

An Application of Cost Benefit Appraisal Technique in Sustainable Urban Infrastructure Provision in Nigeria

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ABSTRACT

Cost benefit analysis is an appraisal technique used in assessing the desirability of an urban infrastructure investment which is likely to have an impact on the people. It emphasizes the economic efficiency in resource use for the project development to better the lives of the people. The research focuses on how Cost Benefit Appraisal technique can be applied in urban infrastructure provision in Nigeria. Data were collected to determine if the amount of public funds incurred in the provision of urban infrastructure equates the benefits derived by the users from such projects. To achieve the aim of the study, several appraisal techniques were studied, including social cost benefit analysis, planning balance sheet analysis, development balance sheet, urban threshold analysis and goal achievement matrix (GAM). This research uses a modified GAM to evaluate the development of urban infrastructure in terms of achievement or non-achievement of set objectives to the users. The result indicated that the distribution of urban infrastructure and tariff are reasonable; while adequacy and quality, regularity of supplied, maintenance of provided infrastructure, among other variables studied were not achieved. In all, the costs of providing the infrastructure outweighed the benefits to the people. The research concluded by recommending that appropriate investment appraisal should be carried out before embarking on urban infrastructure provision.

KEYWORDS: Appraisal Technique; Economic Efficiency; Investment; Urban Infrastructure; Sustainability.

1. INTRODUCTION

Cost benefit analysis is an appraisal technique used in assessing the desirability of an investment or project, which is likely to have an impact on a group of people or the entire community (Udechukwu, 2006). It is used on projects with both quantitative and qualitative implications, thus mainly applied in the appraisal of public sector related projects with social, economic, financial or political implication. Certain aspects of urban development process requires more funds than others, thus the need to carry out investment appraisal that would guide in taking decisions to either embark or reject such proposals. Project evaluation techniques of a more sophisticated nature are normally applied to urban development projects. According to Barlowe (1978), the decision making process in this case is usually guided by public investment criteria and by private desires for the maximization of returns. An ideal investor embarks on projects that promise more benefits above costs, meaning that such projects should have the potential to pay for itself.

The documentary application of cost benefit appraisal technique to public infrastructure has been traced to France with Dupuit's paper on the utility of public works which appeared in 1844. In the United Kingdom, CBA applications was largely transportation based, starting with

the MI motorway project in the 1960s and the closure of rail routes; and was applied in the 1970s to the Channel Tunnel proposals, Third London Airport and road bridges over the River Tay and Severns. Studies have also been made on its application on road development and railways (Umeh, 1977; Hanley and Spash, 1993). The application of Cost Benefit Analysis to proposals for Town Planning and Urban Redevelopment projects was pioneered by Lichfield (1974), evaluation of water resource development project proposed for public funding in the United States of America (Barlowe, 1978) and other categories of land use decisions (Kehinde-George, 1999). This research is hoped to underscore the rationale for Nigerian government to follow the developed countries in appraising the relationship between costs of projects and the expected benefits before embarking on any projects. So much public funds have been sunk into unviable projects or projects that have not impacted positively on the public over the years.

This research is justified on recognition that cost-benefit analysis provides a leading appraisal technique that can be applied to evaluate economic prospects of urban infrastructure proposals vis-a-vis development. It is designed to provide a guide for effective use of the **required** economic resource to produce goods and services to satisfy human wants. Cost benefit analysis emphasizes economic efficiency in resource use. To achieve this, several appraisal stages must be conducted. Though many analysts will disagree on the identification and essence of some stages, the listed structure provides a guide to the analysis. Hanley and Spash (1993) list the essential steps to include: defining the projects, identifying impacts which are economically relevant, physically quantifying impacts, calculating a monetary valuation, discounting, weighting and sensitivity analysis. The steps to be adopted depend on the type and extent of the project.

The main trust of this research is to study how Cost Benefit Appraisal technique can be applied in urban infrastructure provision in Nigeria, while the objective is to critically analyze the cost and benefit of such infrastructure to the funding organization and the users using appropriate appraisal techniques.

