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Demand for Potable Water in Ilaje Local Government Area Ondo State. Nigeria

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ABSTRACT

This study was undertaken to determine the possibilities of balancing the demand of potable waters in Ilaje local government area of Ondo state, Nigeria.

In the study, 12 samples from different sources were collected and analyzed for portability test and concentration of Heavy metal. The different sources are canals, Lagoon and well in four different locations each.

A Global experience was also sought to alienate the demand for this precious resources. Samples collected were analyzed for heavy metals and impurities. Statistical health questionnaire was distribution to health workers and community Heads. A time frame of six month covering rainy and dry Seasons was used to collect the data.

The results obtained were compared with the WHO standard (World Health Organization) for variation Revenant recommendations were also suggested to improve the standard of water.

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INTRODUCTION

Fresh water is essential for healthy ecosystems, for sustainable development and for human survival yet too often, in too many places, waters is wasted, tinted and taken for granted. All over the world, pollution, over consumption and poor water management are decreasing both the quantity and quality of available water. 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 is a social, economic, environmental and political crisis that is found among the world communities and should be given highest priorities.

Kofi A. Annan (2003) stated that "overall demand for water already is far out paces population growth. If the current trends continue, two-third of every three people on earth will suffer moderate to severe water shortages in little more than two decades from now".

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.

Demand for potable water can be met with the assistance from Non-Governmental Organization NGO's, Local Government, State Government, International Organization. Rich Individuals, Scientific Research Centers, localized water modeling and Environmental Education to discourage consumption of polluted and waste water.

In the late 1960s and 1970s several outbreak of cholera through consumption of polluted water was reported around the world. Between 1992 and 1993; 800,000 cholera cases were reported by 21 countries in western Hemisphere, mostly in the coastal areas, with more than 8,000 of the cases resulting to death. By July, 1994, 14,000 deaths from cholera were reported in refugee camps in Rwanda. It has been known that cholera is a water borne diseases (i.e. the infections agent, Vibro cholerae,) is transmitted via water. Furthermore, it is now established that vibrocholerae 01 and 0139 strains are both capable of producing epidemic cholera to the aquatic environment (Huqet et al 1996).

Although, cholera and any of this water borne disease are endemic in Nigeria, its epidemic could be traced to consumption of polluted and waste water, in the densely populated area, where there are poor toilet facilities. The shortage of safe water or drinkable water for the community leads to the consumption of polluted water. In the major sources of water, pollution source is inevitable. In the community due to oil exploration activities / accident source spillages and gas flaring as well as industrial waste and effluent discharge particularly in the study area. The danger caused by water borne disease arises directly from water pollution. Although in western countries, cholera, typhoid, enteric fever and other such disease are common. They affect one sixth of the world's population and kill five million babies each year. (To Sowry,1998).

IMPORTANCE OF WATER IN SUSTAINABLE DEVELOPMENT

The importance of water in human life cuts across domestic, agriculture, industrial, recreational and Research development, Oguntibeju AN (2004) Water-It comes out of the taps and you drink it or boil it to take tea and coffee. You wash with it and use it to wash the cars or water the garden. It falls as rain, snow or hail and waters the earth naturally. Water is seen in ponds, lakes, rivers, streams, wells, stagnant marshes and swamps, dancing into fountains as falls, in muddy puddles or ragging in a stormy sea.

You can sail on the sea (navigation) swim in ponds (recreation) or paddle; go boating on lakes or Rivers (fishing): dive into the local swimming pool. Fish for goldfish to barracuda - all needs water in which to live, whether it is fresh water or sea. It can be used for hydroelectricity and irrigation you cannot live long without water- the water you take in comes out of you when you breath, perspire, cry or go to the toilet and when you flush the toilet after use.

But have you ever really stopped to think about how to attain a balance between demand and supply? How to get safe water for human consumption and how to redeem the world from ravaging diseases associated with unsafe water and for sustainable future development, Olaniyi O.A (2004)

Koichiro Matsuira, Director General, UNESCO, 2003, stated that "water is probably the only natural resource that touches all aspects of human civilization - from agricultural and industrial development to the cultural and religious values embedded in society". In recognition of the central importance of water resources to the planet's future, the United Nations General Assembly proclaimed the year or fresh water because of the following facts.

1.1 billion people lack access to safe water, roughly one-sixth of the world's population and 2.4 billion or 40% of the world's people lack access to adequate sanitation services.

Some 6,000 children die every day from disease associated with unsafe water and poor sanitation and hygiene-equivalent to 20 Jumbo jets crashing every day.

