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Research Article

Assessment of Community Awareness/Participation in Domestic Water Supply Activities for Anguwan Dodo Community, Gwagwalada Abuja Nigeria

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Abstract: Community participation is critical to the success of water supply projects especially in rural and semi-urban areas. Community participation in development programmes are critical components in the conception of projects, design, construction and maintenance towards achieving viable and sustainable projects. This research assessed community awareness/participation in a community located in Gwagwalada Area Council of the Federal Capital Territory in Nigeria, on involvement of the community in water supply activities. The water quality from domestic ground water sources was also assessed. Information gathering was achieved by visiting the community and conducting interpersonal discussions with community members based on questions from questionnaire. Water samples collected from selected domestic water sources were analyzed for Physical, Chemical and Microbial parameters. Results show that physiochemical parameters of domestic water sources meet Standard for Drinking Water. Community awareness/participation assessment showed that community water committees exist but there is the need for community mobilization on water supply projects to increase knowledge on water supply activities. It is recommended that capacity building and technical support at all levels for stakeholders engaging in water projects should be given a priority.

Keywords: Maintenance, operation, water quality, water sources

INTRODUCTION

The sub-Saharan region of Africa has the lowest total water supply coverage in the world. Currently about 300 million people in Africa do not have access to safe water, it is estimated that 663 million people worldwide still use unimproved drinking water sources, including unprotected wells and springs and surface water, nearly half of all people using unimproved drinking water sources live in sub-Saharan Africa (UNICEF/WHO, 2015), this situation exact a heavy toll on the health and economic process of African countries. The Africa Water Vision presentation, at the Second World Water forum, in the Haque 2000, (World Water Council, 2000) as part of the world water vision, represent Africa's effort at addressing the impending African water crises. Within the frame work of the Bank Group's strategic plan (2003-2007) and in response to the Africa water vision and the UN Millennium Development Goals (MDGs), the African Development Bank Group conceived the Rural Water Supply and Sanitation Initiative (RWSSI) in 2003 (AFDB, 2014) with the view to accelerating access to water supply and sanitation service in rural Africa to attain 66% water supply and sanitation by the 2010 and 80% by 2015.

Community Participation (CP) type of management of rural water supply and sanitation schemes is now entering its second decade as a key paradigm for water supply development and management in communities. Participation approach did not appear spontaneously, nor do they exist in a vacuum. They emerged from a long history of trial and error in the rural water supply sector and affected by development in many other sectors particularly those related to more general rural development and resources management. The Dublin conference (UN, 1992) on water and environment came with a water declaration, commonly known as the Dublin statement which has been a landmark in recent history of water resources management. The Dublin statement established four principles:

- Water development and management should be based on participatory approach, involving users, planners and policy maker at all levels
- Women play a central role in the provision, management and safeguarding water
- Water has an economic and social value in all its competing uses and should be recognized as an economic good

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- Fresh water is a finite and vulnerable resource, essential to sustain life development and the environment.

Community participation is fundamental to the success of water supply in rural areas, particularly in developing countries. It is observed that the present organization and operational procedure of the water resource management has not adequately addressed the acute problem of water service in rural areas. Community participation in development programmes are now accepted components of projects design among mainstream donor agencies, people's empowerment, local knowledge and community ownership are indispensable ingredient of project success and sustainability. This research, studied existing arrangement in a community on involvement in the development and operation of water supply schemes.

The study area: Anguwan Dodo community is situated in Gwagwalada area council of Federal Capital Territory Abuja; Nigeria. It is located in Abuja-south on longitude 09°15' 00'' North and latitude 07° 32'00'' East. The annual rainfall ranges between 0.0-729.0 (mm/month). The predominant mother tongue spoken in the Anguwan Dodo municipality of Gwagwalada, Abuja is Bassa. The land is gently sloping with stream flowing at the southern part of the community. There is a lot of sunshine in this area and temperature ranges between 29°C in July and August to 34°C in March and April. Anguwan Dodo has an estimated population of about 1,898 people; the community is a commercially based as well as a residential area.

Objectives: The objectives of the research are:

- To identify areas of community awareness/participation in water supply projects in Anguwan Dodo community
- To assess the water quality of selected domestic water sources in Anguwan Dodo community.

Limitations of research: The limitation experienced in the research work was the difficulty in accessing the community due to poor road network and limited funds for the research.

MATERIALS AND METHODS

The Anguwan Dodo community was zoned into (5) areas for questionnaire administration and selection of domestic water sources for the research. 20 questionnaires were allocated to each of the five zones which were randomly distributed in the stratified zones as described briefly below:

- Zone A-along the chief's house
- Zone B-behind Galadima house
- Zone C-Anguwanbassa
- Zone D-beside Anguwan dodo market
- Zone E-along Abuja- Lokoja road

A total of (10) boreholes and (10) hand-dug wells were selected.

