International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8, Issue-1, May 2019

Groundwater Quality Assessment in Kattedan Industrial Area, Hyderabad, India.

Durgasrilakshmi Hari

Abstract: ***The present work is carried out for assessing the groundwater quality of Kattedan industrial area. About 26 groundwater samples were collected in and around the Kattedan industrial area for a physicochemical analysis. The present water quality status is calculated by considering the following 13 parameters such as pH, Colour, Turbidity , Dissolved Oxygen, Conductivity, Alkalinity, Total dissolved solids, Chlorides, Phosphates, Nitrates, Total Hardness, Calcium Hardness, Magnesium Hardness. The acquired results are compared with BIS 10500: 2012 Drinking Water Specification. The results showed that the ground water with in industrial area has very high content of Total dissolved solids , Turbidity, Conductivity, Colour, DO, chlorides, Phosphates and Mg, Ca and Total Hardness showing that the industrial effluents are causing direct contamination of water, and are also responsible for potential health problems. The results of the study suggest that regular analysis of physicochemical characteristics should be carried out to protect the water resources and to safeguard the groundwater quality in and around Kattedan industrial area.***

Keywords: Physicochemical Parameters, Drinking Water, Industrial Area, Kattedan.

I. INTRODUCTION

For the survival of life and healthy living Water is most of the basic elements on the earth. Groundwater is the most fundamental and suitable freshwater resource. According to physicochemical and microbiological characteristics of water, the quality of may be described. Alteration in the landscape and local drainage will have a direct effect on the groundwater quality and quantity. Pollutants are keeping on added by human actions and natural processes to the groundwater system. Solid wastes from Industries are being dumped on open land and are reacting with infiltrating rainwater and reach the groundwater. The groundwater is polluted with a number of dissolved chemicals with percolating water which reaches the aquifer system. Water pollution is a serious threat that affects water quality, human health, economic development, and social well being. Therefore, it is essential to evaluate groundwater quality at regular intervals and creating a database for future water resources development strategies.

Revised Manuscript Received on 22 May 2019.
***** Correspondence Author
Durgasrilakshmi Hari*, Assistant Professor, Department of Civil Engineering, Vardhaman College of Engineering, Hyderabad (Telangana), India.

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an open access article under the CC-BY-NC-ND license http://creativecommons.org/licenses/by-nc-nd/4.0/

II. STUDY AREA DESCRIPTION

The considered study area Kattedan industrial area is situated in the Rajendranagar Municipality of Ranga Reddy District. It is located 78.45 East longitudes and 17.3025 north latitude of Hyderabad City. Kattedan industrial area is completely surrounded by micro, small and medium scale industries of 535 units. The highest and lowest elevation in the study ranges from 570 to 520m above MSL.

The average rainfall of 750mm and monthly mean temperatures range from 18 ^{o} C to 35^{o} C. Kattedan Industrial area map is shown in Fig. 1. The study area considered is a mixed cluster of different industries such as food industry, engineering workshops, plastic and rubber units, metal melting, chemicals, formulation units, paint mixing, oil mills, etc [5].

