REVIEW OF STUDIES ON MONITORING AND MODELING OF RIVER WATER QUALITY

[1] Dr. P.D. Nemade , [2]Prof. Kumbhare P.P. ,[3]Ajit Chandgude , [4]Gaurav Shinde , [5]Mahesh Choudhar , [6] Nikhil Bandgar
[1]Principal, [2]Assistant prof. ,[3]student
[1]Civil Engineering,
[1]S.B. Patil College of engineering Indapur, Pune, Maharashtra.

Abstract: ***The Bhima River is a major river in South India. It flows southeast for 861 kilometers (535 mi) through Maharashtra, Karnataka, and Telangana states, before entering the Krishna River. Along the river stretch there are about 7000 industries comprising Large, Medium and Small scale units according to CPCB. Most of the industries are located in the Maharashtra Industrial Development Corporation (MIDC). The river is 80% polluted by industries pollution and 20% by domestic wastewater. The following review article presents the findings of the work carried out by the researchers in the past on the various River water. A lot of physico-chemical parameters have been studied in the past by the researchers for various river like Ganga, Yamuna, Krishna etc. but there are very few studies was conducted on Bhima river. This review study focuses on various literatures that have been carried out on river water quality monitoring as well as modeling. This review attempts to highlight the main achievement in the area and outline the advantages of river water monitoring and modeling using different techniques and software.***

Keywords: Bhima River, industrial and domestic pollution, physico-chemical parameters, river water monitoring and modeling.

Introduction:

Rapid increase in human population has resulted in the transformation of the natural environment. The huge amounts of wastes generated in cities are disposed into surface waters of streams and rivers. Thus water in rivers carry large amounts of organic and inorganic matter making the water unsuitable for direct use. In the river, oxygen level reduces and biochemical oxygen demand (BOD) increases due to disposal of untreated wastewater. If dissolved oxygen level falls below critical level, then biological organisms may either die or migrate to regions with adequate oxygen. The river water quality monitoring provides empirical evidence to support decision making on health and environment issue.This review article is focused on presenting the works done by the researchers in the past in this area. This would help in gaining the understanding of what is going on and what river water is going through. This knowledge is important because until and unless we know what the exact situation is, we cannot take the appropriate preventive measures.

Previous Works:

S.Shrestha et al., (2006) has worked on assessment of surface water quality using multivariate statistical technique, this paper reveled that evaluation of temporal/spatial water quality of Fuji River (Japan). In this study the time taken by author was 8 years. In this study 12 parameter at 13 different station points were taken by author and variation in water quality was checked for monthly as well as seasonal variation considering various parameters like pH, Conductivity, Dissolved Oxygen, Biological oxygen demand, Chemical oxygen demand, Total suspended solid, Total coli forms, Nitrate nitrogen, Ammonical nitrogen, Inorganic dissolved phosphorus, Temperature , Discharge.

Su- Young Park et al., (2006) studied the water quality monitoring network in a river system using genetic algorithm. In This study an integrated technique which uses a genetic algorithm (GA) and Geographical information system (GIS) for the design effective water quality monitoring network in large river system was used by the author. Total 110 stations were show considered in this study. The river water monitoring network have been operated for Nakdong River in Korea .the main objective of the study was to check the long or short term variation in water quality and to estimate pollution load from each water shed unit..

Deepiksha Sharma et al., (2011) has worked on water quality modeling for Yamuna River, India by using QUAL 2Kw software. This paper gives information of pollution of Yamuna River and work done by the author to decrease the pollution of Yamuna River by using the monitoring data and mathematical modeling. The sensivity and uncertainly analysis was done using QUAL 2Kw software made model. The study was carried out from 1999 to 2009. From the study it was observed that QUAL 2Kw simulates up to 15 water quality constituent in system. From the result it was found that DO is the main parameter for determine the river pollution because as the DO value is decreased the river water get polluted.

