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SURFACE WATER QUALITY ANALYSIS OF PANCHAGANGA RIVER

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Abstract - *In the present work river water samples are collected from five different stations of Panchaganga river between Panchaganga ghat to Kurundwad and water quality assessment is carried out in December 2020. To assess the environmental impact of disposal of domestic, industrial and household waste into the river. Then water quality index (WQI) study is carried out to assess the environmental impact on the water quality of the Panchaganga river and to arrive at the level of pollution. From the study it is observed that station-1 and station-4 is Medium to Good water quality, station-3 and station-5 found Good to Excellent water quality and station-2 are found Bad water quality and are totally unfit for drinking purpose. This is mainly due to regular addition of domestic sewage, agricultural runoff, industrial wastes and other wastes that are let into the river through drains, nallahs in each station and it may lead to excessive pollution.*

Key Words: Water, Pollution, Water quality index, Surface water, Panchaganga river.

1. INTRODUCTION

Pollution is a significant issue since it is a moderately ongoing improvement in the Planets history. Before the 19th century industrial revolution, individual lived, more in unity with their immediate environment. As industrialisation has spread in immense Quantity, the issue of pollution has spread with it. Water is normally referred to contaminated when it is hindered by anthropogenic containments, because of this content needs it either doesn't useful for human use for example drinking water.

The environment is under more sustained threat from human activity in the 21st century than at any other time in the history with extensive potential social and health consequences. Human health broadly defined, encompassing physical, mental and spiritual dimensions, is highly dependent on the context in which we live. Any threat to our environmental certainties, therefore, has a significant impact on human well-being. Kolhapur is settled on the rising ground on the bank of the river Panchaganga. Panchaganga is one of the major reason for prosperity of Kolhapur, It originates in Western ghats and is a major tributary to Krishna.

1.1 PANCHAGANGA RIVER

The Panchaganga river is one of the important river of India located in Karnataka coastal and Maharashtra. The Panchaganga river of Maharashtra flows through border of Kolhapur. it starts from Prayag Chikhali 8 kilometre from Kolhapur. The Panchaganga formed by 4 streams Kasari, Kumbhi, Tulsi and Bhogavati. Local tradition believes in an underground stream Saraswati which together with the other four streams make Panchaganga river. 1 million peoples and 173 villages on Panchaganga river bank directly or indirectly depends depends on Panchaganga river. East-West Length of River is 108 Km, North-South Length of River is 67 Km, Total Area is 2730.40 Sq.m, Average Width is 110 m, Average Minimum Depth is 3m, Average Maximum Depth is 14 m, Average Rainfall is 2501.9 mm, Average Minimum Temperature is 28°C to 12°C, Average Maximum Temperature is 14°C to 22°C.

The release of effluents and industrial waste from nearby industries has resulted into the pollution of Panchaganga river which has turn the water green primarily near Ichalkaranji where there are numerous textile and seizing. industries which are releasing their fluids without treatment. Eichhornia Crassipes has developed on the river close by Ichalkaranji. Very little endeavours where taken by neighbourhood government bodies to control its development. In a rainstorm the water level ascents and clean out and seen no place until November, in December it begins to develop again and by April .

1.2 STUDY AREA

Kolhapur is the adjacent urban body located along the bank of the river with a population of 549283 and this city is located at 16° 42' N and 74° 14' E, having mean sea level of 570 m. There are 18 sugar factories, stands on rising ground on the south bank of the river Panchaganga. Sampling of water from Panchaganga river at selected 5 stations is being done, Manual method of sample collection is preferred considering all site conditions. we find out from topographic map where the measure effluents from industries release in river like sugar industry textile industry domestic sewage contributing a lot in pollution effect not only health but lives of people. Station-1 is located near Panchaganga Ghat (shivaji bridge), station-2 is located near kasaba bawada –

shiroli bridge, Station-3 is located near Shiroli bridge (near tawde hotel. station-4, is located near Pattan kodoli-ichalkaranji. Station-5 is located near Kurundwad Panchganga river bridge in table-1 & Fig-1.

Table-1: Selected Sites for the study with GPS locations and altitude.

Station no.	Sampling Sites	Site Code	Site Location	Mean Sea Level(m
1	Panchaganga ghat (shivaji bridge)	A1	16°42'18"N, 74º12'55.8" E	538
2	kasaba bawada–shiroli bridge	A2	16º45'42.6"N, 74º15'44.2"E	536
3	Shiroli bridge (near tawde hotel)	A3	16º42'43.5"N, 74º16'50.1"E	538
4	Pattan kodoli-ichalkaranji bridge	A4	16º40'49.2"N, 74º23'44.3"E	531
5	Kurundwad Panchaganga river bridge	A5	16º40'55.6"N, 74º34'33.4"E	531

Fig -1: Geographical distribution of the sampling stations from river Panchaganga.

2. MATERIAL AND METHODS

Sampling was conducted monthly during the period of 7 December 2020 to 18 December 2020. Samples were collected at early morning hours, in polythene bottle. Conducting tests on sample to find out water parameters like pH, Alkalinity (mg/l), Acidity (mg/l), Chloride Content (mg/l), T.D.S (mg/l), D.O (mg/l), BOD (mg/l), COD (mg/l), Sulphate (mg/l) (SO4), Nitrate (mg/l), Phosphate (PO4).

