

WATER RESOURCES MANAGEMENT IN IDOANI, ONDO STATE, NIGERIA

O. A. Agbede, S. O. Adesogan and O. D. Atewogboye

Department of Civil Engineering
University of Ibadan
Ibadan

ABSTRACT: *A purposeful survey aimed at the management of water resources was carried out on the preponderances of water shortage and possible causes in Idoani, a town in Ondo State of South-Western Nigeria. The survey was carried out using structured questionnaire, interview schedule; focus group discussion (FGD) and personal observations with photographs recording. Information of interest and which were included in the instruments were the sources of water, availability of water, population, water storage facilities, water supply system, water demand and water quality. Residents were sensitized on management and maintenance of water resources and its environment. Water samples were collected and analysed to determine the physical, chemical and biological properties in relation to W.H.O. standards. The analysed water samples met W.H.O. standards for potable water.*

Keywords: *Water Resources Management, Water Quality, WHO, Idoani*

Introduction

Fresh water is essential for healthy ecosystems, for sustainable development and for human survival yet too often, in too many places, water is wasted, tinted and taken for granted. Access to safe drinking-water is essential to health. The importance of water, sanitation and hygiene to health and development has been reflected in the outcomes of a series of international policies. Water is the most important natural resource for sustainable development and quality of life, yet it is unevenly distributed; almost one-fifth of the world's population lives in regions where water is scarce and one-quarter suffer from severe water shortage UNDP (2012). To resolve these problems, WHO, UNICEF, and other international organizations have exerted tremendous effort to ensure secure domestic water supply. Pollution, over consumption and poor water management are decreasing both the quantity and quality of available water. 783 million people do not have access to clean and safe water worldwide and as much as 80% of illnesses are linked to poor water and sanitation conditions in developing countries. The United Nations estimates that Sub-Saharan Africa alone loses 40 billion hours per year collecting water; the same as an entire year's labour in all of France (Anonymous,2016). Overwhelmingly, it is the poor in developing countries who suffer the most. It is they who lack access to safe drinking water; it is they who pay the highest price for water; they also lack adequate sanitation and have the least say in water management it is the children among them - more than 2 million - who die each year from water - related diseases. This social, economic, environmental and political crisis that is found among the world communities should be given highest priorities.

The term demand for water is often used inconsistently in literature. Sometimes referring to water withdrawal and other times water consumption or depletion by the people for domestic, industrial and agricultural uses. For the purpose of this study demand for potable water would be defined as; demand for water consumption that will be of value and benefit to man because it has satisfied the WHO standard (Akinola *et. al.*, 2013). According to Orubu (2006), water resources can be broadly grouped into two categories - freshwater and marine water resources respectively. Freshwater resources consist of rivers and their plains, streams, lakes, wetlands, rainwater and underground water reservoirs. On the other hand, marine water resources include lagoons, seas and the oceans. Sustainable welfare of man and indeed, all living things on earth depend on the wise and safe use of water. Freshwater resources provide the main source of safe drinking water for the human population, and also support agricultural activities through natural feeding, and irrigation practices, and it is far cheaper to use freshwater for industrial purposes. In many cases, freshwater resources, particularly rivers and lakes also perform recreational and transportation functions, while marine water resources are of vital importance, particularly for countries with seaward boundaries, providing the natural habitat for exploitable fishery resources.

Historically, water resources have played significant roles in the evolution of human society and civilization. In Europe for instance, the Rhine valley, recognized as a locus of both co-operation and conflict was a primary nexus of economic growth (Sadoff *et. al.*, 2002). Procuring fresh water supplies is becoming increasingly difficult due to so many reasons including pollutions from human activities and other natural effects such as global warming. Therefore, attention has naturally turned to "demand management" in the hope that increased efficiency of water usage will produce sufficient savings to meet future water requirements. However, many communities have little or no knowledge about water resource management; hence, this study.

Communities face many challenges with respect to meeting their water needs. These challenges include increased water scarcity and flooding associated with climate variability and economic uncertainty. The aim of this study is to enlighten the people of Idoani community of the importance of water resources management and maintenance. The work involved characterization of the water sources; determination of available water quantity and quality in the community.

Water Resources Management

Water resource management is the activity of planning, developing, distributing and managing the optimum use of water resources. It is a subset of water cycle management planning as regards to all the competing demands for water and seeks to allocate water on an equitable basis to satisfy all uses and demands. Water resources management may be regarded as the modification of the hydrological cycle for the benefit of mankind. It involves not only the beneficial uses of water resources but also the prevention, avoidance or minimization of the effects of water excess (flood) or deficiency (drought) (Douglas, 1973).

