iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** II **Month of publication:** February 2025

DOI: https://doi.org/10.22214/ijraset.2025.66950

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue II Feb 2025- Available at www.ijraset.com

Experimental Investigation & Assessment of Water Quality Index of Different Locations of Wainganga River at Chhapara, Seoni, M. P., India

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Abstract: Water pollution is a environmental issue in India. The largest source of water pollution in India is untreated sewage. Other sources of pollution include agricultural runoff and unregulated small-scale industry. Most rivers, lakes and surface water in India are polluted due to industries, untreated sewage and solid wastes. The Wainganga is a river in India originating in the Mahadeo Hills in Mundara near the village Gopalganj in Seoni, Madhya Pradesh. It is a key tributary of the Godavari. The river flows south in a winding course through the states of Madhya Pradesh and Maharashtra. We are find out water quality index of different locations of wainganga river.

I. INTRODUCTION

Madhya Pradesh state is blessed with 13 major rivers, numerous lakes and ponds. The cities Seoni, Balaghat of Madhya Pradesh state and Bhandara of Maharastra state is blessed with Wainganga river. Wainganga river is lifeline for these cities and for nearest village. This river covers the village for the live life and purpose like drinking, irrigation, fishing, boating and farming. And this river is maximum polluted by the bathing, washing of clothes, throw of clothes, waste water flow. River Wainganga originates from Talab of Village Mundara District Seoni, having an elevation of 1048m (3438ft) and passes through Chhapara, Keolari towns of Seoni District and then enter in Balaghat District and act as the lifeline of these places. Also, it is considered the holy river of the Hindus. The river highly polluted by flow of the wastewater in to the river and throw of waste. River around the last point with the poor quality of the water. In the proposed research an experimental study has been done for the assessment of water quality index of different locations of Wainganga River at Chhapara, Seoni, M. P., India.

The specific objectives of the present study are:

1) To identify various sample available in the study area and find out status of water quality and to isolate some of more important factors that influenced water quality as physio- chemically, by determining water quality parameters.
2) To compare all examined water quality parameters with water quality standards and guidelines nationally and internationally.
3) To develop aindecies for classifying the drinking water into excellent, good, poor, very poor and unfit depending in the water quality index.
4) To identify the sources of pollution of river and the health impact of pollution of river.
5) Emphasize the relevance of safe drinking water for the public.
6) Provision for the relevance of safe drinking water for the public.

II. LITERATURE REVIEW

P.K.Srivastava, S. Mukherjee, M. Gupta, S.K. Singh, 2011, "Characterizing Monsoonal Variation on Water Quality Index of River Mahi in India using Geographical Information System" The results from this study it was observed that the main pollution of the Mahi River Basin is due to discharge of effluent from industries and through domestic and agricultural runoff. River stretch near urban area is mainly contaminated due to municipal waste and unchecked water uses (abstraction of fresh water and return of wastewater and irrigation waters) increase the mineralization of the river water, especially during the low flow period in the summer, but it counts for only lower percentage of contamination than industrial area.

Deepshikha Sharma, Arun Kansal, 2011, “Water quality analysis of River Yamuna using water quality index in the national capital territory, India (2000–2009)” The entire capital city must be sewered and all the wastewater even in low-lying areas near the river should be sent (through pumps if necessary) for treatment and disposal insuring ‘zero’ discharge in the river. It can be done by upgrading the existing STPs, which do not meet the required disposal standards.

Tirkey Poonam, Bhattacharya Tanushree, ChakrabortySukalyan et al (2015) it is clear that Water quality is a significant criterion in matching water demand and supply. To represent water quality in a lucid way different water quality index for water quality assessment are used which aim at giving a single value to the water quality of a source reducing great number of parameters into a simpler expression and enabling easy interpretation of monitoring data.

M. Mamatha et al, 2017 the WQI for Kapila river water has been calculated for the samples using WAWQI and was found to be 51.33 and 53.72 for S1and S2 respectively. The study reveals that the quality of water is poor. These results reveal that water quality of river is getting deteriorated, mainly due to run-off and sewage water from the town.

