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WATER QUALITY OF RIVER BASIN CONTEXT IN MAHARASHTRA REGION

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Abstract - *Water is most important resource present on the earth and is very precious to maintain healthy environmental conditions. As compared to world water scenario 97% is ocean and 3% is fresh water. Out of which India have 4% water resources and 18% of world's population depends on it. Whereas in Maharashtra five river basins which are specifically rainy rivers. There are various human activities which affects water and cause pollution of water bodies. Due to these activities water quality reduces and it is harmful to all living things. Quality of water refers to characteristics of water namely physical, biological and chemical. Henceforth it's important to develop water quality index for assessment of river water quality. In this paper, different water quality index methods in various regions were discussed.*

Key Words: **Water quality index (WQI), WQImin, CWMI, Maharashtra**

1. INTRODUCTION

Water supply & waste management are very important to maintain the healthy conditions in the society. Water is an essential resource which cannot be created like other things. It is nature's gift to all living beings on the planet. We all are familiar that about ¾ surface of the planet is covered with water. But about 97.3% of the universal water assets come from the oceans and seas.[9]

1.1 World Water Scenario

The world's population is increasing rapidly but that rise is not matching with source of fresh water. World water scenario is nearly 97% is ocean water and 3% is fresh water. In consideration of water sources nearly 75% is polar ice and glaciers, 10% ground water available below 800m deep while 13% ground water available in 800m to 4000m deep and 2% is from other sources.[9]

1.2 Indian Scenario

As compare to World, India have 4% water resources while 18% of the inhabitants. But now country is suffering from the most horrible water disaster in its past and lots of lives are under danger. Currently, millions of Indians are face high water hassle and nearly lakhs of individuals expire every year due to poor admittance to safe water. Thus, there is a significant need to deeper our understanding about aquatic resources and its effective & sustainable use. The NITI Aayog established the CWMI to approve dynamic water management in the states of India.[7]

In Maharashtra, nearly 1821 considerable large dams on the five river basins, but mostly on the four rivers namely Krishna, Godavari, Narmada and Tapi. The 45% water resources of Maharashtra state is mainly from rainy season specific rivers which starts from the Western Ghats and ends in the Arabian Sea. But this water is not fully utilized because the normal height of Western Ghats is 600 meters above the sea level. Currently there are nearly 11000 rural and 389 urban schemes for water supply as well as 26 schemes for sewerage in urban area in the state.

2. Water Quality Index

The quality of water refers to the physical, chemical and biological characteristics of water. The sufficient amount of appropriate quality water assets provides a prerequisite for commercial and environmental development. This is most important for human need, agriculture, and industrial requirement as well as for biotic species purpose. But the abundant anxieties influence quality of water such as industrial activities, pesticides in agriculture, urbanization and natural processes like soil erosion. Due to this water quality becomes a serious issue worldwide. So the quality of water is generally achieved through treatment on the water by considering set of

parameters. The most common criteria's are related to drinking water, human health and the environment. The World Health organization (WHO) sets the guidelines for the water quality parameters.[6]

In Maharashtra, the water quality testing is monitored by state nodal agency Maharashtra Pollution Control Board (MPCB). Monitoring is carried out at 294 stations which include 176 rivers, 36 sea creek, 66 ground-water and 12 nallahs. MPCB has infrastructure to monitor 44 parameters including field observations, general parameters, core parameters and trace metals. The water samples are monitored with a monthly and six monthly frequencies for surface and ground water stations respectively. The water quality status of Maharashtra, Formula and classification of water quality indices and annual average WQI is as follows.[5]

Table -1: Formula and classification of Water Quality Indices for Surface and Ground water