AIM AND OBJECTIVES OF THE STUDY

At the global level several approaches have been set up to spur action and guide the way forward, this we can borrow from;. World leaders at the United Nations millennium summit agreed to half by 2015 the proportion of people without access to safe drinking water. At the 2002 Johannesburg Summit, they reaffirmed their commitment and added a corresponding target to half the proportion of people lacking access to sanitation by the same year. They also agreed to develop natural water management and efficiency plan. To reach these goals is a huge endeavour, requiring substantial resources and coordinated action, not just from government but also from people who use water and those who invest in this precious resources (multilateral oil companies) at the natural level, needed actions include:.

Establishing a water treatment plan:

Changing behaviours in water use and substantial hygiene:

Mobilizing the energy section to participate in provision of safe water:

Participation of communities, particularly women groups:

Setting regional and national targets and plant to generate investment:

Putting in place policies and regulatory frame works for water management that takes into account both public health and ecosystem needs:

Forming partnerships between private companies, bilateral donors, development agencies, banks. Civil society and local communities: for the provision of safe drinkable water.

SCOPE OF STUDY

This study will be restricted to water, sources a of water, causes of pollution, affordable model for treatment of water and demand for portable water in addition, the health risk of consuming bad water will be highlighted with the associated water borne diseases.

STUDY AREA

Ilaje Local Government Area was created in 1994, from the former Ilaje Ese Odo Local Government Area Headquarters at Igbokoda. It is a coastal community by the Southern most edge of Ondo. It has over two hundred and forty five villages and hamlets. The Local Government Area lies between longitudes 6°12°E and $6^0$30°E of the Greenwich Meridian and between latitudes 4°10°N and 4°6°N of the Equator. It is bounded in the West by Ogun State, in the East by Ese Odo Local Government Area and Delta State, in the North by Ikale Local Government Area and in the South by Bight of Benin and Atlantic Ocean. The major occupation of the people is fishing and the means of transportation is by water using small canoes, speed boats and locally constructed small sized.

DATA COLLECTION

The major sources of water to the community are well, canal; and lagoon. Twelve samples were collected. Five litres jerry cans were used on the three occasions that samples were collected.

Sampling Techniques: The sampling plastic bottles were thoroughly washed with detergent and water and then rinsed with 1:1 nitric acid (HN_{03}) water, (1:1) Hydrochloric Acid (Hcl) water and finally rinsed with deionised water in that order and air-dried in advance of sampling. The samples were collected from three wells, three lagoons and three canals in three different locations. After each collection samples were kept in the refrigerator prior to analysis.

HSDQ Distribution: Health Statistical Data Questionnaires were sent to various environmental and health department of the local government area and community leaders so as to gather information on water pollution, water related diseases (reported and recorded).

DATA ANALYSIS AND TECHNIQUES

Samples for potable water analysis were taken to the Lagos State Environmental Protection Agency (LASEPA) for analysis while Texaco Nigeria Plc carried out the Heavy metal analysis. Tests were carried out with atomic spectrophotometer. Materials used include Beakers, Hotplate Funnel, Perkinelmer238, Detergent and Model Atomic Absorption spectrophotometer (ASS).

Reagents: Distilled water, water, HN_{03} and Hcl.

Samples Treatment: I00ml of the samples collected were placed into a beaker and 5ml of (1:1) concentrated hydrochloric acid (HCL) was added to the samples and the samples heated on a hotplate until the volume reduced to 75ml. Then 3ml of concentrated nitric acid (HN_{03}) was added and the samples were heated again until the volume was reduced to 50mi. The sample was then cooled and filtered using what man NO 42 filter paper into 100ml standard flask and made to mark with deionised water.

Determination of Heavy Metals: The digested sample solution was fed into the atomic absorption spectrometer. After setting the equipment to the required condition, readings and determination of the following metals were done

Atomic Absorption Spectroscopic (AAS) Procedure: The AAS analysis started after choosing the proper cathode lamps for the analysis and allowed to warm up for some minutes. This instrument was aligned and the monochromator was positioned at the correct wavelength of the metals to be determined and then the hallow cathode lamp current was adjusted. The appropriate gas supply was connected to the burner following the detail instruction for the instrument and the operating conditions adjusted to give the required flamed condition. The flame was lit and the flow of fuel and oxidant (oxy-acetylene) regulated. The standard solution was then aspirated into flame and the absorbance measured. The sample were identically treated, Deionised water was introduced into the burner between each sample concentration taken. Also concentration of each heavy metal in part per million (ppm) in each sample were also taken for further analysis.