Water resources management involves a sequence of activities and decisions including needs assessment, problem analysis, resource allocation, planning and design, implementation, operation and maintenance, all of which are interrelated in a complex way. These activities are also based on other sub activities, which provide the basic information for decision making. Each decision is based on information on available alternatives, and their anticipated outcomes and effectiveness. For proper management, well-coordinated water resources studied need to be undertaken. It is necessary to quantify all aspects of demand and relate it to available resources. Where the demand exceeds available resources, steps should be taken to either cut the demand to match the available resources or increase the supply. A sad reality is that inequities in having access to water are linked to the manner in which powerful political and economic interests have managed water resources (Swatuk, 2008). This will maintain a favourable balance between water demand and water supply while satisfying the various constraints of quality, technology, availability, sustainability and environmental and economic factors. Rigorous quantitative hydrogeological studies, geophysical investigations, assessment of aquifer parameters, evaluation of well and aquifer hydraulics to determine safe yields, optimum borehole spacing's, water quality testing and economic analysis to determine optimum yields are important prerequisites for scientific management of groundwater resources. Extensive need exists for adequate and reliable data for water resources planning and management. In order to obtain such data, deliberate policies need to be put in place by the concerned authorities to provide the necessary financial backing and a conducive atmosphere to enable water experts and operators to become responsive and responsible to these tasks. Water resources management often time referred to as a water conservation encompasses the policies, strategies and activities to manage fresh water as a sustainable resources to protect the water environment and to meet current and future human demand. This field pertains to the efficient and optimal use of water. It is particularly important from the viewpoints to costs and economics, its availability, quality and desired uses to which the water may be put, the parallel/competing demands for the resource, significance and worth of competing demands, and the most advantageous deployment of the limited financial resource. (Microsoft Encarta, 2009). Agriculture is largest user of the world's fresh water resources, consuming 70% as the world's population rises consumes more food. As the economic base of the country changed, the water law was changed accordingly to meet the needs of the agricultural sector. In the Water Act (1927) water rights were attached to land following the adoption of the riparian doctrine (Bolding, 2004). An assessment of water resources in agriculture was conducted in 2007 by the international water management institute in Sri Lanka to see if the world had sufficient water to provide food for the growing population Molden, (2007). In the light of this finding improving water resources management could therefore be tied to improving livelihoods through increasing access to water for productive uses.

Idoani town (Fig.1) comprises of six quarters which are Iyayu, Amusigbo, Isure, Ako, Okeido and Isewa. The topography of the area is flat and 80% of the land is a crop land with cocoa, yam, vegetables, and corn being the main crop. The population is about 3,500 in the six quarters and 1,850 in the Federal Government College with a total of 5,350. Groundwater and rain water are the main water resources for all purposes in the town. The six quarters have intermittent water supply and a hand lift pump. Water is obtained via the piping tap from six water supply utilities across the quarters. Each utility has a water tank (volume range: 8 - 15 m³), a well (depth: 25 - 40 m), and a pumping station this can be seen in fig 2. Groundwater is pumped to the tank, from which pipelines supply water to the community and residents carry water from public taps to their homes for domestic uses while some are capable of installing a borehole in their compounds. Water is also obtained from a huge concrete reservoir of about 100,000 litres. Fig. 3 shows the pictorial view of the concrete reservoir located in Iyayu quarters. There are about eight water

supply machines that is solar powered in the study area; three in Iyayu quarters, three in Amusigbo, and two in Isure (figs. 4 & 5). Fig. 6 shows the water supply facility donated by the Niger Delta Development Commission in Amusigbo.

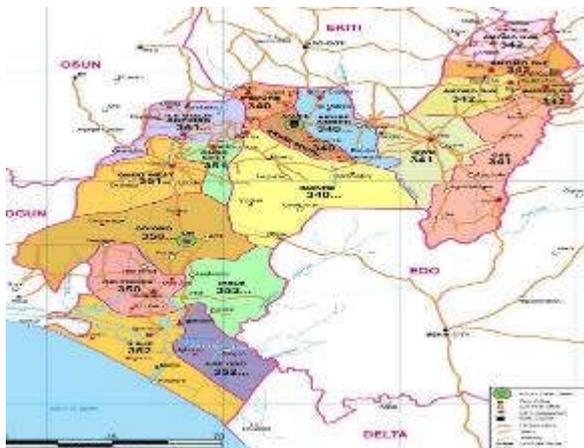


Fig. 1: Map showing the study area



Fig. 2: Pictorial View of a Deep well and a storage tank in Ako Quarters



Fig.3: Pictorial View of a Concrete Reservoir at Iyayu Quarters



Fig. 4: Pictorial View of a Solar Powered Machine Located in Isure



Fig. 5: Pictorial View of a Hand pump machine in Isewa



Fig. 6: NDDC Water Tank Located in Amusigbo

Methodology

(a) Questionnaire survey

In order to achieve the objectives of this project work, a questionnaire survey was carried out on relevant information on the utilisation and management of the available water resources in Idoani. The survey was conducted in 180 households randomly in the village to better understand the water use pattern and behaviour of residents. The research was limited to this number of households because of the response of some residents, most of the elderly people were discouraged because of the language barrier they neither speak Yoruba nor English, except their local dialect. One family member older than 18 years from each household was interviewed. The public places noted in the cause of the survey are churches, mosques, schools, guest houses, pure water factory, and a small scale local garri making factory. Residents of the Federal Government College (FGC) were also interviewed.

