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WATER QUALITY INDEX EVALUATION FOR MONITORING WATER QUALITY OF RIVER BARAK

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ABSTRACT

Water of River Barak that runs through densely populated Silchar city of Assam was taken for evaluation of Water Quality Index(WQI). Water Quality Index is a grade used to represent water quality at particular station at that particular time based on several water quality parameters. The idea is to turn complex water quality into a number that is understandable and usable by all. Important parameters such as pH, Turbidity, Conductivity, Total Dissolved Solids(TDS), Dissolved Oxygen(DO), Residual Chlorine, Chloride and Temperature are taken for the purpose. The study was conducted utilizing a single water sampling method with 7 sampling stations along a stretch of 25 Km as Sonabarighat, Kanakpur, Badrighat, Sadarghat, Karatigram, Annapurnaghat, and Masughat. Weekly data for a period of 3 months was used .The study reveals that Water Quality Index of all stations is in the range of 20 to 40 which indicates water is not polluted and is harmless but turbidity of water is more due to sediment flow.

KEYWORDS: *WQI, River Barak, Water testing.*

1. INTRODUCTION

Water is a vital natural resource and is becoming increasingly scarce. Rivers serve a vital significance as a substantial supply of water. Unfortunately, rivers are polluted as a result of indiscriminate sewage and industrial waste disposal, affecting their physiochemical and microbiological properties. Water quality has deteriorated in recent years as a result of the increasing human population, intensive agricultural practices industrialisation and the discharge of large amount of wastewater into the river.

Due to the impurities present in global water resources, only a few portion of the world's water is available for human consumption. It is important to know the concentration of different parameters of a given sample of the river water and to compare with permissible limits set by regulatory bodies.

Water quality monitoring focuses on the physical, chemical, and biological activities of the water. The Water Quality Parameters (WQP) related to Water Quality Index (WQI) are pH, Conductivity, Turbidity, Total Dissolved Solids (TDS), Dissolved Oxygen and Temperature,.

2. OBJECTIVE

The objective of the study is to find the relationship between physicochemical parameters of water as Water Quality Index (WQI) of Barak river flowing through Silchar city area of Assam.

3. METHODOLOGY

Water quality encompasses everything and anything that it may have picked up along the way, whether colloidal, dissolved, or suspended. For a layperson, the vast amount of data involved in water quality evaluation and monitoring might seem overwhelming. A novel approach has been developed to incorporate the data pool in the form of simple numbers called water quality indexes in an attempt to communicate the information in a more precise and understandable way. Horton (1965) was the first to create this concept in Germany, and since then, several other attempts have been made to develop an acceptable index for evaluating water quality in various regions as well as for global use.

Step 1: In this step, each of the parameters has been assigned a weight (AWi) ranging from 1-4 depending on collective expert opinions taken from the previous studies.

Step 2: In this, the relative weight (RW) was calculated by using the following equation

$$RW = \frac{AW_i}{\sum_{i=1}^{n} AW_i}$$

Step 3: The quality rating scale (Qi) for all the parameters except for pH and DO was assigned by dividing its concentration in each water sample by its own standard according to the drinking water guidelines and the result was multiplied by 100.

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$Q_i = \left[\frac{c_i}{s_i}\right] \times 100$

While the quality rating for pH or DO was calculated on the basis of

Q (p, DO) $= \left[\frac{c_i - v_i}{s_i - v_i}\right] \times 100$

Vi = the ideal value which is considered as 7.0 for pH and 14.6 for DO

Ci = value of water quality parameter subindices fromsampleanalysis.

Step 4: The subindice (SI_i) were calculated first for each parameter and used to compute WQI.

$SI_i = Rw \times Q_i \qquad WQI = \sum_{i=1}^{n} S\,I_i$

The computed WQI values could be classified as

<50= Excellent

50-100 = Good

100-200 = Poor

200-300 =Very poor

>300 = Unsuitable

4. DATA COLLECTION

Sampling was done before sunrise using brown bottle so that it should not affect the water quality parameters. Samples were collected in plastic bottles of 0.5 litre capacity .The bottles were filled upto the top, leaving no space for air, and then sealed to prevent leakage. The name of the places were clearly marked on each bottle and sent to laboratory for testing.