Data for research was collected by visiting the community and conducting inter personal discussion with community members based on questions from questionnaire. Water samples were collected from the 20 water sources randomly selected from the stratified zones in the study area at (4) samples per zone. Analysis of the water samples were conducted using Standard Methods of Water and Wastewater Examination as described by APHA (1985).

Laboratory analysis: The following parameters were analyzed from the water samples collected:

Physical parameters:

- Colour
- Taste/Odour
- Total Suspended Solids (TSS)

Chemical parameters:

- pH
- Iron
- Zinc
- Calcium
- Magnesium
- Chloride
- Manganese
- Chemical Oxygen Demand
- Total Hardness

Table 1: Microbiological requirements for drinking water quality ((Nigerian Industrial Standard (NIS 554), 2007)

Parameter	Unit	Maximum permittedlevels	Healthimpac
Total coliformcount	cfu/mL	10	Indication of faecal contamination
Thermo tolerant Coliform or E.coli	cfu/100 mL	0	Urinarytrack infections, bacteraemia, meningitis, diarrhea, (one of the main cause of morbidity and mortalityamongchildren), acute renalfailure and haemolyticanaemia
Faecalstreptococcus	cfu/100 mL	0	Indication of recentfaecal contamination
Clostridium perfringensspore	cfu/100 mL	0	Index of intermittent faecal contamination
Total bacterial count	$x10^3$(per 100 mL)	10	Bacterialinfection

Table 2: Chemical/Inorganic constituents requirements for drinking water quality (WHO, 2004)

Parameter	Unit	Maximum permitted	Healthimpact
Aluminium (Al)	mg/L	0.2	Potential Neuro-degenerativedisorders
Arsenic (As)	mg/L	0.01	Cancer
Barium	mg/L	0.7	Hypertension
Cadmium (Cd)	mg/L	0.003	Toxic to the kidney
Chloride (Cl)	mg/L	250	None
Chromium (Cr^{6+})	mg/L	0.05	Cancer
Conductivity	µS/cm	1000	None
Copper (Cu^{+2})	mg/L	1	Gastro-intestinal disorder
Cyanide (CN^{-})	mg/L	0.01	Verytoxic to the thyroid and the nervous system
Fluoride (F^{-})	mg/L	1.5	Fluorosis, Skeletal tissue (bones and teeth) morbidity
Hardness (CaCO3)	mg/L	150	None
HydrogenSulphide (H_2S)	mg/L	0.05	None
Iron (Fe^{2+})	mg/L	0.3	None
Lead (Pb^{2+})	mg/L	0.01	Cancer, interferencewithVitamin D metabolism, affect mental development in infants, toxic to the central and peripheralnervoussystems
Magnesium (Mg^{+2})	mg/L	0.20	Consumer acceptability
Manganese(Mn^{2+})	mg/L	0.2	Neurologicaldisorder
Nickel (Ni)	mg/L	0.02	Possible carcinogenic
Nitrate (NO_3)	mg/L	50	Cyanosis and asphyxia (blue-baby syndrome") in infants under 3 months syndrome") in infants under 3 months
pH	mg/L	6.5-8.5	None
Sodium (Na)	mg/L	200	None
Sulphate (SO_4)	mg/L	100	None
Total DissolvedSolids	mg/L	500	None
Zinc (Zn^{2+})	mg/L	3	None

Table 3: Water quality parameters for samples A -E from boreholes

Parameter	Unit	ADB A	ADB B	ADB C	ADB D	ADB E
Zinc (Zn)	mg/L	0.02	0.055	0.045	0.04	0.025
Copper (Cu)	mg/L	0	0	0	0	0
Iron (Fe^{+2})	mg/L	0.005	0.055	0.1	0.005	0.05
Manganese (Mn^{+2})	mg/L	0	0	0.02	0	0.05
Calcium (Ca)	mg/L	3.1	3.2	3.05	3.9	2.6
Cadmium (Cd)	mg/L	0	0	0	0	0
pH		7.1	7	6.9	6.8	7
Turbidity	NTU	0	0	0	0	0
Temperature	C	27.5	27.5	27.5	27.5	27.5
Colour	TCU	0	0	0	0	0
Chromium (Cr^{6+})	mg/L	0.015	0.06	0.055	0.07	0.265
Chlorine	mg/L	0.1	0.1	0.1	0.1	0.1
COD	g/100 mL	0	0	0	0	0