PRESENTATION AND DATA ANALYSIS

The results of the analyses and the summary are presented in Table II-IV

Table II: Physio-chemical character of the analyzed samples from the different locations,

Table III: Mean of physic-chemical character of analyzed samples

Compared with (WHO) World Health Organization.

Table IV: Concentration and mean concentration of heavy metals in the samples in (PPM).

The results presented in these tables were analyzed critically with the assertion that they are as accurate as possible. They were compared with WHO Standard for variations.

A daily water balance in human body will also help to achieve a demand for potable water with the population of less than a million.

Intake of water = loss of water in (ml)

TABLE 1 PHYSIO-CHEMISTRY CHARACTER OF THE ANALYSED SAMPLES (LASEPA 09/12/2006)

PARAMETER	C1	C2	C3	C4	MEAN	L1	L2	L3	L4	MEAN	W1	W2	W3	W4	MEAN	WHO STANDARD
Appearance	Dirty straw	Straw colour	Straw colour	Straw colour	Straw colour	Straw colour	Straw colour	Straw colour	Straw colour	Straw colour	Colour straw	Very lightly	Colourless	Colourless	Colourless	Colourless
Temperature	28.1	28.6	29.5	28.6	28.700	29.9	29.8	29.7	29.4	29.70	29.4	27.6	29.2	29.4	28.9	80-40ºc
PH	7.08	6.63	6.73	6.80	6.810	6.87	6.06	6.6	6.8	6.51	6.99	7.30	7.10	7.20	7.15	6-8
Conductivity	44.8	11.6	15.20	21.40	23-250	3.2	0.036	0.112	2.40	1.44	0.19	1.376	0.76	0.84	0.80	1.0MSCM^{-1}
Suspended solid	236	180	150.0	210	194.00	400.00	400.00	100	108	252	1.00	2.40	1.80	1.60	1.70	10mg/1
Total dissolved solid	264	278	268.00	256	266.50	380	360	368	364	268	210	180	220	210	205	500/1
Total solid	3,582	5095	6,705	5,250	5,518	1,385	1,220	6,000	4,800	3,344.50	1,700	1,527	1008	1800	1508.25	1000mg/1
Total acidity	10.5	4.0	18.00	8.9	9.10	8.0	18	5.0	11.50	10.625	9.0	19.00	16	10.07	13.5	NS
Total hardness	1188	736	965	926	951.50	202	180	160	100	160.00	54	236	188	160	159.50	100mg/1
Chloride	10900	2200	3490	2600	5047.50	650	100	105	180	258.75	3.00	89.00	15.00	18.00	31.25	250mg/1
Nitrates	87	90	87.50	78.00	85.630	67.5	87.07	92.5	88.6	83.90	4.6	112	2.4	2.1	30.275	10mg/1
Phosphate	0.10	0.00	0.06	0.05	0.050	0.03	0.04	0.02	0.03	0.03	0.49	5.0	2,10	0.18	1.943	5mg/1
Sulphetes	1650.0	100.00	500	420	667.50	60.00	70.00	125	95.07	87.50	7.0	53	1.00	0.00	1525	250mg/1
Dissolved oxygen	3.1	5.00	4.1	5.20	4.360	4.00	3.9	4.1	4.2	4.05	4.6	4.8	5.40	4.40	4.80	2.0mg/1
Copper	1.32	1.28	0.87	1.20	1.167	0.38	0.48	0.56	0.68	0.525	0.3	0.15	0.03	0.12	0.15	0.5mg/1
Chromium	1.24	0.20	0.05	0.70	0.567	0.23	0.53	0.40	0.54	0.425	0.03	1.06	0.16	0.24	0.72	0.01mg/1
Lead	1.28	0.80	0.92	0.78	0.945	0.58	0.52	0.38	0.42	0.468	0.44	0.08	0.04	0.04	0.05	0.001mg/1
Nickel	1.26	1.42	1.20	1.26	1.285	0.48	0.44	0.42	0.38	0.43	0.01	0.07	0.04	0.03	0.037	0.02mg/1
Zinc	1.15	0.00	0.48	0.52	0.537	0.532	0.24	0.40	0.48	0.38	0.9	0.02	0.00	0.00	0.23	1.0mg/1

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From table I the mean physio-chemical parameter with exception of colour and PH others show a difference values from WHO standard.