Bhoir Saurabh et al., (2013) conducted study on water quality modeling of Godavari River, India the study shows that Godavari River is polluted by the domestic as well as industrial waste. To control the pollution decision making tools that is the modeling of river water quality by the software QUAL 2E was used in this study. Initially 25km stretch was selected to monitor the river water quality by using parameter like DO, BOD, COD, TSS, Phosphate and pH. The Grab sampling method was adopted to collect the sample. In the present study monthly and seasonal variation in water quality was observed and after monitoring, modeling was done by using QUAL 2E software by considering DO as a main parameter.

Wagh and Kamat, (2014) assessed wastewater characteristics and its pollution for the stretch of Krishna River from Sangli to Haripur during September 2008 to April 2009. Samples were analyzed for pH, temperature, DO, BOD, COD and chlorides. Pollution level was below permissible standards during monsoon season due to dilution of wastewater. BOD and chloride values in summer were found to be higher than monsoon and winter season. DO was depleted in post monsoon period due to insufficient dilution (min 4.5 mg/l). DO was found as low as 1.9

mg/l in winter season and even less than 1.9 mg/l in summer season, which indicated an increase in pollution due to low flow in the river. It was concluded that river was subjected to pollution due to wastewater from nalas throughout the study period.

Gupta et al., (2014) assessed pollution load due to various drains entering the River Mandakini near Chitrakoot (M.P.) in India. Five nalas were selected to analyse physico-chemical parameters and identification of pollutant load. pH, turbidity, TDS, TSS, TS, DO, BOD and COD of samples were analysed and compared with CPCB standards. It was observed that the values of BOD (41-68 mg/l) and turbidity (31-48 NTU) were beyond their permissible standards. The average pollution load was found in the range 0.73 to 161.21 kg BOD/day during March - May, 2011. Average pollution loads of all drains in 3 months period recorded was 199.21 kg BOD/day. It was concluded that river stretch was severely polluted near Roorki city. Therefore, it was suggested that small drains should not be allowed to mix in the river and should be diverted to sewage treatment plant for treatment.

Table 1. Other previous studies

Reference	River Name	Monitoring Parameter	Software used for modeling
Ritu Paliwal et al (2006)	Yamuna River, India	pH, EC, DO, BOD, COD, TSS, TDS, MPN, Turbidity.	QUAL2E
Stefano Marsili-Libelli (2007)	Ombrone and Sieve river, Italy	carbon and nitrogen	QUAL2E
Deepshikha Sharma and Arun Kansal (2011)	Yamuna River, India	pH, EC, DO, BOD, COD, TSS, TDS, MPN, Fecal coliform, Acidity, Turbidity, Hardness. Alkalinity, ammonia, chloride, magnesium, nitrates, nitrites, Temperature	QUAL2Kw
Archana Sarkar and Prashant Pandey (2015)	Yamuna River, India	DO, BOD.	ANN
Mohammad Karamouz et al (2008)	Karoon River, Khuzestan	Temperature, EC TDS, turbidity, DO, nitrate, pH. TSS, chloride, sulphate, nitrite, COD, heavy metals (Fe, As, Hg, Zn, Pb, Cd, Cr, Cu, Mn), BOD5, NH_3 , fecal coliform, toxic materials.	Only Monitoring
Xiuna Zhu et al (2010)	China River	Water temperature, Room temperature, DO, pH, EC, Salinity.	ANN
Ekiye, Ebiare and Luo Zejiao (2010)	Lagos River, China	pH, EC, DO, BOD, COD, TSS, TDS, MPN, Fecal coliform, Acidity, Turbidity, Hardness. Alkalinity, ammonia, chloride, magnesium, nitrates, nitrites, Temperature	Only Monitoring

Conclusion:

From the literature it was observed that the, most of the river pollution is generally due to the industrial as well as domestic waste. Various authors have conducted their studies regarding water quality monitoring of different river to check the monthly as well as seasonal variation. But there are few studies were found on the Bhima River in Indapur, Pune Maharashtra. Different software was used by the authors for water quality modeling and from literature it was found that QUAL2E software is frequently used by the authors for water quality modeling.

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