprises are mainly federal operations engaged in production, most infrastructure agencies and all state-owned enterprises such as water authorities have been excluded (FRN [8]).

Nigeria is however currently fully embracing privatisation with the formulation of the National Privatisation Council headed by the Vice President. However, the privatisation of its water supply sector is still at the formative stage. Public-private partnerships offer much potential in Nigeria. Hence the study is timely and imperative as an immediate solution to increase operational efficiency and achieve institutional strengthening in its water supply services.

2 Rationale for the privatisation of water supply in Nigeria

Many infrastructure services have been regarded as natural monopolies with economies of scale and high sunk capital costs. The public perception had previously been that such services should be provided by the government. It is now becoming recognised, however, that many services can be improved and expanded by exposing them to competition through private sector participation.

Moreover, many services are extensively deteriorated, and their capacity is underutilised because of poor maintenance and lack of funds for operation, causing low operational efficiency and high service costs. The traditional approach of budgetary transfers has not solved these problems (FRN [8]).

The inability of state water authorities to generate sufficient revenues has contributed to large financial deficits. This has left most state water authorities dependent on subventions from state governments to operate and maintain their water systems, service debt obligations, and finance new investment.

The private sector participation in the marketing of water in Nigeria has now become a major phenomenon. Recently, there has been a noticeable increase in the number of bottled and other forms of packaged water called "pure water" being sold on the streets in Nigeria. It costs about 5cents per unit of 500mls and it is available throughout Nigeria. There is a proven willingness-to-pay by the poor for real services. The poor often pay a high price for a service of bad quality provided by informal vendors.

Oyelade and Duncan [9] undertook a study to ascertain the bacteriological quality and the potential health risk of drinking packaged water on sale in Lagos metropolis, Nigeria. They reported that most (90 percent) of the sixty (60) samples analysed had coliform count well above the maximum of 10 per 100 mls recommended by the international standards for drinking water quality (WHO [10].

The study also revealed that twelve of the sixty (60) samples analyzed came from government licensed factories and seven of them had faecal coliform. Faecal coliforms were present in a total of thirty-eight (38) samples.

Confirmatory tests shows that they are enteric pathogenic bacteria. The study further shows that most people in Lagos metropolis, Nigeria regardless of their tribe, social class or occupation consumes packaged water.

Most consumers are aware of the characteristics of potable water and the potential health risks associated with consumption of unhygienic water. Although most consumers consider tap water to be of good quality they nevertheless take packaged water because coupled with its perceived potability, it is readily available and largely affordable.

Hence, lack of adequate and safe water supply have made the prominence of water borne diseases to become an intractable problem in Nigeria. Kajogbola [11] reported the prominence of malaria, dysentery, tuberculosis, chicken pox, measles and pneumonia as the greatest causes of general morbidity within the Ibadan region in Nigeria. The study also revealed that the leading killer diseases in the region are water borne.

Sources close to the National Health Policy of the Federal Ministry of Health (FMH [12]) shows that same morbidity and mortality pattern was also found to be applicable to the larger Nigerian society since water problem is not peculiar to a particular region but a common feature in every community in Nigeria.

A profound change is required in the concept of water supply as a service industry. State water authorities need to operate in accordance with commercial principles and under an umbrella of adequate legislative and administrative autonomy arrangements.

The specific benefits of water supply privatisation follow from the fundamental change in institutional relationship. Those benefits include increased efficiency in investment, management and operation. Moreover, the introduction of private sector arrangements would benefit the Nigerian economy by both reducing budgetary transfers to public agencies and government budget deficits, and by making more efficient use of scarce resources.

Furthermore, experience in reforming economies in Latin America and Eastern Europe confirms the potential of infrastructure privatisation to catalyse large inflows of foreign direct invesment (FDI) (Kerf and Smith [2]). This is particularly important in Sub-Saharan Africa where FDI is very low. Infrastructure privatisation offer opportunities for capital market development and also act as potential signaling device to international investors and populace.

3 Privatisation models and existing structure in Nigeria

3.1 Existing privatisation models around the World

Private sector participation has eight main options, which vary in the degree of involvement of the private sector, the risk for both the public and public sector, the private operator's autonomy and responsibility, the required capital investment, the duration of the contract, and the contractual relationship with

the consumer. The private sector participation options may be grouped into two distinct categories. In the first group, the ownership of the assets remains with the government or the public sector, whereas in the second group, partial or full ownership is transferred (permanently or temporarily) to the private sector.