TABLE II: MEAN OF PHYSIO-CHEMICAL CHARACTERISTICS ANALYSED SAMPLES COMPARED WITH WHO STANDARD

PARAMETER	CANAL LAGOON	WELL	WHO STANDARD
APPEARANCE	Straw Colour Straw Colour	Colourless	Colourless
TEMPERATURE	28.70 29.70	28.90	$35\text{-}40^{0c}$
PH	6,81 6,51	7 15	6-8
CONDUCTIVITY	23.25 1.44	0.80	l.0mscm-1
TOTAL SUSPENDED SOLID	194.00 252	1.70	1.0mg/I
TOTAL DISSOLVED SOLID	266.50 368	205	500mg/l
TOTAL SOLID	5158 3344.50	1508.75	1000mg/l
TOTAL ALKALINITY	55 33.25	205.00	200mg/l
TOTAL ACIDITY	9.10 10.63	13.50	NS
TOTALHARDNES S CHLORIDES	951.5 16 258.75	159.50 31.25	100mg/50 7mg/l
NITRATES	85.63 83.90	32.28	10mg/l
PHOSPHATES	0.050 0.03	1.94	5mg/l
SULPHATES	667.50 87.50	15.25	250mg/l
DISSOLVED OXYGEN	4.35C		2.0mg/!(mm)
COPPER	1.17 0,53	0,15	0.5mg/l
CHROMIOM	0.55 0,43		0.01mgg/I
LEAD	0.045 0.47	0,05	0.001mg/l
NICKEL	1.29 0.43	0.037	0.02mg/l
ZTMT	0,54 0 38	023	1.0mg/l

TABLE III CONCENTRATION AND MEAN CONCENTRATION OF HEAVY METALS IN THE SAMPLES IN (PPM)

Canal 1	0.05	0.07	0.3	0.03	0.04
Canal 2	0.03	0.4	.02	0.22	0.05
Canal 3	0.003	0.05	0.1	0.12	0.05
Canal 4	0.03	0.39	0.3	0.45	0.11
Mean	0.0282	0.2275	0.2250	0.2050	O.OW)
Lagoon 1	0.03	0.84	0.3	0.63	0.06
Lagoon 2	0.01	0.74	0.2	0.76	0.15
Lagoon 3	0.02	0.88	0.4	0.2')	0.02
Lagoon 4	0.01	0.58	0.4	0.63	0.00
Mean	0.0175	0.76	0.3250	0.5775	0.0575
Well 1	0.01	0.21	0.5	0.1	0.02
Well 2	0.01	0.31	0.3	0.02	0.04
Well 3	0.03	0.42	0.2	0.01	0.01
Well 4	0.03	0.39	0.1	0.11	0.08
Mean	0.020	0.3325	0.2750	0.06	0.0375
WHO STANDARD	0.5mg/1	0.01mg/1	0.00mg/1	0.02mg/1	1.(00mg/1

Table IV: Daily water Balance in Human Being

Intake (ml)		Loss (ml)s	
As a liquid	1000	Urine	1,5050
In food	800	Faces facres	100
Oxidation of food	200	Evaporation	850
Total	2000	2,000	

Source: Frank B. Armstrong: Biochemistry 2nd ED (1984) of p. 25a

DISCUSSION AND FINDINGS

Table II shows the results obtained from the physio-chemical character of the analyzed samples from the three sources. It was observed that the highest levels of sulphate and chlorine were recorded in the canals and lagoon. The mean values of the elements were 667.50mg/l (sulphate) and 5047.50 mg/l chlorine in canal while 287.50 mg/l sulphate and 258.75 mg/l chlorine in lagoon. These figures are rather.

high when compared with the (WHO Standard) which is 250 mg/l. The possible sources of sulphate and chlorine comes from oil pollution and other discharges into the water bodies.

The mean values from the well is lower than WHO Standard which is 31,27 mg/l chlorine and 15.25 mg/l for sulphate.

Table III revealed more deviations as clearly shown in total solid detected from the three sources canals, lagoons and wells which were higher (5158, 3344.50 and 1508.75)mg/I when compared with 1000 mg/l WHO standard, While total dissolved solids from the three sources were lower (266.50, 368 and 205 mg/l when compared with 500 mg/l WHO Standard). Furthermore the dissolved oxygen (4.350, 4.05 and 4.8mg/l) from the three sources were rather too high when compared with the 2.0mg/l WHO standard.

Table IV shows that mean concentration of Heavy metal in the samples is (ppm). The mean values of Zinc and Copper were lower when compared with the WHO Standard. While the mean values of chromium, Nickel and Lead were higher when compared with WHO Standard, In the case of Nickel and Copper the mean values were higher for canal because of direct pollution through spillage and slightly lower than the mean value for well because of Distance from direct pollution.

