INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume3, Issue4)
Available online at www.ijariit.com

Indexing Hydrological Parameters of Narmada River influenced by Socio Biological Activities

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Abstract: ***In an effort to determine the water quality of Narmada River flowing from Moretakka, National Sanitation Foundation water quality index was selected in this piece of work. In support of the work, indexing of River water collected from the centre and both left and right catchment areas was conducted between September 2010 and September 2012. The National Sanitation Foundation (NSF) Water Quality Index (WQI) was one of the analytical tools used to summarize the data. Essentially, the WQI converts the concentration data for nine analytes into one of five water quality classes, ranging from "very bad to excellent". Based on the WQI values, water quality typically was in the "good" range for the year 2010-11, while its range decreases to "medium" in the following year 2011-12. The sites nearest the center had the highest water quality rating with significant decreases in water quality occurring in the catchment area, particularly in Left catchment area. Water quality also was significantly impacted by socio biological activities. High total coliform levels (>1600 microorganisms/100 ml) are of particular concern for all the sampling sites.***

Keywords: NSF Index, Narmada River, Hydrological Parameters.

INTRODUCTION

Water provides the earth with the capacity of supporting life. An organism does not have to be told how important water is for their existence. Due to prime necessities of life, this vast natural resource has been depleted and turned into a scarce commodity with increased usage catering to the need of ever expanding the population. There is an almost global shortage of water and the world's most urgent and front rank problem today is supply and maintenance of clean drinking water. Throughout their history, humans have transformed the ecosystems in which they live, both purposefully and through unintended consequences. With a human population of more than 700 billion, unprecedented competition for natural resources now exists around the globe. As a result, many natural patterns of species distributions and interactions that have taken millions of years to develop have been altered [2].

WQIs can be used to compare and report large scale (e.g. statewide) ambient monitoring data or they can be tuned for a more specific purpose as it did to meet a need for a water chemistry-based management tool to help identify nonpoint source pollution in urbanized watersheds within a smaller study region [3, 11].

NSF is a world health organization collaborating center for food and water safety and indoor safety. It is a nonprofitable organization that provides standard development, Product certification, auditing, education and risk management for public health and safety. One important field of NSF's interest in materials and products that come into contact with drinking water system components.

NSF standards are generally accepted standards for a variety of public health related industries and subject areas. These include drinking water treatment and contact materials, health and wellness supplements, food equipment manufacturing and composition, plumbing, refuse containers and dishwashing equipment.

The Narmada is a river in central India and the fifth largest river in the Indian subcontinent. It forms the traditional boundary between North India and South India and flows westwards over a length of 1,312 km (815.2 mi) before draining through the Gulf of Cambey (Khambat) into the Arabian Sea, 30 km (18.6 mi) west of Bharuch city of Gujarat. It is one of only three major rivers in peninsular India that runs from east to west (largest west flowing river) along with the Tapti River and the Mahi River. It flows through the states of Madhya Pradesh (1,077 km (669.2 mi)), Maharashtra, (74 km (46.0 mi)) – (35 km (21.7 mi)) border between Madhya Pradesh and Maharashtra and (39 km (24.2 mi) border between Madhya Pradesh and Gujarat and in Gujarat (161 km (100.0 mi)). The Narmada basin, hemmed between Vindya and Satpuda ranges, extends over an area of 98,796 km2 (38,145.3 sq mi) and lies

between east longitudes 72 degrees 32' to 81 degrees 45' and north latitudes 21 degrees 20' to 23 degrees 45' lying on the northern extremity of the Deccan Plateau. The basin covers large areas in the states of Madhya Pradesh (86%), Gujarat (14%) and a comparatively smaller area (2%) in Maharashtra. In the river course of 1,312 km (815.2 mi) explained above, there are 41 tributaries, out of which 22 are from the Satpuda range and the rest on the right bank are from the Vindhya range. The present paper deals with the NSF water quality indexing of the river water collected from both catchment areas (left and right) and center from Moretakka, one of the major point of the Narmada River in Madhya Pradesh, India.

MATERIAL AND METHOD

The water sample was collected every month in the year September 2010 to September 2012 for quality indexing using NSF.

Sampling Station

Moretakka

This place is situated in West Nimar (Khargone), Madhya Pradesh, India, its geographical coordinates are 22° 14' 0" North, 76° 3' 0" East and its original name (with diacritics) is Mortakka.

