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COMMUNITY PARTICIPATION IN URBAN WATER SUPPLY MANAGEMENT IN ABEOKUTA - LESSONS FOR SUSTAINABLE WATER SUPPLY IN URBAN COMMUNITIES

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ABSTRACT

Provision of water adequately (in terms of quality and quantity) has been a major concern across the globe especially in the developing world. In Nigeria, a number of intervention schemes are established to meet inadequacies in water provision. One of these is the institution of River Basin Development Authorities to augment water supply through the provision of boreholes, dams and the likes. However, there have been claims that the sustainability of these schemes depend largely on the involvement of the recipient communities in the operations and maintenance of these facilities. The involvements of communities in running the borehole facilities provided by Ogun-Oshun River Basin Development Authority (OORBDA) at some locations in the city of Abeokuta (south-west Nigeria) were reviewed in this work. Twenty borehole stations were randomly chosen across the urban areas in Abeokuta and questionnaire items (coded) were administered to ten neighbouring residents to do self-assessment of the functioning and water delivery conditions and the level of community involvement in the management of the boreholes. Using the ratings obtained from questionnaire items, an hypothesis was tested at the significance level $\alpha = 0.05$ using the t statistic. Results show that community participation is highly significant across all but one of the eleven communities whose borehole schemes are still functioning. In addition, a qualitative survey was conducted on two of the eleven communities. The information gathered are deem helpful especially in ensuring sustainable power supply for borehole pumps and in ensuring prompt and adequate maintenance of facilities.

Keywords: borehole water supply, OORBDA boreholes, community involvement, operations and maintenance.

INTRODUCTION

The issue of sustainable provision of water adequate in quantity and quality have been considered as a major element instrumental to the improvement of human health and development [3, 8]. The United Nations considers it as one important tool for enhancing poverty alleviation, human health and child education [11]. A safe and convenient water supply leads to improved health, especially for pregnant women and children and reduction of time consumed in searching for water among other benefits [11]. The importance of sustainable water supply is further visible in its inclusion as a sub-goal in the United Nations' Millennium Development Goals (MDGs) [2, 12]. Though a global importance has been placed on access to safe, convenient and affordable sources of water, most developing countries are still having serious challenges [3]. To corroborate this, InfoChange News and Features claims that the United Nations Development Programme (UNDP) in 2006 estimated that about 50 percent of the population in the developing countries suffer from diseases connected with poor water supply [5]. Moreover, it claims that the annual infant death associated with poor water quality and bad health practices was over two million as at the time of its report. Most of these people have been recognised as mainly from the developing world among which most African nations were identified [12].

Ong'wen also agreed with the earlier cited authors while presenting his classifications of countries in terms of per capita annual fresh-water availability using the 'water-stress-index' as an indicator [9]. Although the indicator categorised most African countries as having abundance of renewable fresh water resources, the author stressed that this is quantitative and does not give cognisance to qualitative issues like 'pollution levels in water sources or the distance people and animals have to walk to reach potable water.' Therefore, water supply may not ultimately refer to available quantity; quality and proximity (or ease of access) considerations are also equally necessary. Thus, the paper seems to suggest that access to quality water and not availability of water sources is the actual problem of water supply in the developing countries of the world [9]. The lacked access to quality water is thus identified with increasing stress on freshwater resources due to natural and man made activities such as increased rate of population growth, washing of pesticides, fertilizers and industrial effluents into water bodies and environmental degradation [9].

Above all, inadequacies in the policy decisions and management of many of the water supply programs in a couple of the developing world (especially African countries) are a clog in the wheel of progress towards achieving adequate supply of water. In this light, active private and communities involvement in water supply has been suggested for effectiveness of these programs [4, 9, 14].

