Environmental Monitoring (ISSN Online: 2771-988X)
April 2022 Vol.1, No.1, pp. 23-26
DOI: https://doi.org/10.55571/em.2022.04005

4D Publishing Group

Assessment of Water Quality Parameters in Kamle District, Arunachal Pradesh, India

Bini Kiron[1,*] Sudip Basack[2] and Ghritartha Goswami[1]
[1]North Eastern Regional Institute of Science and Technology, Nirjuli, Arunachal Pradesh, India
[2]Elitte College of Engineering, Affiliation: MAKA University of Technology, Kolkata 700113, India

*Corresponding author's email: itachikiron@gmail.com

Abstract. In the Kamle District of Arunachal Pradesh, rapid constructions, road cutting, excavation, and indiscriminate use of chemical fertilizers and pesticides in agriculture practices are causing a variety of pollution in the aquatic environment, resulting in deterioration of water quality and depletion of aquatic biota. Humans contract water-borne infections such as typhoid and diarrhea as a result of drinking this contaminated water. As a result, it is required to monitor water quality at regular intervals to evaluate if it is suitable for human consumption or other uses such as irrigation, industry, and so on. The results of investigations on various water quality indicators from various water sources in Kamle District, Arunachal Pradesh, are described in this study paper for both the post-monsoon and pre-monsoon periods. pH, temperature, dissolved oxygen, turbidity, total dissolved solids, nitrate, and phosphate, among other physical and chemical water parameters, were tested and researched. The National Sanitation Foundation (NSF) technique was then used to calculate the water quality index. Based on these data, the water from different sources is classified as very bad, bad, medium, good, and excellent. Overall, the quality of water indicates good status as per the study.

Keywords: Multi-meter; Water quality index; Water quality parameters

1. Introduction

Arunachal Pradesh is India's most remote and least explored state. This huge swath of green on the map of the country is pollution-free, therefore water is conserved in its purest form in most parts of the state. In the Kamle District of Arunachal Pradesh, rapid construction of roads and indiscriminate use of chemical fertilizers and pesticides in agriculture are producing heavy and diversified pollution in the aquatic environment, resulting in deterioration of water quality and depletion of aquatic biota. Humans, particularly children, contract different water-borne diseases such as typhoid, diarrhea, and malaria as a result of the usage of contaminated water. As a result, it is vital to monitor the water quality frequently. The evaluation of the physical, chemical and biological characteristics of water concerning human consequences, intended uses, and natural quality is known as water quality assessment [1]. Water quality index (WQI) is a metric that summarizes information about water quality in a single number based on some factors [2]. The results of studies on water quality from

Environmental Monitoring (ISSN Online: 2771-988X)
April 2022 Vol.1, No.1, pp. 23-26
DOI: https://doi.org/10.55571/em.2022.04005

various sources in Kamle District, Arunachal Pradesh, for the post-monsoon and pre-monsoon seasons of 2019 and 2020 are presented in this study report. The major goal of this study is to assess the water quality parameters pH, Temperature, Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Nitrate (NO3-), Phosphate (PO43-), and Turbidity in Kamle, Arunachal Pradesh. (Note: The above-mentioned parameters were required for the NSF technique to determine WQI) [3].

WQI, designed by the Canadian Council of Ministers of the Environment, has been explained by Sushmitha [4]. The method was tested on Hebbal Lake in Mysore, Karnataka, India, to see how it affected aquatic life, livestock and to see if it's safe to use for enjoyment, irrigation, or drinking. The water quality had been assessed as bad overall. By integrating the water quality factors in a small lake in South Gujarat, India, Tandel [5] evaluated the water quality index in a single number that indicates the quality of water. It was discovered that the quality of the lake's water decreased marginally from winter to summer due to an increase in pollutants concentration caused by water evaporation.

2. Methodology

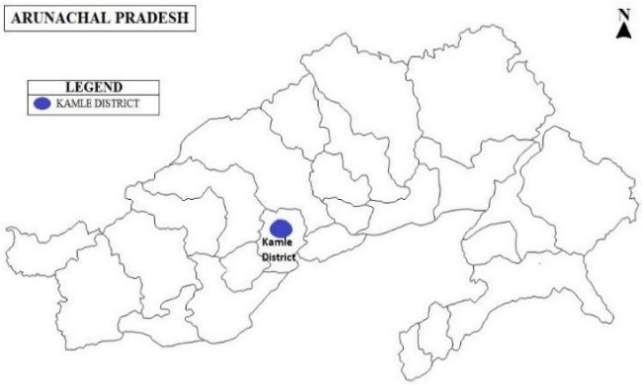

Figure 1. Map showing the location of the water sample source.