2. THEORITICAL/CONCEPTUAL FRAMEWORK

Majority of the daily operational decisions with regards to the allocation of public funds are based on a micro-economic technique of analysis known as project appraisal. The methodology of such project appraisal or evaluation rests on the theory and practice of Cost-Benefit Analysis. Todaro and Smith (2006) have identified the basic idea of Cost Benefit analysis as thus:

- (i) To decide on the worth of projects involving public expenditure (or which public policy can play a crucial role),
- (ii) To weigh the advantages (benefits) and the disadvantages (costs) to society as a whole.

To analyze the cost-benefit of any project, two issues must be cleared: firstly- what is the expected benefit of the proposed project to the people? Secondly- why is government involved in the project execution? Government officials often defended their involvement on two fundamental grounds – efficiency and equity (distributional grounds).

Before we can proceed, it is necessary to examine the concept of costs and benefits. Several costs have been identified in project execution. Project costs, according to Barlowe (1978), include the full value of the land, labour and materials used in establishing, maintenance and operating the project plus the allowance for any adverse effects resulting from the project, while associated cost refers to the value of any additional goods and services needed to make the

products or services of the project available for use or sale. Other costs that are ordinarily involved in the development of land resources to include:

- (i) The actual outlays of cash and human effort required to bring new land resources into use and to qualify partly developed resources for higher uses;
- (ii) The social costs associated with individual and group sacrifices;
- (iii) The time cost, which arise to bring resource developments into use;
- (iv) The supersession costs associated with scrapping existing developments to make way for new resource uses.

Ratcliff (1972) while discussing land utilization costs stated that since the basis of economic decisions affecting urban land is the present and future productivity as measured by net income, it is pertinent to examine the nature of the costs that must be charged against gross revenue. For land to have value, it must be processed or improved in order to release its latent utility. This requires huge capital and the improvements are in stages commencing with site acquisition, clearing, grading and drainage. This is followed by provision of accessed roads, installations of essential utilities such as electricity and water. Such costs add to the land value and should usually be proportionate to the benefit the expected developer will receive on completion of project. With the prospect of benefits, cost considerations help to dictate the purposes for which land and associated infrastructure are developed and the timing of such development.

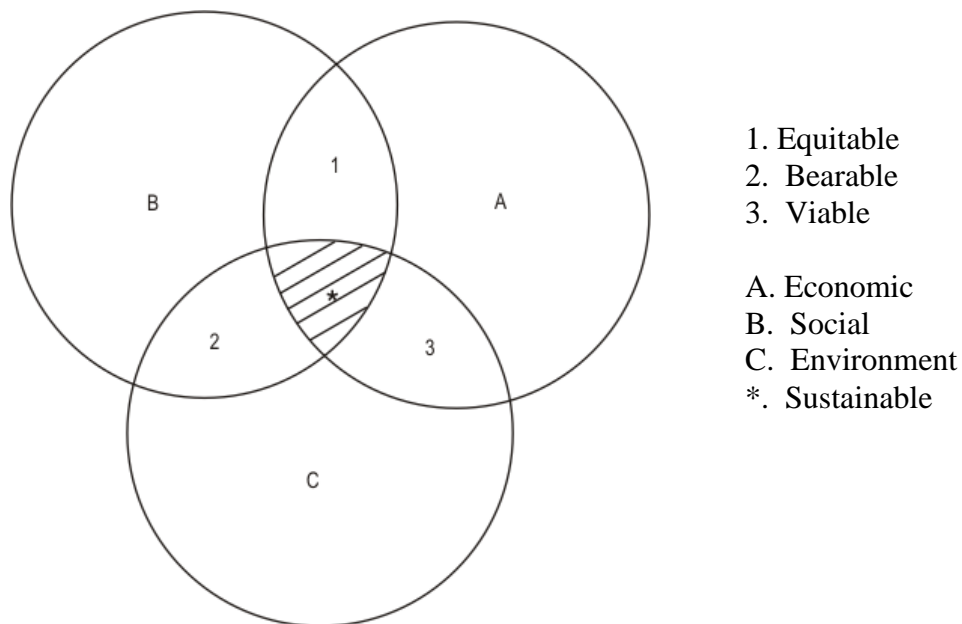
Mcquigan *et al* (1999) examines CBA in the light of several criteria that have been proposed by welfare economists for evaluating the desirability of alternative social and economic states. CBA is the primary tool that economists employ to determine whether a particular policy or policy proposal promotes economic efficiency (Kotchen, 2010). Many public institutions and private investors in Nigeria normally proceed with projects on the assumption that their benefits will certainly exceed their costs even without any form of development appraisal to determine the feasibility and/or viability of such project.. According to Ogbuefi (2002), the main thrust of investment appraisal is the examination of costs and benefits emanating from an investment. In any investment, be it private, corporate or government, there are various implications in form of costs and benefits to the investor. The need for cost-benefit analysis arises because the normal yardstick of commercial profitability that guide the investment decisions of private investors may not be an appropriate guide for public investment on infrastructure. Private investors are interested in maximizing private profits and therefore normally take into account only the variables that affect net-profit: receipts and expenditure, which are both valued at prevailing market prices for inputs and output.