2.1WATER QUALITY INDEX (WQI)

For assessment of Water Quality Index (WQI) obtained values of physicochemical parameters and unit weight were compared with drinking water standards of BIS (Bureau of Indian Standards, 2012),WHO,ICMR as mentioned in the Table-2. Further water quality indexing was assessed by the method adopted by Chaterjee and Raziudin (2002) Quality rating (qn) was evaluated by using the mathematical expression ;

Equation 1: Qn = {100 * [(Vn-Vio / Sn-Vio)]}

Where,

Qn = Quality rating for nth water quality parameter

Vn = Estimated value of nth parameter at a given sampling location

Sn = Standard permissible value of the nth parameter

Vio = Ideal value of the nth parameter in pure water

In most cases ideal value Vio = 0 except in certain parameters like dissolved oxygen and pH. The quality rating calculation for the DO and pH (Vio ≠ 0) is 14.6 mg/l and 7.0 respectively. Unit weight (Wn) is calculated by Equation 2. It is a value inversely proportional to the recommended standard values Sn of the corresponding parameters.

Equation 2: Wn = (K/Sn)

Where,

Wn = Unit weight for nth parameter

Sn = Standard value for nth parameters

K = Proportionality constant

Table-2: drinking water standards along with unit weight

Parameters	Unit	BIS / WHO/ ICMR Standards (Sn)	Unit Weight (Wn)
pH	-	6.5-8.5	0.219
Alkalinity	mg/l	120	0.0155
Acidity	mg/l	15	0
Chloride Content	mg/l	250	0.0075
TDS	mg/l	<500	0.0009
D.O	mg/l	5	0.3723
BOD	mg/l	5	0.3723
COD	mg/l	250	0.3723
Sulphate	mg/l	150	0.124
Nitrate	mg/l	45	0.0413
Phosphate	-	5	0.0094

The overall water quality index is calculated by aggregating the quality rating with the unit weight linearly. It is given in Equation 3.

Equation 3: WQI = [(ΣQnWn) / (ΣWn)]

The range of water quality index and status of water quality as worked out is given in Table-3.

Table-3 : Water Quality Index representing water quality status.

Range of Rating Scale	Quality classification	Remarks
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

3. RESULTS AND DISCUSSION

Water quality is measure of physical and chemical properties of the water, which in turns has its direct influence over the life of aquatic biota. Water quality representing parameters like like pH, Alkalinity, Acidity , Chloride Content , T.S , D.O , BOD, COD , Sulphate (SO4), Nitrate (mg/l), Phosphate (PO4) are considered as vital measures for classification of surface water monitoring. Hence, these physicochemical parameters were assessed (Water quality analysis result shown in Table - 4) during the period 7 December 2020 to, to 18 December 2020 denote the water quality index of Panchaganga river shown in table-5 and Graphical Water quality index (WQI) for the river water sampling stations as per chart-1.

Table -4: Water Quality Analysis Result

Water Parameter	A1	A2	A3	A4	A5
pH	7.87	7.5	7.45	7.45	7.96
Alkalinity	300	260	500	320	480
Acidity	180	130	170	300	150
Chloride Content	65.22	53.88	48.21	90.75	96.42
TDS	500	1050	1800	900	450
D.O	10.2	7.8	6.8	6.4	7.2
BOD	1.8	1.4	5	1.6	3.4
COD	4	52	240	112	168
Sulphate	0.047	0.091	1.44	5.44	3.15
Nitrate	16.46	15.3	11.49	13.48	16.35
Phosphate	32.46	12.25	23.75	22.35	28.70

Table-5: Water quality index (WQI) for the river water sampling stations

Station No.	Water Quality Index (WQI) = Wn X Qn	Water Quality
Station-1	52.71	Non Polluted
Station-2	48.10	Polluted
Station-3	88.25	Non Polluted
Station-4	58.98	Non Polluted
Station-5	87.81	Non Polluted

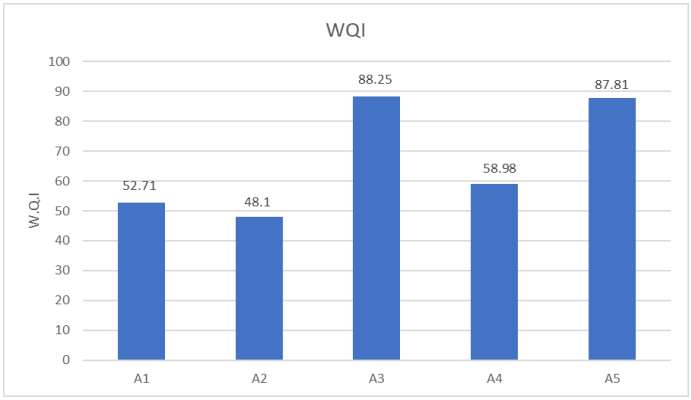

Chart:-1 Graphical Water quality index (WQI) for the river water sampling stations

4. CONCLUSION

The present study is aimed to assess the environmental impacts on the Panchaganga river water quality and to check the level of pollution at the located stations. From the results of present investigation it is concluded that due to non-availability of the adequate land and full-fledged treatment facilities, municipal and industrial wastewater enters into river Panchaganga through various drains and nallahs which deteriorate the quality of river water. As per table-5, the water quality index study revealed that the water quality index (WQI) for station-1 is 52.71 which indicate that water Quality is Medium to Good,Non Polluted. For station-2 is 48.10 indicates Bad for drinking and totally unfit for drinking purpose. For Station-3 is 88.25 indicates water Quality is Good to Excellent, Non Polluted. For Station-4 58.98 are found to be Quality having Medium to Good, Non Polluted. For station-5, 87.81 indicates water is Non Polluted.

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