



Study of water sample of Kharera River to indicates a healthy, neutral baseline that falls within the permissible limits for chemical analysis of natural surface water

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Abstract:

To provide pure water to civilians in Gujrat, India's is the primary goal of the present research. Agricultural planners, social workers, and officials carrying out development projects can learn from the study. The intention is to make recommendations in order to properly construct a plan for agricultural development and opportunities in the area under consideration. The current study's research aims have been maintained in light of Kharera River. In India as a whole, it is currently getting harder to keep up traditional core business in a timely and balanced manner. In actuality, agriculture is a business that is affected by the environment that based on water. However, the Bilimora, Navsari district in Gujrat, India, has seen more pollution and impacts from human activity than any other business. The regional disparity in agricultural growth has been evaluated within the framework of Bilimora, Navsari district in Gujrat, taking into account geographical factors. This study emphasizes the significance of sustainable land management practices in the Bilimora, Navsari district in Gujrat, in order to address regional disparities and investigate prospects for agricultural development.

Keywords: Pure water, Kharera River, Regional disparity, Agricultural development and Navsari district.

1. INTRODUCTION

The human body needs enough water to function properly. Maintaining good cell activity, controlling body temperature, and keeping the tissues functioning properly all depend on sufficient water. About 60–70% of our body is made up of water, which is necessary for human living. The World Health Organization (WHO) states that in order to be healthy, adults should drink at least two litres of water per day. Flushing toxins, controlling body temperature, and avoiding deadly waterborne illnesses all depend on consuming clean, safe water.

2. Review of literature: Due to their broad range of biological action indicates a healthy, neutral baseline that falls within the permissible limits for chemical analysis of natural surface water have generally been the subject of substantial research [1-5]. Aston (1973) reported on Tubificids and water quality [1], Bhateria and Jain studied on Water quality assessment of lake water [2], Dinius (1987) on Design of an index of water quality [3], Alam et al. on Water quality parameters along rivers [4], and Kothari et al., (2021) studied on Correlation of various water quality parameters and water quality index of districts of Uttarakhand [5]. Due to their broad range of biological



action indicates a water quality, quality parameters, distribution system, water quality from simple field and Relationships that falls within the permissible limits for chemical analysis of natural surface water have been the subject of extensive research work [6-10]. Maier & Dandy (1996) on the use of artificial neural networks for the prediction of water quality parameters[6], Diamantopoulou et al., studied on the use of a neural network technique for the prediction of water quality parameters[7], Hall et al., reported on water quality parameters as indicators of distribution system contamination[8], Vermaa and Singh studied on Prediction of water quality from simple field parameters[9], and Nõges reported on Relationships between morphometry, geographic location and water quality parameters of European lakes[10].

A healthy, neutral baseline that falls within the acceptable limits for chemical analysis of natural surface water has often been the focus of extensive research because of their wide spectrum of biological action [11–15]. Arain et al (2014) mentioned on evaluation of water quality parameters in drinking water of district Bannu, Pakistan: Multivariate study [11], Abdelmalik (2018) worked on role of statistical remote sensing for Inland water quality parameters prediction [12], Dey et al., (2021) reported on seasonal variation in water quality parameters of Gudlavalleru Engineering College pond [13], Tabariet al., (2011) studied on long-term variations of water quality parameters in the Maroon River[14]. And Sattari et al., (2016) studied on estimation of water quality parameters with data-driven model [15].

A well-being neutral background that is within the acceptable limits for chemical analysis of natural water surface has often been the focus of extensive research due to their wide range of possible biological action [16–20]. Parmar & Bhardwaj. (2013) studied on wavelet and statistical analysis of river water quality parameters [16], Baban (1993) mentioned on detecting water quality parameters in the Norfolk Broads, UK[17], Lee et al. reported relationships between water quality parameters in rivers and lakes[18], Dezfooli et al. (2018) studied on classification of water quality status based on minimum quality parameters: application of machine learning techniques[19], and Zare (2014)studied on evaluation of multivariate linear regression and artificial neural networks in prediction of water quality parameters[20].

