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Ground Water Quality Analysis and Mapping of District Nuh and Its Surrounding Ecosystem: A Case Study of Nuh, Haryana

Raja Nadir Hussain[1] , Warish[2] , Khurshid Alam[3] , Adil Masood[3]

[1](Dept.of civil engineering, Al-Falah-University, Faridabad India)
[2] (Dept.of civil engineering, Govt Polytechnic Jhajjar, Gurgaon India)
[3] (Dept.of civil engineering, Al-Falah-University, Faridabad India)
[4] (Dept.of civil engineering, Al-Falah-University, Faridabad India)
corresponding auther: rAJA nADIR hUSSAIN

Abstract:*Water, the elixir of life, is a natural resource of utmost importance. Nuh district being a paramount water resource for the Mewat region has been subjected to uncontrolled wastewater disposal. Its 30-km stretch passing through Mewat district has virtually turned into a drain, with water quality unfit for its original purpose i.e irrigation. The quality of water had been severely affected in the past several years due to a rampant release of untreated industrial waste and sewage into the district and lack of mitigating measures. It was observed that the main cause of deterioration in water quality was due to the high anthropogenic activities, illegal discharge of sewage and industrial effluent, lack of proper sanitation, and urban runoff. The study thus presents the current state of the district based on physiochemical water parameters, viz. the temperature, turbidity, total dissolved solid (TDS), pH, biochemical oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen, Sulfate, Phosphate, and total hardness. Apart from the physiochemical investigation, the study also discusses the rise in pollution levels and its effect due to the rapid industrialization in neighboring areas. In the latter phase of this study practical and viable suggestions have been made to overcome this doomed state of affairs.*

Keywords*: Water quality parameters, Nuh district, DO, BOD, COD, total dissolved solids.*

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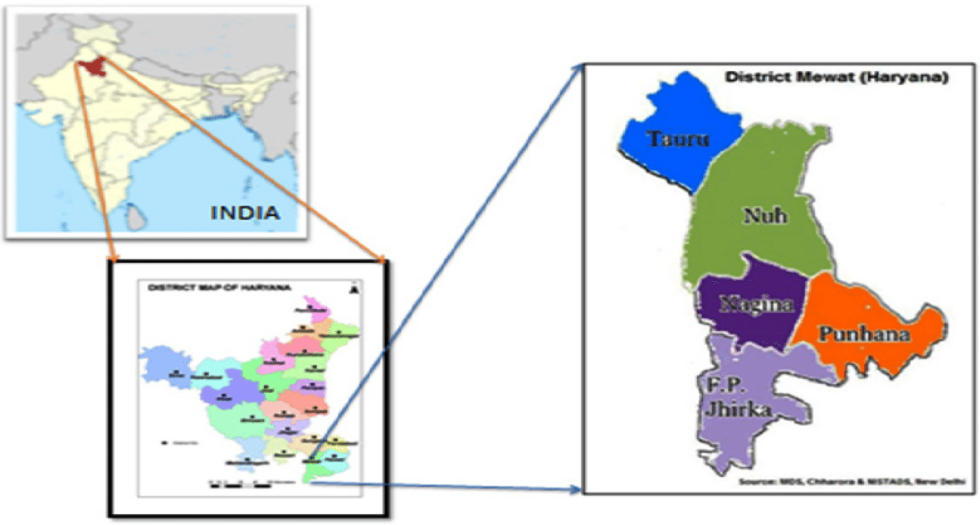
I. Introduction