The first group-public ownership-includes *Service Contracts, Management Contracts, Lease Contracts* and *Concession Contracts.* The second group-at least partial private ownership-includes *BOOT (Build-Own-Operate-Transfer) Contracts and its Variations such as BOT (Build-Operate-Transfer) and BOO (Build-Own-Operate), Reverse BOOT Contracts, Joint Ownership* and *Outright Sale.*

3.2 Existing privatisation structure in Nigeria

Nigeria has some experiences with private sector participation in water supply. The use of private services has resulted from necessity rather than deliberate policy, but has fallen short of achieving the level of competition and efficiency possible.

Several state water authorities in Nigeria has leased computer equipment for billing and collection operations. A local data service company provides and maintains the computers. The computer service has been very satisfactory. Several state water authorities in Nigeria have also tried service contracts with private firms such as property valuators for billing and collection, with mixed results.

In spite of the above, the Lagos State Government is front-lining the full privatization of water supply in Nigeria. There is an ongoing bidding for the World Bank assisted privatization of water supply scheme, a private sector participation strategy being mid-wifed by the State Water Corporation. The concession contract is expected to operate under a Build, Operate and Transfer Scheme. It will be executed under a 23 years lease contract for the management and supply of water to Lagos State.

4 Methodology and estimating issues

4.1 Nature, sources and scope of data

Data for the study was largely obtained from the 1999 first quarterly report of the National Water rehabilitation Project which is IBRD funded with the objective of improving water supply delivery by rehabilitating selected urban and semi-urban water supply schemes and institutional development. The study model the investment into the rehabilitation project and also simulate the cost recovery pattern and the profitability index with the attendant improved service delivery.

The recommended privatization model is a 20-years lease contract for already rehabilitated schemes, in which case, there is no investment risk for private sector participant. A 20-years concession contract in the form of Build,

Operate and Transfer (BOT) option is also suggested to rehabilitate existing urban and semi-urban water supply schemes, in which case, the private sector participant takes investment as well as full commercial risks.

The study sample cover ten Nigerian urban and semi-urban centres. The ten urban and semi-urban centres were chosen to limit the scope of the work. They cover a spread of both Northern and Southern Nigeria.

Data used for the study includes the recommended number of years for lease or concession contract, the rehabilitation investment cost, annual operation and maintenance cost in the rehabilitated systems, total number of systems available in each chosen state water agencies, total number of systems rehabilitated under the IBRD funded project in each chosen state water agencies, the population of the urban and semi-urban centers where the rehabilitated systems are sited, the pre-rehabilitation capacity of the systems, the post-rehabilitation capacity of the systems, the daily water production rate, the unaccounted-for-water, revenue collection efficiency and the recommended price of water.

4.2 Measurement of variables

The variables used in the study are defined as follows: SWA is the state water agencies where the rehabilitated systems are sited; RI_{Cost} is the rehabilitation investment cost in each chosen state water agencies in U.S \$; OM_{Cost} is the annual operation and maintenance cost in the rehabilitated systems in U.S \$; SYS_{avail} is the total number of systems available in each chosen state water agencies; SYS_{Reh} is the total number of systems rehabilitated under the IBRD funded project in each chosen state water agencies; POP_{Reh} is the population of the urban and semi-urban centers where the rehabilitated systems are sited; $CAP_{Pre-Reh}$ is the pre-rehabilitation capacity of the systems in cubic metre per day; $CAP_{Post-Reh}$ is the post-rehabilitation capacity of the systems in cubic metre per day; WPR_{Daily} is the daily water production rate in the rehabilitated systems in cubic metre per day; UWF is the unaccounted-for-water in the rehabilitated systems in percentage; RCE is the revenue collection efficiency in the rehabilitated systems in percentage; P_W is the recommended price of water defined as the median price paid per cubic meter (1,000 litres) in U.S \$; WRE is the water revenue expected in the rehabilitated systems in U.S \$; NPV_K is the net present value of the investment at the firm's cost of capital K; IRR is the internal rate of return of the investment and PBP is the payback period of the cost of investment

4.3 Model specification

The Discounted Cash Flow (DCF) Principles including the Net Present Value method, the Internal Rate of Return method and the Discounted Pay back Period method constitute our major model for the study. The Discounted Pay Back Period method serves as further check to have an idea of the break even point in our investment analysis.