Due to their vast range of potential biological activity, a well-being neutral background that falls within the permitted limits for chemical analysis of natural water surfaces has frequently been the subject of substantial analysis [21–25]. Yadav et al., (2022) reported on evaluation and calibration of bedload equation for the mountain ephemeral stream of Gujarat, India[21], Mehta and Yadav (2020) studied on hydrodynamic Simulation of River Ambica for Riverbed Assessment: A Case Study of Navsari Region[22], Guruji and Agnihotri (2019) studied on land use land cover analysis of Khapri Watershed in Dang District Using Remote Sensing (RS) and Geographical Information System (GIS[23], Balaji, and Satheeshkumar (2021) reported on numerical modeling of flooding and Salinity Intrusion Along River Ambica, Gujarat[24], and Patel and Yadav (2023) studied on analysis of changes in extreme rainfall characteristics over Ambica river basin, India[25].



A well-being neutral backdrop that is within the allowed limits for chemical analysis of natural water surface has often been the focus of extensive study due to their broad variety of potential biological process [26–30]. Mehta et al (2022) worked on flood modelling for a data-scare semi-arid region using 1-D hydrodynamic model: a case study of Navsari Region[26], Pathan et al., mentioned on integrated approach of AHP and TOPSIS (MCDM) techniques with GIS for dam site suitability mapping: a case study of Navsari City, Gujarat[27], Bhavsar et al., (2025) worked on evaluating the impact of urbanization and pollution on drinking water quality in Southern Gujarat: A study of physical, chemical, and microbial contaminants[28], Pathan et al. (2022) reported on AHP and TOPSIS based flood risk assessment- a case study of the Navsari City, Gujarat[29] and Khatri et al studied on rural environment study for water from different sources in cluster of villages in Mehsana district of Gujarat[30].

In both rural and urban locations, water scarcity and pollution are serious environmental problems, i.e., for Innovative study [31] for eco-friendly environment [32].

They cause the quality of water, particularly drinking water, to deteriorate. To guarantee that the water consumed is drinkable, a thorough qualitative evaluation of the water is therefore required. The objective of this study is to evaluate the water quality using a classification system based on BIS and CPCB standards by analysing the physicochemical characteristics in various water sources.

Problem Statement: Pure water is becoming increasingly difficult to maintain traditional core businesses in India as a whole in a timely and balanced manner. In reality, the environment has an impact on pure water. However, in this specific natural surface water, the effects of pollution and human activities have grown. Geographical considerations have been taken into account when evaluating the permitted limitations differential in agricultural growth within the context of Bilimora, Gujarat, India.

Investigative queries

1. What are the long-term trends in the area with water sources?
2. How has the study utilization area and reporting area changed over time in Kharera River?
3. How has the area of study permanent pastures changed over time of natural surface water?
4. What changes have occurred to the area that is covered with within the permissible limits for chemical analysis of natural surface water.

2. MATERIALS AND METHOD

2.1 Methodology

The study uses water samples from the Kharera River that cover the Bilimora region from morning to evening. The primary source of the data is government documents and other documents, which guarantee reliability and quality. Due to their extensive range of potential biological activity, a well-being neutral background that is within the permitted limits for chemical analysis of natural water surface has frequently been the subject of substantial research [33–36]. Patel et al., (2022) reported on Bharuch District, Gujarat, India: factor analysis and geographical distribution of water

quality characteristics [33] and Gaur (2018) worked on an updated review on Quantitative and Qualitative Analysis of Water Pollution in West Flowing Tapi River of Gujarat, India [34]. Mishra and Bhatt (2008) studied on physico-Chemical and Microbiological Analysis of Under Ground Water in VV Nagar and Nearby Places of Anand District, Gujarat, India [35] and Shah, et al., (2008) mentioned on ground water quality of Gandhinagar taluka, Gujarat, India [36]. Tables 1 and 2 show the distribution of water in Bilimora as well as the distribution of net hydrated acres using irrigated and arid approaches. Water distribution and variation in Bilimora using watered and aqueous technologies One statistical method for evaluating the importance of modifications to each land use classification is variance analysis. After then, the data is evaluated to make inferences about general patterns and how they might affect the Bilimora region. Study of water sample of Kharera River to indicates a healthy, neutral baseline that falls within the permissible limits for chemical analysis of natural surface water