Surface Water Quality		Ground Water Quality	
$WQI=\sum_{i=1}^{P} Wi\,Ii$		$WQI=\sum_{i=1}^{n=9} qi \cdot wi$	
Where, Ii = sub index for water quality parameter Wi = weight (in terms of importance) associated with water quality parameter P = number of water quality parameters		Where, qi = quality rating wi = relative of each weight	
WQI	Quality classification	Remarks	Color code
Surface Water Quality			
63 – 100	Good to Excellent	Non Polluted	
50 – 63	Medium to Good	Non Polluted	
38 – 50	Bad	Polluted	
38 and less	Bad to Very Bad	Heavily Polluted	
Ground Water Quality			
< 50	Excellent	Non Polluted	
50 – 100	Good Water	Non Polluted	
100 – 200	Poor Water	Polluted	
200 – 300	Very Very Poor	Polluted	
> 300	Water Unsuitable for drinking	Heavily Polluted	

Source: Water Quality Status of Maharashtra 2017-18, by MPCB, January 2019.

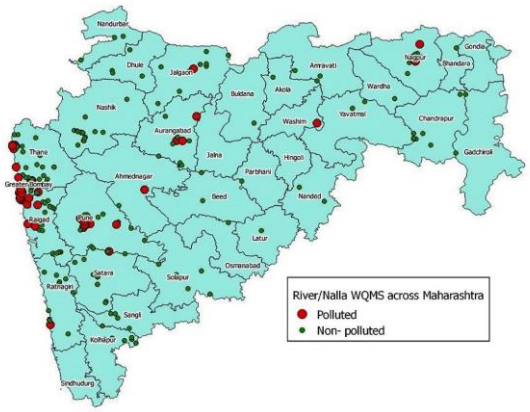

Fig -1: Water Quality Status of Maharashtra
Source: Water Quality Status of Maharashtra 2017-18, by MPCB, January 2019.

Table -2: Annual average WQI for surface WQMS in various basins and sub basin.

Basin	Sub basins	Name of Rivers	Category wise No. of WQMS					
			G2E	M2G	B	B2V	Dry	Total
Tapi	Tapi Upper	Tapi, Purna, Pedhi	2	3	—	—	—	5
	Tapi Middle	Tapi, Girna, Rangavali, Amravati, Bori, Burai, Gomai, Hiwara, Kan, Mor, Panzara, Titur, Waghur	9	4	—	—	2	15
Godavari 1	Godavari Upper	Godavari, Chikhali nalla, Darna	14	5	1	—	—	20
	Godavari Middle	Godavari, Bindusara	8	1	2	—	—	11
	Manjra	Godavari, Manjara	2	—	—	—	—	2
Godavari 2	Wardha	Wardha, Penganga	—	11	1	—	—	12
	Weinganga	Kolar, Kanhan, Weinganga	3	8	—	4	—	15

	Pranhita and others	Weinganga	—	1	—	—	—	1
Krishna	Bhima Upper	Bhima, Nira, Chanrabhaga, Mutha, Ghod, Indrayani, Pawana, Sina, Vel, Nalla, Mula-Mutha	3	18	15	—	—	36
	Krishna Upper	Krishna, Panchaganga, Koyna, Urmodi, Verna	14	7	—	—	—	21
West Flowing Rivers		Kalu, Ulhas, Patalganga, Bhatsa, Vasishti, Mithi, Kundalika, Savitri, Amba, Kundalik, Muchkundi, Surya, Tansa, Vaitarna	19	18	3	2	—	42
Nallah		Raboli nalla, Colour Chem nalla, Sandoz nalla, BPT Navapur, Tarapur MIDC nalla, Pimpal-Paneri nalla	—	3	3	6	—	12
Saline			1	18	17	—	—	36
Total			75	97	42	12	2	228

Water quality decreases day by day due to industrialization, man-made activities, land filling, waste filling, mining, habitat fragmentation, deforestation, excessive use of pesticides in agriculture, change in agriculture pattern and untreated water directly mixture into river etc. Henceforth it is necessary to work on Water Quality Index to maintain quality of river water as well as quality of ground water.