COMMUNITY PARTICIPATION IN WATER SUPPLY PROVISION

'Over the last decades community management has become the leading concept in rural water supply. It started with community involvement in system construction and developed into community participation and community management' [6]. Community participation has been identified as paramount to the success of water supply programs in various countries of the world (such as Argentina, Egypt, Malaysia and so on) [10]. These programs have been identified with 'strong and active community participation from the inception…, during execution, and…in the administration and operation' [11]. Faulkner and Lenehan have also highlighted the successes recorded in engaging the support of the rural communities in Zimbabwe and South Africa. The paper emphasizes the need for community partnership and adaptations to local peculiarities as necessary for successful implementation of water provision schemes [4]. Moreover, the earlier successes of international supports in water supply in Africa (especially during the years of International Drinking Water and Sanitation Supply Decade in the 1980s) have been linked to participation of the community in maintenance and management [11].

Even in extreme cases where the government had not taken any tangible initiative in water provision, the involvements of communities have been resorted to as the solution. The case of some villages in Northern Sudan that were previously neglected by the government has been cited [14]. For these villages, water provision was mainly through the joint efforts of a Non-Governmental Organisation and the community at the end of the day. The report of the year 2000 activities of ACTION AGAINST HUNGER (an NGO with the headquarters in the United States) in Warder and Korahai Zones of the Ogaden region (one of Ethiopia's federal states) also showed a similar trend [1].

The issue of community involvement in water schemes is still ongoing having entered its more advanced stage of management and maintenance [6]. Further lessons could still be learnt in this regard. Besides, most of the available sources have focused more on rural water supply, which may tempt one to suggest that all is well with water supply in urban areas especially in the developing regions of the world. Thus, this paper is an attempt at investigating communities' participation in urban water supply. In addition, useful information can be gathered on ensuring sustainable water supply for urban communities, particularly those in the developing countries.

The focus on this work is the water supply intervention scheme of the Ogun-Oshun River Basin Development Authority (OORBDA) in urban communities in Abeokuta, the capital city of Ogun State (south-west Nigeria). It examines the borehole program of the agency in the communities spread across the city. Particular attention was paid to borehole stations that were still actively serving their respective communities and have had a successful record of community involvement in operations and management. Specifically, the paper reviews the community involvement activities of two of such OORBDA borehole facilities. Valuable lessons for community participation in sustainable water supply are identified from the activities of the communities running these two stations.

BRIEF INFORMATION ABOUT THE STUDY AREA

The city of Abeokuta lies southwest of Nigeria with an estimated 2007 population of over 600,000 people (projections from 1991 population figures at a growth rate of 3.5 percent) [8]. The average daily demand of 120 million litres of water by this population cannot be adequately catered for by the city's water scheme whose 2007 delivery capacity was about 80 million litres [8]. Presently, reports show that this capacity has even dwindled further. This implies that dependence on alternative sources to handle the shortfall is inevitable. A readily available option is the groundwater. Though rainwater is mostly harvested by individual housing units during the rainy seasons, the absence of the rains during the dry seasons leaves no option other than dependence on groundwater.

Communities and individuals make use of wells and boreholes to tap groundwater. Water from boreholes and wells are good alternatives to tap water. With an appreciable level of protection within the underground aquifer 'groundwater has excellent microbial and chemical quality and it therefore requires minimal or no treatment' and, in addition, 'the capital cost of groundwater development when compared to surface water development is modest' [8]. Among other agencies, OORBDA as a government agency has sunk boreholes at various locations and these serve the host communities across the city. How well these OORBDA's boreholes have satisfied the motive for their installation is an issue that needs to be verified.

More importantly, the impact of community participation on the level of functionality and delivery of these facilities is also an area that can be investigated.

METHODOLOGY

The research approach was both quantitative and qualitative in nature. As the number of recent OORBDA boreholes could not be ascertained, twenty borehole facilities were randomly chosen across the city for assessment, each being about ten years old or less. For each of these locations, a quantitative survey was conducted on a random sample of ten people within the community to generate a self-rating of the borehole performance and information on the level of community involvement in its operations and maintenance. The responses of these were analysed as appropriate.

