International Journal of Engineering Science Invention (IJESI)
ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726
www.ijesi.org ||Volume 8 Issue 04 Series. I || April 2019 || PP 31-35

Impact of Urbanization and Industrialization on Ground Water and Soil Quality - Dasarahalli Zone, Bangalore City

Savitha A L [1], Dr. B C Nagendra Prasad [2]
[1] *Research Scholar, MIT, Mysore, Karnataka, India*
[2] *Professor and Head, Department of Civil Engineering, MIT Thandavapura, Mysore, Karnataka, India*
Corresponding Author: Savitha A L

Abstract : *Groundwater is a precious and most widely distributed resource of the earth. The rapid pace of industrialization that has nowadays become the need of the hour for a developing country like India is a major source of groundwater pollution. A good number of industries of different types which have been established in the conurbation of Bangalore have been loading the environment with ever increasing levels of pollutants which are entering the soil/water and degrading the quality of groundwater. In this study a total number of 20 ground water samples were collected from different locations of Dasarahalli zone which included Peenya Industrial Area and analyzed for various Physical and Chemical properties such as pH, Alkalinity, Chloride, Calcium, Magnesium, Total dissolved solids, Total hardness and Nitrate in the Laboratory using analytical methods. Water quality of the study area is determined using a tool known as Water Quality Index (WQI). The WQI for the study area ranges from 12.4 to 9189.96. The high values of WQI is due to high values of Chromium, Nickel, Cadmium, Iron, Lead, TDS, TH, Calcium, Magnesium, Nitrate, Chloride, and Alkalinity. Soil samples were collected to investigate both distribution and migration of heavy metals in soil profile. The concentrations of heavy metals viz. Iron, Chromium, Cadmium and Lead in soil were analyzed. The present analysis reveals that ground-water and soil of the study area needs some degree of treatment and should be protected from future contamination.*

Keywords – *Water Analysis, Quality Assessment, Water Pollution, Heavy Metals, Industrial Area.*

Date of Submission: 29-03-2019 Date of acceptance: 09-04-2019

I. Introduction

Water is essential for sustenance of life. India, like any other developing country of the world, is facing increasing environmental problems. The vast population and ever increasing industrial activities in India, makes its water resources more vulnerable to water quality deterioration. The groundwater resources are at higher risk as its remediation is very difficult. The major anthropogenic activities for continuous groundwater quality deterioration are urbanization, industrialization, and agriculture run off. Also the problem of drinking water contamination, water conservation, and water quality management has assumed a very important role for sustainable development of countries, such as India. During the past two decades, the water level in several parts of India has been falling rapidly due to an increase in extraction. The quality of water is vital owing to its suitability for various purposes since it is directly linked with human welfare. Groundwater quality variation is a function of physical and chemical patterns in an area influenced by geological and anthropogenic activities. The good number of industries of different types which have been established in the conurbation of Bangalore has been loading the environment with ever increasing levels of pollutants. These pollutants may enter the soil/water and degrade the quality of groundwater. Besides, discharge of untreated wastewater through bores and leachate from unscientific disposal of solid wastes also contaminate groundwater, thereby reducing the quality of freshwater resources.

II. Details Of The Study Area

Bangalore city lies between Latitude $12^0 52^1 21^{11}$ to $13^0 6^1 0^{11}$ and East Longitude $77^0 0^1 45^{11}$ to $77^0 32^1 25^{11}$covering over an area of approximately 400 sq.km. The study area taken, that is Dasarahali zone, is covered in part of the Survey of India Topo sheet No. 57 H/9. The area covering about 50.88 sq.km lies to the Northern part of Bangalore city and houses more than2100 industries dominated by chemical, leather, pharmaceutical, plating, polymer and allied industries. Nearly 200 million cusecs of water is brought into the city through the urban water supply system. A large portion of water is distributed through old pipelines and leaking public fountains (stand posts). The leakage of wastewater infiltration from damaged sewers could cause at least 10percent of sewage to infiltrate into ground water. This leakage would partially offset the decreased infiltration from built-up surfaces in the city. In Dasarahalli zone the Peenya Industrial AREA (PIA) or Peenya

