Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 12, No.3, December : 2024

REVIEW ON WATER QUALITY ANALYSIS OF KHARUN RIVER FOR SOLVING THE PROBLEMS OF URBAN-RURAL INTEGRATED DEVELOPMENT

Shalini Singh, Ph.D. Research Scholar, Dept. of Chemistry, Shri Rawatpura Sarkar University, Raipur
Dr. Anubhuti Koshle, Professor, Dept. of Chemistry, Dean Faculty of Science, Shri Rawatpura Sarkar University, Raipur
Dr. Mithilesh Singh, Professor, Dept. of Electrical Engg., Shri Rawatpura Sarkar University, Raipur

ABSTRACT
Poor water quality has a direct impact on water quantity in a number of ways. Polluted water that cannot be used for drinking, bathing, industry or agriculture effectively reduces the amount of useable water within a given area. The river ground water and surface water is threatened with pollution from various sources viz., domestic wastes, industrial wastes, agricultural wastes, run off from urban areas and soluble effluents. The quality of water is a vital concern for mankind. The present work on measurement of physiochemical parameter of Chhattisgarh Kharun river water sample in Industrial and Non-Industrial areas. Parameters like Physical and chemical properties like pH, Turbidity, Conductivity, TDS, and property like BOD, COD, DO, were analyzed. The water qualities of Industrial also as Non-Industrial area of Chhattisgarh River are so poor. The concentrations determined were quite the utmost admissible and desirable limit in comparison with the National and International organizations like WHO. The aim of this analysis is to solve the problems of rural development and urbanisation in perspective of viksit Bharat.
Keywords: physiochemical parameter, BOD, COD, DO, WHO

I. Introduction
Raipur is the biggest agricultural produce market, industrial hub and eminent cultural platform of Chhattisgarh State. Raipur is the largest market of steel in India. Raipur houses one of the biggest iron markets in India. Presently there is no collection network for waste water. Mostly all the households are having sanitation units with septic tanks and supernatant is discharged into nearby drains, which eventually flows in 17 nallas before meeting Kharoon River at 7 locations around the city. In the year 1982 an underground drainage scheme was executed in some parts of Raipur city and 5 sewage pumping stations were constructed to collect the sewage and three oxidation ponds were also constructed near Dal DalSeoni, Birgaon and Changorabhata which are now not in very good condition.
From the drainage pattern of Raipur city it has been identified that total 23 numbers nallahs including all sub nallahs are major carrier of sewage water.
The methods of water quality analysis are selected according to the requirement. Some examples such as for Drinking: As per WHO/CPCB Standards, for Irrigation: pH Conductivity Sodium & Potassium Nutrients Specific compounds, for Industries: as per specific requirement, for Domestic Consumption: as per BIS Standards and for Water Bodies: As per CPCB guidelines. The factors playing key role for the selection of methods are: (i) Volume and number of sample to be analyzed (ii) Cost of analysis (iii) Precision required (iv) Promptness of the analysis as required.
Properly designed and executed chain-of-custody forms will ensure sample integrity from collection to data reporting. This includes the ability to trace possession and handling of the sample from the time of collection through analysis and final disposition. This process is referred to as “chain-ofcustody” and is required to demonstrate sample control [12-14].

II. Problem identification
The present work on physiochemical parameter of Chhattisgarh river water sample in Industrial and Non-Industrial areas. Parameters like Physical and chemical properties like pH, Turbidity,

Conductivity, TDS, and property like BOD, COD, DO, were analyzed. The water qualities of Industrial also as Non-Industrial area of Chhattisgarh River are so poor. The concentrations determined were quite the utmost admissible and desirable limit in comparison with the National and International organizations like WHO. The economic and concrete discharges in river catchment areas were the main sources of pollution in river that indicate that the water is unsuitable for both domestic, and agriculture uses and that they affect on human health.

III. Water quality parameters and their permissible limit

Water quality standards have been established by a number of national and international organizations like BIS [15] (Table 1). If the water in rivers and other water bodies meet these quality criteria, then only it is safe for drinking and other purposes [16].