Sampling location: 1. Pujupen, 2. Belakyallo, 3. Raga, 4. Murimugli, 5. Muri, 6. Liguvillage, 7. MachDong, 8. Don, 9. Gepen, 10. Gepen2, 11.Gemi, 12. Gemi2, 13. Puchigeko, 14. Bopi, 15. Godak, 16. Pucku, 17. Kamporijo, 18. Bamvillage, 19. Dugu, 20. Pamluk, 21. Atas, 22. Yatap, 23. Buscamp, 24.Boasimla, 25. Tayasimla1, 26. Tayasimla2, 27. Pakoro, 28. Buyaso, 29. Goyu, 30. Goyu2, 31. Atum, 32. Atum2, 33. Sippu, 34. Potin goyu, 35. Paro, 36. Kerbari, 37. Tath koro, 38. Dollungmukh, 39. Dollungkoro, 40. Soni koro,

For both the post- and pre-monsoon periods, water samples were taken using the following protocols. Only 40 water samples, each containing 1.5 liters, were taken during both the post-monsoon and pre-monsoon seasons due to the lack of roads in remote places, road connectivity issues, and deep forest regions. The samples were collected in polypropylene bottles. The majority of the samples were taken from the nearby population center. Water samples were gathered from portions of rivers such as the Kamle River in Tamen and the Subansiri River in Ligu hamlet. State/District/Source/number is used as the sampling name; for example, AP/K/SW/001. Spring Water (SW) and River Water (RW) are the two sources. AP is Arunachal Pradesh, K denotes Kamle district, and 001 denotes the source number. The data collected using the device was written down. pH, Dissolved Oxygen (DO), Nitrate, Phosphate, Water Temperature, Turbidity, and Total Dissolved Solids (TDS) are just a few examples.

2.1. eXact@ Micro 20.

It's a high-performance dual-wavelength photometer. It's great for testing drinking water, pools, and spas, as well as environmental and educational purposes. This equipment measures parameters like alkalinity, hardness, nitrate, phosphate, sulfate, chloride, and fluoride. The readings of the parameters are presented on the screen automatically. The time requirement for reagents in eXact® Micro dual

Environmental Monitoring (ISSN Online: 2771-988X)
April 2022 Vol.1, No.1, pp. 23-26
DOI: https://doi.org/10.55571/em.2022.04005

wavelength photometer is given in the manual book of eXact [6]. A multimeter is to measure the pH, Temperature, Oxidation-Reduction Potential, Dissolved Oxygen, Conductivity, and Total Dissolved Solids. Turbidity Meters are instruments that measure the turbidity of a liquid sample using the NTU (Nephelometric Turbidity Unit) unit.

3. Water Quality Index (WQI)

The WQI provides information on water quality in a single number. Water can be categorized as excellent, good, acceptable, or unfit for usage based on a single value [3]. Microsoft Excel was used to compute the WQI for the 40 samples collected during the post-monsoon and pre-monsoon seasons. Dissolved Oxygen, pH, Temperature, Phosphate, Nitrate, Turbidity, and Total Dissolved Solids are the parameters used. Due to unforeseen conditions, other parameters such as Fecal coli and Biological Oxygen Demand (BOD) were eliminated.

3.1. WQI Calculation

The WQI was calculated using the NSF (National Sanitation Foundation) approach in this study [3]. For both the post-monsoon (2019) and pre-monsoon (2020) periods, the values for WQI were calculated using the selected parameters, which included dissolved oxygen, pH, temperature, phosphate, nitrate, turbidity, and total dissolved solids. The following WQI values were calculated with the help of an online calculator [7]. Since seven tests are conducted, two tests, Fecal Coliform, and BOD are not included. If less than nine tests are done, the overall WQI can be approximated by dividing the sum of seven subtotals by the sum of their weighting factors [7]. The various ranges of WQI and their accompanying status of water quality, as well as their potential use, are summarized by Brown [2].

4. Result and Discussions

Table 1. Water Quality Index obtained for post-monsoon (2019) and pre-monsoon (2020)

Sample No.	WQI Post-Monsoon	WQI Pre-Monsoon	Sample No.	WQI Post-Monsoon	WQI Pre-Monsoon
AP/K/SW/01	79.45	79.45	AP/K/SW/21	83.56	82.19
AP/K/SW/02	76.71	79.45	AP/K/SW/22	71.23	67.12
AP/K/SW/03	71.23	71.23	AP/K/SW/23	87.67	87.67
AP/K/SW/04	73.97	73.97	AP/K/SW/24	84.93	84.93
AP/K/SW/05	84.93	82.19	AP/K/SW/25	83.56	83.56
AP/K/SW/06	83.56	82.19	AP/K/SW/26	76.71	75.34
AP/K/SW/07	71.23	69.86	AP/K/SW/27	83.56	84.93
AP/K/SW/08	72.60	73.97	AP/K/SW/28	76.71	76.71
AP/K/SW/09	84.93	84.93	AP/K/SW/29	80.82	80.82
AP/K/SW/10	83.56	84.93	AP/K/SW/30	84.93	86.30
AP/K/SW/11	83.56	83.56	AP/K/SW/31	87.67	87.67
AP/K/SW/12	82.19	84.93	AP/K/SW/32	83.56	82.19
AP/K/SW/13	83.56	83.56	AP/K/RW/33	82.19	82.19
AP/K/SW/14	82.19	83.56	AP/K/SW/34	80.82	78.08
AP/K/SW/15	78.08	82.19	AP/K/SW/35	83.56	83.56
AP/K/SW/16	60.27	64.38	AP/K/SW/36	87.67	84.93
AP/K/SW/17	75.34	82.19	AP/K/RW/37	78.08	76.71