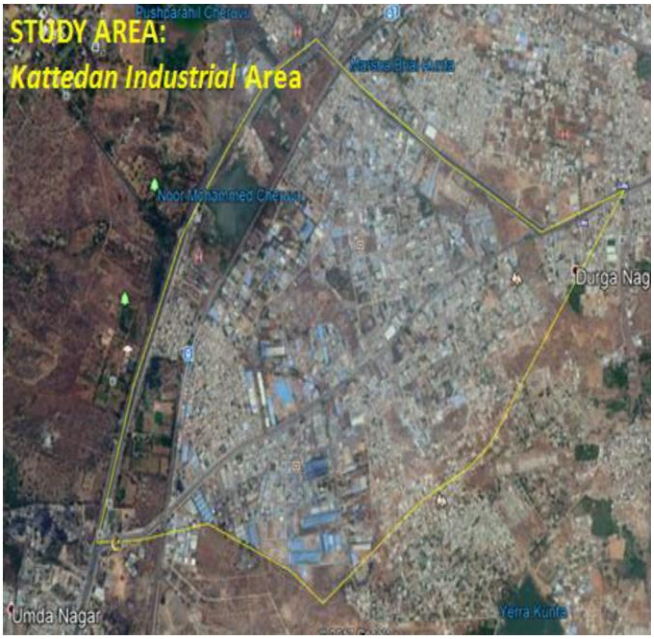

Fig 1: Study Area Map

III. PURPOSE OF PROJECT

In Kattedan industrial area many industries discharge their generated liquid wastes and solid wastes into nearby sewers and water resources and on the Open land along roads and lakes (Fig 2). The industrial wastes consist of significant amounts of hazardous chemicals and their by-products. The groundwater pollution problem has become so acute in most of the parts of the study area. Hence groundwater resources may be deteriorated and human health gets affected except necessary steps for regular water quality assessment and mitigation are taken.

Fig 2: Liquid Effluent and solid waste disposal on open land in Kattedan industrial area

IV. OBJECTIVES OF THE STUDY

- To conduct physicochemical analysis of groundwater.
- To determine the intensity of the groundwater pollution.
- To identify the extent of the affected area due to groundwater contamination.
- To generate awareness among the people about the groundwater contamination and the problems related to health problems.