The Concept of Sustainable Development emerged in 1987 with emphasis on development as a process of change in the direction of investment, orientation of technology and institutional changes which are in harmony to meet human needs and aspirations. The approach embodies the notion and ideals of a development process that is equitable and socially responsive, recognizing the extensive nature of poverty, deprivation and inequality between one neighbourhood and the other in an urban centre or one region and another in a country. Urban infrastructure provision requires equitable distribution of available resources between users in a given location now and in the future. Therefore, to continually meet the needs of the present generation means that there must be continued growth in the supply of urban services. Many authors associate various aspects of urban growth with destruction and degradation of the environment while others relate sustainability to economic stagnation (Umeh, 1977; Udia, 2003; Uchegbu, 2008; Ozigbo, 2002). For the purpose of this research, sustainability is concerned with

the provision, maintenance and upgrading of urban infrastructure that enhances the quality of urban life. This incorporates the development of water, sewer, roads and other infrastructure systems that meet the needs of current and future generations in a socially, economically and environmentally sustainable manner (Wikipedia, 2007; Munasingha and McNedy, 1995; Barton, 1996; Coote 2006 and Nnodu, *et al*, 2009) which are conditions essential for creating efficient infrastructural facilities.

This concept is illustrated with sustainable development represented at the shaded point where the three interlocking circles overlap in Fig. 2.1.

Fig.1: Interdependency of the three pillars of sustainable development



In traditional government policy-making, the three basic elements of sustainable development are often considered separately. In contrast, sustainable development calls for solutions that make sense from all three perspectives simultaneously. By satisfying the triple line (social, economic and environmental goals), sustainable development could be applied in the provision and in reshaping decaying urban infrastructure. According to Nnodu *et al* (2009), the nexus of sustainable development indicates a new way for sustainable solutions. This is a way in which community, economic and environmental development is integrated and justification given to the huge sum of money sunk into urban infrastructure provision. Development is real only if it makes human lives better in all respects.

From the foregoing, Cost Benefit Analysis involves a comprehensive study of social, financial and economic implications of projects on the environment. For public infrastructure and services, it is usually adopted where the normal criteria of profitability will not be as relevant nor all impacts of the project can be quantified in monetary term. Most policies, however, are likely to produce winners and losers, and CBA requires only that the gains to the winners exceed the losses to the losers. It is particularly adopted for those projects that do not yield direct income such as road construction, water provision and other urban development, redevelopment or rehabilitation schemes. These projects are provided for the living and need to be maintained for the future generation.

3. REVIEW OF RELATED LITERATURE

The literature is reviewed under two sub-heads: funding and appraisal techniques.

3.1 Funding of Urban Infrastructure in Nigeria

Access to finance constitutes a significant challenge to the provision of urban infrastructure in Nigeria. As a result of dearth of money for long-term financing, funding of urban infrastructure has remained the responsibility of the three tiers of government in Nigeria, like in other developing countries of the world. With our low income per capita, only a limited number of persons or organizations can venture into the sector (Udoudoh, 2014). The government provides and manages all forms of infrastructure using public funds. The government plans, designs, builds, runs, maintains, and if necessary, replaces facilities of the infrastructure (Public Procurement Best Practice Guide, 2008). While it is imperative that infrastructure should be provided as an index to improve the people's standard of living, the question that freely comes to minds is: *does the performance vis-a-vis the benefits utility users derived from such facilities commensurate with the cost expended in their provision?*

