Assessment of Groundwater Pollution Due To Conventional on-Site Sanitation Systems

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Abstract- *In this work study regarding the pollution of the groundwater in Kopargaon. The physicochemical parameters pH, Total dissolved solids(TDS), Total hardness(TH), Dissolved oxygen(DO), Biochemical oxygen demand (BOD), Chemical oxygen demand (COD), Electrical conductivity(EC), Chloride (Cl), Sulphate (S), Phosphate (Ph), Turbidity, Fluoride (F), Magnesium (Mg), Potassium (K)were analyzed. Ten Groundwater samples were analyzed, in the latter part of may-june 2016 and Nov-Dec 2015.*

The Godavari River, receives all domestic and industrial waste waters from the all part of Kopargaon. The river, with no natural flow in the dry season, is extensively used for, irrigation, fishing and domestic water supply. water samples were collected from nine different points along the river and ground water samples were collected from three irrigation areas along the river. The samples were analyzed for physico-chemical parameters.

The bore groundwater samples are collected during the pre monsoon period i.e., may-June 2016 from the nine boreholes located in the study area.

Groundwater samples are collected during the post monsoon period i.e., Nov-Dec 2016 from the nine boreholes located in the study area.

Keywords- Groundwater, Pollution, Pre monsoon, Post monsoon.

I. INTRODUCTION

1.1 Background Information

Water is essential to the existence of man and all living things. Water is a crosscutting element of the growth and poverty reduction strategy (GPRS) and is linked to the entire Millennium Development Goal. Improving water services and uses are essential for increasing hygiene and sanitation service levels that affect productive lives of people.

1.1.1 General

India is a tropical county with a vast diversity of climate, topography and vegetation. Though blessed with fairly high annual rainfall, it is not uniformly distributed in time and space resulting in bulk of the rainfall escaping as runoff. The scarcity of surface water especially in the lean season in most parts of the country means that groundwater plays a decisive role. Groundwater may be considered as one of the most precious and one of the basic requirements for human existence and the survival of mankind providing him the luxuries and comforts in addition to fulfilling his basic necessities of life and also for industrial and agricultural development thus being a very important constituent of our eco-system. Poor health in developing countries is largely due to diseases like cholera, dysentery, gastroenteritis andworm infections carried by contaminated food water. Effective sanitation is an important way of reducing the incidence of such diseases.

1.2 Groundwater pollution

Groundwater pollution (also called groundwater contamination) occurs when pollutants are released to the ground and make their way down into groundwater.

1.3 Importance of groundwater

Groundwater constitutes some 97% of all freshwater that is potentially available for human use. Groundwater is therefore of fundamental importance to human life. When rain falls, a part infiltrates the soil. While a proportion of this moisture will be taken up by plants or evaporate back into the atmosphere, some will infiltrate more deeply, eventually accumulating as an underground water body or reservoir.

1.4 Objectives

1. Study of groundwater quality in the selected areas of Kopargaon.
2. To assess the Physico-chemical parameters of Groundwater.
3. To study the seasonal (i.e., pre-monsoon and post-monsoon) variation of Physico-chemical parameters at selected stations.

4. To find out Water Quality Index (WQI) for Pre monsoon and Post monsoon results**.**

II. LITERATURE REVIEW

DoulayeKoné, et al [1] have studied in Low-Cost Options for Pathogen Reduction and Nutrient Recovery from Faecal Sludge Recently, the application of excreta-based fertilizers has attracted attention due to the strongly increasing prices of chemically produced fertilizers. Faecal sludge from on-site sanitation systems is rich in nutrients and organic matter, constituents which contribute to replenishing the humus layer and soil nutrient reservoir and to improving soil structure and water-holding capacity. Hence, it represents an important resource for enhancing soil productivity on a sustainable basis. However, there is little in the scientific literature about the performance of treatment technology allowing recovery of nutrient resources from human waste. This paper reviews the state of knowledge of different processes that have been applied worldwide. Their pathogen removal efficiency as well as nutrient and bio solids recovery performances are assessed. The chapter outlines the gaps in research for further development

B.Dzwairoet al [2] have studied in resource-poor and low-population-density areas, on-site sanitation is preferred to off-site sanitation. However, its groundwater pollution potential in such areas conflicts with IWRM principles that advocate for sustainability of water resources in terms of both quality and quantity. Given the widespread use of shallow groundwater for domestic purposes in rural areas, maintaining groundwater quality is a critical livelihood intervention. Results indicated that pit latrines were microbiologically impacting on groundwater quality up to25m distance, raising fears of exposure to pathogens associated with coli forms. Nitrogen values were of no immediate threat to health. The shallow water table increased pollution potential from pit latrines. Raised pit latrines and other low-cost technologies could be considered to minimize potential of groundwater pollution

III. METHODOLOGY

This topic consist about of result of physico-chemical parameters of groundwater in selected bajartal area of Kopargaon.