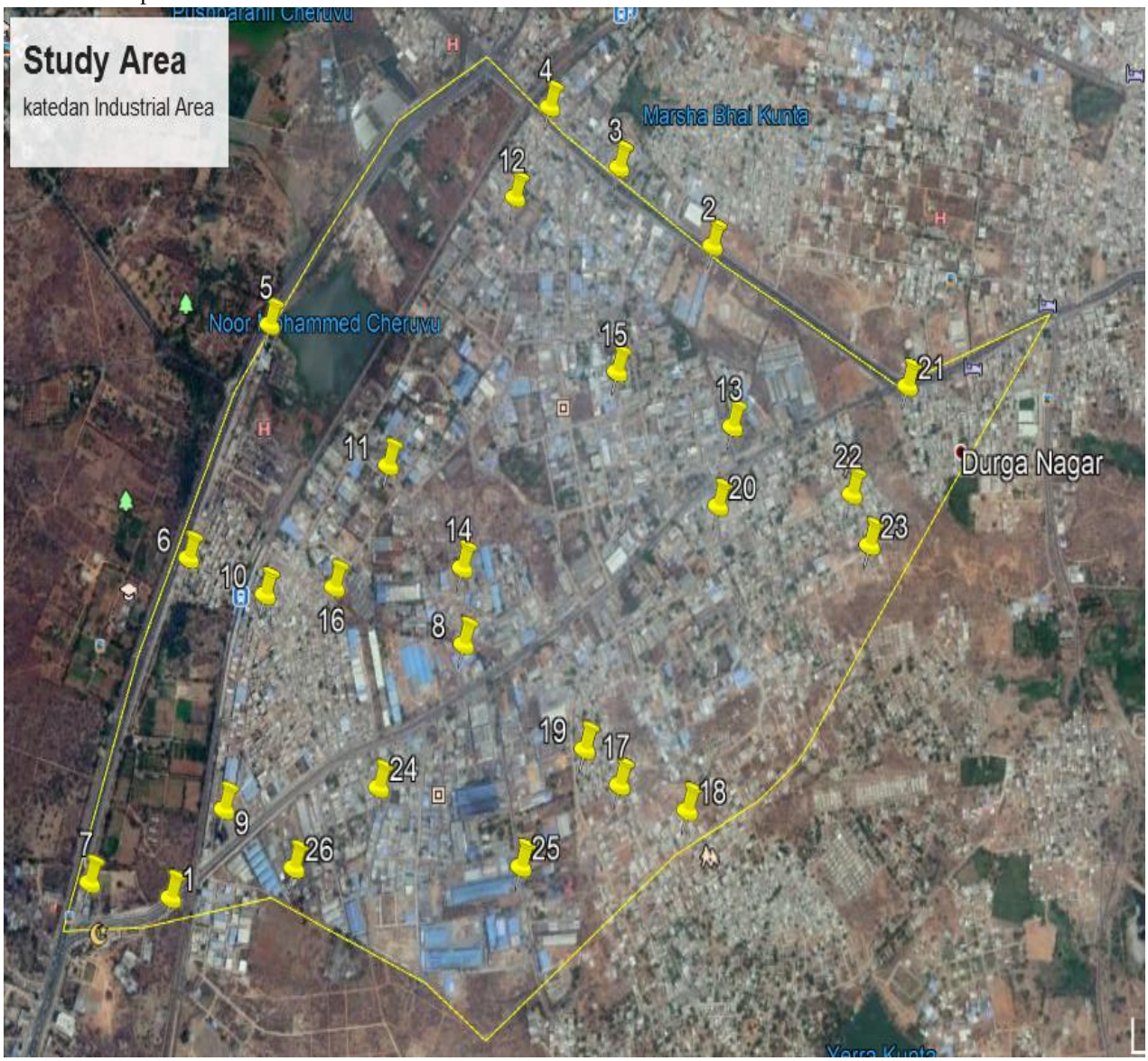

Fig 3: Pictorial Representation of Collected Water Samples Location

V. DATA AND METHODOLOGY

Around 26 water samples were collected in Kattedan industrial area to assess the physicochemical characteristics of groundwater. The collected water Samples were stored in one liter capacity clean sample bottles. Fig 3 shows the pictorial representation of collected water samples with location and the Table 1 shows the details of the sample location.

Table 1: Location of the water samples along with their Latitudes and Longitudes

S. No	Colony Name	Location Name	Latitude	Longitude
1	Gaganpad	Amavari Temple	17.302799	78.423106
2	Babul Derry	Grand Funtion Hall	17.316997	78.438598
3	Nawab shahed Kunta	Lucky Motors	17.318795	78.435801
4	Saibaba Nagar	Soumany Plywood	17.320197	78.4337
5	Netaji Nagar	Idly Tiffin Centre	17.315234	78.425479
6	Netaji Nagar	Ashok Kumar	17.310062	78.42314
7	Gaganpad	Narsing Rao House	17.303112	78.420749
8	Orange Cargo Carriers	Srinivas House	17.308195	78.431402
9	Sri Ram Nagar	Shakeel House	17.304669	78.424579
10	Sri Ram Nagar	Vital House	17.30927	78.425603
11	Sri Ram Nagar	Vivekanad House	17.312094	78.429093
12	Saibaba Nagar	Netha House	17.418098	78.43271
13	State Highway	Sai Grammar School	17.312939	78.439193
14	State Highway	Amma Garden	17.309848	78.43431327
15	Old Kurnool Road	LG Air Conditionar	17.314155	78.435794
16	Sri Ram Nagar	Shyam Nayak House	17.309433	78.4276
17	Adasha Colony	Pochama Temple	17.305187	78.43951
18	Sai Colony	Deepee Transport. Co	17.3046	78.437899
19	NGOS Colony	Ayyapa Temple	17.305951	78.43494
20	Ganesh Nagar	Poineer School	17.311197	78.438771
21	Durga Nagar	Ravi Brillant School	17.313856	78.444352
22	NGOS Colony	Narsimha House	17.311456	78.442688
23	NGOS Colony	Krishna Reddy House	17.310331	78.443171
24	NGOS Colony	Sai Genral Stores	17.305136	78.429036
25	NGOS Colony	Srinivas Bola House	17.303474	78.433156
26	Mudhubau Colony	Ramayya House	17.303431	78.42665

The thirteen different parameters are analyzed from the 26 samples as per the customary procedures. Table 2 represents the adopted method, instruments and chemicals used for the physicochemical characteristics analysis of various parameters of the water samples.

Table 2: Parameters, Testing Methods, Instruments and Chemicals Used for Physicochemical Characteristics Analysis

S. No	Parameters	Testing Method	Instruments used	Chemicals used
1	pH	Electrometric Method	pH meter	Buffer tablets
2	Colour	Platinum Cobalt Method	UV-Spectrophotometer	-
3	Dissolved Oxygen	Membrane electrode method	DO Meter	Potassium Chloride Solution
4	Turbidity	Electrometric Method	Nephelometric turbidity meter	-
5	Conductivity	Wheat-stone bridge principle Method	Digital Conductivity meter	Standard KCl Solution
6	Alkalinity	Titration Method	Pipette, Burette, Conical flask	Sulphuric acid, Methyl orange inidicator, Phenolphthalein inidcator
7	Total dissolved solids	Electrometric Method	Digital TDS meter	-

8	Chlorides	Titration Method	Pipette, Burette, Conical flask	Potassium Chromate indicator, Silver Nitrate
9	Phosphates	Spectrophotometric method	UV-Spectrophotometer	Phosphates Reducing Reagent, Phosphate acid reagent
10	Nitrates	Spectrophotometric method	UV-Spectrophotometer	Nitrate Spectrophotometric Grade Tablets
11	Hardness	Titration Method	Pipette, Burette, Conical flask	Buffer solution, Eriochrome black T indicator, Muroxide Indicator, NaOH (2N), Standard EDTA Solution 0.01M, Standard Calcium Solution.