It is a public notion that efficient provision of urban infrastructure in Nigeria is compounded by poor public funding due to either poor budgeting, estimation of acquisition, maintenance cost or sheer mismanagement of funds allocated for such projects. Ogboi (2009) observes that investment in infrastructure development declined drastically over the last two decades leading to cumulative backlog of unmet needs. This assertion tallies with Makoju (2006) earlier observation that government neglected funding of electricity infrastructure from 1980 - 2000 leading to the collapse of virtually all major component parts of the sector. The same thing goes for roads construction and provision of pipe-borne water. For urban infrastructure to be reliable, an operation must be financially viable. This means that the financing of such a project cannot be separated from the appropriate investment decision. Various researches including Makoju (2006), Delaney (2008) and Udoudoh (2014) noted that public funding of urban infrastructure has stifled Nigeria's infrastructural development while users' charges appear inadequate and unreliable. Then, what is the way forward?

In financial management, there are two identified problems which relate to affordability, namely, Ability to Pay (ATP) and Willingness to Pay (WTP) principles. EAP Task Force (2006) sees the affordability analysis as the starting point to ensure that the prices for infrastructure are determined such that most households are able to pay for the services. The other alternative is chosen to ensure that the financing cash-flow gap is closed. The willingness to pay is the expected maximum payment a user is willing to pay for a given service level whereas the notion of the ability to pay relates to the upper limit of expenditure on urban infrastructure that a household can pay without undermining its ability to pay for other vital goods and services. Though affordability depends on the income level of the household, availability of the services when required is another major factor. Ogbuefi (2004) has also argued that where benefits received from such projects can be identified and measured, the benefit principle can be applied.

3.2 Appraisal Techniques adopted in Measuring the Performance of Public Infrastructure

This research studied how Cost Benefit Appraisal technique can be applied in evaluating the performance of urban infrastructure in Nigeria. Several methods as postulated by Hill (1968), Umeh (1973), Kehinde-George (1999) and Ogbuefi (2002) come to fore, namely:

- Social cost benefit analysis,
- Planning balance sheet analysis
- Development balance sheet
- Urban threshold analysis, and
- Goal Achievement Matrix (GAM).

Todaro and Smith (2006) argue that the point of departure for social cost benefit analysis is where it does not accept the actual receipts as the true measure of social benefits over actual expenditures as the true measure of social costs. Not only will actual market prices diverge from their true value, but private investors do not take into account the external effects of their decisions. These externalities can be sizeable and pervasive. In other words, where social costs and benefits diverge from private costs and benefits, investment decisions based entirely on the criterion of commercial profitability may lead to wrong decisions from the point of view of social welfare, which should be the government primary concern. Social cost benefit technique can therefore be viewed as community costs and benefits that help in the calculation of the impact on non-profit use of land.

Planning balance sheet attempts to measure economic and non-economic costs and benefits of proposed or operational projects. It is a combination of quantitative and qualitative statement of costs and benefits arranged in such a manner as to make a comprehensive analysis discernable. Geddes (2002) posits that financial manager must therefore assess the company's strategic position and the underlying dynamics of the business in which it operates. This is because an understanding of the industry structure and competitive pressures will help in the development of forecasts of revenues and marginal benefits. Based on an understanding of external pressures, together with the knowledge of the firm's cost structure, the analyst can develop a financial structure and probably imagine the users' satisfaction level.

Development Balance Sheet involves preparation and evaluation of the implications of costs and benefits of a particular development. It enables the developer to appreciate the implications of the proposed or ongoing development in order to determine whether to proceed with the development or not. Basically, a balance sheet may be prepared for the purpose of informing the company directors as to whether or not the assets of the company are being used to their best advantage (Aluko & Ajayi, 1992).

Urban Threshold Analysis as articulated by Ogbuefi (2002) is founded on the philosophy that as towns grow, they encounter some physical, structural and technological limitations. This brings to fore the theory of urban expansion and in-cooperation. Most urban centres expand to submerge the surrounding villages which lack most indices of urbanization. The problems of these urbanized villages can only be surmounted by making additional costs or investment in essential infrastructure. Most urban centres in Nigeria are presently facing threshold problems to urban growth.

