

Innovative Strategy For Water Supply Project In Okpuno Town Using Optimal Solution

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ABSTRACT

A sustainable water supply in developing countries may seem to be an unattainable goal for the many who have experienced the problem and frustration of dealing with communities ignorant of the complexities of water supply technology. The strategy proposed in this paper includes and integrates the operation and project processes with the development of a community based organisation, will be committed to the people and the cost effective operation of water supply delivery system using linear programming in minimizing, to obtain optimal operation cost.

Keywords: Community, participation, water supply, linear programming, operation and maintenance.

the communities can be achieved. The beneficiaries of water supply and sanitation projects should learn where the water comes from, where the waste go to, why these services should be paid for and how to take responsibility for and ownership over the infrastructure provided, Todet al (2003). Actually, the progress of water supply and sanitation programme is still left behind as a result of poverty, knowledge, attitude and behavioural related to health. However, in this proposed Okpuno-water scheme, the community organisation must be fully involved in the determination of their needs, strategies, planning process, design, construction and the operation and maintenance.

I. Introduction

Water is a source of life and researches over the years have pointed to the fact that fresh water resources are not unlimited. Therefore, the provision of potable water to communities is broad process that requires the coordination of needs, resources and institutional framework and this coordination needs to underpinned by effective facilitation as recorded by WHO/UNICEF (1996).

Although drought is a threat in northern Nigeria, the communities need to use these scarce resources with care so that future generation will be able to benefit from good quality water. Kerry Smith (1993) in his Rethinking Rural Water supply policy stated that, water as source of life entails correct utilization of water and does not mean merely consumption without thinking what happens to it afterwards. It also mean taking care of waste water in order to avoid pollution and alleviate the spread of dangerous diseases.

Water supply and sanitation are considered human rights and they are basic priorities of the reconstruction and development programmes in Nigeria. In some developing countries, experience shows that provision of water and sanitation facilities goes with education and training in their proper use before good result, in improving the quality of life in

1.2 Aims and Objectives

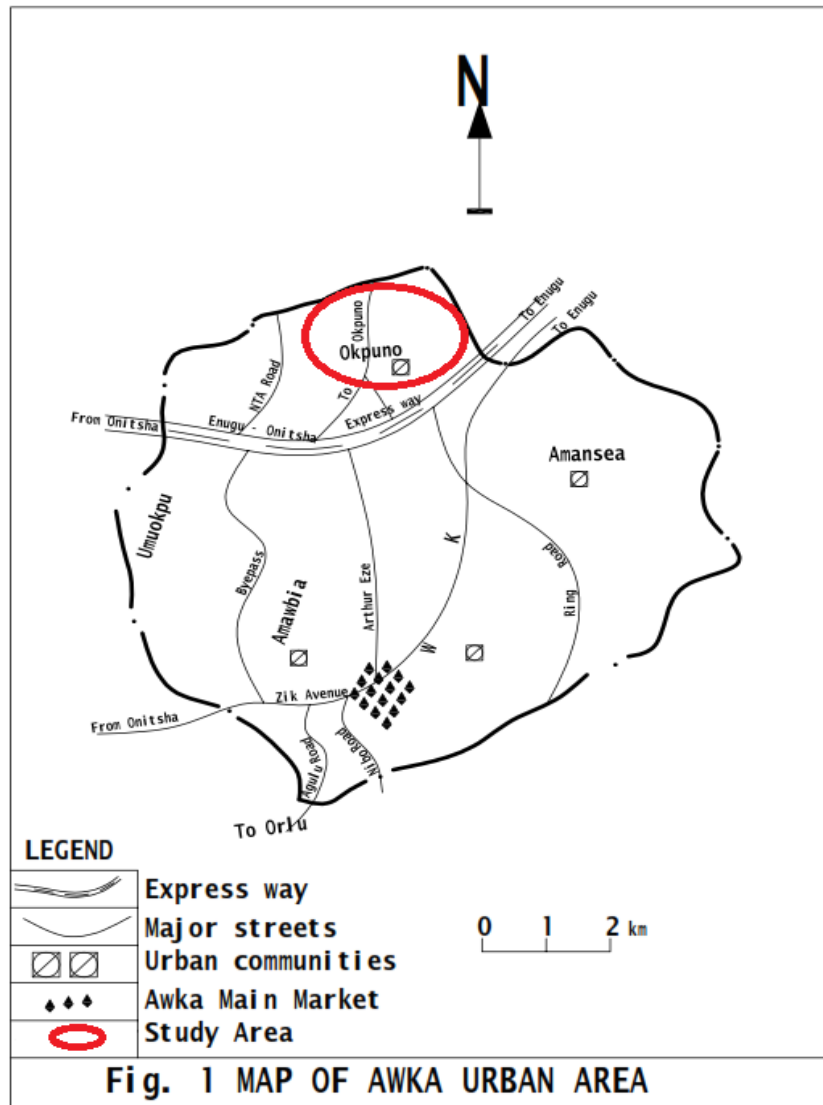
Meanwhile, the objectives of this water scheme are to:

- Develop a sustainable service for provision of water supplies
- Provide safe water for the large population
- Accelerate coverage of safe water supply
- Improve public health and sanitation
- Develop private sector to actively support water supply and sanitation activities
- Provide a good example for community participation in water supply and sanitation sector
- Supply water to consumers at right place, price, quality, quantity and level of service.
- Minimize the cost of production and maintenance

II. METHODOLOGY

2.1 Study Area

Okpuno town is one of the five towns that made up Awka municipal urban in Awka South Local Government Area in Anambra State. She is located between latitudes 6°13 and 6°23, then longitude 6°49 and 7°04, with a population of 13,761 both male and female. Okpuno is situated in the Anambra – Imo River Basin Authority underlaid in the basic sedimentary rocks. See fig. 1 below.