3. WATER QUALITY INDICES IN DIFFERENT GLOBAL REGIONS

Wei Sun, Dongjiang River, Correlation Analysis WQImin.[1] He simplifies the procedure of spatial and chronological changes and modify the WQI and termed it as WQImin. It is based on the Principal Component and correlation analyses of water parameters. This gives the same result as the previous index. WQImin also replicates the periodic changes of water quality. They also suggest that constant nursing should be conducted to evade industry pollution. Furthermore, the procedures and their results provided here a makes baseline reference for the future observing of the Dongjiang River. They also recommended that stratagems of water pollution anticipation should be applied uninterruptedly for suitable management along the Dongjiang River.

Devendra Swaroop Bhargava, Ganga River, Weighted Arithmetic Average.[2] The objective of this study is to assess WQI for zoning and classification of Ganga River. By considering all the beneficial use of Ganga River and values of variables in the sensitivity function with their weights, he streamlined the model for WQI. Further by compelling weighted arithmetic average he calculated overall WQI values. It results that the water quality of Ganga River at certain point is not even class III in summer season when the consumption of water is at most. He recommends that high quality levels of river will be conserved by increasing consciousness in the field of water pollution.

Gurdeep Singh, Mining Talukas of Goa, Physico-chemical Parameters.[3] The main purpose of this study is to select appropriate treatment technique to meet the alarmed issues in mining talukas of Goa, India. They evaluated surface water quality of different mining regions of Goa by testing numerous physico-chemical parameters. From this study, they observed that highest WQI value during monsoon seasons whereas lowest WQI value in post monsoon season.

Ramotra K. C., Warana River Basin, Influence of Spatiotemporal Changes.[8] The purposes of their study are to measure the influence of spatiotemporal changes and living standard of the society in the region. The data is collected by the conducting field work in nearby villages of sugar factory. They found that communities near complex have high living standards as compared to individuals who are situated away. The study advises that by creating facility of irrigation and new techniques in farming sector their living standard will be raised.

Mohite S. A., Warana River Basin, Change in Biodiversity.[4] He studied the change in ecosystem and fishing activities in Warana river basin. The study

involves change in biodiversity of the river due to habitat fragmentation, mining, deforestation, change in agriculture pattern, soil extraction for brick kilns and industrial pollution. They mainly focus of fish diversity and variations in riparian organisms. They conduct survey of fishermen's and field study to bring the result. The major causes for changes are habitat destruction, soil erosion, sand mining, agricultural expansion, water level fluctuation, over fishing and pollution. They conclude that Warana river basin is undergoing gradual negative changes in its quality and recommended that there is serious need to shield the riparian environment of Warana river basin and parallel rivers in Western Ghats.

NITI Aayog, Composite Water Management Index: A tool for Water Management.[7] This report gives the guidelines for developing CWMI in Indian states. These suggested strategies help as a valuable reference for the planning of policies. The data involved in this report was made openly accessible, so this will guide for real planning procedure.

4. DISCUSSION

The WQI for surface and ground water can be obtained by different methods. The value of WQI is based on the geographic region and different seasons. It can be calculated by weighted arithmetic average method, evaluating physico-chemical parameters, applying correlation analysis of water parameters to minimizing WQI to obtain WQImin, by considering spatiotemporal changes on biodiversity of river etc.

After considering different methods and Geographic landscape of India, NITI Aayog developed guidelines for WQI of different states of India. In India, different states have different topographical pattern, so we have to consider different parameters based on that particular region. For Maharashtra, NITI Aayog gives the guidelines to calculate WQI.

5. CONCLUSIONS

Water Quality Index is necessary to analyze quality of river water and ground water. In Maharashtra (India), Maharashtra Pollution Control Board (MPCB) publishes report on water quality data every year. By analyzing that data and NITI Aayog guideline we can evaluate values of WQI in different seasons. Further we can use it to develop Composite Water Management Index (CWMI) of particular river basin to improve the quality of water and effective management of river water.

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