Hill (1968) develops the Goal Achievement Matrix when he modified the Planning Balance Sheet method of project evaluation, and rather focused attention on the objectives of the project or scheme. He examines all the alternative courses of action in the light of the objectives and the results of the various aspects stated. He contends that the benefits in this analysis conceptually represent progress towards the desired objectives while costs represent retrogression from those objectives. It should be noted that sometimes, costs and benefits are not measured in monetary terms, but in terms of goals achieved and those not achieved. Therefore, the costs are seen as the disadvantages, while benefits are seen as the advantages. These investment appraisal techniques are exhaustively analyzed by Udoudoh (2014) in his study on the performance of urban physical infrastructure in Nigeria.

4. METHODOLOGY

In any CBA, several appraisal stages must be conducted. Though many analysts will disagree on the identification and essence of some stages, the listed structure provides a guide to the analysis. Hanley and Spash (1993) list the essential steps to include: defining the projects, identifying impacts which are economically relevant, physically quantifying impacts, calculating a monetary valuation, discounting, weighting and sensitivity analysis. This research work adopted the Goal Achievement Matrix (GAM) in evaluating the performance of urban infrastructure because of its advantages over other techniques. In analyzing GAM as postulated by Hill (1968), Ogbuefi (2002) argues that it can be used to determine the extent to which specific standards are being met. In a situation where objectives are set and the measurements of the extent to which the set objectives are to be determined, the application of Goal Achievement Matrix becomes necessary. In this manner, costs and benefits can be expressed either in monetary, physical or qualitative terms.

This research used a modified GAM in that there is no emphasis on monetary costing as the nature of this study does not call for that. GAM is applied to evaluate the development of urban infrastructures in terms of achievement or non-achievement of set objectives. The method considers both quantitative and qualitative measures in evaluating the performance of public electricity and water infrastructure operation. More so, GAM feature sees retrogression from objectives as disadvantages (costs) and progress towards objectives as advantages (benefits) which make it applicable to this study.

The data used in the research were collected from both primary and secondary sources. Those from secondary source were collected from the records maintained by Akwa Ibom Water Corporation (AKWC), an agency responsible for the provision of pipe-borne water to Uyo urban; and Uyo Office of Power Holding Company of Nigeria (PHCN), an agency responsible for the provision of public electricity supply in the study area and in fact, the entire Nigeria. Data collected from these offices are presented in Tables 1 – 3 and analyzed using simple arithmetical techniques. It was also pertinent to gather some data primarily from the direct beneficiaries of public infrastructure. To achieve this, 50 questionnaires were produced and administered to respondents using simple random technique. The result sieved from the questionnaires was used to evaluate the performance of urban infrastructure. This is shown on Table 4 where Goal Achievement Matrix technique is applied.

Table 1: Expected Quantity of Water produced per Pumping Station in Uyo

Location of pump	Water production in m ³					
	Capacity Per hour	Pumping hours	Per day	Per week	Per month	Per year
Idu Uruan	250	8	2,000	14,000	56,000	672,000
Mbiaobong	250	8	2,000	14,000	56,000	672,000
Ekit Itam	625	8	5,000	35,000	140,000	1,680,000
Obio Etoi	250	8	2,000	14,000	56,000	672,000
Secretariat Complex	250	8	2,000	14,000	56,000	672,000
Ekpenyong Street	625	8	5,000	35,000	140,000	1,680,000
Total	2,250	8	18,000	126,000	504,000	6,048,000

Source: AKWC, Uyo and Computed by Researcher (2014)

From Table 1, the AKWC has the installed capacity to pump water for eight (8) hours/day. All the water pumps have the capacity of producing 6,048,000m³/year. But from experience, the Water Company could not attained this feat because of some identified problems which include poor electricity supply, breakdown of pumps due to age or negative impact of human activities, over usage and lack of maintenance, broken and obsolete pipelines, poor management techniques and any other administrative problems. Consequently, the provision of adequate supply of water according to the installed capacity of the pumps became an unachievable task in the studied area. Water pumping hours was reduced by the AKWA from eight (8) hours to four (4) hours per day. This also resulted in reducing the water pumping capacity of the pumping stations. Pumping stations with five (5) pumps were allowed to operate three (3) pumps each, while those with two (2) pumps operate one each (see Table 2).