(b) Laboratory Analysis

Water samples were analysed for their physio-chemical properties. These include: physical, chemical and biological constituents such as pH, conductivity, turbidity, acidity, calcium, chromium, zinc, plate count and Coliform count. The data were statistically analysed using SPSS 20. The analyses provided the mean \pm standard deviation for each case. The use of descriptive statistics was employed to examine relationships between variables.

Results

Table 1 shows the frequency and percentage distribution by socio-demographic characteristics of respondents that participated in the survey of water resources management in Idoani, Ondo State. It shows from the table and Fig. 7, that age group 30-39 years constitute the highest representation out of all the entire respondents interviewed in the survey (50.0%) followed by age group 40-49 years (17.5%). Respondents aged 20-29 years and 50-59 were of equal proportion of 15.0% while age group 60 years and above approximately accounted for 3%. Almost two-third (65%) of respondents that participated in the survey were married (65.0%) compared with single and divorced respondents (27.5% and 2.5%) respectively. Others such as widowed or separated accounted for 5.0% out of the entire respondents interviewed for the survey. Meanwhile, 45.0% of the respondents were civil servants while 20.0% of them were farmers and 17.5% were traders (Fig. 8). Respondents who were self-employed were just 5%. It was observed that 42.9% of the entire respondents interviewed had family size between one and three while those that had four-six and above six family sizes were 25.7% and 31.4% respectively (Fig. 9).

Table 1 Socio-Demographic Characteristics of Respondents

Age	Frequency (N=40)	Percentage
20-29	6	15.0
30-39	20	50.0
40-49	7	17.5
50-59	6	15.0
60 and Above	1	2.5
Total	40	100.0
Marital Status		
Single	11	27.5
Married	26	65.0
Divorced	1	2.5
Others	2	5.0
Total	40	100.0
Occupation		
Civil Servant	18	45.0
Self employed	2	5.0
Farming	8	20.0
Trading	7	17.5
Engineering	2	5.0

Others	3	7.5
Total	40	100.0
Family Size		
1-3	15	42.9
4-6	9	25.7
6 and Above	11	31.4
Total	35	100.0
Religion		
Christian	21	52.5
Muslim	19	47.5
Total	40	100.0