The emergence and rapid growth of Okpuno town linked to the high demand of potable water as a result of overwhelm development viz-a-viz the transport networks and attraction of basic service providers, therefore a sustainable development is a simple option required to attain the objective of the water scheme, as the community members agreed to have borehole fields comprising of seven boreholes to be able to alleviate the problem of water scarcity since the State Water Corporation has been in moribund.

2.2 Programme and Process

Okpuno water scheme will involve two sets of processes, namely project process involving conception, planning, designing and construction, while operation processes involving operation, maintenance, administration and accounting, Fox (1994).

The focus of this paper is to satisfy the needs of the community and to generate revenue towards these needs. The delivery system must comprise of water

source, submersible pumps, overhead tank and pipelines required to supply water to the community and there shall be emphasis more on revenue generation Wijk-Sijbesma(1989).

The course of production, the variables of place, price, quality and service must be satisfied, meaning there must be reasonable revenue and inevitable system success. The cost of operation and maintaining the delivery system must not exceed the revenue that can be generated from the sale (supply) of water IRC (1994).

One of the basic priorities of the Government is the empowerment of previously disadvantage, to make their own decision and to take ownership of developmental projects. The education and training are vital part of every community water supply and sanitation project because the beneficiaries of these projects should be an inseparable part of the whole development process, from the pre-project phase through monitoring and evaluation, implementation

and finally to the operation and maintenance after a project has been completed according to Wong (2005) in his updating the institutional debate in sustainable water management.

2.3 System Engineering

The strategic planning of Okpuno water resources development involves two sets of processes, project process and operation process. A cost of five million naira (₦5M) and three million naira (₦3M) are allocated for them respectively.

In the plan of actions, four (4) project engineers and five (5) operation engineers are proposed to be used for the development of a cost of eight million (₦8M).

It was discovered that additional cost of five million (₦5M) and two million naira (₦2M) will be required for additional construction and maintenance after a period of time through available funds for these, is six million naira (₦6M). The community which is involved with water scheme, may need to train three (3) skilled men for the project process and eight (8) skilled men for the operation process at cost of nine million (₦9M). The question is how should the funds be distributed for the various cost to be able to make the best of the available funds.

Therefore linear programming will be ideally used to minimize the cost of the project and operation to achieve an optional solution.

Linear Programming

Let the project process be X_1

Let the operation process be X_2

The objective function is thus minimize $Z = 5x_1 + 3x_2$

Subject to: $4x_1 + 5x_2 \leq 8$
 $5x_1 + 2x_2 \leq 6$
 $3x_1 + 8x_2 \leq 9$
 $x_1 ; x_2 \geq 0$

Solution

Minimize $Z - 5x_1 - 3x_2 = 0$

Subject to: $4x_1 + 5x_2 + S_1 = 8$
 $5x_1 + 2x_2 + S_2 = 6$
 $3x_1 + 8x_2 + S_3 = 9$
 $x_1 ; x_2 \geq 0$

Basic	Z	X_1	X_2	S_1	S_2	S_3	Sol
Z	1	-5	-3	0	0	0	0
S_1	0	4	5	1	0	0	8
S_2	0	5	2	0	1	0	6
S_3	0	3	8	0	0	1	9
Z	1	-3 1/8	0	0	0	3/8	27/8
S_1	0	17/8	0	1	0	-5/8	19/18
S_2	0	17/4	0	0	1	-1/4	15/4
X_2	0	3/8	1	0	0	1/8	9/8
Z	1	0	0	0	31/34	5/34	23 1/34
S_1	0	0	0	1	- 1/2	- 1/2	1/2
X_1	0	1	0	0	4/17	- 1/17	15/17
X_2	0	0	1	0	-3/34	5/34	27/34

Thus $X_1 = 15/17$ million = ₦882,353
 $X_2 = 27/34$ million = ₦794,118

This implies that from the available resources, the total cost available within the constraints is $Z = 231/34$ million = ₦6,794,118 out of which the amount available for training of one worker for project process X_1 ₦882,352 while for amount available for training of one worker for maintenance process is $X_2 = ₦794,118$.

III. Discussion

The implication of this project on community water supply and sanitation can be seen from two points of view. One looking at purely technical issue and another looking at socio-economic aspect. These are the basic aspects to be taken into consideration when the framework for education and training processes in community water

supply and sanitation project is to be developed, IRC (1993).

However, community based organization is proposed to be established which is better positioned and closer to the people, will implement a community-focused water supply strategy than an externally based organisation. Moreover, the constraints will be inadequate knowledge, skills and experience that will be required to effectively manage this water scheme. If Okpuno community will not understand these issues and difficulties to be overcome, poses a threat according to Meinzen et al (2002) in their collective action for managing resources.

IV. Conclusion

Okpuno as a developing community, should be empowered and participate in the project phases of the water supply development, though is invaluable in generating, a sense of ownership, responsibility and commitment within the community, but is not sufficient to ensure sustainability. Therefore a community based organisation should take on the responsibility of learning and implementing the skills required to manage, operate and maintain the water scheme. Often time, when the larger, experienced water supply utility takes responsibility for water supply in a developing area, the imposition of their own strategy and policies may be inappropriate for the community concerned, Platteau and Abraham (2002).

Rowlands (1995) opined in his empowerment examined, as a result local capacity and contents may not be developed, so decision making is centralised away from the community, the people's needs are generalised or ignored and the operating cost ultimately increase. Consequently, community empowerment and transfer of responsibilities for water scheme management to community based organisational structure may be inefficient initially, but with careful planning and community-based water supply management will be the most effective option in the long run.

Therefore, main purpose of the project is to supply sustainable potable water and gainful employment for the young school leavers in the community.

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