Table 4: Water quality parameters for samples F- J from boreholes

Parameter	Unit	ADB F	ADB G	ADB H	ADB I	ADB J
Zinc (Zn)	mg/L	0.075	0.03	0.025	0.12	0.03
Copper (Cu)	mg/L	0	0	0	0	0
Iron (Fe^{+2})	mg/L	0.050	0	0.1	0.50	0.05
Manganese (Mn^{+2})	mg/L	0.005	0	0.015	0.005	0.05
Calcium (Ca)	mg/L	4.750	4.4	4.100	4.200	3.55
Cadmium (Cd)	mg/L	0	0	0	0	0
pH		7	7.1	7.2	6.8	6.8
Turbidity	NTU	0	0	0	0	0
Temperature	C	27.5	27.5	27.5	27.5	27.5
Colour	TCU	0	0	0	0	0
Chromium (Cr^{6+})	mg/L	0.3	0.38	0.41	0.4	0.49
Chlorine	mg/L	0.1	0.10	0.10	0.1	0.10
COD	g/100 mL	0	0	0	0	0

Microbiological parameters:

- Total bacteria count

The laboratory results obtained were compared with drinking water standards presented in Table 1 and 2:

RESULTS AND DISCUSSION

Table 3 to 8 presents the laboratory results on the water samples collected from the study area. (The abbreviation ADB stands for Anguwan Dodo Borehole, ADW stands for Anguwan Dodo Well).

Table 5: Water quality parameters for samples A-E from Hand dug wells

Parameter	Unit	ADW A	ADW B	ADW C	ADW D	ADW E
Zinc (Zn)	mg/L	0.03	0.045	0.03	0.02	0.04
Copper (Cu)	mg/L	0	0	0	0.01	0
Iron (Fe^{+2})	mg/L	0.01	0.01	0	0.01	0.01
Manganese (Mn^{+2})	mg/L	0	0	0	0	0.05
Calcium (Ca)	mg/L	3.325	3.35	3.17	3.5	2.32
Cadmium (Cd)	mg/L	0	0	0	0	0
pH		7.1	7.2	7	7.2	7.2
Turbidity	NTU	0	0	0	0	0
Temperature	C	27.5	27.5	27.5	27.5	27.5
Colour	TCU	0	0	0	0	0
Chromium (Cr^{6+})	mg/L	0.025	0.03	0.04	0.03	0.035
Chlorine	mg/L	0.1	0.1	0.1	0.1	0.1
COD	mg/L	0	0	0	0	0
TSS	mg/L	0	0	0.2	0.05	0

Table 6: Water quality parameters for samples F-J from hand dug wells

Parameter	Unit	ADW F	ADW G	ADW H	ADW I	ADW J
Zinc (Zn)	mg/L	0.025	0.075	0.03	0.12	0.125
Copper (Cu)	mg/L	0	0	0	0	0
Iron (Fe^{+2})	mg/L	0.01	0.005	0	0.015	0.021
Manganese (Mn^{+2})	mg/L	0.05	0	0.1	0.1	0.005
Calcium (Ca)	mg/L	4.3	4.4	4.15	4.2	3.55
Cadmium (Cd)	mg/L	0	0	0	0	0
pH		7	7.2	6.8	7	7
Turbidity	NTU	0	0	0	0	0
Temperature	C	27.5	28	27.5	27.5	27.5
Colour	TCU	0	0	0	0	0
Chromium (Cr^{6+})	mg/L	0.03	0.035	0.035	0.035	0.04
Chlorine	mg/L	0.1	0.1	0.1	0.1	0.1
COD	mg/L	0	0	0	0	0
TSS	mg/L	0	0	0	0.5	0

Table 7: Physical parameters of samples from Anguwan Dodo borehole/wells

ADB water sample	ADW water sample	Colour	Taste/Odour
ADB A	ADW A	Acceptable	Unobjectionable
ADB B	ADW B	Acceptable	Unobjectionable
ADB C	ADW C	Acceptable	Unobjectionable
ADB D	ADW D	Acceptable	Unobjectionable
ADB E	ADW E	Acceptable	Unobjectionable
ADB F	ADW F	Acceptable	Unobjectionable
ADB G	ADW G	Acceptable	Unobjectionable
ADB H	ADW H	Acceptable	Unobjectionable
ADB I	ADW I	Acceptable	Unobjectionable
ADB J	ADW J	Acceptable	Unobjectionable

Table 8: Bacteriological analysis of Anguwan Dodo hand dug wells

Well samples (ADW)	Total bacterial count $x10^3$(per 100 mL)
ADW A	17
ADW B	25
ADW C	8
ADW D	23
ADW E	32
ADW F	13
ADW G	21
ADW H	17
ADW I	14
ADW J	42

Discussion of result: The Total Suspended Solids of the water samples were all within limits for drinking water quality as presented in Table 5 and 6. Sample I (Table 4) from borehole source shows a concentration of 0.5 mg/L for Iron content while the acceptable limit for drinking water is 0.3 mg/L. The concentrations ofother chemical parameters were found to be within acceptable limits of standards for drinking water. The colour, taste/odour of all the water samples collected were observed to be within acceptable limits for drinking water as presented in Table 7. The total bacterial count of Anguwan Dodo Wells (ADW) presented in Table 8 varied from 8 to 42×10^3(per 100 mL).