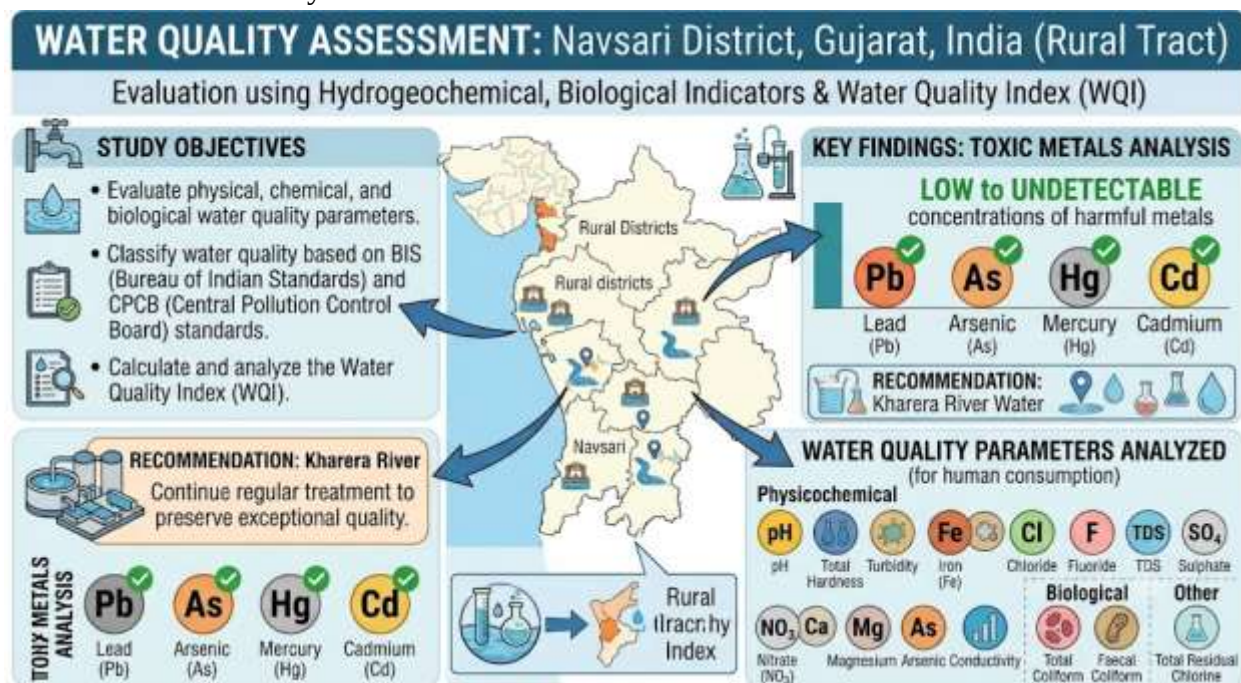


Fig 1 Study of water sample of Kharera River to indicates a healthy, neutral baseline

3 Discussion and conclusion

Kharera River water should be healthy baseline that is within acceptable bounds for natural surface water the field of chemical analysis. The rate of economic growth is linked to changes in these social variables, and evidence of a healthy, neutral baseline that falls within the allowable limits for chemical analysis of natural surface water in the Kharera River water sample.