E. E. Etim, R. Odoh, A. U. Itodo, S. D. Umoh, U. Lawal1et al, 2013, found Water quality of different sources of water (stream, borehole and pipe born water) in the Niger Delta region of Nigeria was evaluated by Water Quality Index (WQI) technique.In their study, WQI was determined on the basis of various physico-chemical parameters like pH, total alkalinity, chlorides, sulphate, nitrate, total hardness, calcium, magnesium, electrical conductivity, dissolved oxygen, biochemical oxygen demand, total dissolved solids and total suspended solids

III. METHODOLOGY

A. Weighted Arithmetic Water Quality Index

Weighted Arithmetic Water Quality Index method classified the water quality according to the degree of purity by using the most commonly measured water quality variables.

Table 1.1: Water Quality Rating as per Weight Arithmetic Water Quality Index Method [53]

WQI Value	Rating of Water Quality Bottom
0-25	Excellent water quality
26-50	Good
51-75	Bad
76-100	Very Bad
100& ABOVE	Unsuitable for drinking purpose

B. National Sanitization Foundation Water Quality Index

A commonly-used water quality index (WQI) was developed by the National Sanitation Foundation (NSF) in 1970 (Brown and others, 1970). The NSF WQI was developed to provide a standardized method for comparing the water quality of various bodies of water. 142 water quality scientists were surveyed about 35 water quality tests and asked to consider which tests should be included in an index (Brown and others, 1970; Mitchell and Stapp, 2000).

Table 1.2: Water Quality Rating as per different Water Quality Index MethodsNational Sanitation Foundation Water Quality Index (NSFWQI)

WQI Value	Rating of Water Quality Bottom
91-100	Excellent water quality
71-90	Good
51-70	Medium
26-50	Bad
0-25	Very Bad

C. Canadian Council of Ministers of the Environment Water Quality Index (CCME WQI):

CCMEWQI is based on a formula develop by the British Columbia Ministry of Environment, Lands and parks and modified by Alberta Environment.

Table 1.3. Water Quality Grading as per CCMEWQI

Grading	CCME WQI	Water Quality Status
Excellent	95-100	water quality is protected with a virtual absence of threator impairment; conditions very close to natural or pristine levels.
Good	80-94	water quality is protected with only a minor degree ofthreat or impairment; conditions rarely depart from natural or desirable levels.
Medium	65-79	water quality is usually protected but occasionallythreatened or impaired; conditions sometimes depart from natural or desirable levels.
Bad	45-64	water quality is frequently threatened or impaired;conditions often depart from natural or desirable levels.
Very Bad	00-44	water quality is protected almost always threatened orimpaired; airment; conditions rarely depart from natural or desirable levels.

D. Oregon Water quality index (OWQI)

The Oregon Water Quality Index (OWQI) is a single number that expresses water quality by integrating measurements of eight water quality variables (temperature, dissolved oxygen, biochemical oxygen demand, pH, ammonia+nitrate nitrogen, total phosphorus, total solids, and fecal coliform.

Table 1.4 Oregon Water Quality Index

WQI Value	Rating of Water Quality Bottom
91-100	Excellent water quality
85-89	Good
80-84	Fair
60-79	Poor
0-59	Very Poor

IV. STUDY AREA

Wainganga River passes through many major cities and districts including, Seoni, Balaghat and Bhandara. Wainganga is not a transboundry river. It originates and ends within the Indian borders. The River Wainganga is existing in Seoni and Balaghat district in Madhya Pradesh. The river originates from Talab of Village Mundara District Seoni and passes through Chhapara, Keolari towns of Seoni District and then enter in Balaghat District.

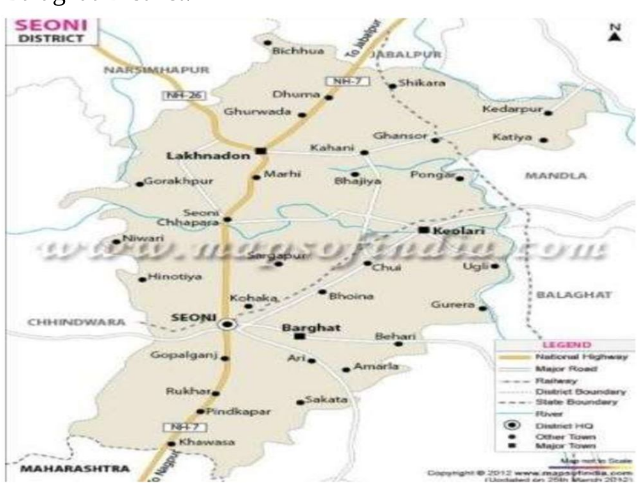


Figure 3 Map of Seoni District

Figure 4 shows satellite view of wainganga river at Chhapara.