Table 2: Actual Quantity of Water Supplied per Pumping Station in Uyo

Location of pump	Water production in m ³					
	Capacity Per hour	Pumping hours	Per day	Per week	Per month	Per year
Idu Uruan	125	4	500	3,500	14,000	168,000
Mbiaobong	125	4	500	3,500	14,000	168,000
Ekit Itam	375	4	1,500	10,500	42,000	504,000
Obio Etoi	125	4	500	3,500	14,000	168,000
Secretariat Complex	125	4	500	3,500	14,000	168,000
Ekpenyong Street	375	4	1,500	10,500	42,000	504,000
Total	1,250	4	5,000	35,000	140,000	1,680,000

Source: AKWC, Uyo and Computed by Researcher (2014)

From the Table above, it is obvious that there is a great shortage in the quantity of water supplied in Uyo urban. This results from reduction in pumping hours from eight (8) hours to four (4) hours/day and pumping capacity by half, that is from 250m³/ hours to 125m³/hour and 625m³/hour to 375m³/hour. This clearly indicated that the benefit water consumers derived is not commensurate to the total cost of developing the water installations as the available water provided is not adequate to meet the people's demand.

Water Corporations in most Nigerian urban centres are operated not as investment but just like conventional government ministries, where the best hands are not employed to work or where the workers are not encouraged to put in their best for better result. The corporations therefore cannot generate enough internal revenue to pay its staff, maintain its installations nor expand its facilities to meet urban growth and population. This is why they are forced to operate at 50% of the installed capacity. The resort of most people to private boreholes for domestic and commercial water is a sign of inability of urban dwellers to derive expected benefit from public water supply.

Investigation was also carried out on how additional megawatts of electricity installed in Nigeria benefit the people. This is presented on Table 3 below:

Table 3: Electricity Supply and Consumers' Population in Uyo

Year	Electricity Supplied (Mw)	Consumers' Population
2001	10.00	43,470
2002	10.70	43,980
2003	10.80	44,490
2004	11.40	45,130
2005	12.90	45,750
2006	14.00	48,320
2007	16.30	49,290
2008	21.00	49,300
2009	23.00	49,310
2010	28.60	50,290

Source: PHCN Office, Ekpenyong Street, Uyo.

Table 3 shows that the megawatts of electricity provided by PHCN for the period between 2001 and 2010 was much higher than the population of consumers that benefitted. By the year 2001, the mega watts of electricity supplied in Uyo was 10.00, while the population of electricity consumers was 43,470. Ten years after, precisely in 2010 the megawatts increased to 28.60; an increase of 18.60mw while the population of electricity consumers moved up by only 6,820 (i.e. 50,290 – 43,470). Though electricity facilities are installed at all nooks and crannies of the city, the quality of electricity supply to homes are either poor, epileptic or may remained unavailable for a long. By all ramifications, the performance of electricity provided from PHCN is relatively very poor. The high cost of its provision cannot be compared to the benefit derived by its consumers, thus the resort to private generating plants for domestic, commercial and industrial by consumers.

5. APPLICATION OF GOAL ACHIEVEMENT MATRIX (GAM) TECHNIQUE

Goal Achievement Matrix (GAM) was adopted to evaluate the performance of utility agencies providing urban infrastructure, via-a-vis, the benefit of the project to the users in the study area with emphasis on determining the extent which the goals of the agencies are achieved. The methodology emphasized the application of GAM. The procedures used in determining the extent to which the sets goals were achieved are as follows:

- (i) To identify the goals and objectives of utility agencies (PHCN and AKWC).
- (ii) To operationalize the goals and consider some specific objectives and code them accordingly, for example A to G.
- (iii) To express the achievements of each objective by scoring them against specific variables they meant to achieve.

By way of operationalization, the broad objectives of the agencies (PHCN and AKWC) schemes were considered and simplified into the following variables.