The major environmental issues of our time are the growing concern about the water quality suitable for use by humans and animals (Calamari and Naeve, 1994). It is a known fact that the water quality condition for the state of Harayana is under a constant threat. Due to rapid industrialization and urbanization water bodies have been subjected to rampant disposal of wastewater (Biney et al., 1994). Water being the elixir of life, influences human settlement patterns, agricultural activities and citing of industries (Nwaugo et al., 2006). In amidst of all this, Water bodies become a subject of uncontrolled dumping of wastes which degrade the quality of water and restrict its further use. (Trouba,2002). The state of Haryana is one of the few states of the country that has a diverse agriculture profile and for this reason it has been divided into agro climatic zones which encourage mass production of rice, wheat, seasoned fruits. In order to preserve its ascendancy in terms of crop production and other diverse agriculture based activities, the state fulfills its water requirements through a number of districts. The various districts operating in the state include Yamuna district. Nuh district,Jui district,Jawaharlal Nehru and Bhakra district. Nuh district being a subsidiary of Yamuna River originates from okhla barrage in Delhi. Flowing through Faridabad and Nuh along a stretch of 50 km, the district water has been primarily utilized for irrigation purposes. As the district flows through the industrial hub of Nuh and Faridabad it is subjected to untreated water, garbage and solid waste disposal. Further adding to the deterioration of the water quality is the unauthorized sewage dumping by the Jhugi Jhopri cluster located at the banks. Pollution in the Nuh District is mainly due to discharge of untreated or partially treated effluents from 26 drains of Delhi and Uttar Pradesh into the Yamuna river in Delhi territory. Higher BOD levels have also affected the district ecosystem and aquatic flora and fauna have struggled to thrive. The present objective of this research is to determine the physiochemical parameters of the water samples procured from the district and make suitable assessments based on the results and also ascertain the influence of pollution sources. According to Kaushik,et al.,2010 Highest concentration of DDT has been reported in Yamuna districts .

II. Description of the study area

Mewat district (Haryana) lies between 26° 39' 00"N and 28° 32' 25" N latitude and between 76° 39' 30" E and 77° 20 E longitudes having population of 1089263. It has a geographical area of 1507 square kilometres comprising 1441.71 square kilometres of rural area and 65.29 square kilometres of urban area Palwal is situated at the bottom of south Haryana. It has a geographical area of 1367 square km. Mewat district, which is located in the south eastern bulge of the State, has elongated shape in the north-south direction. Its northern boundary is made by Nuh district and eastern boundary by Palwal district, whereas major part of western boundary and southern boundary is common with Alwar and Bharatpur districts of Rajasthan State. Nuh district flowing in NCR has been chosen for analysis. It instigates from one of the main branch of the Okhla drain and Yamuna River, in close proximity to NCR at an elevation of 199 m above MSL and traverses a length of 70 km. It caters for catchment of 259 sq miles before out falling in river Yamuna in tehsil PalwaL. Its discharge is maximum during monsoon seasons. Downstream river flows through series of shallow gorges. The floods in the district are mainly due to heavy rains and over flow of Yamuna River. This district consist of hillocks valleys and undulated terrain. The topography of the district is such that no perennial river flows through it except River Yamuna which touches the eastern boundary of palwal and Hodal. However there are number of Barsati Nallahs/ Hill torrents which cross the whole of the district. Over flowing of some local streams also increases the quantum of floods. The floods in Yamuna River are caused due the excessive discharge of water from Tajewala head. Flooding in certain villages near Ballabgarh tehsil used to pose serious problems but all such villages have been provided with ring bund.
The sampling locations and the District have been shown in the figure 1.



Source: 'Mewat Development Society' and 'State Election Commission, Haryana'

Figure 1: Nuh district and sampling locations

III. Materials And Methods

3.1 Sample Collection and Analysis

The sampling procedure was in accordance with the CPCB Guide manual for water and wastewater analysis.

Grab samples were collected in open water sampler (1.5 L capacity) equipped with a simple pull-ring for testing of physiochemical parameters at two distinct locations in the District. The samples were collected from 10:00 AM to 1:00 PM during the study. To evaluate the lake water quality, water samples were kept in polyethylene plastic bottles cleaned with metal free soap, rinsed thoroughly with distilled water and finally soaked in 10% nitric acid for 24 h. All samples were stored in insulated cooler containing ice and delivered on the same day to laboratory and all samples were kept at 4^0C until processing and analysis.

