DonnishJournals

Donnish Journal of Geography and Regional Planning
Vol 2(2) pp. 009-014 March, 2016.
http://www.donnishjournals.org/djgrp

Original Research Paper

Safe Water and Sanitation Situation in Ilesa Metropolis, Osun State, Nigeria

Omotoso, Oluwatuyi[1]* and Oyeniyi, Samson Oluseyi[2]

[1]Department of Geography and Planning Science, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria.
[2]Faculty of Environmental Studies, Department of Urban and Regional Planning, Osun State College of Technology, Esa-Oke, Nigeria.

Accepted 18th February, 2016.

Water and sanitation coverage in Nigeria is among the worst in the world and the number of deaths resulting from water related problem is unbearable. The paper therefore examines safe water and sanitation situation in Ilesa and compares the physical, chemical and micro-biological characteristics with World Health Organization recommended standards. Data were collected from both primary and secondary sources and it was revealed that hand-dug wells were peoples' main source of water in the study area and all the samples pass chemical characteristics test, but they are all unsafe for drinking because they did not meet (WHO) recommended standard due to the presence of harmful micro-organisms which are found to be a fallout of poor sanitation. Immediate and long term recommendations suggest water treatment, public enlightenment on the dangers of unsafe water, improved sanitation, protection of drinking water sources, sinking of new and deeper wells away from the repository of dirt, and enforcement of environmental laws among others were recommended. The paper will be of immense benefit to policy makers, health workers and individuals.

Keywords: Safe water, Sanitation, Parameters, Hand-dug Wells.

INTRODUCTION

Water is life, it is a unique liquid; without it as we know, life is impossible, (Dabi, 2006). It covers a little over 70 percent of the entire earth's surface, despite this; about 1.2 billion people, mainly in developing countries do not have access to reliable source of safe drinking water. (Barbara 2005). Hence, the importance of quality drinking water is now a major issue all over the world and particularly in developing countries where most sicknesses are associated with poor drinking water quality and contaminated food (Federal Environmental Protection Agency FEPA, 1996). In Nigeria, availability of good quality drinking water is very appalling, only 55% has access to pipe-borne water and 35% has access to sanitation. It is very saddening and disheartening that many Nigerians, despite their poor economic status have to bear the burden of sourcing their own water for domestic and industrial uses.

United Nations Children's Fund, UNICEF (2012) reveals among other facts, that access to drinking water and sanitation is among the major challenges in Nigeria. Water and sanitation coverage rate in Nigeria is among the lowest in the world. Nigeria is not on track with Millennium Development Goals of 75 per cent coverage for safe water and 63 per cent for basic sanitation coverage by 2015. UNICEF Report 2012 ranked Nigeria third behind China and India as countries with the largest population without adequate water and sanitation. A 2008 report from Water And Sanitation Sector Coverage (WESC) reveals the number of people having access to water from improved sources have decreased by 3 per cent from 1990 to 2006 and its still decreasing, it also reveals that only about 26 per cent has access to improved sanitation with the situation in rural areas becoming more pathetic as the days roll by. With this scenario, the possibility of Nigeria meeting the Millennium Development Goal (MDG) of provision of safe drinking water for 75 per cent of the population with 63 per cent sanitation in 2015 is out of the question. Despite this situation, the budgetary allocation for the provision of water has been dwindling since (2010), the Federal Government budgeted 112 billion naira, in 2011, it dropped to 62 billion naira, and in 2012, it came down to 39 billion naira, mercifully in 2013, it came up slightly to 47.8 billion naira. (Jide, 2012)

Access to the combination of safe drinking water and hygienic sanitation is a precondition for health and success in the fight against poverty, hunger, child death, and gender inequality of every human being, this inaccessibility of human to safe drinking water and sanitation in Nigeria is mainly man made. It is a fallout of poor sanitation habit, (Jide, 2012). According to a United Nations report of (2012), inadequate

Corresponding Author: Omotoso, Oluwatuyi (Ph.D). Department of Geography And Planning Science, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria. Email: oluomotoso06@yahoo.com

sanitation made the available water less useable. Poor waste disposal practices have led to ground water contamination while poor management of industrial and domestic sewage, toxic matters, and industrial chemical pollution of pesticide has combined to degrade water qualities, (Ogbuagu and Unodu 2006).