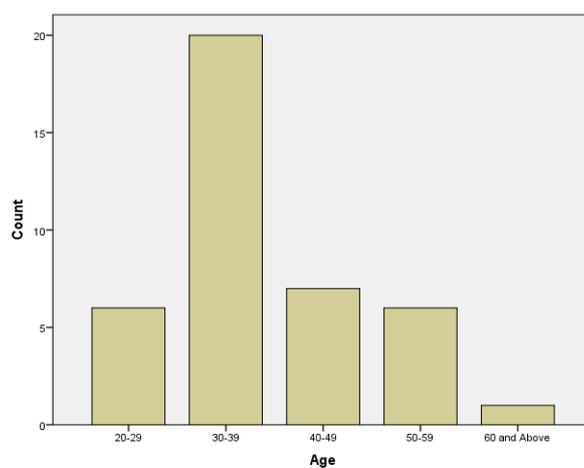


Fig. 7: Graphical representation of age of respondents

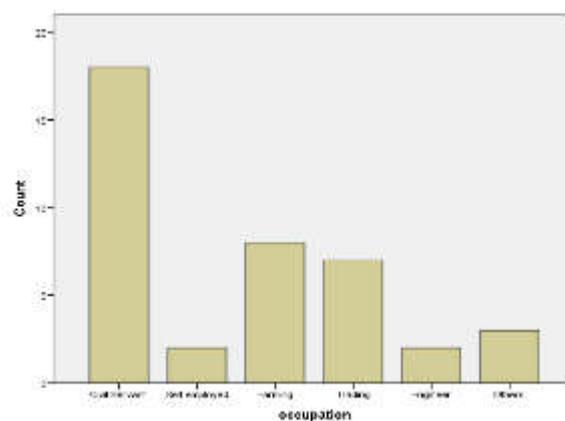


Fig. 8: Graphical representation of occupation of respondents

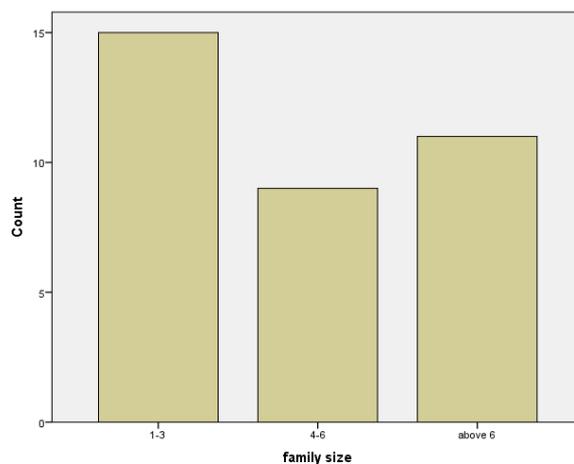


Fig. 9: Graphical representation of respondent's family size

Table 2 shows the response of the residents on water resources management. Obviously from the table three-quarter (75%) the respondents sourced their water from the ground while 22.5% of them sourced their water from surface. Only 2.5% of the entire respondent used rain water. The main water collection type Idoani were well and borehole water, well water accounted for 45% and borehole water accounted for 42.5%. Roof catchment and other collection of water were 2.5% and 10.0% respectively. Also, in the water distribution method of respondents in the management of water, larger proportion (63.9%) of them use pumping into storage as a method of water distribution, meanwhile 36.1% of the rest use direct pumping method for their water distribution. In the same vein, 43.2% of people of Idoani used reservoir for their storage facility while 37.7% of them were used to storage tank and the rest respondents adapted to other methods storage facility (18.9%). Moreover, larger proportion (87.5%) of respondents claimed regular availability of water compared with the 12.5% who claimed scarce water in the area of study. Larger proportion of respondent as well claimed flooding was the main water pollution in the area. 70% of the entire respondent claimed they did not assess their water regularly compared with the rest that claimed to have assessed their water regularly (30%). In the similar vein, almost half (47.4%) of respondents were opined that individuals were responsible for water maintenance in the study area while, 18.4% and 34.2% claimed the source of water maintenance responsibilities were from the government and community. A large proportion (85%) of the people said that there was no awareness program on water resources management in the area.

The results of the physical, chemical and biological analyses are presented in Table 4. From the result analysis presented above, it was discovered that the water (ground water) satisfy the WHO standard which makes the water suitable for all human activities

Table 2: Result of Respondents on Water Resources Management in Idoani

Source of Water	Frequency (N=40)	Percentage (%)
Surface water	1	2.5
Ground water	30	75.0
Rain water	9	22.5
Total	40	100.0
Water Collection Type		
Well	18	45.0
Borehole	17	42.5
Roof catchment	1	2.5
Others	4	10.0
Total	40	100.0
Water Distribution Method		
Direct pumping	13	36.1

Pumping into storage	23	63.9
Total	36	100.0
Storage Facility		
Storage tank	14	37.8
Reservoir	16	43.2
Others	7	18.9
Total	37	100.0
Water Availability		
Regularly	35	87.5
Scarce	5	12.5
Total	40	100.0
Water Pollution		
Flooding	31	100.0
Regular Assessment of Water		
Yes	12	30.0
No	28	70.0
Total	40	100.0
Water Maintenance Responsibility		
Government	7	18.4
Community	13	34.2
Individual	18	47.4
Total	38	100.0
Awareness Program on WRM		
Yes	6	15.0
No	34	85.0
Total	40	100.0

Table 3: Result of the analysis of water sample at Idoani

S/N	Parameters	Iyayu	Amusigbo	ASOF	WHO
1	pH	7.2	6.9	6.5	6.5-6.8
2	Conductivity (μ S)	154	385	185	400
3	Turbidity (mg/L)	1.0	1.0	0.5	10
4	Acidity (mg/L)	0.3	0.8	0.5	-
5	Ca ⁺⁺ (mg/L)	160	155	190	75-200
6	Cu ⁺⁺ (mg/L)	0.6	0.5	0.4	1.0
7	Zn ⁺⁺ (mg/L)	0.6	0.4	0.5	5.0
8	Cadmium	0.3	0.3	0.1	0.003
9	Total plate count (cfus/MI)	1.4X 1.0	3.2X 1.0	1.0X 1.0	
10	Total Coliform count (cfus/MI)	NIL	NIL	NIL	
11	Organism isolated	Bacillus SPP.	Bacillus SPP	Bacillus SPP	

CONCLUSION

In conclusion, the role of water resource management to any nation cannot be overemphasized as it guarantees regular and prompt delivery of water to the people. Despite considerably improved water supply facilities and living standards in rural areas, traditional lifestyles and household habits continue to significantly affect water management. Water resources facilities in Idoani were highly affected in the aspect of maintenance especially the boreholes and wells, lack of quality of resources and ignorance of the residents on water resources management. From the laboratory analysis, it was confirmed that the water satisfied the WHO standards which makes the water suitable for all human activities.

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