3.1 Study Area: Kopargaon is a town and a municipal council in Ahmednagar district in the Indian state of Maharashtra. Study area has been selected in kopargaon town having onsite sanitation as the preferred mode of disposal of the excreta. It was also ensured that groundwater sources are available in the vicinity of the on-site sanitation systems. Sampling locations were identified in the vicinity .For physico-chemical parameters, the samples were collected in pre-cleaned 1000-ml bottles. The bottles were cleaned with double distilled water before sampling sanitation systems Sampling locations. Were identified in the vicinity .For physico-chemical parameters, the samples were collected in pre-cleaned 1000-ml bottles. The bottles were cleaned with doubled distilled water before sampling.

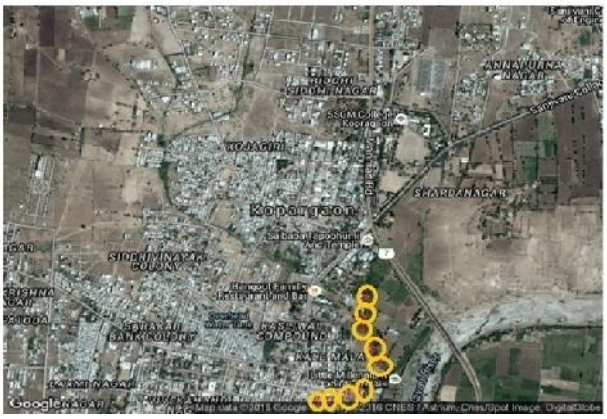

Figure 3.2 Samplinglocation in Kopargaon (study) area

IV. RESULT AND DISCUSSION

In this topic Results of physicochemical parameters of selected sampling stations is discussed in detail.

4.1 A) Physicochemical analysis of ground water quality parameters during Pre Monsoon.

Overall results of Groundwater samples at pre monsoon season:

1. pH

pH value of water samples were varying from 7.35 to 7.98 and these values are within the limits prescribed by ISI and WHO.

2. Total Dissolved Solids

TDS level was found between 1196 to 1375 mg/l. which is very higher than permissible limit.

3. Total hardness

Hardness indicates 300 to 416 mg/l which is within permissible limits

4. Dissolved Oxygen

samples were found D.O. 6.2 to 7.15.

5. Biochemical Oxygen Demand (BOD)

The BOD in the groundwater shows a range of 2.9 to 3.68 mg/l.It is below 5 mg/l so which is within permissible limits.

6. Chemical Oxygen Demand (COD)

The COD in the groundwater shows a range of 9.0 to 9.31 mg/l . It is below 10 mg/l so which is within permissible limits.

7. Electrical conductivity

The Electrical conductivity range between 2100 to 2197 mg/l.

8. Chloride

Concentration of chloride vary from 213 to 291 mg/l. Obtained range which is slightly higher than permissible limits.

9. Sulphate

The Sulphate in the groundwater range from 217 to 240 mg/l . It is in between 200 to 400 mg/l so which is within permissible limits.

10. Phosphate

All values of Phosphate are less than 0.1.

11. Turbidity

Turbidity should be limited upto 5 mg/l & maximum permissible value is 10 mg/l. it indicates 5.4 to5.9 mg/l which is within permissible limits.

12. Fluoride

The fluoride content in the groundwater range from 1.2 to 1.4 mg/l. In all samples fluoride concentration is in permissible limit. According to recommendation of WHO maximum permissible level of fluoride should be below 1.5 mg/l.

13. Magnesium

Concentration of magnesium was observed between 1.52 to 1.68 mg /l.

14. Potassium

Concentration of Potassium was observed between 38.9 to 40.0 mg /l.

B) Physicochemical analysis of ground water quality parameters during Post Monsoon

Overall results of Groundwater samples at pre monsoon season:

1. pH

pH value of water samples were varying from 6.20 to 7.10 and these values are within the limits prescribed by ISI and WHO.