Industrial Estate (PIE), located about 18 kms from the heart of Bangalore on either side of National Highway no 4, connecting Bangalore-Pune, reigns as the largest industrial estate in South Asia. Set up in1978 with a handful of units, PIE today sprawls over an area of 40 sq km as three stages and four phases and has a population of about 3, 80,000. Units of all sizes are located in study area .Nearly 2,500 of them are small units. Though this is only one of the dozen industrial estates abutting Bangalore, it is the most prominent. These industries are engaged in a range of manufacturing and service activities in engineering and agricultural equipment, chemical, pharmaceutical, electrical, electronics, electroplating, building materials, automotive parts, castings, foundries, forgings, garment sand scientific instruments. Garment making and exporting units alone number 100 and form a big group at the dasarahalli.

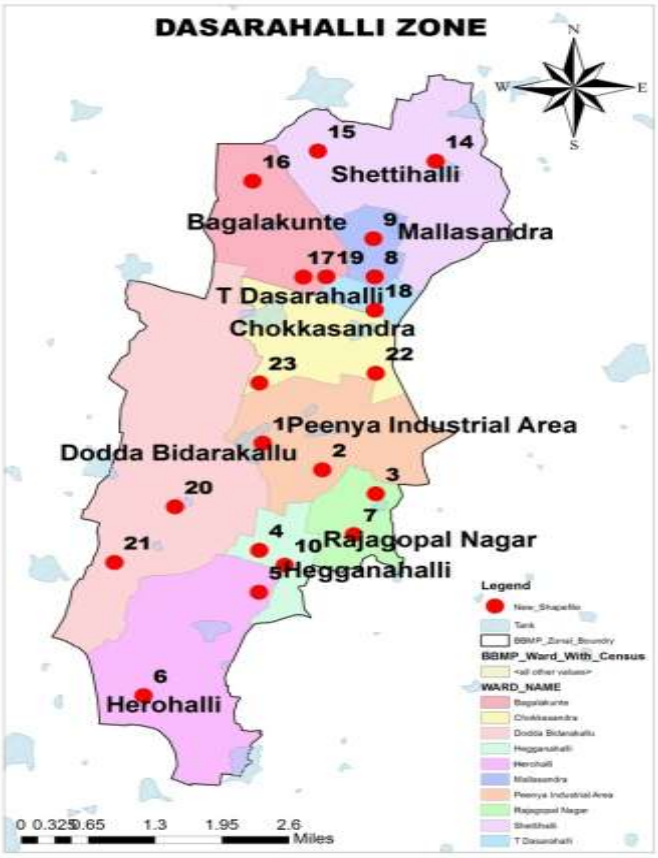
Map showing the study area

III. Methodology

Quantitative measurements of quality parameters in natural water serve as keystone to address the basic environmental problems. Most of the problems in environmental engineering/sciences must be approached initially in a manner that will define the problem. Adopting suitable analytic methods and procedures that have been provided to yield results can achieve this satisfactorily.

Sampling Technique

Probability sampling design, which is also known as random sampling, has an equal chance of inclusion of every item of an object in the sample. Random sampling ensures the law of statistical regularity, which states that if on an average, the sample chosen is a random one; the sample will have the same composition and characteristics as the object under consideration. This is the reason why random sampling is considered as the best technique of selecting a representative sample and selected for the study



Location map of Dasarahalli zones showing the sample stations

Water samples

Sample Collection, preservation and analysis are doing as per the standard methods. Water samples are taken at each station. The polyethylene sample containers cleaned by 1 mole/L of nitric acid and left it for 2 days followed by thorough rinsing of distilled water. One litre of samples was collected for the analysis. The generally suitable techniques for the reservation of samples followed as per Indian standard methods. The pH, Electrical conductivity, Total Alkanity, hardness chloride Total suspended solids. Nitrate and sulphate are analysed as soon as possible. The samples for trace metal analysis are acidified with concentration HNO3 to bring pH < 2.