Table 1 Results of water samples (total 20 samples, randomly collected) from Kharera River in Gujarat



S. No	Sample no.	Reported pH rang in water sample	S. No	Sample no.	Reported pH rang in water sample
1.	1st.	7.0	11.	11th.	7.1
2.	2nd.	7.0	12.	12th.	7.2
3.	3rd.	6.9	13.	13th.	6.4
4.	4th.	7.1	14.	14th.	7.1
5.	5th.	7.2	15.	15th.	7.0
6.	6th.	7.0	16.	16th.	7.0
7.	7th.	7.2	17.	17th.	7.2
8.	8th.	7.1	18.	18th.	7.1
9.	9th.	7.1	19.	19th.	7.0
10.	10th.	7.3	20.	20th.	7.2

Note: Permissible Range: 6.5 and 8.5, Healthy Neutral Baseline: 7.0–7.4, Kharera River Water Sample Analysis: 7.0 -7.4.

On basis of water samples (total 20 samples, randomly collected in day time from morning to evening) collected from the Kharera River in South Gujarat (a major tributary of the Ambica River) typically exhibit a pH ranging from 6.9 to 7.5. all collected samples were passing through Digital PH meter for measurement of alkaline nature. This slightly acidic to mildly alkaline nature generally falls within the permissible limits set by WHO. **Permissible Range:** According to regulatory bodies like the World Health Organization and the Bureau of Indian Standards, the acceptable range of pH for natural surface water and aquatic ecosystems is between 6.5 and 8.5.

Healthy Neutral Baseline: A pH value close to 7.0–7.4 represents an ideal neutral baseline.

Kharera River Water Sample Analysis: The study of the Kharera River sample indicates a pH of 7.2. This specific value provides essential insights into the ecological status of the river.

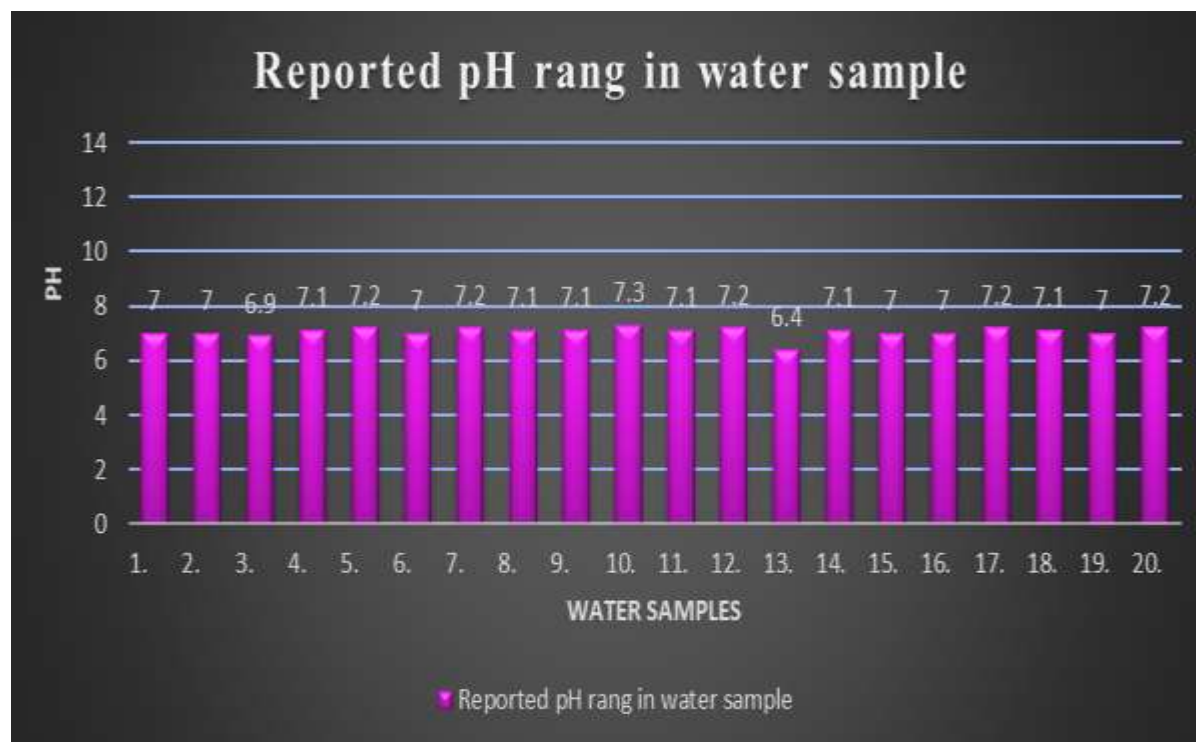


Fig 2 Results of water samples (total 20 samples, randomly collected) from Kharera River in Gujarat