VI. RESULTS AND ANALYSIS

The present study aimed at the changes in the groundwater quality to assess the intensity of pollution in the different locations of Kattedan industrial area. The results of physicochemical analysis of Ground Water samples are presented in Table 3.

Table 3: Results of Physicochemical analysis of Ground Water samples

SAMPLE NO	pH	COLOUR (HU)	DO (ppm)	TURBIDITY (NTU)	CONDUCTIVITY (µS/cm)	ALKALINITY (ppm)	TOTAL DISSOLVED SOLIDS (ppm)	CHLORIDES (ppm)	PHOSPHATES (ppm)	NITRATES (ppm)	CALCIUM HARDNESS (Ca) (ppm)	MEGNESIUM HARDNESS (Mg) (ppm)	TOTAL HARDNESS (ppm)
1	7	**9**	5.5	**81.4**	**1000**	90	**1850**	**750**	**1.8**	1	**430**	**695**	**1125**
2	6.49	**9**	4.4	**4.2**	**1000**	100	**6420**	**800**	**0.34**	12	**255**	**225**	**480**
3	6.78	**8**	6.8	0.7	**1110**	60	**2280**	**1000**	**0.7**	1	**195**	**1205**	**1400**
4	6.7	**27**	4.9	**13.3**	**1000**	170	**1880**	250	**0.24**	2	**600**	**440**	**1040**
5	6.98	**15**	4.5	0.7	**1000**	50	**2050**	**1500**	**0.26**	1	**305**	**430**	**735**
6	6.74	4	**3.1**	0.6	**1000**	100	**1550**	**1350**	**0.16**	5	**455**	**350**	**805**
7	6.68	**6**	**2.9**	0.9	**1000**	40	**2420**	**650**	**0.12**	2	**630**	**655**	**1285**
8	6.95	**7**	4.9	**2.4**	**1000**	90	**1980**	**1422**	**0.2**	3	**535**	**755**	**1290**
9	6.83	**12**	**3.4**	**100**	**1000**	30	**2230**	**950**	**0.17**	2	**905**	**445**	**1350**
10	6.89	**6**	**3.5**	**21.2**	**1470**	150	**1010**	**785**	**0.16**	1	**525**	**500**	**1025**
11	6.74	4	**2.3**	0.9	**1570**	70	**1010**	**666**	**0.58**	16	**515**	**210**	**725**
12	7.01	**7**	4.3	0.7	**1000**	30	**4230**	**280**	**0.27**	5	**2005**	**860**	**2865**
13	6.64	**6**	**3.7**	**2.6**	**1000**	110	**4850**	**2562**	**0.22**	3	**870**	**560**	**1430**
14	6.65	4	**3.5**	0.9	**1000**	40	**1930**	**1111**	**0.14**	2	**550**	**365**	**915**
15	6.74	**5**	**3.5**	**11.6**	**1000**	70	**2070**	**822**	**0.29**	2	**650**	**585**	**1200**
16	6.69	**5**	**3.4**	**2.7**	**1000**	20	**2300**	**658**	**2.14**	3	**785**	**395**	**1180**
17	6.64	**13**	**2.6**	**1.6**	**1460**	50	**1080**	**1212**	**0.45**	13	**410**	**330**	**740**
18	6.66	**11**	4.3	1	**1970**	60	**1540**	**1352**	**0.41**	5	**700**	**145**	**845**
19	**6.3**	4	4.3	**12.3**	**1150**	40	**7210**	**1488**	**0.26**	3	**245**	**180**	**425**
20	6.93	**9**	4.7	**2.4**	**1350**	70	**9300**	**1265**	**0.29**	23	**475**	**505**	**980**
21	6.59	**15**	**3.6**	**2.9**	**1320**	20	**8710**	**685**	**0.38**	4	**430**	**520**	**950**
22	6.86	**8**	**2.8**	**1.9**	**1250**	50	**7830**	**925**	**1.22**	22	**260**	**695**	**955**
23	**8.88**	**9**	**3.4**	**8.3**	**450**	70	**2710**	**989**	**1.46**	2	**165**	**155**	**320**
24	6.51	**27**	**1.7**	**35.2**	**1310**	90	**8130**	**258**	**0.19**	1	**580**	**585**	**1165**
25	7.04	4	**3.4**	**3.7**	**1560**	110	**1060**	**1908**	**0.21**	27	**570**	**575**	**1145**
26	6.5	9	**3**	**1.8**	**1280**	60	**8100**	**252**	**1.2**	11	**790**	**145**	**935**