Sampling station was selected on the basis of its importance in anthropogenic or socio biological activities on the catchment areas. The station is situated near villages or municipal town where the population wholly depends upon the River water to fulfill their all daily life activities as well as ritual activities. By analyzing the quality of water through various physicochemical and microbiological parameters and then indexing through NSF, we can determine the impact on Narmada water quality due to percolation of a pollutant from socio biological activities and their effect on human health.

Sampling Method

The water samples were collected every month from September 2010 to September 2012 from sampling station Moretakka. The collection of water samples has been done from selected station in horizontal manner i.e. from both sides of the catchment areas and just from the center of the River every month during the study period. Water samples were collected in air tight autoclaved sterile black bottles.

Analysis of water sample

Standard methods for the examination water and wastewater to determine the physical, chemical and biological examination of water [1, 10] were used for analyzing different parameters related to NSF water quality indexing of the collected water samples from different areas of selected sampling station.

Calculation of water quality index

Water quality index (WQI) was calculated by using National sanitation foundation (NSF) water quality index created by Mr. Brain Oram, Professional Geologist. The WQI was directly calculated using online calculator [8].

FIG 01: Spiritual mass bath on the left catchment area

FIG 02: sampling from center

FIG 03: sampling from Catchment area

RESULT AND DISCUSSION

Table 01 represents the maximum, minimum, mean with Standard Deviation of different parameters analyzed during the study period. Out of fifteen analyzed parameters, nine were used in NSF WQI. On finding the WQI value through water quality index legend (Table 02) the Range for WQI was determined and thus the quality of the River water was determined for the sampling station taken under consideration.

Table 03 represents the WQI and Water quality level yearly for three different horizontal sites viz. Left catchment area, center and Right catchment area of each sampling stations. From the table 03, it could be estimated that the water quality of the catchment areas is poor as compared to that of the free flowing center water. The water quality index of the River in the catchment areas is generally in the range of 67 to 69, which indicates the water quality is in the medium range. It also indicates that due to a high level of anthropogenic and socio biological activities the water flowing in the catchment areas getting polluted and contaminated. The same amount of water is generally consumed by a human for drinking and other domestic purposes which would be harmful to their health and would also imbalance the population diversity of aquatic fauna and flora existing in these catchment areas. Furthermore on comparing the water quality of two successive years i.e. 2010-2011 and 2011-2012, we also conclude that the quality of water is also gradually deteriorating year after year, it indicates that no major steps have been taken by any organization to aware the human population about the loss of such a precious natural resource, which is a matter of concern.

Table 01: Analysis of physicochemical and bacteriological parameters of Narmada River in Moretakka

Parameters	Unit	Moretakka (Right Catchment Area)			Moretakka (left Catchment Area)			Moretakka (Centre)		
		Max	Min	Mean & SD	Max	Min	Mean & SD	Max	Min	Mean & SD
Temperature	°C	34.6	21.5	27.384±3.46	34.9	22.5	27.548±3.46	34	21	26.73±3.37
pH	units	9.3	7.8	8.4748±0.40	9.4	7.6	8.4724±0.43	8.8	7.4	8.25±0.41
Transparency	cm	48	10	33.56±13.67	49	11	34.68±13.64	53	11	38.38±14.27
Alkalinity	mg/l	248	98	180.16±40.84	252	105	189.56±81.28	234	88	167.74±42.00
Chloride	mg/l	53.6	14.3	33.672±8.64	55.6	19.3	35.532±9.32	48.9	18	30.24±7.27
Free CO2	mg/l	12.3	0	3.0716±2.79	10.32	0	3.0564±2.46	11.4	0	2.51±2.57
Hardness	mg/l	205	95	138.32±27.27	220	100	147.08±30.01	195	80	125.88±28.30
DO	mg/l	8.9	6	7.228±0.64	8.5	6	7.132±0.70	9.3	6.9	7.70±0.47
BOD	mg/l	4.2	0.6	1.716±2.55	3.9	0.6	2.164±1.11	3.6	0.5	1.45±1.14
COD	mg/l	44	17	31.8±16.10	49	20	34±8.35	42	18	32.55±6.70
Nitrate	mg/l	5.12	0.31	2.8164±1.04	5.23	1.34	3.013±0.98	4.92	0.9	2.62±0.80
Phosphate	mg/l	3.85	0.95	1.918±0.75	4	1.15	2.0972±1.75	3.55	0.8	2.23±0.72
TDS	mg/l	290	103.7	179.52±47.33	288	113.7	180.48±42.70	250	127.8	181.81±35.78