Adverse effects related with each metal

Lead: The detection of higher concentration of lead from the samples has detrimental effect on the health of the people. Lead, a poison metal can affect the central and peripheral nervous system, renal cardiovascular and reproductive system. It can cause damages to marrows system and gastrointestinal symptoms are main signs of lead poisoning. Lead also interferes with the formation of red blood cells leading to anemia (Dreishbach 1980). All the twelve water samples including the supposedly controlled potable water labeled Lac, Wac and Cac all failed the potable water test.

Chromium: Chromates are carcinogenic causing especially cancer in mammals. A higher concentration as detected from the samples would be toxic to aquatic organisms.

They may cause ulceration and skin membranes corrosion and chromosome aberrations in eggs (i.e. mutagenic) (Pressmark 1999).

Copper: It is present naturally in sea water in concentration ranging from 1 to 25 mg/l. It forms complexes with anions making it more toxic. Copper in suspension clogs the gills of fishes and shellfishes preventing free flow of water through them. Gaseous exchange is impeded and the fish dies from asphyxiation or of hypoxia (William 0. Odiete,1999). Also ingesting large quantity of soluble copper salt produces introxication, nausea, vomiting, diarrhea and even death. (Bartenhasen, Turner and Osmond 1985).

Zinc: It was detected that the level of Zinc in the three samples are lower than the WHO Standard of 1.0 mg/i lower concentration of Zinc in the body can lead to a delay in fetal growth. (Bartenhasen, Turner and Osmond 1985).

Nickel: The high concentration of Nickel in canal 1.29mg/l when compared with 0.02mg/l WHO standard is on higher side. The element which would have been as a result of oil pollution serves as catalyst to order health

Comparison of detected metal level with WHO standard

In comparison the data with World Health Organization (WHO) standard, it was observed that the mean concentration of chromium, lead and nickel are higher than the WHO Standard which is 0.01 mg/l (chromium), 0.001 mg/l (leads) and 0.02 mg/i (Nickel) while the mean concentration of copper and Zinc are far too low as seen in Table II, Non-governmental Organizations (NGOs), UNEP, UNICEF, WHO and World Bank are implementing one project or the other in order to ensure lasting solution to this looming problem in our country Nigeria. These efforts have not been good enough for the desired effect to be felt by the ever increasing poor population of the rural and urban slums. Therefore this study shall be considered appropriate to the present community and preserve a glowing future for the coming generation.

RECOMMENDATIONS

Based on the foregoing, it is suggested that the environmental regulations and Protection policies should be strictly enforced in area of oil pollution in Nigeria.

- Compensation for oil spillage and pollution should be commensurate so as to clean up the effect and bring relief to the affected communities.
- On the other hand the oil companies should involve in more research and development on environmental protection-related area as well as utilizing and adapting international research and development findings designed to improve on the existing control devices and processes.
- It is also suggested that statutory responsibilities for compliance with environmental regulation be concentrated on one regulating body as to the case with majority of developed countries. For instance in United States of America (USA) ail the environmental protection issues are administered by the Environmental Protection Agency established in 1969.
- It is recommended also that the implementation of various water schemes be improved to eradicate health hazards.
- Environmental education of the masses should be sought in the area of water management and personal hygiene using various media.
- The Government should train and retrain waterworks personnel with thorough working supervision by specialist to ensure conformity of supplying notable water with (WHO) standards for good health.

CONCLUSION

On the basis of the failure of the analyzed samples to meet the potable test as well as high concentration of heavy metals in the analyzed samples, coupled with incessant oil pollution and damage to ecosystem and biodiversity without providing for the most pressing need of the people; One can conclude that, the Government and all Stake-holder should see to the problem of the people so as to provide immediate and lasting solution. In summary, the demand for water either for fishing, washing, navigation, transportation, agricultural and industrial uses cannot be put aside, because it is the life wire of the people and the **wealth** of every community and nation, It is also the **automobile** for economy growth and development, In addition, it is the **trade-route** to other local and neighbouring states. It provides **energy** that drives the industries and finally it is the **resources** that concretize the hope of the people, being the mother of all resources because crude oil is found under water, Btu the quest and demand for potable water should be given urgent and immediate attention. The recent oil spillage at Awoye on 4th August, 2004 NDDC (2004) did not only affect biodiversity, but the water body was polluted and socio-cultural activities were seriously affected.

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