Evaluation of water quality:

Water quality of any water body can be evaluated by physical, chemical and biological assessment.

Table 1. Water quality parameters and their permissible limit

Water quality parameters	Bureau of Indian standards
pH	6.5- 8.5
Dissolved oxygen (DO) (mg/l)	-
Biochemical oxygen demand (BOD) (mg/l)	-
Chemical oxygen demand (COD) (mg/l)	-
Turbidity (NTU)	5
Total Dissolved Solids (mg/l)	2000
Nitrate (mg/l)	45
Phosphate (mg/l)	-
Calcium (mg/l)	200
Magnesium (mg/l)	100
Chloride (mg/l)	1000
Fluoride (mg/l)	1.5
Total hardness CaCo3 (mg/l)	600
Total Coliform Bacteria	Nil/100ml

Source: (Bureau of Indian Standards, 2012)

Objectives of the present study

To obtain the objectives of proposed study the following steps have to be taken:

- Collection of samples, sampling size area etc.
- Collection of water samples pre mansoon and post mansoon from Naalas which enter to the river as 17 nallas flowing in Raipur before meeting Kharoon River and collection of water samples at 10 locations around the Raipur and nearby in approximate 40 KM region.
- For water quality monitoring we proposes to develop a model will developed with sensor which gives alarm indication when parameter changes and volume of pollution increase which fitted at naalah entry point of river.

IV. Methodology

Water quality analysis is required mainly for monitoring purpose. Some importance of such assessment includes:

(i) To check whether the water quality is in compliance with the standards, and hence, suitable or not for the designated use as shown in figure 1 that water is collected at various point.

(ii) To monitor the efficiency of a system, working for water quality maintenance

(iii) To check whether upgradation / change of an existing system is required and to decide what changes should take place

(iv) To monitor whether water quality is in compliance with rules and regulations. Water quality analysis is of extremely necessary in the sectors of: Public Health (especially for drinking water) and for Industrial Use.

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 12, No.3, December : 2024

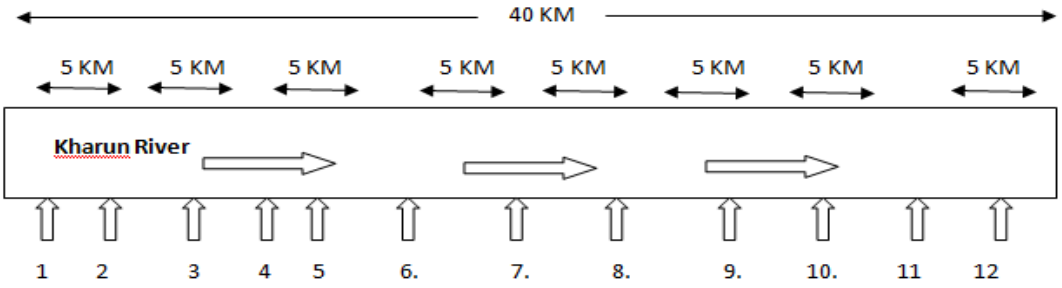

Fig.1: Water sample location Point

The steps for water quality analysis shown in Fig. 6 and the parameters for water quality analysis shown in Fig. 2.