3.2 Determination of Physiochemical parameters

The water samples were analyzed for various physicochemical parameters using standardsmethods recommended by WHO guideline, Edition of the Drinking Water Standards and Health Advisories, Indian Standard for Drinking Water Bureau of Indian Standards and 21st edition of American Public Health Association. Physical parameter like pH and electronic conductivity (EC) was determined quickly after sampling and other parameters like turbidity, total dissolved solids (TDS), chemical parameter hardness, chloride, sulphate, acidity, phosphate,, dissolve oxygen (DO), biological oxygen demand (BOD) and chemical oxygen demand (COD) were determined in the laboratory. Standard analytical techniques were adopted for

physical and chemical analysis of water samples4. The various methods used for analysis is shown in Table 2. The instruments used were of precise accuracy and the chemicals used were of analytical grade

Parameter	**Methods/Instrument**
pH	Digital pH meter
Electrical conductivity	Conductivity meter
SO_4	Spectrometry
PO_4	Spectrometry
Chlorides	Argentometric titration method
Total hardness	EDTA titration method
DO	Azide Modification method
COD	open reflux method
BOD	5 days test
Total alkalnity	Indicator method
Turbidity	Nephelometric method

Table1: Methods to estimate physiochemical parameters

Quality Parameter	**Unit**	**BIS**
Temperature	0C	-
Electrical conductivity	(μ mhos/cm)	2250
Total dissolved solids (TDS)	Mg/l	2100
pH	-	8.5
Total hardness	Mg/l	-
BOD(3d 27^{o}c)	Mg/l	-
SO_4	Mg/l	1000
COD	Mg/l	No mention
DO	Mg/l	-
Turbidity	NTU	-

Table2: Water quality parameters laid down by BIS for class 'E' type surface water (irrigation purpose)

IV. Results and Discussion

The results of water quality tests conducted at are summarized in Table 3

Quality Parameter	**Unit**	**Block 1**	**Block 2**	**Block 3**	**Block 4**
Temperature	0C	29.6	28.3	30.7	28.6
EC	μmhos/cm	625		695	
Total dissolved solids (TDS)	Mg/l	670	730	546	656
pH	-	6.4	6.5	6.8	6.6
Total hardness	Mg/l	400	430	464	480
Cl	Mg/l	135	124	126	148
SO_4	Mg/l	206	230	290	270
DO	Mg/l	5	4.5	5.8	5
Turbidity	NTU	319	330	280	318
NO3	Mg/l	5	6	3	4
PO_4	Mg/l	0.4	0.6	0.78	0.44
Chlorides	Mg/l	196		158	
Total Alkalinity	Mg/l	208	270	180	

Table3: Physiochemical parameters computed at sampling locations

Point 1 = Nuh; Point 2 = Punhana block = 3 Firozpur block = 4 Tauru block

4.1 Temperature

The temperature of Nuh district was found to vary around 25-30 ^{o} C mark. Although the study was carried out for a brief period, any substantial variation in the temperature during the study was not recorded. Optimum temperatures are needed for aquatic flora and fauna to dwell in the aquatic ecosystem.

4.2 Total Dissolved Solid

The total dissolved solids in water are due to the presence of sodium, potassium, calcium, magnesium, manganese, carbonates, bicarbonates, chlorides, phosphate, organic matter, and other particles. The value of total dissolved solids for sample 1&2 were determined as 754 and 548 respectively. The value is acceptable as compared to BIS standard .Bhandari et al.,2010 also reported that TDS values for Nuh district varied from 698-830.