Thus the Net Present Value, NPV of our investment opportunity at the firm's cost of capital K with constant cash flows that goes on for the life of the opportunity is given by

$$NPV_K = (WRE - OM_{Cost}) \left[\frac{1}{K} - \frac{1}{K(1 + K)^N} \right] - RI_{Cost} \tag{1}$$

where $(WRE - OM_{Cost})$ is the net annual cash flow, RI_{Cost} is the initial cash outlay and N is the life of the opportunity in years. NPV_K is often referred to as the Present Value of Annuity and the parenthesis in equation (1) is called the annuity factor obtained from standard annuity factor tables.

The Internal Rate of Return, IRR is the exact DCF rate of return which the investment is expected to achieve, that is, the rate at which the NPV is zero and is given by

$$NPV_K = 0 = (WRE - OM_{Cost}) \left[\frac{1}{IRR} - \frac{1}{IRR(1+IRR)^N} \right] - RI_{Cost} \tag{2}$$

(Lumby and Jones [13]). The discounted pay back period, PBP usually expressed in years (N) is the period it takes to recover the initial cash outlay on a capital investment in present value and is given by

$$NPV_K = 0 = \sum_{t=1}^{N} \frac{(WRE - OM_{Cost})_t}{(1 + K)^t} - RI_{Cost} \tag{3}$$

4.4 Empirical analysis of data

The data were analyzed using computer techniques (spreadsheet applications). The Net Present Value (NPV) was computed using the variables in equation (1). The stereotypical cost of capital (10%) was used as the firm's cost of capital, K since the interest rate used in estimating loan repayment due World Bank is 7.5% per year (FMWRRD [6]). The Internal Rate of Return and the Discounted Pay Back Period were obtained by solving for IRR and N in equation (2) and (3) respectively using iterative technique (newton's approximations). The Water Revenue Expected (WRE) was computed using

$$WRE = (P_W)(365*WPR_{Daily})(1 - UFW)(RCE) \tag{4}$$

The recommended price of water was fixed using the following criteria (a) expressing the recommended price of water as a percentage of the minimum wage of public servants and as a percentage of the per capita income assuming that a household has only one source of income (b) comparing the recommended price of water with the median price of water in Africa and other developing economies (UNCHS [14]).

The water consumption pattern of an average Nigerian urban and semi-urban household family size of five (FOS [15]) is about 4.5 cubic metre per month (Oyebande [16]). Our recommended price of water is U.S $ 1.0 per cubic meter. Hence an average household would spend about U.S $ 4.50 (=N=495.00) on water consumption per month which is almost equivalent to an average household electricity charge per month.

The minimum wage of public servants in Nigeria is about U.S $ 68.00 (=N=7,500.00) per month and the 1998 per capita income is U.S $ 358.00 (ECA [17]) hence an average household expenditure on water consumption would amounts to about 7% of the minimum wage of public servants and 15% of the per capita income.

Moreover, the median price of water in Africa and other developing economies is U.S $0.998 per cubic meter (UNCHS [14]) which is almost equivalent to our recommended price of water.

5 Result and discussion

From Table 1 below, our mean net present value at the firm's cost of capital, NPV_K is U.S $ 67,224,152.00 which is a measure of economic profit or excess return from our investment. Our mean internal rate of return, IRR is 28.35% which imply that our investment is generating a return much more higher than the firm's cost of capital, K of 10%.

It signify that our investment would generate sufficient cash flow to pay the interest on loan, repay the actual loan capital and leave a mean surplus of U.S $67,224,152.00 for a mean investment cost of U.S $ 3,503,500 over the 20 years lease or concession contract for the rehabilitated systems in each of the state water agencies. It means that the return on investment in the Nigerian water supply sector for every U.S $ 1.0 is U.S $ 19.0 over the 20 years lease or concession contract period.