The target respondents are males and females, eighteen years and above, who hold a minimum level of education to enable them read and communicate in a simple manner. The quantitative questionnaire contains simple and limited number of items (there are actually two items related to community participation). The first section of the questionnaire covers items on demographics and the age of the borehole while the second, which is the main section (containing two items), focused on community management efforts. Responses were rated on a four-point scale. The main test items were drafted such that favourable responses attract higher ratings (these being 3 and 4). The points obtained for the two items were summed up as the total rating obtained for each responder. The sample means and standard deviations were determined for each borehole station as well. Hypotheses were raised in the analysis to test the significance of the survey result since the sample was only a small percentage of each of the communities. A null hypothesis was raised to test whether the assessment obtained from the sample can be generalised for each of the community. The null hypothesis is stated thus:

$H_{0:}$ *Boreholes in the urban communities do not enjoy community support in maintenance and operations in a sustainable manner.*

This is expressed as

H_0: $\mu < 6$* ………………….. i

and the alternative, H_a: $\mu \geq 6$* ………………… ii

To reduce the possibility of research error due to inappropriate sampling, the t statistic was used as the test statistic (based on the assumption that the sample sizes of the borehole sites are small) [7].

*see appendix C for how this number was obtained

Moreover, after the analysis of the data obtained from the quantitative assessment, two of the borehole stations whose level of community involvement in its operations are significant (based on the result of the hypothesis testing), are further investigated by a qualitative survey. The users of these two facilities were made to respond to open-ended questions that nd mode of operations in community management of these facilities in their respective locations. The responses were analysed and information were extracted as appropriate.

This qualitative survey focused on some selected members of the two communities. These are members of the executive of the communities' associations, residents in the communities within the last ten years (at least) or both. In order to have detailed information about the community involvement, the survey sample size was not particularly fixed but was not less than ten in any case.

RESULTS

Quantitative Survey:- The sex distribution indicates that there are 92 males and 108 females (indicating 46% and 54% respectively). Age distribution as presented in table 1 shows that none of the respondents is below eighteen years of age. The fact that most are below forty-five years also adds credibility to the results obtained in that these are possibly the set of people who use the borehole facility often and, as such, their responses are deemed reliable. Moreover, that more than ninety percent have at least secondary education indicates that most respondents are capable of giving appropriate responses to survey questions (see table 1). The others who have lower education level were considered based on the premise that they are older members of their communities and, may have more detailed information as a result. This set of people was given the necessary aids on request but without influencing their response decisions as much as possible. It was ensured that the administration of questionnaires was limited to residents living within 1000 meters radius from the borehole locations in line with international standard [13].

Table 1: Respondents' Age Distribution and Educational levels

Age Distribution	No. of respondents	Percentage (%)		Educational levels	No. of respondents	Percentage (%)
18 - 25	38	19.0		Primary School	17	8.5
26 - 35	71	35.5		Secondary School	62	31.0
36 - 45	55	27.5		NCE/ND/Other Diploma	52	26.0
46 - 55	27	13.5		HND/B.Bc	51	25.5
56 - above	9	4.5		Higher Degree	18	9.0

Responses confirm that all the twenty boreholes are still within ten years after construction (table 2). However, it was indicated that seven are non-functional as at the time of the survey. Besides, all the responses from two stations were discarded based on the sharp divide in the responses as regards the functionality of the boreholes (this may indicate that the questionnaires were not sincerely filled by the respondents). On the long run, responses from eleven stations were used in the analysis (table 2) though one or two of the ten responses in three of the eleven stations were also discarded (see table 3a) on the premise that they were not found usable. 106 responses were used for the analysis eventually as indicated (table 3a).

The mean of the aggregated scores and the standard deviations for the borehole locations are presented in table 3a. The overall mean scores and standard deviations are also presented in table 3b.