- | | | | | | |
|---|---|----------------------|---|---|-------------------------------|
| A | - | Adequacy and quality | B | - | Distribution network |
| C | - | Regularity of supply | D | - | Tariff reasonability |
| E | - | Maintenance culture | F | - | Attraction of investors (PPP) |
| G | - | Revenue generation. | | | |

These variables were then scored against the objectives they were meant to achieve in a matrix form. For the purpose of clarification, a matrix is a set of numbers arranged in rows and columns to form a two way table, where the rows and columns can be studied and analyzed mathematically (Udofia, 2002). Where more than 40 respondents out of 50 representing 80% of the sampled population agreed that the objective is achieved, one (1) was assigned while zero (0) was assigned where less than 10 respondents representing 20% of the sampled population said that the objective was not achieved.

Table 4: Goal Achievement Matrix Application

Objectives	Adequacy and quality	Distribution network	regularity of supply	Tariff reasonability	Maintenance culture	Attraction of investors	Revenue generation
A	0						
B		1					
C			0				
D				1			
E					0		
F						0	
G							0

Source: *Field Survey by Researcher (2014)*

Table 4 above showed that public utility agencies have achieved objectives B and D. They are able to distribute public electricity and water infrastructure most parts of the urban area. Reasonable tariff was achieved as most respondents interviewed accepted that the current utility bills charged are moderate, while others said the bills are low.

Objectives A, C, E, F and G have not been achieved, though some recorded partial achievements, which in any case still scored zero. This proves that there is inadequacy in quantity and quality of supply. Also, the supply of urban physical infrastructure is not regular as per objective C. There are many instances where the customers are not supplied electricity and water for hours, days, weeks or months in some parts of Uyo urban. Consequently, users resort to alternative source of supply such as private generating sets, electric/gas lamps, kerosene lantern, touch light or candles, among others.

Objective E - maintenance culture was not achieved. This is the reason we have collapsed infrastructure, vandalized electric poles and circuit, leak water pipes, obsolete equipment and other problems. Infrastructure maintenance is not incorporated into infrastructural development policy in Nigeria, hence funds are not readily made available for routine maintenance.

Objective F - attraction of investors was not achieved because of the legal instrument on provision and management of urban physical infrastructure in Nigeria.

Also Objective G – attaining adequate revenue generation was not achieved or almost partially achieved because the consumers are not satisfied with the supply of urban infrastructure from public sources for various reasons.

6. CONCLUSION AND RECOMMENDATIONS

This research has shown that cost-benefit analysis is required for any major infrastructural project that requires huge capital outlay. Carrying out cost-benefit analysis plays an important role in deciding whether to proceed with an investment or not. This shows that it can be performed at different stages of the project as it leads to better decision making. CBAs are designed to ensure that decisions to embark on major infrastructure projects are made on the basis of the best investment appraisals. Therefore, investment appraisers in the public and private sectors of the economy should not shy away from advising their principals on the worthwhileness or otherwise of any envisaged projects that will gulp several millions of public funds.

The fact that CBA is based on monetization of all costs and benefits has actually resulted in a lot of criticism. One source of such controversy is the conceptual foundation of CBA as it relates to distributional equity (Kotchen, 2010). One of such criteria is *Pareto optimality* as provided by Baumol (1977) who declared that a change is desirable or consistent if at least one person is made better off and no one is made worse off. Such a policy produces a ‘Pareto improvement’ as it would obviously pass the cost-benefit test. Although this criterion seems to be relatively value free, as well as potentially verifiable, it suffers from the severe weakness that few changes are likely to leave some individuals better off and no one worse off. The affordability analysis is the starting point to ensure that the prices for infrastructure are determined such that most households are able to pay for the services. Though affordability depends on the income level of the household, availability of the services when required is another major factor. The ability or willingness to pay and benefit principles is not considered by public utility agencies in Nigeria because of the enabling framework regulating the agencies.

This research has shown that costs and benefits are not only measured in monetary terms, but can also be measured in terms of goals achieved and those not achieved as shown in the application of Goal Achievement Matrix (GAM) technique. In this manner, the costs are seen as the disadvantages while benefits are seen as the advantages. Even though this evaluation technique is used, it must be admitted that like other evaluation techniques, it has its short comings. There is the problem in the choice of numerical weighting of the objectives, which could be subjective and arbitrary when using Goal Achievement Matrix (GAM).

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