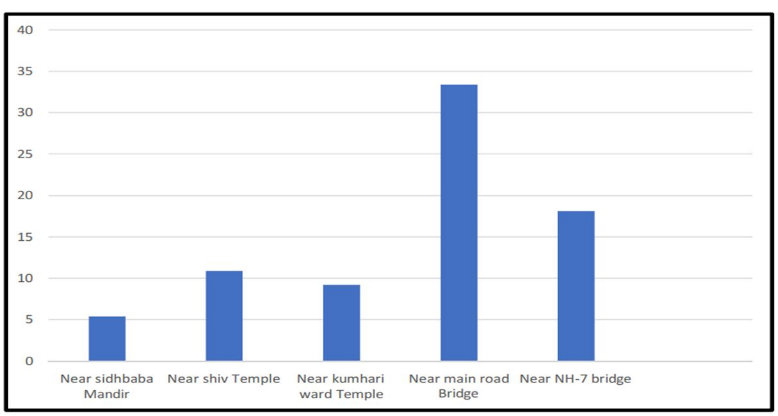
In the Wainganga river we planned to assess the quality of water from five different sites of river in Seoni district, village Chhapara, for physical, chemical and biological parameters and the results are compared with the standards given by WHO and Buereau of Indian Standard to determine the extent of pollution. Water samples were collected in the properly washed water bottle of 1 litre capacity in the month of Nov 2024, from the five selected sites at 9.00am to 12.00pm of River Wainganga for analyzing the water quality parameter. The main objective of study is to evaluate the physical, chemical and biological properties of water.

- Near Sidhbaba Mandir (N22°23′24″E79°32′19″)
- Near shiv Temple (N22°23′22″E79°32′31″)
- Near Kumhari ward Temple (N22°23′36″E79°32′38″)
- Near Main road Bridge (N22°23′21″E79°32′32″)
- Near NH-7 bridge (N22°23′1″E79°32′51″)

V. RESULT AND DISCUSSION

A. Turbidity

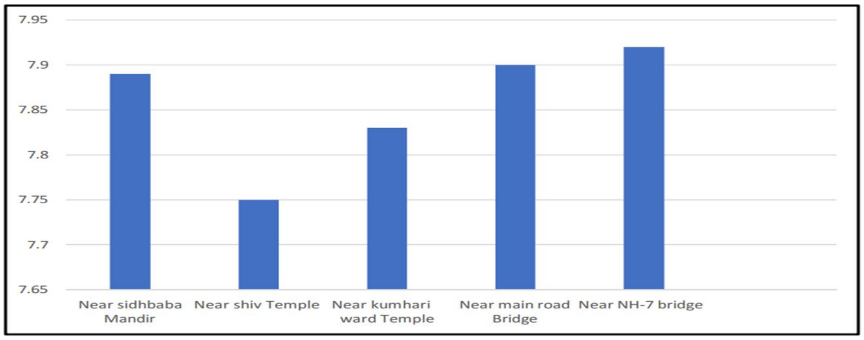
The Turbidity of water can be related to the expression of optical property and reflects the intensity of light scattered by the particles present in the water. The high turbidity value reported at near main road bridge was 33.4 NTU and then in decreasing order 18.1 NTU near NH7 bridge, near shiv temple 10.9NTU, 9.2 NTU near kumhari ward temple and last lowest value is in the location of near sidhbaba mandir 5.4 NTU.