Table 2: Operating Conditions of the Twenty Borehole Stations

Stations/Locations	Less than 5 yrs after construction	Between 5 and 10 yrs after construction	More than 10 yrs after construction	Remarks on condition
1	---	X	---	functioning
2	---	X	---	functioning
3	---	X	---	functioning
4	---	X	---	responses discarded
5	X	---	---	not functioning
6	---	X	---	not functioning
7	X	---	---	functioning
8	---	X	---	not functioning
9	X	---	---	functioning
10	X	---	---	functioning
11	---	X	---	functioning
12	X	---	---	functioning
13	X	---	---	functioning
14	X	---	---	responses discarded
15	X	---	---	functioning
16	---	X	---	not functioning
17	X	---	---	functioning
18	---	X	---	not functioning
19	---	X	---	not functioning
20	---	X	---	not functioning

Note: X indicate the number of years after construction as obtained from information during survey of facilities and confirmed by respondents

Table 3a: Mean and Standard Deviations of Respondents Assessments (Coded) in each of the Eleven Functioning Borehole Stations

Borehole locations	Mean	Standard Deviation	No of usable responses, n
1	5.60	0.49	10
2	4.50	1.02	10
3	4.22	1.13	9
7	5.30	0.46	10
9	4.38	1.11	8
10	4.60	0.80	10
11	4.80	0.60	10
12	3.80	0.98	10
13	4.20	0.98	10
15	4.78	0.79	9
17	6.00	0.45	10
		Total =	106

Table 3b: Overall Mean and Standard Deviations (All the Eleven Borehole Stations)

Mean	Standard Deviation
1.04	4.75

The result of the hypotheses testing for the borehole stations is presented in table 4. The results show that the null hypothesis was rejected for all the eleven stations except one (α = 0.05). Thus, the responses of the test sample for each of the eleven communities can be generalised in all but one of the communities. From this result, it can be said that, for ten of the communities, community involvement in running the borehole facilities is highly significant. Overall hypothesis testing (for all the boreholes put together) further strengthens this claim (see table 5). The null hypothesis was rejected in the overall testing as well.

Table 4: The Results of Hypotheses Testing for the Eleven (11) Borehole Stations

Borehole Locations	df (= n-1) Where n =no of responses	Calculated t statistic	Rejection Region t statistic (1-tailed test)	Remarks (is null hypothesis rejected?)
1	9	-2.58	-1.83	yes
2	9	-4.65	-1.83	yes

3	8	-4.73	-1.86	yes
7	9	-4.81	-1.83	yes
9	7	-4.13	-1.90	yes
10	9	-5.53	-1.83	yes
11	9	-6.32	-1.83	yes
12	9	-7.10	-1.83	yes
13	9	-5.81	-1.83	yes
15	8	-4.63	-1.86	yes
17	9	0.00	-1.83	no

Table 5 Overall Hypotheses Testing Result

df (= n-1) Where n = no of responses	**Calculated t statistic**	**Rejection Region t statistic (1-tailed test)**	**Remarks (is null hypothesis rejected?)**
105	-12.37	-1.66	yes

Qualitative Survey: The two borehole stations chosen are located at Lafenwa and Asero community in Abeokuta. The Lafenwa borehole serves the market community at Lafenwa in Abeokuta while Asero station is located within the housing estate. The information gathered through the survey is further discussed in the sub-sections following.

Asero Estate Community:- The community had a problem with getting water from the borehole station after it was provided by OORBDA. Information gathered indicated that the yield was inadequate. Moreover, after a while, the borehole ceased to deliver and the station was abandoned for some period. However, the need for water within the community was growing. The situation was more aggravated with the difficult geophysical terrain of the area, which made sinking wells and boreholes in individual housing units an arduous task. Thus, the community had to rise up to finance the re-boring of the well. This came out successful and the community started enjoying water from this facility. The water is pumped into a reservoir for onward transmission to the public taps installed close-by. More importantly, to ensure a sustainable water delivery, a solar powered pumping system was employed. (Thus, the issue of non-availability of resources for power generation is handled once and for all). In addition, water rates were assigned per unit container vessel (25 litre-keg) used for fetching water from the borehole facility. These are collected and kept in the reserve to finance any exigencies or other needs which could have otherwise hampered sustainable supply of water from the borehole facility.

