Assessment of Quality and Quantity of Public Water Supply in the Polytechnic, Ibadan

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Abstract **– The quality and quantity of water source play an important role in any environment. The study was conducted to assess both the quality and quantity of public water supply in The Polytechnic, Ibadan. Orisun Hall of Residence has five residential blocks - A, B, C, D and E. There are three boreholes within the hall premises which serve as the bases of water sources. The water quality parameters which were obtained from each of the boreholes were subjected to water analyses - physicochemical and bacteriological in accordance to standard methods. The results were statistically analysed and comparison also made with some recognized standards The water analyses revealed include Physico-Chemical Tests: odour, taste, appearance, colour, electrical conductivity, total dissolved solids, pH, total solids, total alkalinity, chloride, total hardness, chlorine demand, dissolved oxygen, hardness, iron, silica, calcium ion, magnesium ion and sulphate and also Bacteriological Tests: coliform organisms, total colony count and Escherichia Coli. The results obtained showed clearly that almost all, parameters were limit bound within the specified standard range. Few deviated above the maximum permissible limit of WHO. Further treatment is recommended for the water and periodic clean up of tanks to flush out settling siltling were also recommended. Constant supply of water to the available tanks precisely thrice a day or in alternative thrice the number of tanks be made available instead since all boreholes yield well.**

Keywords **– water quality, water quantity, water supply,**

I. INTRODUCTION

Water is important to the growth of any economy. It is vital for the life and health of people and ecosystems and a basic requirement for the development of countries around the world. Men, women and children lack access to adequate water and safe water to meet their basic needs. There has not been much alteration in the quantity of water available in Nigeria yet there is shortage of water. Safe and sustainable drinking water is becoming very scarce in the developing countries. In developing countries, particularly in tropical regions, the problem of water quality is usually even more acute, since the collection and treatment of waste water is not so far advanced. In small settlements, sources of drinking water and disposal of sewage are sometimes scarcely separated, and in congested cities lacking adequate drainage, the dangers from water-borne diseases are compounded.

The rate of urbanization in Nigeria is alarming and the major cities are growing at rates between 10 to 15% yearly. In studies relating to the Nigerian experience, attention has been raised on the neglect of studies on rain, well and borehole water quality as a combined work, thereby resulting in lack of literatures, especially on borehole water quality assessment due to the belief that it is pured through the natural purification process (Efe, 2002a). Ayoade & Oyebande, (1983) reported that this neglect has impaired adequate information or knowledge of the quantity, quality and pattern of distribution of Nigeria's water resources.

Increasing industrialization of the world's communities has also led to greater pollution of natural sources of water. In developing countries such as Nigeria, the siting of industries is determined by various criteria, some of which are environmentally unacceptable and pose serious threats to public health. The establishment of industrial estates beside residential areas in most state capitals and large urban centres in Nigeria is significant in this respect.

Surface water and groundwater contamination, air pollution, solid waste dumps and general environmental degradation, including the loss of land and aquatic resources, are major environmental problems caused by industrialisation in Nigeria. Improper disposal of untreated industrial wastes has resulted in coloured, murky, odorous and unwholesome surface waters, fish kills and a loss of recreational amenities. A significant proportion of the population still relies on surface waters for drinking, washing, fishing and swimming. Industry also needs water of acceptable quality for processing. In this modern, rapidly changing world, the hydrologist must therefore be concerned with water quality in addition to the traditionally recognized evaluations of water quantities.