There is increase of trace elements in potable water, microbial contamination from faeces, coliform and E-coli, also, the influence of filthy unguided waste and sewage disposal will increase the threat of human health, (Olusoji, 2006). Van and Pur, (1979) also reported that there is a direct relationship between fecal pollution and disease quality of water and sanitation. Poor quality water may also affect both soil and crop yields and lead to possible health hazard to the consumer of such produce. (Oyedode,1999).

STATEMENT OF THE PROBLEM

Without clean water, peoples' health and livelihood can be severely affected; the education of children (particularly girls) suffers as the daily tasks of survival takes precedence over all other concerns. (Nwankwoala, 2010). It is reported that in most developing countries, one person out of every five alive today lacks access to safe drinking water, while two in five persons do not have access to even basic sanitation. Every day, 500 people die of diarrhea, typhoid fever disease, 90 percent of them are under the age of five. (Ogbuagu, 2006).

Many among them suffer from river blindness, hepatitis among others. At any time, almost half of the population in the developing world has one or more diseases linked to poor water and sanitation or poor water source management. Available statistics show that more than 3.4 million people die every year from water sanitation and hygiene related causes. Ninety nine percent of these deaths occur in developing countries (Ojo, 2012). To say the least, water and sanitation related causes claim more lives than any war claimed through gun.

AIMS AND OBJECTIVES

The aim of the study is to investigate the drinking water qualities in the study area and examine the roles played by sanitation in safe drinking water situation while the objectives are to determine the sources of water and their safety in the study area, study the implications of water and sanitation situation on the residents and present workable solutions capable of ameliorating the precarious safe water situation in the study area.

THE STUDY AREA

Ilesa is one of the major towns in Osun State, South Western Nigeria. It lies within latitude $7^{o}35^{1}$ and $7^{o}40^{1}$ N and longitude 4^{0} 13^{1} and $4^{o}38^{1}$E. The climate is humid tropical type with the temperature of about 29^{o}C, while the mean annual rainfall is about 170^{0}cm. The underlined geology is fine-grained biotite gneiss and schist although quartzite, quart- schist rocks are common especially on slopes and ridges. The entire city is drained by Oora River, which flows southward and South-eastward.

The population is projected from 212,225 by (National Population and Housing Census, 2006) to be approximately 262,225 people in (2014). The city serves as the headquarters of two local government areas; Ilesa East and West. The cosmopolitan city is mainly peopled by the Yoruba ethnic group who are predominantly farmers, traders, artisans and civil servants cohabiting peacefully with other tribes and nationalities. Ilesa is not connected to any form of public water scheme, and the intention to do so is not in sight yet, there have been years of neglect and failed promises from both Central and State Governments to provide the people with potable water.

Most recent effort to introduce an improvement on deplorable water situation was in 2007, when the then State Government pledged a mini-water project in each of the 30 Local Government Areas of the state (Osun State Year Book, 2007) unfortunately, neither of the two Local Government Areas in the city benefited from the scheme.

Similarly, the embarrassing water situation attracted national and international attention when Ogun Osun River Basin Authority and Millennium Development Goals, (MDGs) came to the rescue by sinking some wells, those few bore-holes are solar powered and are often poorly maintained, so, they are not reliable sources of water.

Accessibility to Safe drinking water in the study areas is costly in time and money, as those who can afford it depend on sachet water popularly known as pure water and bottled water, whose sources and safety are not regularly monitored by regulating authorities, despite that, this water is sold double the price it is sold in other nearby cities even in the same state.

RESEARCH METHODS

The researchers conducted a reconnaissance survey of the study area to identify sources of drinking water, adopting systematic method, a water source was randomly picked to represent two political units/wards, since twenty political units/wards existed, ten water sources were randomly picked as samples. Water samples were taken between 6 and 8am into sterilized plastic bottles for immediate laboratory analysis with a focus on physical, chemical and micro-biological characteristics of the water samples taken. Similarly, oral interviews were conducted and secondary data collection methods were also employed to access information on safe water and sanitation situation in the city.