2. Total Dissolved Solids

TDS level was found upto1011 to 1245 mg/l. which is very higher values than permissible limit. As per standard greater than 600 mg/l unacceptable for drinking purpose.

3. Total hardness

Hardness is indicates 128 to 254 mg/l which is within permissible limits.

4. Dissolved Oxygen

D.O. of sample is between 4.05 to 4.87 mg/l..

5. Biochemical Oxygen Demand (BOD)

The BOD in the groundwater range between 1.05 to 1.98 mg/l. It is below 5 mg/l so which is within permissible limits.

6. Chemical Oxygen Demand (COD)

The COD in the groundwater range between 8.0 to 8.29 mg/l. It is below 10 mg/l so which is within permissible limits.

7. Electrical conductivity

The Electrical conductivity are range between 2006 to 2088 mg/l.

8. Chloride

chloride vary from 191 to 208 mg/l. . Obtained range which is slightly higher than permissible limits.

9. Sulphate

The Sulphate in the groundwater shows a range of 120 to 130 mg/l.

10. Phosphate

All values of Phosphate are less than 0.1.

11. Turbidity

Turbidity vary between 3.6 to3.9 mg/l which is within permissible limits.

12. Fluoride

The fluoride content in the groundwater shows a range of 1.06 to 1.2 mg/l.

13. Magnesium

Concentration of magnesium was observed between1.28 to 1.41 mg /l.

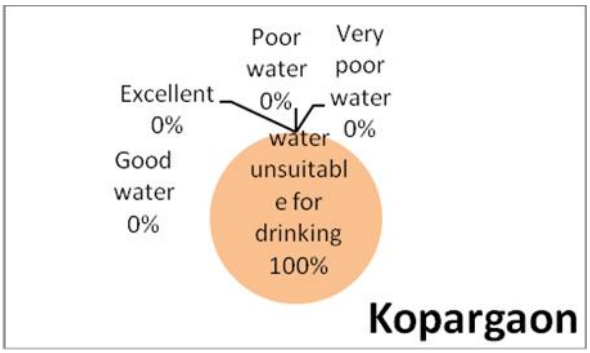

Figure 4.1Groundwater quality status at Kopargaon.(Pre monsoon)

V. CONCLUSION

The bore well groundwater samples are collected during the pre monsoon period and post monsoon period i.e., April-may 2016 and Nov-dec 2015 from the nine bore well holes located in the study area. The quality analysis has been carried out for the parameters like pH, Total dissolved solids(TDS), Total hardness(TH), Dissolved oxygen(DO), Biochemical oxygen demand (BOD), Chemical oxygen demand (COD), Electrical conductivity(EC), Chloride (Cl), Sulphate (S), Phosphate (Ph), Turbidity, Fluoride (F), Magnesium (Mg), Potassium (K) by following the standard methods prescribed as per IS codes.

- The pH value of water samples were varying from 7.35 to 7.98 and these values are within the limits prescribed by ISI and WHO.
- The TDS level was found between 1196 to 1375 mg/l, which is very higher values than permissible limit. As per standard greater than 600 mg/l unacceptable for drinking purpose.
- For potable water the TH should be limited upto 300 mg/l & maximum permissible value is 600mg/l. Hardness for various sample is between 300 to416 mg/l which is within permissible limits.
- Dissolved oxygen for various sample is between 6.2 to 7.15.
- The BOD in the groundwater shows a range of 2.9 to 3.68 mg/l.
- The COD in the groundwater shows a range of 9.0 to 9.31 mg/l .
- The Electrical conductivity range between 2100 to 2197 mg/l.
- Concentration of chloride vary from 213 to 291 mg/l.
- The Sulphate in the groundwater range between 217 to 240 mg/l.
- All values of Phosphate are less than 0.1 mg/l.
- Turbidity vary from 5.4 to 5.9 NTU which is within permissible limits.
- The fluoride content in the groundwater shows a range of 1.2 to 1.4 mg/l. Concentration of magnesium was observed between 1.52 to 1.68 mg /l.
- Concentration of Potassium was observed between 38.9 to 40.0 mg /l.

As per results in pre monsoon and post monsoon period all values of water quality index (WQI) are greater than 300 so these water are unsuitable for drinking. These water are only useful for the domestic purpose.

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