II. STUDY AREA

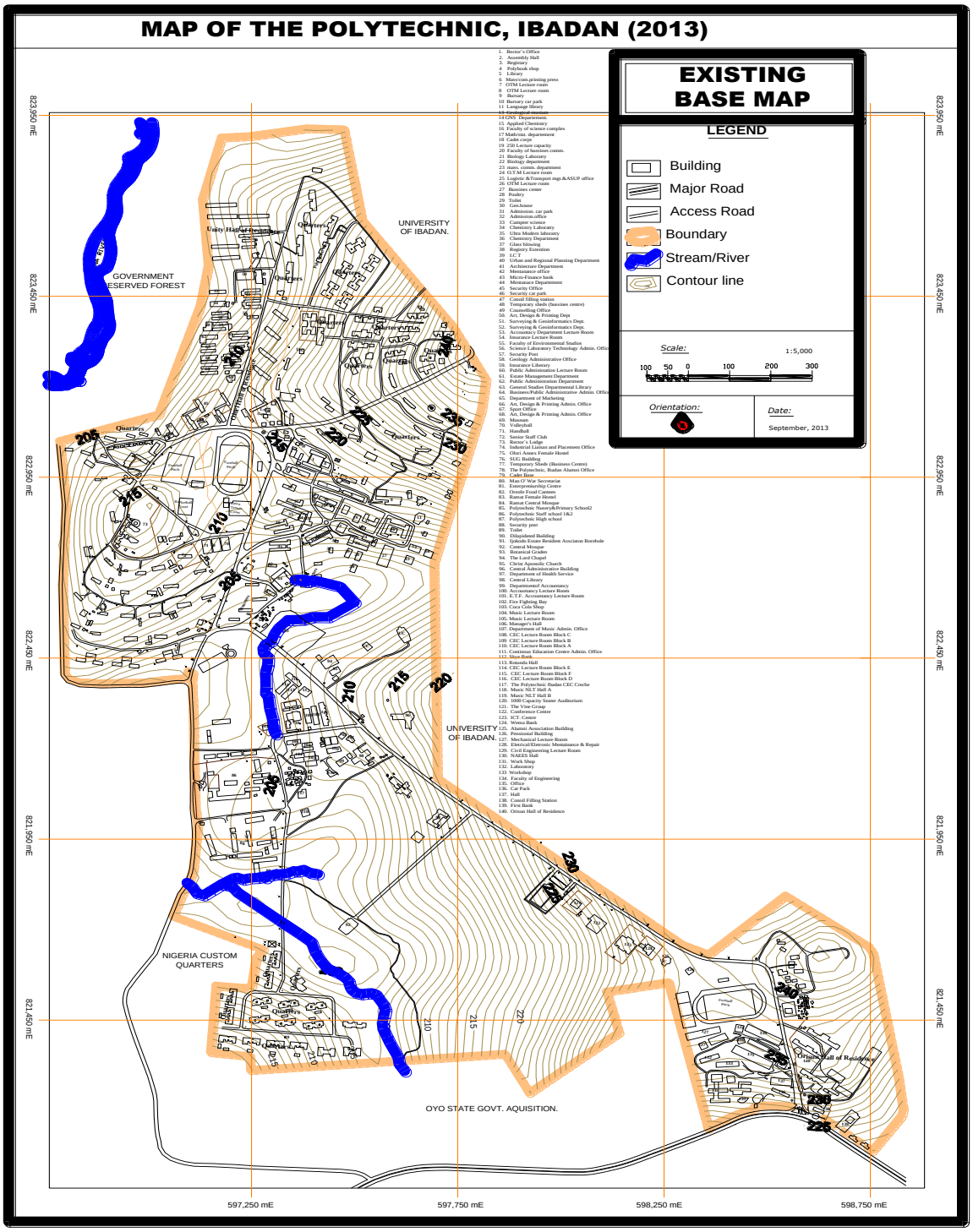

Fig 1. Map showing the Study area

III. MATERIALS AND METHODS

In Orisun hall of residence, the three boreholes in Blocks A-E were used as sources in the water analyses. For water quantity, Table1 indicated the estimated population of occupants in the study area. Table2 showed the available tanks and their capacities. Based on 135lit/head/day for institutional needs and 626 occupants, 84510 litres of water would be needed per day. In the area of water quality, samples were collected from the boreholes and analyses were done in the area of physicochemical and bacteriological characteristics of water. Water quality parameters analysed in accordance to standard method included temperature, colour, turbidity, conductivity, total solids, pH, dissolved oxygen, total alkalinity, total hardness, silica, nitrate, calcium, BOD, COD, colony count, coliform count and E-Coli organism.