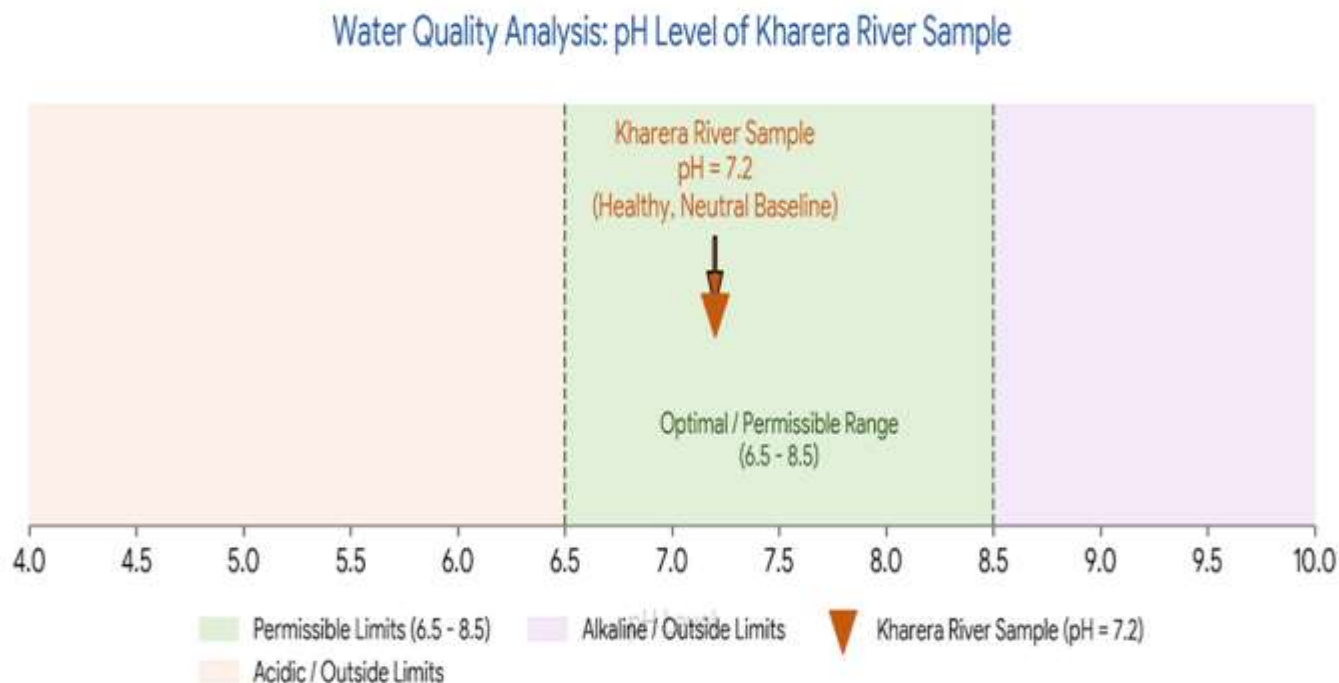




Fig 3 Study of Kharera River to indicates permissible limits of natural surface water

Conclusion:

All of the water sources had low to undetectable concentrations of harmful metals, including lead, arsenic, mercury, and cadmium, according to toxic metal analysis. Additionally, it is advised that the water from the Kharera River continue to be regularly treated in order to preserve its exceptional quality. This study evaluates the water quality of a rural tract in five districts of the Navsari districts of Gujrat, India, using hydrogeochemical and biological indicators and the Water Quality Index (WQI). On basis of water samples (total 20 samples, randomly collected in day time from morning to evening) collected from the Kharera River in South Gujarat (a major tributary of the Ambica River) typically exhibit a pH ranging from 6.9 to 7.5. all collected samples were passing through Digital PH meter for measurement of alkaline nature. This slightly acidic to mildly alkaline nature generally falls within the permissible limits set by WHO. The results are the characteristics that determine the quality of water for human consumption. In both rural and urban locations, water scarcity and pollution are serious environmental problems. They cause the quality of water, particularly drinking water, to deteriorate. To guarantee that the water consumed is drinkable, a thorough qualitative evaluation of the water is therefore required. The objective of this study is to evaluate the water quality using a classification system based on BIS and CPCB standards by analyzing the physicochemical characteristics in various rural water sources.

Data accessibility/ Data availability: Every piece of information has been included in the manuscript, addendum and data has been incorporated in the manuscript.

Declaration of Competing Interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of generative AI and AI-assisted technologies in the writing process: The authors employed GPT 4 in order to enhance the manuscript's language and readability during the preparation process. Following their use of this tool/service, the writers took full responsibility for the publication's content and reviewed and amended it as necessary.

Author contributions statement: Each and every part of this study project, including its conception, planning, data collection, analysis, interpretation, and revision, has been contributed to by author. Each author has participated in experiments, reviewed the article, interpreted data, checked the work for grammar and spelling, and designed the study. Furthermore, as a corresponding author, mentor, and supervisor of the study activity contributed. The submitted version has the approval of all authors.

Conflict of Interest: All authors have no any conflicts of interest.

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References

1. Aston, R. J. (1973). Tubificids and water quality: a review. *Environmental Pollution* (1970), 5(1), 1-10. [https://doi.org/10.1016/0013-9327\(73\)90050-5](https://doi.org/10.1016/0013-9327(73)90050-5)
2. Bhateria, R., Jain, D. Water quality assessment of lake water: a review. *Sustain. Water Resour. Manag.* 2, 161–173 (2016). <https://doi.org/10.1007/s40899-015-0014-7>
3. Dinius, S. H. (1987). Design of an index of water quality 1. *JAWRA Journal of the American Water Resources Association*, 23(5), 833-843. <https://doi.org/10.1111/j.1752-1688.1987.tb02959.x>
4. Alam, M.J.B., Islam, M.R., Muyen, Z. et al. Water quality parameters along rivers. *Int. J. Environ. Sci. Technol.* 4, 159–167 (2007). <https://doi.org/10.1007/BF03325974>
5. Kothari, V., Vij, S., Sharma, S., & Gupta, N. (2021). Correlation of various water quality parameters and water quality index of districts of Uttarakhand. *Environmental and Sustainability Indicators*, 9, 100093. <https://doi.org/10.1016/j.indic.2020.100093>
6. Maier, H. R., & Dandy, G. C. (1996). The use of artificial neural networks for the prediction of water quality parameters. *Water resources research*, 32(4), 1013-1022. <https://doi.org/10.1029/96WR03529>
7. Diamantopoulou, M.J., Papamichail, D.M. & Antonopoulos, V.Z. The use of a Neural Network technique for the prediction of water quality parameters. *Oper Res Int J* 5, 115–125 (2005). <https://doi.org/10.1007/BF02944165>
8. Hall, J., Zaffiro, A. D., Marx, R. B., Kefauver, P. C., Krishnan, E. R., Haught, R. C., & Herrmann, J. G. (2007). On-Line water quality parameters as indicators of distribution system contamination. *Journal-American Water Works Association*, 99(1), 66-77. <https://doi.org/10.1002/j.1551-8833.2007.tb07847.x>
9. Verma, A.K., Singh, T.N. Prediction of water quality from simple field parameters. *Environ Earth Sci* 69, 821–829 (2013). <https://doi.org/10.1007/s12665-012-1967-6>
10. Nöges, T. Relationships between morphometry, geographic location and water quality parameters of European lakes. *Hydrobiologia* 633, 33–43 (2009). <https://doi.org/10.1007/s10750-009-9874-x>
11. Arain, M. B., Ullah, I., Niaz, A., Shah, N., Shah, A., Hussain, Z., ... & Kazi, T. G. (2014). Evaluation of water quality parameters in drinking water of district Bannu, Pakistan: Multivariate study. *Sustainability of Water Quality and Ecology*, 3, 114-123. <https://doi.org/10.1016/j.swaqe.2014.12.005>
12. Abdelmalik, K. W. (2018). Role of statistical remote sensing for Inland water quality parameters prediction. *The Egyptian Journal of Remote Sensing and Space Science*, 21(2), 193-200. <https://doi.org/10.1016/j.ejrs.2016.12.002>
13. Dey, S., Botta, S., Kallam, R., Angadala, R., & Andugala, J. (2021). Seasonal variation in water quality parameters of Gudlavalleru Engineering College Pond. *Current Research in Green and Sustainable Chemistry*, 4, 100058. <https://doi.org/10.1016/j.crgsc.2021.100058>