Soil samples:

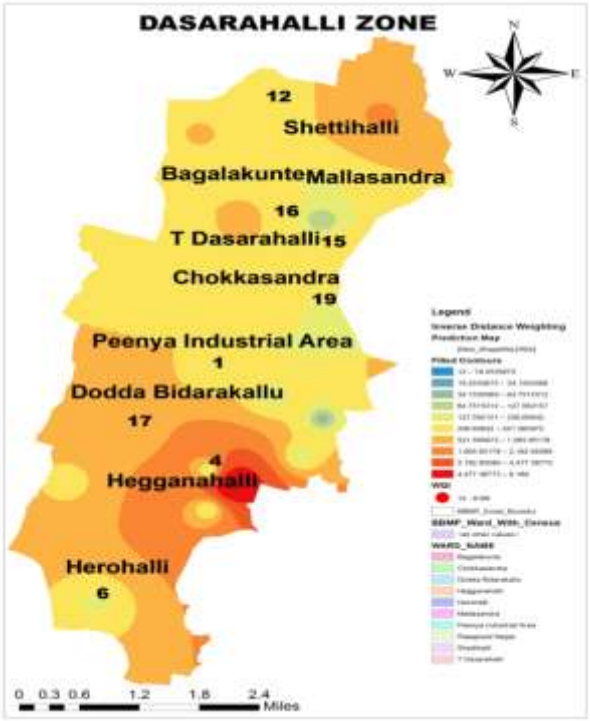
Sample collection, preservation and analysis are doing as per the standard methods. The sampling of soil is by using hand augur. The composite samples collected and they are keeping in the suitable labelled container. The collected soil samples are protected from sunlight to minimise any potential reaction. The dry soil samples for various tests are prepared as per the Indian standard method. The received soil samples dried in sun or air and the pulverization is going to do for that samples. The pulverised soil is passed through the specified sieve and is use for various physico-chemical laboratory analysis.

IV. Results And Discussion

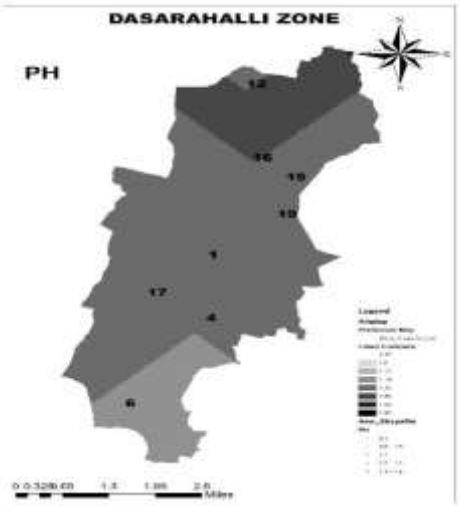
The samples collected from sources are analyzed by using standard procedure for ground water and soil samples. The results obtained were evaluated in accordance with the prescribed under 'Indian Standard Drinking Water Specifications IS 10500(1991) of Bureau of Indian Standards (1991). The obtained results are tabulated in the tables 1 and 2 shown below.

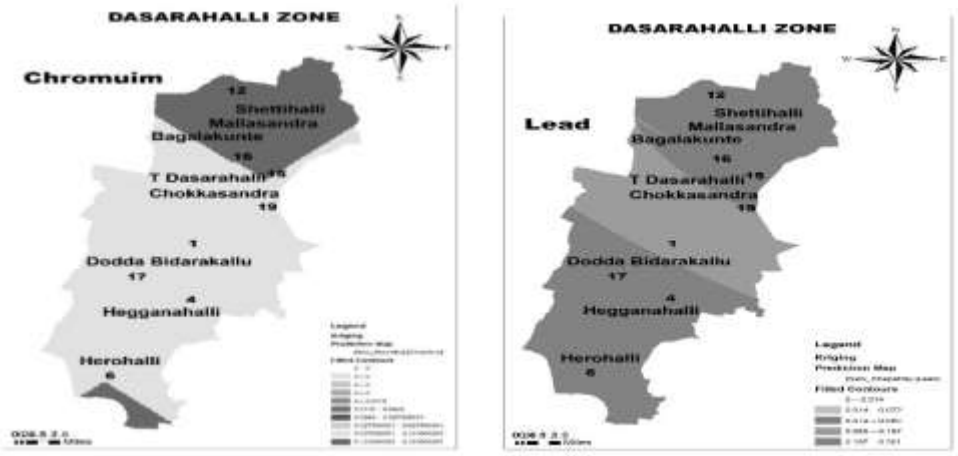
Table 1. WQI values and status of Water Quality

WQI values	Quality of water	Percentage of water Samples
<50	Excellent	25%
50-100	Good	2%
100-200	Poor	15%
200-300	Very poor	18%
>300	Unsuitable for drinking	40%



Spatial distribution of water quality index





Spatial Distribution of Heavy Metals in Soil at Dasarahalli Zone.