4.3 pH

Water pH indicates acidic or basic nature and it is an important parameter in drinking and irrigation usages of waters. It has profound effects on water quality, affecting the solubility of metals, alkalinity and hardness of water (Osibanjo et al., 2011) pH is used to determine whether a solution is acidic or alkaline. The pH values of all water samples are found to be in the range of 6.4 to 6.8 for the samples (table 3). This value is however lower than the standard of 8.5, recommended by BIS. The recorded pH values are an indicator of the slight acidic nature of the district. Other studies carried out on Nuh district have recorded a pH value of nearby 7.6.Thus indicating towards the nature of water changing to acidic ,because of industrial water disposal.

4.4 Total Hardness

Total hardness is defined as the sum of calcium and magnesium hardness in mg/L as CaCO3.The total hardness of Nuh district is measured as 400 and 464 mg/l. By analyzing other studies carried out it has been observed that the hardness levels of the district have elevated over the years.

4.5 Biochemical Oxygen Demand

Biological oxygen demand (BOD) is considered as an important parameter in an aquatic ecosystem to establish the status of organic pollution (jain et al., 2000; Prasannakumari et al., 2003). The effect of domestic, agricultural and industrial effluents on the water quality are based on the BOD levels and can be categorized as unpolluted (BOD<1.00 mg/l),moderately polluted (2-9 mg/l) and heavily polluted(BOD> 10 mg/l)The Biochemical Oxygen Demand (BOD) for Nuh district was recorded as high as 40.9mg/l.

4.6 Turbidity

Turbidity depends on the nature of the water bodies such as river under flood conditions, lake or other water existing under relatively quiescent conditions, wherein, most of the turbidity is due to colloidal and extremely fine dispersions (Ravi et al., 2013). High turbidity of water as observed in our samples can decrease fish productivity, as it will reduce light penetration into the water and thus oxygen production by the water plants. Dissolved suspended solids will also clog filters and injure fish gills (Carballo et al.,2008). However, the only real long term solution to turbidity is to divert muddy water away from the pond and ultimately protect dykes from erosion, which cause the high water turbidity.

4.7 Chemical oxygen demand

Chemical oxygen Demand (COD) determines the amount of oxygen required for chemical oxidation of most organic matter and oxidizable inorganic substances with the help of strong chemical oxidant. COD values observed for the samples 1&2 were found to be 78 and 60. The higher levels may be due to higher decomposition activities and lower water levels. Similar trends have been observed in several studies (Fokmare and Musaddiq, 2002; Garg et al., 2010).

4.8 Dissolved Oxygen

DO is the factor that determines biological changes by aerobic or anaerobic organisms. Thus, dissolved–oxygen measurement is vital for maintaining aerobic treatment processes intended to purify domestic and industrial wastewaters. The optimum value for good water quality is 4 to 6 mg/L of DO, which ensures healthy aquatic life in a water body(Avvannavar and Shrihari, 2008).The DO measurements for the sample were recorded as 2 and 1.9mg/l respectively .

V. Adverse effects on surrounding Ecosystem

- Due to uncontrolled mining and pollution in this area flora and fauna is facing a stressed condition and interference of human activities in their natural habitat leads to entry of some of the wild animals in human habitat and they are either killed by poachers or even other animals like dogs etc.
- Release of toxic chemicals into the surface water is leading to magnification of chemical and biological impurities into the food chain.
- Due to accumulation of sewage and other waste disposal, the self purification and recycling capacity of the district is declining steadily.
- Agricultural lands in Mewat district are irrigated with saline to marginally saline water that has resulted into land degradation.
- The rising pollution levels in the district are also affecting the quality of groundwater, which is being utilized by the majority of population living nearby.

VI. Conclusion and recommendations:

The present study clearly demonstrates that the water quality in the Nuh district is unsuitable for domestic purpose because of waste dumps and sewage discharge from industries and other anthropogenic

sources when compared with the standards proposed by BIS. In most circumstances, anthropogenic sources in water bodies include terrestrial sources from mining, industries, and urbanization along the districts. The consumption of water around the mining and industrial area may cause health hazards to the local residents. It is necessary that industries should discharge their water effluents only after proper treatment, and district authorities, local government bodies, and Municipal Corporation should take appropriate steps to check the water contamination in this area. The extent to which human activities have influenced the concentration of pollutants at a particular location is especially important to the local authority as it is fundamental to the need, or otherwise, for control of pollutants discharged in effluents. It is important that the regulatory authorities should implement and enforce an appropriate strategy to monitor, regulate, and protect this area.