Preliminary survey and oral interviews reveals that the city does not have reliable routine coverage of sanitation services, many houses have no working toilet, the available ones are old full and flow out occasionally, many residents defecate in undeveloped sites (See Plate 2), some in nearby rivers/streams channels and even in their dust bins and lither the enter living environment with dirt as they bring them out in the night and dispose them on drains, refuse are indiscriminately deposited, dead family members are buried in the compounds, free ranged animals lither the living space with their dungs in this same vicinity where people source their drinking water. (See plates 1)

Although, third tier of government should be responsible for sanitation exercise but the operation of Local Government in the State is faced with legal battles, the leadership has not been democratically elected therefore, they are less accountable, hence, it has been by appointment from the loyalists of the State Governor and his political party for few years now.

The State Government therefore took-up the responsibilities, it bought a vehicle each for all the local Government Areas of the State and engaged some youths for the purpose, but this has not gone far in addressing the situation.

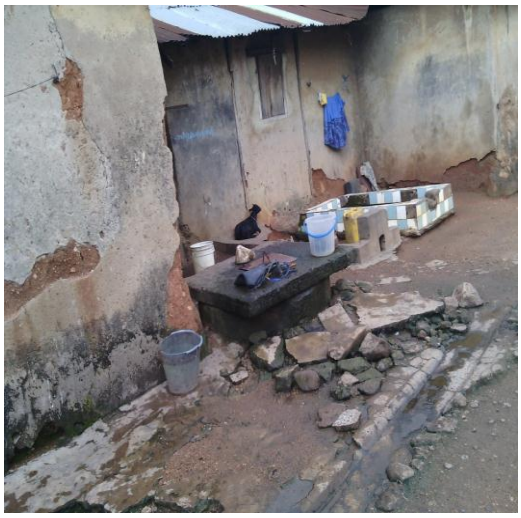

PLATE 1

PLATE 2

Furthermore, overwhelming majority of inhabitants depend on hand-dug wells for their water needs, most of these wells are too shallow, poorly covered, or not covered at all, these results in polluted surface water from the surrounding area gaining direct entrance into them, raw sewage do find their ways in to wells through seepage, run-off and flood enters directly during heavy rains especially when some wells are just one foot higher than the earth surface, free ranged animals like goat sheep and fowls pass nights on wells and their dungs equally enter the wells directly, other negative consequences of poor sanitation on drinking water safety in the study area include citing of wells close to septic tanks, burial sites of dead family members buried within the compounds and dump sites located within the living space, these are repository of filth through which many contaminants pollutes the well waters.

Water is drawn manually from the wells and the drawers are left on the wells or beside the wells on a bare floor, these drawers serve as piggy-back for germs and dirt getting into the well waters especially when many wells are not covered, poorly covered or poorly constructed. (See Plates 1 and 2), beside these, the study area falls within the tropics, characterized by high rainfall which does increase the likelihood of ground water pollution since the water table is shallow and there are little or no impermeable weathered materials which may reduce the infiltration in the area. (Orimogunje, 2009). All these facilitate water pollution of the aquifer or underground water that recharges the hand-dug wells by contaminated leachate.

RESULT OF THE LABORATORY FINDINGS AND DISCUSSION (table 1)

The water samples were ***colorless*** and clear except samples 5 and 9 that are not clear. Sample 1 and 2 are slightly *acidic* while sample 3 to10 are slightly basic. This acidity may be due to contamination resulted from the presence of dissolved carbonate, hydroxide, calcium, magnesium and sodium. Acidic water favors corrosion of pipe and utensils, highly acidic water may also be hazardous to human health. *Visual Hardness or Turbidity (NTU)* are insoluble suspended particles, this is also too high in sample 5, going by WHO recommended value, it renders the sample unsafe for drinking because the particles come with micro-organisms which are dangerous to human health. *On conductivity,* the entire water samples possess the required range of WHO value of 900µcm-^{1}.

The value obtained on *Total Dissolve Solids* in all the sample fall within WHO recommended value of 100mg/L, while the values of the samples ranges from 34.0-288mg/L. *Calcium Hardness (CaCO3)* is due to the presence of calcium and magnesium in water, although, the recommended value of WHO was not stated, but it is average between 50-120mg/L or 3-7 grains per gallon because water becomes acidic at low hardness level, hence, it is relatively low in the samples especially 8 and 9 but average in samples 1 and 7. For Magnesium *Hardness ($CaCO^{3}$),* WHO required value was not stated, but the average remains between 50 – 120mg/L, only samples1and 7 falls within the average while others reveal low hardness.