Graph 1 shows Turbidity values variatonof all locations

B. pH

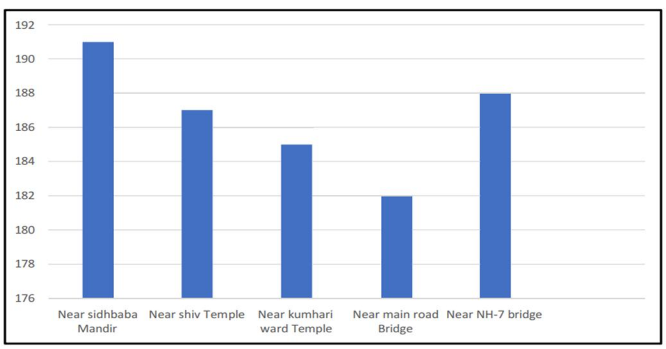
The pH value of all the studied water sample was 7.89, 7.75, 7.83, 7.9, and 7.92 in measured in near sidhbaba Mandir, near shiv Temple, near kumhari ward Temple, near main road Bridge and near NH-7 bridge respectively. The pH value prescribed by the IS 6.5 to 8.5.



Graph 2 shows pH values variaton of all locations

C. Total Alkalinity

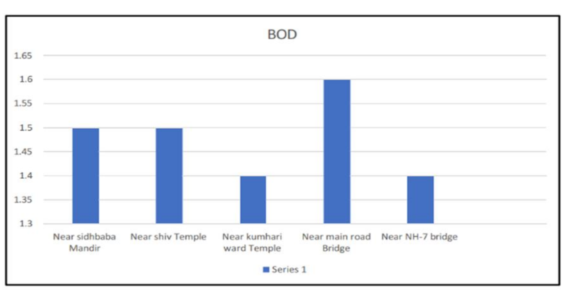
Alkalinity acts as a buffer against rapid pH change. Whereas carbonates and bicarbonates associated with sodium and potassium contribute only alkalinity not hardness because of incapability of sodium and potassium to form complex with electron donor ligands. Value of alkalinity obtained 191 mg/l, 187 mg/l, 185 mg/l, 182 mg/l, and 188 mg/l in measured in near sidhbaba Mandir, near shiv Temple, near kumhari ward Temple, near main road Bridge and near NH-7 bridge respectively.



Graph 3 shows Total Alkalinity values variaton of all locations

D. Biochemical Oxygen Demand (BOD)

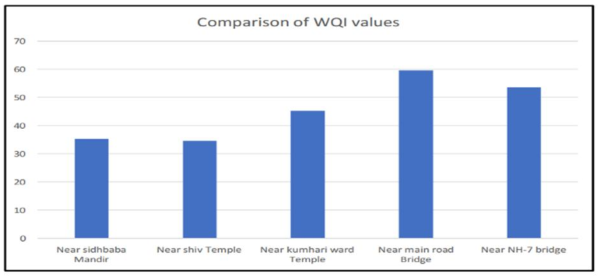
BOD is a measure of the amount of oxygen that bacteria will consume while decomposing organic matter under aerobic condition. The BOD value of river water was 1.5 mg/l, 1.5 mg/l, 1.4 mg/l, 1.6 mg/l and 1.4 mg/l measured in near sidhbaba Mandir, near shiv Temple, near kumhari ward Temple, near main road Bridge and near NH-7 bridge respectively which is lower then value 6 requirement limit by WHO.



Graph 12 shows Biochemical Oxygen Demand (BOD)values variaton of all locations

VI. CONCLUSION

The objective of the study was to assess the Water Quality Index of different locations of water supply in Chhapara, District - Seoni. It is evident that from the data analysis water quality of all selected locations of water supply are within permissible limit, but the analysis of Water Quality Index of samples indicates the quality of near main road bridge and near NH -7 bridge are poor water quality category that lies in the range between 51 - 75 therefore be treated before use to avoid water related diseases. The WQI of near sidhbaba Mandir, near shiv Temple, near kumhari ward Temple, near main road Bridge and near NH-7 bridge were 35.23, 34.59, 45.24, 59.58 and 53.57 respectively and clear indicating that water quality near sidhbaba Mandir, near shiv Temple and near kumhari ward Temple are good. By comparing WQI of five Water locations of the river near sidhbaba Mandir, near shiv Temple, and near kumhari ward Temple are of good quality WQI status because of the less disturbance and the water in these locations are still by natural flow. The poorest water quality among them is of near main road Bridge and near NH-7 bridge.