5. STUDY AREA

The study area considered in the present work is Barak river basin. Barak river is one of the major rivers of South Assam. The 564 kilometers long river is part of the Surma-Meghna river System. It originates in the hill of Manipur where it is the biggest and most important river. After Manipur, it flows through Assam. It later enters Bangladesh where it forks into Surma and Kushiyara rivers. The Sub-basin of Barak River covers the state of Assam, Nagaland, Manipur, Mizoram, Tripura and Meghalaya with an area of about 27,659 sq. km. There are 7 stations selected along a stretch of 25 Km. starting from Sonabarighat, Kanakpur, Badrighat, Sadarghat, Karatigram, Annapurnaghat, and Masughat.

6.RESULTS

Parameters	R1	R2	R3	Mean value	Standards
Residual Chlorine	1	1	1	1	0.2
E conductivity	4	5	2	3.666667	500
pH	1	4	4	3	6.5 – 8.5
Hardness	1	1	1	1	300
Chlorine	4	3	4	3.666667	250
DO	4	5	4	4.333333	5
TDS	4	2	2	2.666667	500

R1 – Relative weight of parameters taken from reference paper Dwivedi and Pathak .

R2 – Relative weight of parameters taken from reference paper Psece and Wunderlin.

R3 - Relative weight of parameters taken from reference paper Pathak and Banerjee.

Station wise WQI Calculation.

SONABARIGHAT							
Parameter	**Weights**	**Relative weights**	**Standards**	**Mean concentration**	**Quality ratings(Si)**	**Sub index level(SILi)**	**WQI**
Residual Cl	1	0.051722354	0.2	0	0	0	53.32
EC	3.667	0.189665874	500	85	17	3.224319851	
Ph	3	0.155167063	6.5	9	138.4615385	21.48467029	
hardness	1	0.051722354	300	35	11.66666667	0.603427468	
chloride	3.667	0.189665874	250	10	4	0.758663494	
TDS	4.334	0.224164684	500	54	10.8	2.420978587	
DO	2.667	0.137943519	5	9	180	24.82983345	

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KANAKPUR							
Parameter	**Weights**	**Relative weights**	**Standards**	**Mean concentration**	**Quality ratings(Si)**	**Sub index level(SILi)**	**WQI**
Residual Cl	1	0.051722354	0.2	0.1	50	2.58611772	55.35
EC	3.667	0.189665874	500	77	15.4	2.920854453	
Ph	3	0.155167063	6.5	8.8	135.3846154	21.00723317	
hardness	1	0.051722354	300	42	14	0.724112962	
chloride	3.667	0.189665874	250	50	20	3.793317472	
TDS	4.334	0.224164684	500	50	10	2.24164684	
DO	2.667	0.137943519	5	8	160	22.07096307	

BADRIGHAT							
Parameter	**Weights**	**Relative weights**	**Standards**	**Mean concentration**	**Quality ratings(Si)**	**Sub index level(SILi)**	**WQI**
Residual Cl	1	0.051722354	0.2	0	0	0	50.67
EC	3.667	0.189665874	500	94	18.8	3.565718424	
Ph	3	0.155167063	6.5	8.4	129.2307692	20.05235894	
hardness	1	0.051722354	300	44	14.66666667	0.758594531	
chloride	3.667	0.189665874	250	20	8	1.517326989	
TDS	4.334	0.224164684	500	61	12.2	2.734809145	
DO	2.667	0.137943519	5	8	160	22.07096307	

SADARGHAT							
Parameter	**Weights**	**Relative weights**	**Standards**	**Mean concentration**	**Quality ratings(Si)**	**Sub index level(SILi)**	**WQI**
Residual Cl	1	0.051722354	0.2	0.35	175	9.05141202	57.001
EC	3.667	0.189665874	500	104.5	20.9	3.964016758	
Ph	3	0.155167063	6.5	6.65	102.3076923	15.87478416	
hardness	1	0.051722354	300	53.65	17.88333333	0.924968105	
chloride	3.667	0.189665874	250	24	9.6	1.820792386	
TDS	4.334	0.224164684	500	67.5	13.5	3.026223234	
DO	2.667	0.137943519	5	8.1	162	22.34685011	

KARATIGRAM RONGPUR							
Parameter	**Weights**	**Relative weights**	**Standards**	**Mean concentration**	**Quality ratings(Si)**	**Sub index level(SILi)**	**WQI**
Residual Cl	1	0.051722354	0.2	0.04	20	1.034447088	51.15815091
EC	3.667	0.189665874	500	103.5	20.7	3.926083583	
Ph	3	0.155167063	6.5	6.09	93.69230769	14.53796023	
hardness	1	0.051722354	300	49.1	16.36666667	0.846522534	
chloride	3.667	0.189665874	250	32	12.8	2.427723182	
TDS	4.334	0.224164684	500	67	13.4	3.003806765	
DO	2.667	0.137943519	5	9.2	184	25.38160753	