Environmental Monitoring (ISSN Online: 2771-988X)
April 2022 Vol.1, No.1, pp. 23-26
DOI: https://doi.org/10.55571/em.2022.04005

4D Publishing Group

AP/K/SW/18	73.97	72.60	AP/K/SW/38	73.97	73.97
AP/K/SW/19	83.56	82.19	AP/K/RW/39	82.19	82.19
AP/K/SW/20	80.82	73.97	AP/K/RW/40	82.19	83.56

Based on NSF's method, the various ranges of WQI and their corresponding status of water quality are summarized in Table 1. It is observed that out of a total of 40 samples, most of the sample comes under a good rating. The distribution of water samples based on the Water Quality Index and its range for the post-monsoon (2019) and pre-monsoon (2020) season is described in Figure 2 as shown below.

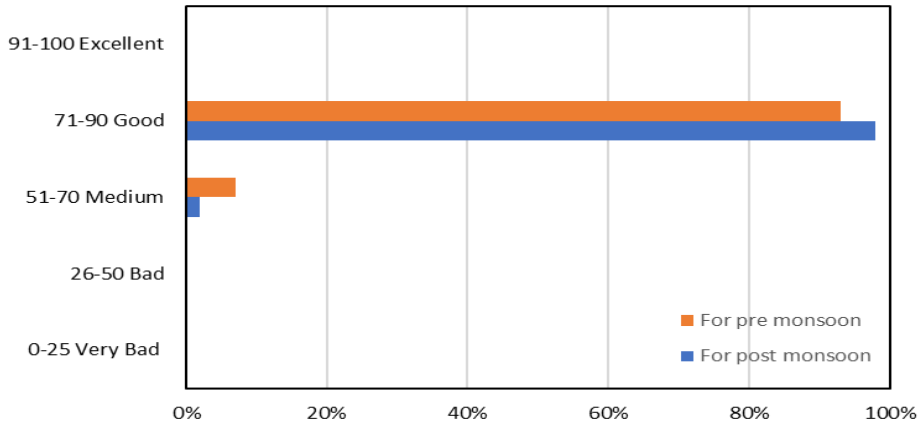

Figure 2. Percentage water samples as per water quality status for pre- and post-monsoon seasons

The average WQI value for the post and pre-monsoon season is 80.03 percent and 79.99 percentage respectively, which indicates a good water quality state.

5. Conclusion

According to WQI calculations and observations, the quality of spring water flowing from the forest is far superior to river water. Samples were taken from Pujupen, pucku, and Yatap villages that have a low WQI, preventing them from being used for any purpose until they are properly treated. Most of the water sources in the Kamle district are found to be in good condition, with most of the Physico-chemical water parameters being within BIS's acceptable range. For the post-monsoon period of 2019, 98 percent of its water sample sources are suitable for drinking, whilst for the pre-monsoon period of 2020, 93 percent of its water sample sources are suitable for drinking, with spring waters accounting for the majority. Almost all of the water sources evaluated are suitable for irrigation without further treatment. In Arunachal Pradesh, variations in WQI are primarily due to unpredictably high rainfall. The post-monsoon period's average WQI is higher than the pre-monsoon period's average WQI. Above 90-98 percent of water, sample sources examined using the NSF Method of WQI are assigned a "Good" water quality status.

References

[1] Meybeck, M. and Helmer, R. (1992). Water Quality Assessments- A guide to use of Biota, Sediments, and water in Environmental Monitoring. Second Edition, DOI: 10.4324/9780203476710

[2] Brown, R.M., McClelland, N.I., Deininger, R.A., and Tozer, R.G. (1970) A Water Quality Index: Do We Dare? Water Sew. Works 117, 339–343.

[3] Bureau of Indian standard and Environmental Protection Act. (2016). 2(1). https://www.indiacode.nic.in/bitstream/123456789/2157/3/A2016-11.pdf

[4] Sushmitha, B. R. Uma, H. R., and Mahesh M. K. (2013) Assessment of Water Quality for Hebbal

Lake of Mysore, 2(2).
[5] Tandel, B. N., Soni, C. K., and Macwan, J. (2010). Assessment of water quality index of small lake in South Gujarat Region, India. http://psrcentre.org/images/extraimages/63.%2010.pdf
[6] Manual book of eXact@ Micro dual wavelength photometer, https://www.manualslib.com
[7] Lutz, D. S. Water Quality Index Calculator, modified on 04/26/2011 02:48:27. Http://home.eng.iastate.edu/~dslutz/dmrwqn/water_quality_index_calc.htm