The obtained physicochemical analysis results of Groundwater samples of Kattedan industrial area are compared with the BIS (IS: 10500): 2012 Drinking water quality standards and the Comparative result summary is shown in Table 4. The samples which do not meet the drinking water desirable specifications as per BIS are shown in bolded numbers in Table 3. Table 5 represents the potential risks and effects of tested groundwater quality parameters according to USEPA guidelines. Understanding the potential health effects of poor groundwater quality parameters is essential to plan treatment facilities and to safeguard human health.

Table 4: Comparative statistical summary of the physicochemical parameters analyzed

S. No	Parameters	BIS 10500 : 2012 Drinking Water —Specification Desirable - Permissible	Ground Water Quality ranges in Study Area
1	pH	6.5 to 8.5- No relaxation	6.3-8.88
2	Colour(HU)	5-15	4-27
3	Dissolved Oxygen(ppm)	4-6 BIS (1991)	1.7-6.8
4	Turbidity(NTU)	1-5	0-100
5	Conductivity (µS/cm)	300-600 (WHO/ICMR)	450-1970
6	Alkalinity(ppm)	200-600	20-170
7	Total dissolved solids(ppm)	500-2000	1010-9300
8	Chlorides(ppm)	250-1000	252-2562
9	Phosphates(ppm)	0.08-0.1	0.12-2.14
10	Nitrates(ppm)	45-No relaxation	0-27
11	Total Hardness(ppm)	200-600	320-2865
12	Calcium Hardness(ppm)	75-200	165-2005
13	Magnesium Hardness(ppm)	30-100	145-1205

Table 5: Potential risks and effects of tested groundwater quality parameters with USEPA guidelines

S. No	Parameters	Risks or Effects
1	pH	Low pH - corrosion, metallic taste High pH – bitter/soda taste, deposits, Affects mucous membrane; affects aquatic life
2	Colour(HU)	Visible tint, acceptance decreases
3	Dissolved Oxygen(ppm)	D. O. corrodes water lines, boilers and heat exchangers, at low level marine animals cannot survive.
4	Turbidity(NTU)	Higher level of turbidity is associated with disease causing bacteria's.
5	Conductivity(µS/cm)	Conductivity due to ionizable ions. High conductivity increases corrosive nature of water.
6	Alkalinity(ppm)	Low Alkalinity (i.e. high acidity) causes deterioration of plumbing and increases the chance for many heavy metals in water are present in pipes, solder or plumbing fixtures.
7	Total dissolved solids(ppm)	Hardness, scaly deposits, sediment, cloudy colored water, staining, salty or bitter taste, corrosion of pipes and fittings
8	Chlorides(ppm)	High blood pressure, stomach discomfort. Salty taste, corroded pipes, fixtures and appliances, blackening and pitting of stainless steel.
9	Phosphates(ppm)	Algal growth, stimulate microbial growth, Rancidity Mold growth
10	Nitrates(ppm)	Methemoglobinemia or blue baby disease in infants
11	Hardness(ppm)	Scale in utensils and hot water system, soap scums, Deterioration of the quality of clothes.

VII. CONCLUSION

The ground water within industrial area has very high content of Total dissolved solids , Turbidity, Conductivity, Colour, DO, chlorides, Phosphates and Mg, Ca and Total Hardness showing that the industrial effluents are causing direct contamination of water, and are also responsible for potential health problems. The obtained results are not within the BIS standards of drinking water indicating poor Ground Water quality in the study area. Improper and untreated disposal of domestic sewage, Industrial wastewater, and other anthropogenic actions are the major causes for pollution of Groundwater in the Kattedan Industrial area. Treatment units must be installed at effluent outlets in Industries to reduce intensity of pollutants.

