Asian Journal of Water, Environment and Pollution, Vol. 6, No. 3, pp. 61-65.

Evaluating Externally Funded Water Supply Projects in Nigeria

P.A. Okereke and E.C. Onyenechere[1*]

Dept. of Building, Faculty of Environmental Sciences, Imo State University, Owerri, Nigeria
[1]Dept. of Geography & Environmental Management, Faculty of Environmental Sciences
Imo State University, Owerri, Nigeria
✉ emmazob@yahoo.com

Received August 31, 2007; revised and accepted September 10, 2008

Abstract: Hitherto, most policy issues in connection with water supply were usually without any detailed financial and economic feasibility studies. This has been so because of the popularly held misconception that water is a social commodity, which should be provided free of charge by government. With the now common resort to external loans to fund water project, the issue of project evaluation has become a precondition by foreign creditors such as the World Bank and the African Development Bank. This paper examines the necessity for evaluating externally funded water supply projects in Nigeria using the National Water Rehabilitation Project (NWRP) in some States as a case study. It examines some popular methods used in evaluating projects, noting that these methods are not suitable for water projects because SWAs in Nigeria have no investment options than in water supply for now. The paper suggests the adoption of the "priority index" approach.

Key words: Evaluating, externally, funded, Nigeria, projects, water.

Introduction

Project Background

Water is essential for human existence. Studies such as Nygard et al. (2004), show that the importance of the provision of potable water supply in any nation cannot be over emphasized. With increasing population, wealth and economic activities generally, there is a corresponding increase in the demand for water supply globally (United Nations Organization, 1978; Jayawardena, 2004) and locally (Onyenechere, 2004).

The intensity of demand imposes considerable stress on existing supplies to necessitate an increment or expansion of capacity of existing water schemes. According to Okereke et al. (2000) such an expansion or rehabilitation of water supply systems entails huge investment which, in the light of the present competing economic and social demands, state governments are hardly in a position to carry the burden of funding such projects. Resort to external borrowing to implement new projects or expansion programmes becomes imperative.

Owing to the non-existence of a national policy on water, government at the various levels has not devoted adequate attention to the water sector (Okereke and Opara, 2000). This accounted for the years of neglect suffered by water supply facilities all over the country. It was in order to redress this situation that the Federal Ministry of Agriculture, Water Resources and Rural Development entered into agreement with the World Bank to finance the National Water Rehabilitation Project (NWRP) with the total sum of N250 million. Each of the 30 states of the Federation and the Federal Capital Territory Abuja was to receive $10 million at the inception of the project in 1992 (Brief on National Water Rehabilitation Project Loan, 1992).

*Corresponding Author

Study Objectives and Scope

For the purpose of this study, a case analysis was made on the Aba Urban Water Scheme. The scheme consists of a combination of surface water treatment plant and a battery of boreholes located at Christ the King Catholic Church (CKC) and Ariara market. The intake is served by two pumps each at the low lift (LL) and high lift (HL) lifting water into a service reservoir located at Lever Brothers premises. Water is supplied through a network of pipeline covering the whole of Aba metropolis with a population of over 800,000 inhabitants.

The scheme was originally designed to supply a total of 60,000 cubic metres of water per day. At the pre-NWRP, it was supplying less than 30,000 cubic metres per day. On completion of the rehabilitation works the per daily supply was envisaged to increase from 30 litres to about 60 litres.

The rehabilitation works was to include:

(i) Repair/refurbishment of water treatment plants;
(ii) Leak detection and relaying of pipes;
(iii) Repair of water storage tanks;
(iv) Introduction of effective and uniform accounting system; and
(v) Institutional strengthening of state water agencies (SWAs), to include manpower training and restructuring of the management of SWAs as a way of capacity building.

Methods/Results and Discussion

Evaluating the National Water Rehabilitation Project in Old Imo State

Financial and economic feasibility forms the basis for justifying the rehabilitation or increase in the capacity of existing schemes. It also shows the bill or tariff consumers would be willing to pay for the additional supplies so as to cover at least the interest on the borrowed fund and at a cost over and above the operational cost of the rehabilitated schemes. In addition, the evaluation of a water project should clearly show the degree of competitiveness between the demands of the future and the present by discounting future benefits and cost through the rate of interest on borrowed funds.

For the purpose of evaluating the NWRP in old Imo State, a case analysis of the Aba Water Scheme was made. Results from the analysis will help to define the level of risks in the external funding of the water sector in lmo State in particular and in Nigeria in general. This is because the Aba water scheme is typical of most water supply schemes across the country.

Investment Decision Parameters

Owing to the social sentiments attached to water, the preference for the present over future value should not be a necessary condition for financial feasibility of a water project. This is because it is a standard procedure for public agencies involved in the implementation of such projects to allow for such benefits (or sometimes cost) that do not appear in the financial accounts. These include such benefits (cost) from:

(i) Non-reimbursable features such as erosion and flood control measures;
(ii) Value of water being over and above the price paid by consumers (as it is the case in old Imo State);
(iii) Increase in the general well-being and standard of living of the beneficiaries;
(iv) Enhanced employment opportunities; and
(v) Increase in business activities in water related ventures.