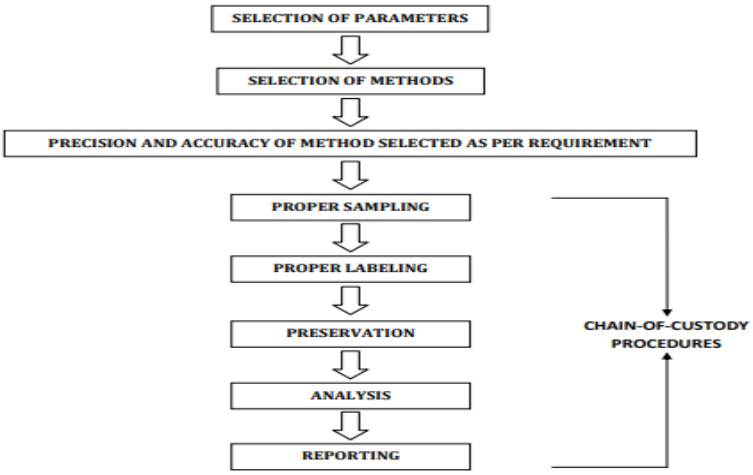

Fig 2: Steps for Water Quality Analysis

Water pollution is one of the biggest fears for the green globalization. In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. The measured values from the sensors can be processed by the core controller. The Arduino model can be used as a core controller. Finally, the sensor data can be viewed on internet using WI-FI system in control room. The proposed water quality monitor sensor developed shown in fig 3 (i) & (ii) on real time monitoring of water quality in IoT environment [9-17].

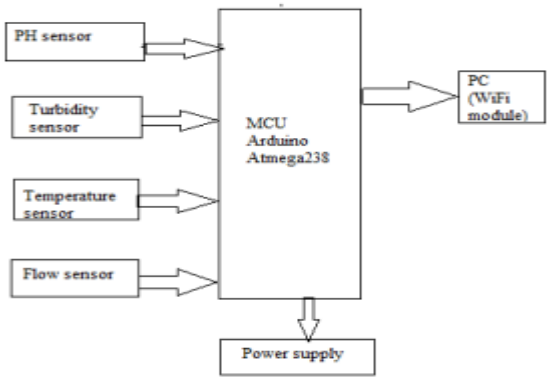

Fig 3 (i).

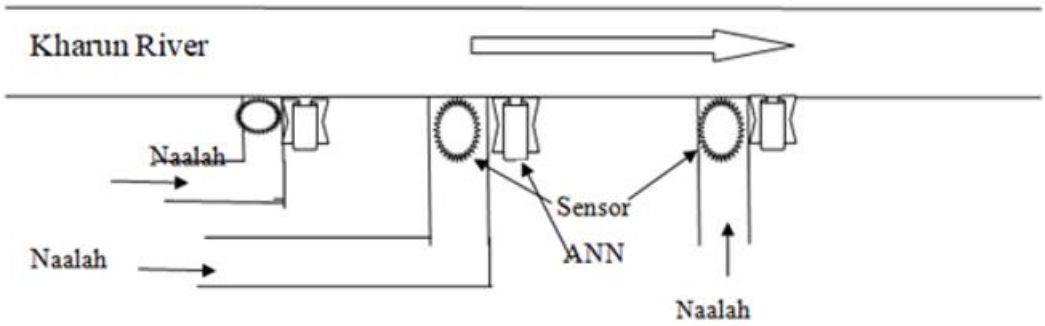

Fig 3 (ii) Proposed water quality model with sensor devices.

V. Conclusion

The water samples of Kharun River are collected and analyzed for different water quality parameters during different seasons.

- We will develop a best procedure and methods for determination of water quality parameters physical, biological and chemical parameters etc.
- We compare our detection method will be more sensitive and accurate that checked whether the water quality is in compliance with the standards, and hence, suitable or not for the designated use.
- Our detection techniques will be easy, simple and economical to monitor whether water quality is in compliance with rules and regulations.
- We develop the model of artificial neural network For validation of result for detection & removal of water quality problems in future. For artificial neural network Data Preparation, Model Architecture Selection, Model Structure Selection, Model Calibration, Model Validation, and Model Implementation steps have taken.
- Our research work protects the society and save the human life and target to reduce the pollution of Kharun river.
- The Kharun River is heavily polluted during the summer than other seasons. The flow reduction during the summer season contributes to the deterioration of water quality. High pH, TS, Hardness, DO, BOD and MPN values suggest purification may be necessary for domestic consumption.
- The nallah which is close to the industrial region is highly affected from industrial waste. This is the reason to suggest any treatment plant between kharun river and industrial area. Highly affected water can cause many more disease like tumor so it has been suggested to purity the water quality before it used.
- It is suggested that proper measures are required to avoid contamination as water is used for domestic and irrigation purpose.
- This analysis is to solve the problems of rural development and urbanisation in perspective of viksit Bharat.