Nitrate (NO_3^{2-}); the WHO value is between 10 and 50mg/L while the values obtained range between 1.98-15.3mg/L which is low and preferred especially when the high concentration of calcium in water is harmful to human health and even aquatic animals. *Iron (Fe)* concentration in the samples is below required values compared with WHO recommended value of 1mg/L, the values obtained range between 0.02-0.08, and hence, it is acceptable. *Alkalinity* level is also good and preferred when compared with recommended value of WHO; the average obtained is 10-40mg/L while the WHO recommended value is 100mg/L. *Magnesium (Mn)*; the WHO value is 0.1-04 while the values obtained in the samples ranges between 0.01-0.02, hence, it concentration is acceptable. *Calcium (Ca^{2+});*

The values obtained in the samples ranges between 8.2-96.9, although, WHO did not state any value but National Agency for Food and Drugs Administration and Control (NAFDAC) recommended 75mg/L for drinking water, therefore, all the samples fall within recommend values, this is also applicable is to *Sodium (Na^{2});* the values ranges from 6.49-75.4mg/L while the WHO recommended value is 200mg/L, *Sulphate* (SO_4^{2-}); WHO value is 200mg/L while samples have value range of 1.0-36.0 and it was not detected in samples 4 and 7.

Table 1. Chemical, physical, and biological characteristic of water samples

PARAMETERS	UNITS	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4	SAMPLE 5	SAMPLE 6	SAMPLE 7	SAMPLE 8	SAMPLE 9	SAMPLE 10	NAFDAC MAX. ALLOW LIMIT	WHO STANDARD	
													Highest desirable	Max. desirable
Appearance/Color	clear	Clear	Clear	Clear	Clear	Slightly clear	Clear	Clear	Clear	Cloudy	Clear	-	-	-
Temperature	^{0}C	26.2	26.4	26.1	25.9	26.7	26.8	26.2	26.1	26.4	26.3			
pH	pH	7.20	7.30	5.60	5.90	5.20	6.40	6.10	5.54	5.76	6.28	6.50-8.50	7.0-8.90	6.50.9.50
Turbidity	NTU	0.21	2.96	0.85	0.00	15.3	2.22	1.13	0.00	0.36	0.00	5.0	5.0	5.0
Conductivity	µs/cm	287	138	50.0	277	267	298	663	192	213	102	1000us/cm^{-1}	900	1200
Total dissolved solute	Mg/L	192	92.5	34.0	186	179	200	444	129	143	68.3	500	500	1500
Total hardness $CaCO_3$	Mg/L	112	288	36.8	64.0	62.0	96.0	102	30.0	50.0	46.0	100	100	500
Calcium hardness $CaCO_3$	Mg/L	52.0	246	10.0	36.0	30.0	56.0	42.0	18.0	28.0	20.0	75	-	-
Magnesium hardness $CaCO_3$	Mg/L	60.0	46.0	26.0	28.0	32.0	38.0	60.0	12.0	22.0	26.0			
Nitrate (NO_3^{2-})	Mg/L	3.00	2.84	2.80	3.46	4.12	2.82	15.3	1.96	4.87	5.20	10	10	50
Iron (Fe)	Mg/L	0.04	0.02	0.03	0.02	0.08	0.03	0.04	0.02	0.03	0.02	0.3	1	3
Alkalinity	Mg/L	34.0	40.0	10.00	31.0	18.00	26.00	30.00	38.00	40.00	29.00	100	100	100
Manganese (Mn)	Mg/L	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.01	2.0	0.1	0.4
Calcium (Ca^{2+})	Mg/l	20.8	96.9	4.01	14.4	12.0	23.2	16.8	7.21	11.2	8.02	75	NS	NS
Magnesium (Mg^{2+})	Mg/L	14.6	11.2	6.34	6.83	7.81	9.27	14.6	2.93	5.37	6.34	20	20	20
Chloride (Cl^-)	Mg/L	14.0	116	12.0	22.0	35.0	26.0	72.0	26.0	30.0	9.99	100	200	250
Sodium (Na)	Mg/L	9.10	75.4	7.80	14.3	22.8	16.9	ND	1.00	2.00	1.00			
Sulphate (SO_4^{2-})	Mg/L	2.00	36.0	4.00	ND	3.00	1.00	ND	1.00	2.00	1.00	100	250	500
Total Bacteria Count	Cfu/mg	6	12	10	7	24	16	10	8	9	7	0	0	0
coliform Total	Cfu/mg	3	4	4	3	8	6	3	4	4	3	0	0	0

Table 2. Diseases related to water and sanitation.