14. Tabari, H., Marofi, S. & Ahmadi, M.(2011), Long-term variations of water quality parameters in the Maroon River, Iran. *Environ Monit Assess* 177, 273–287. <https://doi.org/10.1007/s10661-010-1633-y>
15. Sattari, M. T., Joudi, A. R., & Kusiak, A. (2016). Estimation of water quality parameters with data-driven model. *Journal-American Water Works Association*, 108(4), E232-E239. <https://doi.org/10.5942/jawwa.2016.108.0012>
16. Parmar, K. S., & Bhardwaj, R. (2013). Wavelet and statistical analysis of river water quality parameters. *Applied Mathematics and Computation*, 219(20), 10172-10182. <https://doi.org/10.1016/j.amc.2013.03.109>
17. Baban, S. M. (1993). Detecting water quality parameters in the Norfolk Broads, UK, using Landsat imagery. *International Journal of Remote Sensing*, 14(7), 1247-1267. <https://doi.org/10.1080/01431169308953955>
18. Lee, J., Lee, S., Yu, S. et al. Relationships between water quality parameters in rivers and lakes: BOD5, COD, NBOPs, and TOC. *Environ Monit Assess* 188, 252 (2016). <https://doi.org/10.1007/s10661-016-5251-1>
19. Dezfooli, D., Hosseini-Moghari, SM., Ebrahimi, K. et al. Classification of water quality status based on minimum quality parameters: application of machine learning techniques. *Model. Earth Syst. Environ.* 4, 311–324 (2018). <https://doi.org/10.1007/s40808-017-0406-9>
20. Zare Abyaneh, H. Evaluation of multivariate linear regression and artificial neural networks in prediction of water quality parameters. *J Environ Health Sci Engineer* 12, 40 (2014). <https://doi.org/10.1186/2052-336X-12-40>
21. Yadav, V. K., Yadav, S. M., & Kachhawa, N. S. (2022). Evaluation and calibration of bedload equation for the mountain ephemeral stream of Gujarat, India. *Current Science* (00113891), 123(12). 10.18520/cs/v123/i12/1499-1507
22. Mehta, D.J., Yadav, S.M. (2020). Hydrodynamic Simulation of River Ambica for Riverbed Assessment: A Case Study of Navsari Region. In: AlKhaddar, R., Singh, R., Dutta, S., Kumari, M. (eds) *Advances in Water Resources Engineering and Management. Lecture Notes in Civil Engineering*, vol 39. Springer, Singapore. https://doi.org/10.1007/978-981-13-8181-2_10
23. Guruji, A., Agnihotri, P. (2019). Land Use Land Cover Analysis of Khapri Watershed in Dang District Using Remote Sensing (RS) and Geographical Information System (GIS). In: Vasant, P., Zelinka, I., Weber, GW. (eds) *Intelligent Computing & Optimization. ICO 2018. Advances in Intelligent Systems and Computing*, vol 866. Springer, Cham. https://doi.org/10.1007/978-3-030-00979-3_47
24. Balaji, R., Satheeshkumar, J. (2021). Numerical Modeling of Flooding and Salinity Intrusion Along River Ambica, Gujarat. In: Sundar, V., Sannasiraj, S.A., Sriram, V., Nowbuth, M.D. (eds) *Proceedings of the Fifth International Conference in Ocean*