Moreover, the operations and maintenance of the borehole was placed in the custody of an influential member of the community (this fellow is a retired civil servant who, incidentally resides the closest to the borehole site). This member of the community operates the solar powered pump, ensures users pay for the water obtained from the borehole and makes returns to the community treasury. She is also monitors maintenance and repairs.

The community members interviewed are of the opinion that the current level of participation of the community in water provision via the borehole scheme will ensure a lasting water provision for the community. However, others are of the opinion that the community could do more. They frown at situations when water is not available simply because the operator is not around or is busy somewhere and, as a result, would not operate the pump as at when due. They are of the opinion that water should be made available at all times to warrant paying for it in the first instance. Others opined that the water could be made available at regular periods of the day, preferably in the evening periods when most of the residents would have returned from work. A few suggested that employing an operator would be a lasting solution (instead of a volunteer operator).

Lafenwa Market Community:- The members of the community took it upon themselves to handle the operation and maintenance of the borehole facility provided for the market after its installation. Like in the case of Asero Community, the issues of generating power for the pumping system and handling repairs is a paramount issue to contend with. The community had no choice than to come up with solutions to tackle these challenges since most of them, especially the butchers and meat sellers, depend on the water in their operations and activities.

In their own case, rather than levy users at the point of fetching water, the community drew up a schedule of fees which members of the market community are obliged to pay. This is necessary because the facility is fuel-powered and this means making resources available for fuelling in a sustainable manner to ensure constant water supply. The levies are also used for repairs and maintenance.

Moreover, the operation, maintenance and repair works were committed to a set of individuals who under the co-ordination of the community leadership. Unlike what obtains in the estate, water is pumped twice a day (early in the morning and by mid-afternoon) since the market community depend largely on it for their usage. The pumped water is stored in the overhead tank for usage during the time of the day that water is not pumped. The fact that the community have more than one person running the borehole makes it more efficient. The absence or unavailability of one person does not affect the availability of water at any given time since others will be available to handle the operations. In summary, the community members highlighted that community participation is one key factor that ensured the successful running of the borehole scheme.

DISCUSSIONS

This work has been able to establish that community participation is significantly present in the running of water supply schemes of communities in an urban setting like Abeokuta. The analysis shows that community involvement in managing ten of the eleven OORBDA's borehole is significant. The null hypothesis was rejected for each of the ten borehole indicating that the responses of the survey sample is highly likely to be a true reflection of the overall feelings of across each of the ten communities. Furthermore, the activities of two of the communities in running the government-provided schemes are outlined. Basic lessons could be drawn from the outcome of this work. These are outlined as follows:

1. Boreholes facilities seem to be a reliable means of sustainable water supply for urban communities provided that there is no difficulty in the geo-physical terrain and that the boreholes are properly sunk. This runs in support of what authors had earlier outlined [8, 11, 15, 16]. Besides, the quality of water is relatively higher [8].
2. The need for community participation cannot be underplayed if sustainable water supply will be ensured. Almost all of the communities (except one) whose boreholes are functioning identify community participation as a trait common to these schemes.
3. Sustainable power generation is an issue that should be given consideration. Solar powered pumping system seems to be a cost-effective approach compared with others. Though, Asero Estate community would have incurred an initial expenditure in installing the solar power generators, there is little or no running expenses. However, the market community at Lafenwa funds power generation continuously in as much as it desired sustainable water supply.
4. Further on sustainable supply from the borehole scheme, there is a need to provide resources by which the maintenance and operations of the boreholes will be effected. The communities have shown that it will be most appropriate for this to be through provisions by the members of the community themselves. It is better in order to avoid the bureaucracies and unnecessary delays involved in putting the repair and maintenance responsibilities on the shoulder of the government. Communities can adopt different strategies depending on its nature and communal interactions. However, it must be ensured that this is sustainable.
5. In addition, it may be necessary to employ or appoint personnel to handle all operations and maintenance works of the water supply facilities. There may be conflict of personal interests with that of the community especially if the running of the facilities are left to volunteers.