Social assessment: The level of community awareness/ participation in Anguwan Dodo relating to Water Supply activities is presented in Table 9. Responses from community members showed that ground water is the main source of domestic water supply in the community, 30 respondents identified the borehole as domestic water sources in the community while 32 respondents identified the hand dug wells as sources of domestic water supply in the community (a total of about 80% of respondents). Only 8 respondents identified rain harvesting as a domestic source of water while 6 people identified surface water (river) as a

Table 9: Community awareness/participation in water supply activities

Name of community: Anguwan Dodo				Period of survey: June- December 2014			
Age of respondents				Sex of respondents			
15 -30 years		24		Male	49		
31-45 years		36		Female	27		
46 and above years		16					
Occupation of respondent		Types of domestic water sources mainly used in community		Providers of improved water sources		Are there non functional water sources in community	
Type of occupation	No. of respondents	Water Sources	No. of Respondents	Providers	No. of respondents	Availability of non functional sources	No. of respondents
Civil servants	27	Boreholes	30	Federal Govt.	10	Yes	48
Business	23	Hand dug wells	32	Local Govt.	37	Not aware	28
students	14	Rainwater harvesting	8	Community	23		
Famers	12	Rivers	6	Water vendors	6		
Repair of brokendown water sources		Availability of water project committees		Availability of regular meetings by Committee		Identification of water committee meeting participants	
Responsible body	No. of respondents	Committesavailable	No. of respondents	Individual response	No. of respondents	Respondent participating in water committee meetings	No. of respondents
Community	48	Yes	70	Yes	68	Yes	58
Not aware	28	Not aware	6	Not aware	8	No	18
Contribution to water projects		Does water supplied meet demand					
Individual response	No. of respondents	Individual response	No. of respondents				
Yes	58	Yes	40				
Not aware	18	No	36				

source of water. This shows that most of the respondents depend on ground water supply as their domestic source of water. 58 of out of 76 respondents agreed to contribute to water supply projects while 48 stated that the community is responsible for the repair/ maintenance of these sources. Respondents that identified theLocalGovernmentasthe major waterprovider -37 of the respondents (49%), 23 respondents (30%) identified the community as providers of domestic water sources while the Federal Capital Development Authority (FCDA) had 10 respondents (13%) as providers of domestic water sources. The commercial water vendors were identified by 6 (8%) of respondents. 70 respondents (92%) said that there is the existence of the community water project committee. 58 respondents participate in the community water committees. 40 (53%) of the total respondents considered water supply in the community as being adequate, others felt the need for improved supply to meet the demand of the community.

CONCLUSION AND RECOMMENDATION

Conclusion: From the results obtained, the following conclusions are made:

- The physiochemical parameters of water samples collected from the study area meet the WHO and Nigerian Industrial Standard for Drinking Water.
- About 80% of respondents considered Anguwan Dodo Borehole (ADB) and Anguwan Dodo Well (ADW) as the main sources of water in the community.
- Providers of improved domestic water sources in the community include the Federal Government, Local Government and Community.
- Community awareness on ‘operation and maintenance’ of improved domestic water sources should be improved.
- Some respondents were generally satisfied with the quantity of the water supplied from the improved water sources while others perceive the need for increased supply.
- Community mobilization on water supply projects will improve knowledge in the community, responses as ‘not aware’ will be reduced in surveys.

RECOMMENDATION

From the study, the following recommendations are made:

- Hand dug wells should be upgraded to protected hand dug wells to eliminate microbial contaminants in water.
- Community awareness on ownership of improved domestic water sources towards achieving sustainable projects should be included in community water committee activities.

Appendix:Sample questionnaire used in Anguwan Dodo community

S/N	Research question	Yes	Not aware
1	Age of respondent		
2	Sex of respondent		
3	Occupation of respondent		
4	What are the main sources of water in the community?		
5	Who are the providers of the community major sources of water?		
6	Does the community have functional and non-functional sources of water?		
7	Does the community repair non-functional sources of water?		
8	Are there community water committees?		
9	Do the water committees meet regularly?		
10	Do you participate in the water committee meetings?		
11	Does the quantity of water supply to the community meet the demand?		

- Community mobilization on improved domestic water sources should be embarked on by the Local Government Authority.
- Capacity Building and technical support at all levels for stakeholders engaging in water project implementation and management should be given a priority.
- Models with global best practices of community participation should be strengthened in all community projects.

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