References

[1] Goyal S.(2019)" The Impact of Industrial Waste on the Water Quality of Kharun River, Raipur (Chhattisgarh)" IOSR Journal of Applied Chemistry (IOSR-JAC) e-ISSN: 2278-5736.Volume 12, Issue 9 Ser. I (September. 2019), PP 20-24.

[2]. Mise S. R. (2017) "Evaluation of water quality of kharun river stretch near the Raipur city" (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 09 Sep -2017, 1071-78 PP.

[3] Abdul, G. 2006. "Removal and stabilization of chromium metal ions from industrial effluents". Electronic Journal of Environment Agriculture Food Chemistry. pp. 1286-1295.

[4] Setshedi, K.J.;Mutingwende, N.; Ngqwala, N.P. "The Use of Artificial Neural Networks toPredict the PhysicochemicalCharacteristics of Water Quality inThreeDistrictMunicipalities",

Eastern Cape Province, South Africa. Int. J.Environ. Res. Public Health 2021,18,5248. https://doi.org/10.3390/10.3390/ijerp h18105248.

[5] Akinmolayan, F., Thornhill, N., and Sorensen, E. (2015),'A detailed mathematical modelling representation of clean water treatment plants', in, 12th International Symposium on Process Systems Engineering and 25th European Symposium on Computer Aided Process Engineering, Elsevier, pp.2537–2542

[6] Al-Abri, M. and Hilal, N. (2008) 'Artificial neural network simulation of combined humic substance coagulation and membrane filtration' Chemical Engineering Journal, 141, 1-3, 27–34

[7] Baxter, C.W. et al. (2001) 'Drinking water quality and treatment: the use of artificial neural networks' Canadian Journal of Civil Engineering, 28, S1, 26–35

[8] Julio, N.; Figueroa, R.; Ponce Oliva, R.D." Water resources and governance approaches: Insights for achieving water security". Water 2021, 13, 3063. [CrossRef]

[9] Abrams, A.L.; Carden, K.; Teta, C.; Wågsæther, K." Water, sanitation, and hygiene vulnerability among rural areas and small towns in south Africa: Exploring the role of climate change, marginalization, and inequality". Water 2021, 13, 2810. [CrossRef]

[10] Shannon, M.A.; Bohn, P.W.; Elimelech, M.; Georgiadis, J.G.; Mariñas, B.J.; Mayes, A.M. "Science and technology for water purification in the coming decades". Nature 2008, 452, 301–310.

[11]. Zulkifi Nurani S.(2017)" Detection of contaminants in water"supply: A review on state-of-the-art monitoring technologies and their applications, elsevior, doi: 10.1016/j.snb.2017.09.078

[12] Guidorzi M., Franchini M., Alvisi S (2004) Elsevier, " A multi-objective approach for detecting and responding to accidental and intentional contamination events in water distribution systems". *J. Urban Water*. 2009;6:115–135.

[13] Ostfeld A., Salomons E.(2004) Elsevier, "Optimal layout of early warning detection stations for water distribution systems security". *Water Res. Plan. Manage. Div.* 2004;130:377–385.

[14] Preis A., OstfeldA(2008) Multi-objective contaminant response modelling for water distribution systems security. *J. Hydrol.* 2008;10:267–274.

[15] Oliker N., OstfeldA(2015) elsevier"Network hydraulics inclusion in water quality event detection using multiple sensor stations data". *Water Res.* 2015;80:47–58. [PubMed].

[16] Venkata R., Shankar N., Raghunathan R (2014), Elsevier, "Optimal sensor placement for contamination detection and identification in water distribution networks". 24th European Symposium on Computer Aided Process Engineering. 2014:1447–1452.

[17] Daigavane V.V. (2017), "Water Quality Monitoring System Based on IOT" ISSN 0973-6972 Volume 10, Number 5 (2017), pp. 1107-1116, Research India Publications.

[18] Turkar SS. (2011), "Various methods involved in waste water treatment to control water pollution" jocpr, ISSN No: 0975-7384, pp 58-65