Group	Disease	Route leaving host	Route of infection
Diseases which are often water-borne	Cholera	Feaces	Oral
	Typhoid	Feaces/urine	Oral
	Infectious hepatitis	Feaces	Oral
	Giardiasis	Feaces	Oral
	Amoebiasis	Feaces	Oral
	Dracunculiasis	Cutaneous	percutaneous
Diseases which are often associated with poor hygiene	Bacillary dysentery	Feaces	Oral
	Enteroviral diarrhoea	Feaces	Oral
	Paratyphoid fever	Feaces	Oral
	Pinworm (Enterovirus)	Feaces	Oral
	Amoebiasis	Feaces	Oral
	Scabies	Cutaneous	Cutaneous
	Skin sepsis	Cutaneous	Cutaneous
	Lice and typhus	Bite	Bite
	Trachoma	Cutaneous	Cutaneous
	Conjunctivitis	Cutaneous	Cutaneous
Diseases which are often related to inadequate sanitation	Ascariasis	Fecal	Oral
	Trichuriasis	Fecal	Oral
	Hookworm (Ancylostoma necator)	fecal	Oral Percutaneous
Diseases with part of life cycle of parasite in water	Schistosomiasis	Urine/feaces	Percutaneous
Diseases with vectors passing part of their life cycle in water	Dracunculiasis	Cutaneous	Percutaneous

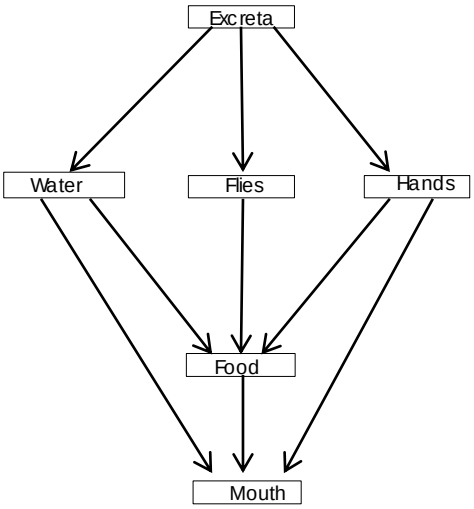

Figure 1. Principal elements of fecal-Oral disease transmission

Adopted from WHO; seminar pack for drinking water quality (2012)

It must be noted that chemical water quality is not as important as the microbiological quality of drinking water except when levels of certain chemicals are high from natural sources such as fluorides and nitrate.

MICRO-BIOLOGICAL CHARACTERISTICS OF WATER SAMPLES

The number of bacterial counts in the water samples ranges 3-24cfu/ml and the number of coliform stands between 3-6 while WHO recommended zero, therefore, all the water samples are unfit and unsafe for drinking. Certain bacterial species, particularly coliform are normal inhabitant of large intestine of human and other animals and are consequently present in feaces, thus, the presence of these bacteria in water is an evidence of fecal pollution or contamination which may arise from sewage influence, pit latrine, or refuse dumps resulting in various diseases. Microbiological quality of drinking water has implicated in the spread of important disease among which are dysentery, cholera, hepatitis giardiasis, guinea worm, typhoid and schistosomiasis and so many other diseases that are associated with intake or use of water from doubtful, unsafe or contaminated sources. (See Table 2 and fig 1)

IMPLICATIONS AND CONSEQUENENCES

Considering physical and chemical characteristic, only sample 5 and 9 failed the test of safety, as a result of their high turbidity, slightly cloudy/unclear. In contrast, all the water samples fail micro-biological test, they contain a lot of bacteria that are harmful to human health. Hence, these contaminations are not natural, but are directly and indirectly caused by poor sanitation and other related activities of the residents of the study area and his activities on the environment. As stated earlier, this has resulted in many deaths, especially of children less than five years.