For such projects, which are considered as a social responsibility of government, it is best to strike a balance between economic viability and social exigency when deciding on its priority by weighing the decision against the scale of preference expressed through a priority index S using the formula:

$$S = \frac{E_s + E_e + E_f}{\Sigma W_i} \quad (1)$$

where E_i : (E_s, E_e and E_f) are the weightings of the social exigency, economic viability and financial feasibility respectively. For any of the factors considered in the decision making parameters, their respective weighting E_i could be calculated from the expression:

$$E_i = \frac{W_i}{W_s} \quad (2)$$

where W_i is the weighting of i^{th} factor in the scale of preference ($0 \leq W_i \leq 5$) and W_s is the sum of the maximum weighting point of each of the factors ($W_s = 15$). Depending on the value of S_I, a water project is considered as top priority when $S = 1.0$; of priority for $0.5 \leq S \leq 1$, and of low priority when $S \leq 0.5$.

Comparison of Investment Decision Parameters

To facilitate taking decision on issues of investment in water supply projects through debt or equity financing, policy makers have in addition to applying the economic and financial feasibility criteria, to depend on certain investment efficiency calculation to establish certain parameters with the project (Hirshleifer et al., 1960;

Farid et al., 1989). The three investment decision parameters in common use are:

(i) The net-present value (NPV);
(ii) The annual net benefits (ANB); and
(iii) The internal rate of return (IRR).

In practice, none of the above decision parameters apply in SWAs in Nigeria since they are yet to rely on the capital market for their capital projects. Also, SWAs in Nigeria have no investment options other than in water supply for now.

Results and Discussion

Based on the analysis of the balance sheet of the SWA pre- and post-NWRP (Table 1), there is sufficient evidence to show that the repayment capacity of the Aba Water Project is quite adequate. For example, the level of risk in external borrowing is marginal (2.5%), given the appropriate rate of returns (ARR) of 68% based on the revenue generated as against operating and other costs. For more realistic evaluation, it is better to adopt a tailor-made model in determining the appropriate rate of returns (ARR).

Table 1: Analysis of monthly income and expenditure pre- and post-NWRP (1993)

	Pre	*Post*
Expenditure	N 3242,000	30,580,000
Difference		N 27,338,000
Less loan payment		N 6000,000
Less refund		N 573,000
Net		N 20,325,000

Source: Imo State Public Utility Board (ISPUB), 2003

Such a model involves the management of SWA determining for each project, an acceptable level of risk, that is, the variance or standard deviation between what is encountered in reality and what was proposed or expected from a project. Determining an acceptable level of risk for such a model and hence calculating the ARR involves constructing a management acceptable utility curve (MAUCE) using the following procedures:

(i) Finding a tentative mark up (m_o) along the axis of the σ (Re) co-ordinate system using the risk free rate (i_o) as base (Figure 1).
(ii) Computing the standard deviation of the expected return on project (j) that is σ_o (Rj) based on m_o.
(iii) Finding V_R—the vertical projection of σ_o (R_j) on the MAUCE which the project fits to an acceptable position in the risk-return co-ordinates.

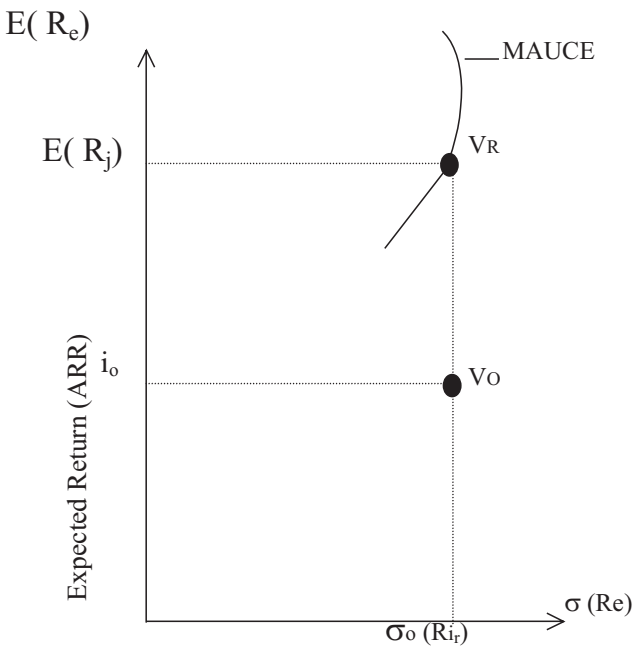

Figure 1: Determining Appropriate Rate of Returns (ARR).

(iv) The ARR for i^{th} project is thus, the projection of V_R on the expected return axis (the vertical co-ordinate).

Findings

Despite the limitations of this approach, which includes the over pricing of contracts, it is quite suitable for evaluating water projects because of the restricted nature of the water sub-sector where competition is not as keen as in other sub-sectors in the construction industry. The calculation of the investment decision parameters NPV and ANB using the value of ARR obtained from this model, gives adequate information to enable appropriate decision-making.