- Engineering (ICOE2019). Lecture Notes in Civil Engineering, vol 106. Springer, Singapore. https://doi.org/10.1007/978-981-15-8506-7_17
25. Patel, Z. B., & Yadav, S. M. (2023). Analysis of changes in extreme rainfall characteristics over Ambica river basin, India. *ISH Journal of Hydraulic Engineering*, 29(4), 569–579. <https://doi.org/10.1080/09715010.2022.2098681>
26. Mehta, D.J., Eslamian, S. & Prajapati, K. Flood modelling for a data-scare semi-arid region using 1-D hydrodynamic model: a case study of Navsari Region. *Model. Earth Syst. Environ.* 8, 2675–2685 (2022). <https://doi.org/10.1007/s40808-021-01259-5>
27. Pathan, A.I., Agnihotri, P.G. & Patel, D. Integrated approach of AHP and TOPSIS (MCDM) techniques with GIS for dam site suitability mapping: a case study of Navsari City, Gujarat, India. *Environ Earth Sci* 81, 443 (2022). <https://doi.org/10.1007/s12665-022-10568-6>
28. Bhavsar, P. S., Mishal, S. S., Devre, P. V., Lad, V. K., Sawat, A. H., Yadav, S. R., & Gore, A. H. (2025). Evaluating the impact of urbanization and pollution on drinking water quality in Southern Gujarat: A study of physical, chemical, and microbial contaminants. *Cleaner Water*, 100168. <https://doi.org/10.1016/j.clwat.2025.100168>
29. Pathan, A.I., Girish Agnihotri, P., Said, S. et al. AHP and TOPSIS based flood risk assessment- a case study of the Navsari City, Gujarat, India. *Environ Monit Assess* 194, 509 (2022). <https://doi.org/10.1007/s10661-022-10111-x>
30. Khatri, N., Tyagi, S. & Rawtani, D. Rural environment study for water from different sources in cluster of villages in Mehsana district of Gujarat. *Environ Monit Assess* 190, 10 (2018). <https://doi.org/10.1007/s10661-017-6382-8>
31. Lal M. Innovative study for enhanced performance of the photogalvanic cells for solar energy conversion and storage. *Environ Prog Sustainable Energy*. 2025;44(5); <https://doi.org/10.1002/ep.70031>
32. Lal M, Gangotri KM. Innovative study in renewable energy source through mixed surfactant system for eco-friendly environment. *Environ Sci Pollut Res.*, 2023;30(44): 98805–98813, <https://doi.org/10.1007/s11356-023-28246-w>
33. Patel, D., Pamidimukkala, P., Chakraborty, D., & Yadav, A. (2022). Bharuch District, Gujarat, India: factor analysis and geographical distribution of water quality characteristics. *Environmental Nanotechnology, Monitoring & Management*, 18, 100732. <https://doi.org/10.1016/j.enmm.2022.100732>
34. Gaur, S. (2018). An Updated Review on Quantitative and Qualitative Analysis of Water Pollution in West Flowing Tapi River of Gujarat, India. In: Singh, V., Yadav, S., Yadava, R. (eds) *Environmental Pollution. Water Science and Technology Library*, vol 77. Springer, Singapore. https://doi.org/10.1007/978-981-10-5792-2_42



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35. Mishra, A., & Bhatt, V. (2008). Physico-Chemical and Microbiological Analysis of Under Ground Water in VV Nagar and Nearby Places of Anand District, Gujarat, India. Journal of Chemistry, 5(3), 487-492. <https://doi.org/10.1155/2008/671978>
36. Shah, M. C., Shilpkar, P. G., & Acharya, P. B. (2008). Ground water quality of Gandhinagar taluka, Gujarat, India. Journal of Chemistry, 5(3), 435-446. <https://doi.org/10.1155/2008/481694>