Moreover, our mean discounted payback period, PBP is 3.8 years signifying that our break even point is 4 years meaning that our investment would pay back its outlay over a 4 year period for the rehabilitated systems in each of the state water agencies. Hence the return on investment in the Nigerian water supply sector is high enough to attract a private sector participant.

On the side of efficient service delivery from Table 1 below, the result indicate that at rehabilitation and private sector participant entry, the mean per capita per day water consumption in the chosen urban and semi-urban centers would have increased from 34 litres to 58 litres which is close to the mean per capita per day water consumption of 70 litres used for planning purposes in the provision of the water supply and sanitation policy of the Federal Republic of Nigeria. The mean daily water production from existing plants would have increased by 70% with mean capacity utilization of 84%. Unaccounted-for-water

Table 1: Investment appraisal of the privatisation of water supply in Nigeria using discounted cash flow techniques

SWA	RI_{Cost}	OM_{Cost}	SYS_{Avail}	SYS_{Rch}	POP_{Rch}	$CAP_{Pre-Rch}$	$CAP_{Post-Rch}$	WPR_{Daily}	UFW	RCE	WRE	NPV_K	IRR	PBP
BAUCHI	3795603	230397.7	16	10	158278	1657.3	7818	4622.7	0.145	0.77	1110824.4	3699997.6	21.53	16
BORNO	5181309.45	97138.05	27	5	815833	5964	17316	15127	0.2	0.52	2296883.7	13546445	26.9	3
JIGAWA	3109090	53677.69	22	4	263400	3079	4912	4692	0.1	0.52	801487.44	3257463.1	21.95	6
KANO	11944778	115347.6	17	2	1401706	134843	205146	205146	0.1	0.87	58629701	486223022	32.8	1
YOBE	5143746	34659.09	16	5	978714	10928	25836	24550	0.14	0.48	3698997.6	26052966	29.51	2
DELTA	807331.51	17550.51	54	5	226000	4290	17780	4290	0.2	0.72	901929.6	6721918.3	30.86	2
EDO	1322010.52	36452.33	41	3	342100	6700	18800	7771	0.6	0.6	680739.6	4163193.6	27.73	3
KOGI	1083708.22	22277.51	95	12	200306	5008	6976	6462	0.6	0.5	471726	2742716.4	26.75	3
KWARA	1035794.31	40577.2	63	6	799198	56590	83140	60946	0.4	0.8	10677739	89524748	33.1	1
ONDO	1611636.6	84469.7	28	5	954926	20752	35603	22204.5	0.2	0.7	4538599.8	36309045	32.37	1

Source: The estimates reported here are obtained using spreadsheet computation procedures

would have reduced from over 50% to 20% and mean water revenue collected which could hardly meet the cost of operation and maintenance would have increased to 65%. Hence, it is evident from our study that more of Nigerian citizenry would have access to potable water with increase in per capita per day water consumption through private sector participant.

6 Conclusion and policy recommendations

There are a number of obstacles facing private participation in Nigerian water supply sector. The main sources of capital are likely to be foreigners and most foreigners may be reluctant to invest. Political uncertainty is high in Nigeria, and in traditional utilities the capital costs are high, the expected lifetime of the investment is long, and returns will be in local rather than foreign currency. Thus investment appears quite risky, and if foreign investors are willing to invest, they may demand a high risk premium. Moreover, privatisation most often lead to higher prices for basic services such as water.

Hence, to attract foreign investors on acceptable terms, government need to create a favourable climate for business by providing macroeconomic stability, competitive taxes, freedom to repatriate capital, and all the aspects of governance that affect willingness to invest-including contract enforcement, low corruption, and adherence to transparent rules, including for privatization (Ayogu [18]).

At the same time, to protect against exploitation of a monopoly position, government should develop regulations that conform to international good practice for governance and pricing. An even better way to prevent abuse of monopoly power is to permit free entry and open competition where this is compatible with market size and technology. In brief, governments need to enhance their credibility and the rule of the law to attract private finance and to protect property rights and the public interest.

Another major fears about privatization concerns the potential loss of present and future employment. Improvements in efficiency have been leading to job losses in many parts of the world (ILO [19]). However, lack of modernization and lack of competition may eventually contribute to higher job losses. The long term effects of privatization on employment depend on whether the enabling environment exists in which they can operate efficiently.

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