6.1 Recommendations:

- Sound watershed management and pollution control measures to reduce the sources of pollution.
- Regular Monitoring and Surveillance is required for keeping a check on Heavy metals and pesticide inflow into the Nuh district.
- Setting up of a treatment plant for effluent treatment thereby reducing the pollution load.
- Stringent laws and standards to be implemented to regulate the rampant disposal of waste water into the Nuh lake.
- More laboratories should be available in the region to monitor the physiochemical parameters levels of the district.
- Bioremediation program should be launched to control the effects of organic pollution and eutrophication.

References

[1]. Warish , Adil Masood, Tarique Ahmad, Najib Hasan water quality of Nuh district in Haryana IRJET Volume: 04 Issue: 06 | June - 2017
[2]. Nwaugo, V.O.; Obiekezie, S.O.; Onyeagba, R.A.; Okereke, J.N.; and Udebuani, A. 2006. The physicochemical
[3]. investigation of Amicol Lake in Ivo area of Ebonyi State, Nigeria. World Journal of Biotechnology, 7: 1055-1061.
[4]. Kaushik, A., Sharma, H.R., Jain, S., Dawra, J. and Kaushik, C.P., 2010. Pesticide pollution of river Ghaggar in Haryana, India. Environmental monitoring and assessment, 160(1), pp.61-69.
[5]. Carballo, E.; Eer, A.V.; Schie, T.V.; and Hilbrands, A. 2008. Small- Scale fresh water fish farming. Agrodok 15.
[6]. WHO (World Health Organization). 2003. Global journal of pure and Applied Science Vol. 4 No. 2.
[7]. Bhandari,M ,Ahlawat and Garg,2010.water quality of Nuh district in Haryana.International journal of Environmental protection,Vol30
[8]. Osibanjo, O., Daso, A.P. and Gbadebo, A.M., 2011. The impact of industries on surface water quality of River Ona and River Alaro in Oluyole Industrial Estate, Ibadan, Nigeria. African Journal of Biotechnology, 10(4), pp.696-702.
[9]. Jain, Y and Dhanija S K (2000): "Studies in a Polluted Centric Water Body of Jabalpur With Special Reference to Which Physico-Chemical and Biological Parameters", J.Envi. Biol., Vol. 7, pp. 83-88
[10]. Prasannakumari, A.A., Devi, T.G. and Sukeskumar, C.P., 2003. Surface water quality of river Neyyar-Thiruvananthapuram, Kerala, India. Pollution Research, 22(4), pp.515-525.
[11]. Ravi kumar, P., Mehmood, M.A. and Somashekar, R.K., 2013. Water quality index to determine the surface water quality of Sankey tank and Mallathahalli lake, Bangalore urban district, Karnataka, India. Applied water science, 3(1), pp.247-261.
[12]. Fokmare, A.K., Musaddiq m. 2002. A study of physico-chemical characteristics of Kapsi lake and Purna river waters in Akola district of Maharashtra (India). Nature Environment Pollution Technology, 1, pp.261-263.
[13]. Garg, R.K., Rao, R.J., Uchchariya, D., Shukla, G. and Saksena, D.N., 2010. Seasonal variations in water quality and major threats to Ramsagar reservoir, India. African Journal of Environmental Science and Technology, 4(2).
[14]. Avvannavar, S.M. and Shrihari, S., 2008. Evaluation of water quality index for drinking purposes for river Netravathi, Mangalore, South India. Environmental Monitoring and Assessment, 143(1), pp.279-290.

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