Among the diseases that are largely related directly or indirectly to unsafe water resulted from poor sanitation have their routes from faeces, urine and are transmitted through mouth (oral). (See table 2 and fig. 1). This implies that with improved sanitation all the diseases could be checked and a good number of resulted deaths prevented. It also implies that sustainable environmental management is essential for continued existence and wellbeing of the human race.

CONCLUSION

The work focuses on safe water situation and sanitation in Ilesa, Osun state, Nigeria. Chemical and biological analysis were carried out in the water samples drawn from the city. 80 per cent of these samples possess acceptable chemical properties, but all of them fail to pass the micro-biological test using WHO as major standard and where necessary NAFDAC recommended value was used. The work also showed that contamination of drinking water samples resulted from infiltration of leachate from nearby latrine, septic tanks, and dungs from free ranged domestic animals dung hills and other repository of dirt. All are direct or indirect consequences of poor sanitation of the people of the study area.

RECORMENDATIONS

To achieve a drastic turnaround of the precarious safe water and sanitation situation in the study area, both immediate and longtime strategies are needed.
Immediate strategies

- Drinking water treatment should start without further delay; these may include boiling, filtering, disinfection and sedimentation.
- Public enlightenment campaign should be embarked upon by relevant stakeholders and community leaders on the dangers of unsafe water and poor sanitation.
- All water sources should be protected against all forms of contacts; hand-dug wells should be covered properly, they should be made water tight with cement by using rings or pave the walls in the wells.

- Motorized methods should replace manual methods of drawing water from wells to minimize external contact
- Improved household and community sanitation through proper management of refuse, domestic and industrial waste

Long Term Strategies

- Government should embark on alternative water source; standard water project should be embarked upon for the city.
- Government should intensify her effort in the area of environmental sanitation; the whole city should be covered and environmental sanitation law should be enforced with renewed vigor.
- New and deeper well should be sunk and cited away from repository of filth like latrine, septic tanks, burial site of family members dumping site and where possible at upper gradients.
- More environmental officers / community health workers should be employed, trained and equipped to facilitate restoration of environmental sanctity and enforcement of environmental laws in the study area.

REFERENCES

Aribigbola, A. (2010). Meeting Millennium Development Goals (MDGs) target for water and sanitation in urban area of Africa: The example of Akure, Ondo State, Nigeria. Journal of sustainable development in Africa Volume 12.No.3, 201

Babara, W. M. (2005). Environmental science: A Self-Teaching guild. Jesse Publisher, North Carolina, USA. P238.

Dabi, D. D. and Rotdung, B. (2006). An Assessment of Household Strategies to Cope With Water Scarcity in Amper Town Kanke LGA, Plateau State. Journal of environmental science volume 10(2) 2006.pp. 112-123.

FEPA, (1996) Federal Environmental Protection Agency. Proceeding of stake holders work shop on the environment pp. 13

Jide, O. (2012). Safe water and Sanitation in Nigeria; The Punch News magazine Sep. 4, 2014.

NPC, (2006). National Population Commission: A Publication of Federal Republic of Nigeria on Census by Nigeria Population Commission.

Nwankwuala H.O. (2010). Ground water management system, Nigeria implication for economic growth: International journal of environment science

Ogbuagu, J. O. and Nnodu, V. C. (2006). Characteristics of bore hole water in part of Anambra State, Nigeria International journal of environment science Vol. (20)

Olusoji, S. A. (2010). Geology and Ground water quality of Southwestern Nigeria. International Journal on Environmental Issues. Vol.1 7 p1-14

Orimogunje, O.O. (2009) Geo-Spatial Mapping of Wetland Potential in Ilesa, South Western Nigeria, Obafemi Awolowo University Press, Ile-Ife.

Oyedode, Y.O. (1999). Water Quality for Irrigation. A seminar paper Presented at Agricultural Engineering, Institute Technology, Kwara State Polytechnic, Ilorin, pp1.

Osun State Year Book, (2008).

World Health Organization, (2009). International Drinking Water Standard 3rd Edition, Geneva WHO.

UNICEF, (2008). Water and Sanitation Summary Sheet, Seminar Pack for Drinking Water Duality, 2008

UNICEF Report, (2012). Water and sanitation. Volume7. No 1. pp. 1

Van Poeteren, R. P. R. G. and Pur, j. A. (1979). The Importance of clean Water to Industries in Developing World. Hong Kong: Caovener Press, pp. 9