Drinking water in the study area needs precautionary measures with respect to quality before consuming in order to save the people from undesirable health effects. The state and central Governments should come forward for continuous monitoring of water quality and enacting suitable laws and implementing them strictly to control the deterioration of ground water quality in the Kattedan industrial area.

ACKNOWLEDGEMENT

The author is very thankful to the Vardhaman College of Engineering, Hyderabad for providing necessary lab-oriented facilities.

REFERENCES

1. APHA (1998) Standard methods for the examination of water and wastewater, 20th edition, American Public Health Association, Washington D. C, USA. (1998)
https://www.mwa.co.th/download/file_upload/SMWW_1000-3000.pdf
2. BIS (IS: 10500) (2012) Bureau of Indian Standards Specification for Drinking Water. (2012)
http://cgwb.gov.in/Documents/WQ-standards.pdf
3. Dorairaju, S.V. & Narasimha Rao, C & Bujagendra Raju, M & Chalapathi, P.V. Analysis of Drinking Water Quality and its Impact on Human Health in Chandragiri, Near Tirupati, India. Biosciences Biotechnology Research Asia. 10. 379-381. 10.13005/bbra/1139. (2013)
4. Karanth K. R Groundwater assessment, Development and management, Tata-McGraw Hill Publishing Company Limited, New Delhi, p.720. (1987)
https://www.scirp.org/(S(lz5mqp453edsnp55rrgjct55))/reference/ReferencesPapers.aspx?ReferenceID=1342371
5. K.B. Rekha and M.V.S.S. Giridhar Assessment of Water Quality Index of Groundwater Economical Hybrid Power SystemsSamples in Kattedan Industrial Area, Ranga Reddy District, Andhra Pradesh, India. (2014)
https://www.researchgate.net/publication/265908533.
6. Mushtaq Hussain and T. V. D. Prasad Rao Assessment of the ground water quality and its suitability for drinking and irrigation purposes: A case study of Patancheru, Andhra Pradesh, India" Arch. Appl. Sci. Res., 5 (6):232-238. (2013)
https://www.scholarsresearchlibrary.com/articles/assessment-of-the-ground-water-quality-and-its-suitability-for-drinking-and-irrigation-purposes-a-case-study-of-patanche.pdf
7. Rao, C.S., Rao, B.S., Hariharan, A.V.L.N.S.H. and Bharathi, N.M, Determination of water quality index of some areas in Guntur district Andhra Pradesh, Int. J. Appl. Bio. Pharm. Tech., I(1). 79-86. (2010)
http://www.sciepub.com/reference/14029
8. Rizwa Reza and Gurdeep Singh, Assessment of Ground Water Quality Status by Using Water Quality Index Method in Orissa, India, World Applied Sciences Journal (12):1392-1397, ISSN 1818-4052. (2010)
https://pdfs.semanticscholar.org/a71b/ce49719b166e2cc87035aaf5166563d62563.pdf
9. Das, S. & Nag, S.K. J Earth Syst Sci (2015) 124: 965. https://doi.org/10.1007/s12040-015-0583-8
10. Kpatinde Talagbe Aime, A. H. Abdul Wahab , Fadina K. S. J , Oting W. K. A, Sinatoko D. B. O. Current Situation of Water Pollution and Human Health in the Republic of Benin, International Journal of Scientific and Research Publications, 8.3. (2018) ISSN 2250-3153. http://dx.doi.org/10.29322/IJSRP.8.3.2018.p7509
11. Mutiu A. Alabi, Gbolahan Idowu, Olalekan H. Oyefuga, Rita M. Sunday, Temitope Olowokere, Folake G. Osanaiye and Stella Odiaka, Assessing the Ground Water Quality in Sagamu Town, Ogun State, South West Nigeria, IOSR Journal Of Environmental Science, Toxicology And Food Technology (IOSR-JESTFT) e-ISSN: 2319-2402,p- ISSN: 2319-2399. 6.3, PP 57-63 (2013), http://www.iosrjournals.org/iosr-jestft/papers/vol6-issue3/J0635763.pdf

AUTHORS PROFILE

Durgasrilakshmi Hari, Assistant Professor, Department of Civil Engineering, Vardhaman College of Engineering, Hyderabad, India.