V. CONCLUSIONS

The study revealed pH, Chloride and Alkalinity of all the samples are well within the permissible limit, also indicated high to very high nitrate concentration in groundwater, which could lead to blue babies disease in infants along with various other health disorders. The Quality of Groundwater is determined using a technique called water quality index. The results obtained shows that 25% of water samples were found poor quality and 15% of water sample falls under moderately poor category. The water quality index ranges from 12.4 to 9189.96. The distribution study of heavy metal concentration in soil reveals that, the distribution of Chromium concentration is very high, lead and Cadmium concentration is very low in the study area. The migration study of Heavy Metal concentration in soil reveals that, the concentration of the top soil is more as compare to bottom (60 cm) soil. In few of the sampling station which is vice-versa it might be due to runoff the top soil. The parameters exceeding limit can be controlled by adopting proper sewage treatment and disposal mechanism. The wastewater generated from industries should be properly treated and disposed off and strict legislation on industries setting up and operating their effluent treatment plants should be enforced mandatorily and suitable measures should be taken against the industries violating the ETP norms. Any laxity on the part of the authorities may lead to further deterioration in the quality of groundwater.

REFERENCES

[1]. M.S. Nagaraja Gupta and, C.Sadashivaiah, "Assesment of Water Quality In Peenya Industrial Area, Bangalore", International Journal of Research in Engineering and Technology, Volume: 03 Special Issue: 06 | May-2014 | IJRET: eISSN: 2319-1163 | pISSN: 2321-7308

[2]. A. Ramesh, B.S. Nagendra Prakash, "Assessment of Ground Water Quality in Designated Peenya Industrial Area and Estate, Bangalore, India – ACase Study" ,International Journal of Environmental Protection IJEP Vol. 2 Iss. 6 2012 PP. 21-25 www.ij-ep.org ○C World Academic Publishing

[3]. Ronald A. Fleming, Richard M. Adams, and David E. Ervin (1998), "The Role of Soil Test Information in Reducing Groundwater Pollution".Journal of Agricultural and Resource Economics 23(1):20-38.

[4]. T Aravinda1, H B Balakrishna (2013) "Morphometric analysis of Vrishabhavath watershed using Remote Sensing and GIS", International Journal of Research in Engineering and Technology, Volume: 02 Issue: 08

[5]. S.Venkateswaran, S.Vediappan (2013), "Assessment of Groundwater Quality for Irrigation Use and Evaluate the Feasibility Zones through Geospatial Technology in Lower Bhavani Sub Basin, Cauvery River, Tamil Nadu, India". International Journal of InnovativeTechnology and Exploring Engineering (IJITEE), ISSN: 2278-3075, Volume 3, Issue-2.

[6]. P.V. Sivapullaiah (2009), "Effects of soil pollution on Geotechnical behavior of soils", IGC - 2009, Guntur, India.

[7]. Ronald A. Fleming, Richard M. Adams, and David E. Ervin (1998), " The Role of Soil Test Information in Reducing Groundwater Pollution".Journal of Agricultural and Resource Economics 23(1):20-38.

[8]. V Raju, S Manasi , N Latha (2008)"Emerging ground water crisis in urban areas – A case study of ward no. 39, Bangalore city-, Institute for social and Economic change" –Working Paper (196) – www.isec.ac.in wp%20%20196pdf.

[9]. Charmaine Jerome and Anitha Piu(2010)-."Evaluation of water quality index and its impact on the quality of life in an industrial area in Bangalore South India," , India American journal of scientific and industrial research 2010.1.3. 595.60.

[10]. Sivapullaiaih PV, Sadhashivaiah AS. "Assessment of groundwater quality in designated Peenya Industrial Area and Estate, Bangalore, India – A case study". International Journal of Environmental Protection. 2012; 2(6):21-25.

Savitha A L" Impact of Urbanization and Industrialization on Ground Water and Soil Quality - Dasarahalli Zone, Bangalore City" International Journal of Engineering Science Invention (IJESI), Vol. 08, No. 04, 2019, PP 31-35