Graph 14 Showing WQIs Value of different locations at Chhapara.

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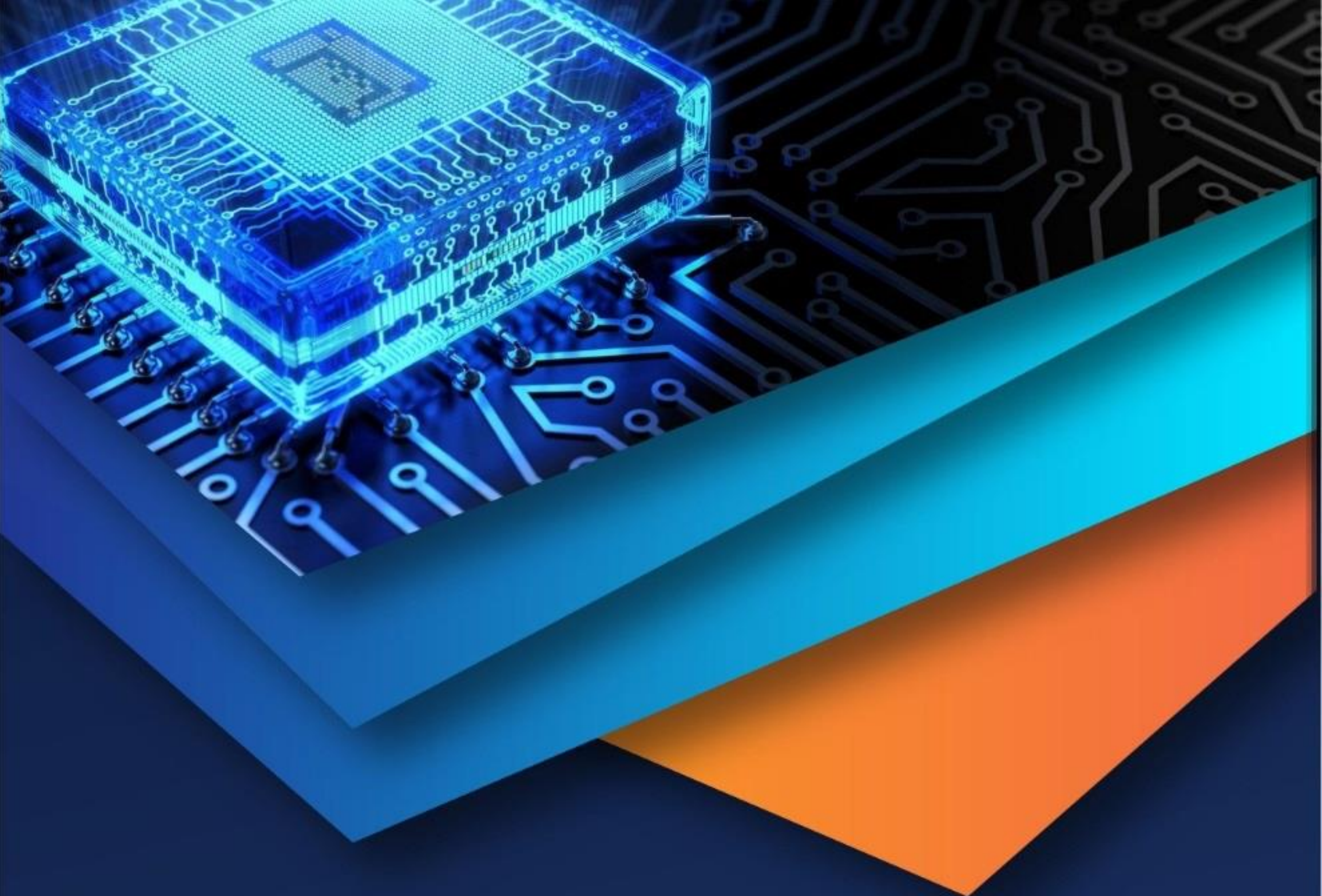

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