Table 1: Occupants of Hall of Residence

Block	Room Available	Occupant/ Room	Total
A	**28**	**2**	**56**
B	**29**	**2**	**58**
C	**69**	**2**	**128**
D	**96**	**2**	**192**
E	**96**	**2**	**192**
Total			**626**

Table 2: Tanks Capacities

HALL OF RESIDENCE (BLOCK)	*TANK No*	*TANK ARRANGEMENT*	*TANK CAPACITY*	*TOTAL CAPACITY (Liters)*
A	**5**	**3** **2**	**3000** **2000**	**9000** **4000**
B	**6**	**2** **4**	**3000**	**6000**
C			**2000**	**8000**
D	**4**	**2** **2**	**3000** **2000**	**6000** **4000**
E				
TOTAL	**15**	**15**		**37000**

IV. RESULTS AND DISCUSSION

The results of both physicochemical and bacteriological analyses were presented in the Tables 3 and 4 respectively. The colour of water in the three boreholes was the same with value of 5 Hazen Unit. WHO also specified same value, 5 HU. Turbidity ranged from 1.01 - 2.42, WHO gave 5 NTU, Total Solid lied between 646 - 904, WHO maximum value of 1500, Total Fill Solid (Total Dissolved Solid) ranged from 118 - 782, WHO 1000, pH was 6.8 through. WHO ranged from 6,5 - 8.5. Chloride was between 68 - 126, WHO gave 250. There was no traces of Nitrate in the water. Iron equally ranged from 0 - 0.01 while WHO specified 0.3.For Electrical Conductivity, the 1st and 2nd sources had values outside the range of WHO, 1063 and 1570 respectively. Only the 3rd source had 1063 which lied in the specification of WHO of 1200.The Bacteriological parameters in Table 4 included colony count, coliform count and Escherichia Coli Organism. The E. Coli indicated the presence of feacal traces in water and the value conformed with the microbial standard given by WHO in which none was detectable in 100ml sample as stipulated for drinking water.

Table 3: Summary of Physio-Chemical Parameters of Water Sample

Parameters	**Level in Sample**			**WHO**
	1st	**2nd**	**3rd**	
Temperature (°C)	26.9	26.4	26.8	
Appearance	cwtp	cwtp	Cwtp	
Odour	Odourless	Odourless	Odourless	**Unobjectionable**
Colour (H.U)	5	5	5	**5**
Turbidity (N.T.U)	2.08	2.42	1.01	**5**

Total Solid (mg/l)	928	904	646	500-1500
Total Fil Solid (mg/l)	774	782	118	**1000**
Total Non Fil Solid (mg/l)	158	122	528	
pH at Laboratory	6.8	6.8	6.8	**6.5-8.5**
DO (mg/l)	1.5	2.1	3.8	
Total Alkalinity (mg/l)	94	72	68	Max 120
Total Hardness (mg/l)	102	78	108	100-150
Calcium Hardness (mg/l)	62	50	82	
Magnesium Ion (mg/l)	9.60	6.72	6.34	30-50
Magnesium Hardness(mg/l)	40	28	26	
Sulphate (mg/l)	22	19	21	250-400
Chloride (mg/l)	68	115	126	**250**
Conductivity (µs/cm)	1549	1570	1063	**400-1200**
Salinity (mg/l)	774	786	521	
Silica (mg/l)	8.0	8.0	7.0	
Nitrate Ion (mg/l)	0.00	0.00	0.00	**45**
Calcium Ion (mg/l)	24.8	20.0	32.8	75-200
PO_3 (mg/l)	**0.00**	**0.00**	**0.00**	
BOD (mg/l)	0.29	0.44	0.64	-
COD (mg/l $KMnO_4$)	-	-	-	2-5
Fe (mg/l)	0.01	0.00	0.00	**0.3**

Source: Researcher's Fieldwork, 2019.

cwtp: clear with tiny properties

Table 4: Summary of Bacteriological Parameters of Water Sample

Parameters	**Level in Sample**			**WHO**
	1st	**2nd**	**3rd**	
Colony Count (MPN/100ml)	32	35	30	
Coliform Count (MPN/100ml)	01	01	02	Nil in 1ml
Escherichia Coli Organism (MPN/100ml)	0	0	0	Nil in 1ml

Source: Researcher's Fieldwork, 2019.

V. CONCLUSION

Water quantity in terms of occupants and supplied proportion and also quality parameters in boreholes were assessed to evaluate supply level and degree of purity of the boreholes water. it was noted that all boreholes yield well and most of the parameters conformed with WHO guidelines. It is recommended that water coming from the boreholes need to be filtered before gaining entrance into the tanks. Also, tanks need to be cleaned up periodically to remove settling silt at the inner base of the tanks. Increase in pumping time to thrice a day or in alternative increase the tank capacities to thrice the initial numbers and pump once would solve the problem of inadequate water quantity making the water enough for occupants daily. The need to have a programme of effective monitoring of ground water quality is welcome.

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