The Aba water scheme was estimated to cost a total of N 16,493,931 as counterpart fund in local currency and US$4,954,897 as foreign loan provided by the World Bank under the Urban Development Programme. The loan repayment schedule for the scheme is as shown in Table 2. Table 2 was obtained from Federal Ministry of Water Resources (1996). With this investment, the Aba water scheme was expected to increase its output to 60,000 cubic metres per day, allowing 25% as unaccounted water due to wastes and illegal connections. Thus, the total accruable revenue at a minimal rate of N1/m^3 of water pre-NWRP was estimated to be N45,000 per day. The total revenue generated from the water

Table 2: Amortization of loan for Aba water scheme

Date Due		*Payment (US $)*
Oct.	15, 1996	54,720
April	15, 1997	58,050
Oct.	15, 1997	59,040
April	15, 1998	61,320
Oct.	15, 1998	63,690
April	15, 1999	66,150
Oct.	15, 1999	68,730
April	15, 2000	71,340
Oct.	15, 2000	74,100
April	15, 2001	76,980
Oct.	15, 2001	79,980
April	15, 2002	83,010
Oct.	15, 2002	86,250
April	15, 2003	89,580
Oct.	15, 2003	93,030
April	15, 2004	96,600
Oct.	15, 2004	100,350
April	15, 2005	104,220
Oct.	15, 2005	108,270
April	15, 2006	112,440
Oct.	15, 2006	116,760
April	15, 2007	121,260
Oct.	15, 2007	125,970
April	15, 2008	130,830
Oct.	15, 2008	135,870
April	15, 2009	141,150
Oct.	15, 2009	146,580
April	15, 2010	152,220
Oct.	15, 2010	158,070
April	15, 2011	163,440

Source: Federal Ministry of Water Resources (FMWR), 1996.

scheme stood at an average monthly of about N 2,000,000 (about US$2,000). With such calculation in view, the yearly revenue from the Aba scheme alone at the pre-NWRP rate of N1/m^3 is N16 million ($160,000) while at the post-NWRP rate of N4/m^3, it is N64 million ($640,000). This amount is quite adequate to cover the operational cost, the payment of counterpart fund of N513,000 monthly, and the amortization of the loan.

Conclusion

Although water is regarded by some as a totally social commodity, there is absolute need for proper project evaluation in view of the huge capital outlay involved and the potentials for waste of resources through inefficient use. The adoption of the three known investment decision parameters NVP, ANB and IRP in water project evaluation is not realistic in countries where water is regarded as a social commodity. However their application presupposes that the "appropriate" rate of returns reflecting the level of risk was based on the repayment capacity of the borrowed fund because of the limited investment portfolio and the resort to external financing of water projects.

In such a situation, it is advisable to adopt a tailor-made model on the basis of management acceptable utility curve (MAUCE) for determining the "appropriate" rates of return in the calculation of NPV and ANB. According to Carruthers (1973) and Falkenmark (1982) in evaluating water projects, there should be a balance between economic viability, financial feasibility and social exigency in view of the other inherent benefits or cost, whose value are not monetized. To achieve this, appropriate formula to establish the degree of priority in the scale of preference taking into consideration social exigencies, and economic viability have been given.

References

Brief on National Water Rehabilitation Project Loan, No. 33 22, UNI, Abuja, 1992.

Carruthers, I.D. (1973). Impact and Economics of community water supply. Wye College Press, Ashford.

Falkenmark, M. (1982). Rural Water Supply and Health—The need for a new strategy. The Scandinavian Institute of African Studies, Uppsala.

Farid, F., Boyer, L.T. and R. Kangan (1989). Required Return on Investment. *Journal of Construction Engineering and Management*, **155(1):** 109 -123.

Federal Ministry of Water Resources (1996). Report on ADB Loan for Social Services Projects, Abuja.

Hirshleifer, J., Dettaven, J.C. and J.W. Milliman (1960). Water Supply Economics, Technology and Policy. University of Chicago Press, Chicago.

Jayawardena, U. de S. (2004). Sources of Ground Water in Crystaline Hard Rocks of Kandy Area, Sri Lanka. *Asian Journal of Water, Environment and Pollution*, **1(1-2):** 119-122.

Nygard, K., Vold, L., Halvorsen, E., Bringeland, J., Rottingen, A. and P. Aavitsland (2004). Water Borne Outbreak of Gastroenteritis in a Religious Summer Camp in Norway, 2002. *Epidermiology and Infection*, **132(2):** 223-229.

Okereke, P.A., Udeagu, E.l. and E. Uduma-Eze (2000). Water Supply Management in Nigeria (Examples in Some States). Cajec Publishers, Owerri.

Okereke, P.A. and A. Opara (2000). The Water Problem and Housing in Old Imo State. Proceedings of National Conference on Housing and Environment, Imo State University, Owerri.

Onyenechere, E.C. (2004). Industrial and Service Water Demand/Consumption in Ebonyi and Enugu States: Avoidance of Land Dereliction. *International Research Journal in Engineering, Science and Technology*, **1(1):** 90-94.

United Nations Organization (1978). Guidelines for the Establishment of industrial estates in developing countries. United Nations, New York.