Though it may be argued that this work does not have a thorough means of detecting assessors' bias, one fact remains that the users of these facilities are better judges of community participation in the borehole scheme of their areas. In addition, the reliability of the result further stems from the fact that responses showing traces of inconsistency or sharp differences were jettisoned as explained earlier.

Besides, one other area of limitation is that borehole statistics were not made available by OORBDA and this has a tendency of affecting the result especially if the number of communities sampled are found to be inadequate. However, this effect may be minimized with the choice of the tool used for testing the hypotheses (the t statistic) and the small value of the α chosen for the significance level. Further studies could conduct preliminary surveys around local government wards within the city in order to have a close estimation of the borehole facilities within the city.

An adequate choice of number of borehole stations to be used can then be made. In addition, it is advised that further studies monitors the performance of the borehole stations over a period (a year or two consecutively). A pre-test and post-test survey can be carried out in this regard. It is hoped that this approach will bring out more revelations as regards the impact of community efforts in water supply through these borehole sites.

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APPENDICES

Appendix A: Questionnaire

Dear respondents,

This questionnaire items are expected to generate your assessment of the OORBA borehole in your community. Responses shall be treated as confidential. Please tick the appropriate box and give details where necessary.

SECTION A: Personal and General Data

1. Sex: Male □ Female □

2. Age: 18-25 □ 26-35 □ 36-45 □ 46-55 □ 56-above □

3. Highest education level: Pry School □ Secondary School □ Diploma/NCE□ HND/B.Sc □ Higher Degree □

4. Type of residence/apartment: Single room □ Double rooms □ Self-contained □ Flat apartments□ Others ________

5. Average number of people in your apartment ____________

SECTION B

1. When was the borehole put in place?
Up to 5 yrs □ between 5 to 10 yrs □ more than 10 yrs □

2. The borehole is serving the community adequately as at present
Yes □ No □

3. Average distance of your apartment from borehole location
0metres -100metres□ 101metres-500metres□ 501metres-1000metres□ over1000 metres□

4. There are officers/personnel operating and maintaining the borehole
Strongly agree □ Agree □ Disagree □ Strongly Disagree □

5. The community is responsible for financing the operations and maintenance of the borehole
Strongly agree □ Agree □ Disagree □ Strongly Disagree □

Appendix B: Qualitative Survey Questions

1. For how long have you resided in the community?
2. Is there any development/landlords/residents association in your community?
3. If yes, are you a member of the executive of the association?
4. If no, why has there not been any association?
5. How old is the OORBDA borehole facility in your area?
6. In your assessment, has the borehole been functioning since inception? Do you get adequate water supply from the borehole right from the inception?
7. If yes, what do you think is a major factor that has made this possible all along?
8. If no, what are the challenges your community have had to face in getting water from the borehole?
9. What have been the contributions of your community in the water provision from the borehole scheme? Is there any tangible involvement of the community? Please describe in details.
10. How has the community contributed to the operations and maintenance of the borehole facility?
11. Is there any financial obligation by the community towards operations and maintenance?
12. Do you see the participation of the community in running the borehole as necessary?
13. Would you rather prefer the government to operate and maintain the borehole?
14. In what area would you want the community to make adjustment/improve in participating in water provision through the borehole scheme?

Appendix C: The Numbers Used in the Hypotheses Equations

The numbers used for the pair of hypotheses were obtained based on two considerations - the numbers on the assessment scale (that is, 1,2,3 and 4) and the number of questionnaire items used for the assessment (that is two items - items 4 and 5 only).

On the assessment scale, choosing numbers 3 and 4 indicates a positive response, disproving the null hypotheses and giving weight to the alternate. However, choosing 1 and 2 indicates a contrary opinion (supporting the null hypotheses). Consequently, the minimum on the scale to disprove the null hypotheses was chosen as the threshold (that is, 3). This was multiplied by the number of assessment items. That is, the two items as used multiplied with 3 as the threshold for each item gives 6 as the threshold used for the hypothesis.