T. Coliform	MPN	1600	350	912.2±464.55	1600	400	956.2±436.12	1600	79	394.06±397.63
F. Coliform	MPN	92	27	53.88±20.43	102	21	60.48±23.78	51	11	24.94±12.83

Table 02: NSF Water Quality Index

S. No	Water Quality Index Legend	
	Range	Quality
1	90-100	Excellent
2	70-90	Good
3	50-70	Medium
4	25-50	Bad
5	0-25	Very bad

Table 03: Water quality of Narmada River using NSF water quality Index

S. No	Sampling site	NSF WQI September 2010-2011	Water Quality September 2010-2011	NSF WQI September 2011-2012	Water Quality September 2011-2012
1.	Moretakka (Right Catchment Area)	73	Good	69	Medium
2.	Moretakka (Centre)	76	Good	74	Good
3.	Moretakka (Left Catchment Area)	72	Good	67	Medium

CONCLUSION

It has been calculated through NSF Water Quality Index that water quality of the Narmada River catchment areas is under stress of severe pollution due to the discharge of wastewater from various sources into the River. The water is not suitable for drinking, bathing, swimming etc. In order to save these catchment areas from further deterioration, effective pollution control measures must be taken in the near future.

A government commitment is needed along with cohesive academic research centered on surface waters as a problem and a vital biome, so that its importance may be understood, and so that conservation as a principle may be accepted by administrators. Careful management of natural resources should be a result – not destruction of habitat and erosion of resources. The Water Quality Indices are the most effective ways to communicate the information on water quality trends to the general public or to the policymakers and water quality management

REFERENCE

[1]. APHA. (2002) The standard method for examination of water, American Public Health Association Inc. New York 22nd Ed. pp 10-161.
[2]. Belanger L. (2002) Source and effect of acid rock drainage in the Snake River watershed, Summit County, Colorado, M.Sc thesis, Dept of Civil. Environmental and Architectural Engineering. Univ of Colorado.
[3]. Hallock D. (2002) A Water Quality Index for Ecology's Stream Monitoring Program. Washington State Department of Ecology, Publication No. 02-03-052.
[4]. Kaur, H., Syal, J. , and Dhillon, S.S. (2001) Water quality index of the river Satluj. PollRes. 20(2), 199-204.
[5]. Kaurish, F.W. and Younos, T, (2007) Developing a Standardized Water Quality Index for Evaluation Surface Water Quality. Journal of the American Water Resources Association., 43(2), 533-545.
[6]. Magudeswaran, P.N., and Ramchandaran, T. (2007) Water quality index of river Noyyal at Tripur, Tamilnadu, India. Natl. Environ. and Pollu. Technol., 6(1), 51-54.
[7]. Mohanta, B.K., Patna, A.K. (2000) Studies on the water quality index of River Sanamacchakandan at keonjhar Garh orrisa. Poll. Res., 19(3), 377-385.
[8]. NSF Water Quality Index Calculator: http://www.water-research.net/waterqualityindex/
[9]. Okendro, N. Singh, S. K. and Mahanta, P. C. (2007) Multivariate statistical analysis of water quality data in Narmada river. J. Ecopysiol. Occup. Hlth., 45-53.
[10]. Pelczar, J. M., Chan, E.C.S., Krieg, N.R. (2005) Microbiology: Tata McGraw Hill Pub, 5th Ed. ISBN-0-07-462320-6: pp 261-330.
[11]. Schiff, R. and Benoit, G. (2007) Effects of Impervious Cover at Multiple Spatial Scales on Coastal Watershed Streams. Journal of the American Water Resources Association. 43(3), 712-730.
[12]. Srikanthan, L., Jayaseelan, J., Narendran, D., Manikandan, I., Singh, D.S.H. (2013) Determination of ground water quality using water quality index in part of Chennai City, Tamilnadu Indian Journal of Science, 3(8), 81-84.
[13]. Srinivas, J., Purushotham, A.V. and Krishna, K.V.S.G. (2013) Determination of Water Quality Index in Industrial areas of Kakinada, Andhra Pradesh, INDIA. Int. Res. J. Environment Sci, 2(5), 37-45.