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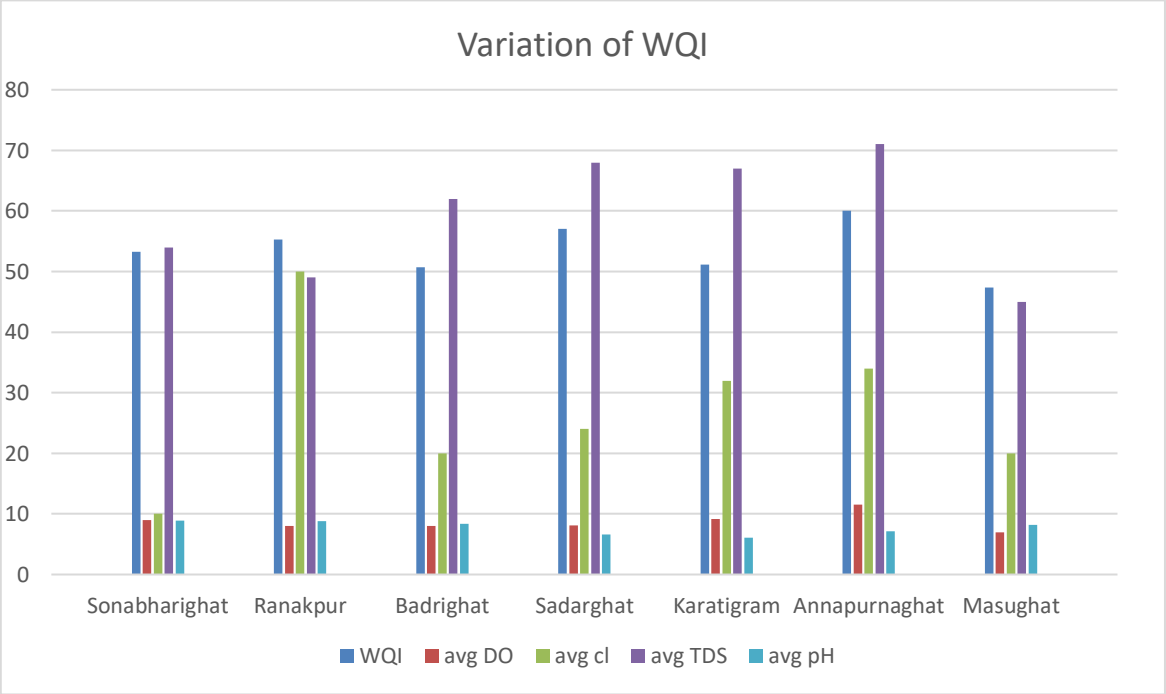
ANNAPURNAGHAT							
Parameter	**Weights**	**Relative weights**	**Standards**	**Mean Concentration**	**Quality ratings(Si)**	**Sub index level(SILi)**	**WQI**
Cl	1	0.051722354	0.2	0.01	5	0.258611772	59.47
EC	3.667	0.189665874	500	105.8	21.16	4.013329885	
Ph	3	0.155167063	6.5	7.1	109.2307692	16.94901767	
hardness	1	0.051722354	300	44.7	14.9	0.770663081	
chloride	3.667	0.189665874	250	34	13.6	2.579455881	
TDS	4.334	0.224164684	500	70.9	14.18	3.178655219	
DO	2.667	0.137943519	5	11.5	230	31.72700941	

MASUGHAT							
Parameter	**Weights**	**Relative weights**	**Standards**	**Mean Concentration**	**Quality ratings(Si)**	**Sub index level(SILi)**	**WQI**
Residual Cl	1	0.051722354	0.2	0	0	0	47.35
EC	3.667	0.189665874	500	91	18.2	3.451918899	
Ph	3	0.155167063	6.5	8.2	126.1538462	19.57492182	
hardness	1	0.051722354	300	48	16	0.82755767	
chloride	3.667	0.189665874	250	20	8	1.517326989	
TDS	4.334	0.224164684	500	59	11.8	2.645143271	
DO	2.667	0.137943519	5	7	140	19.31209269	



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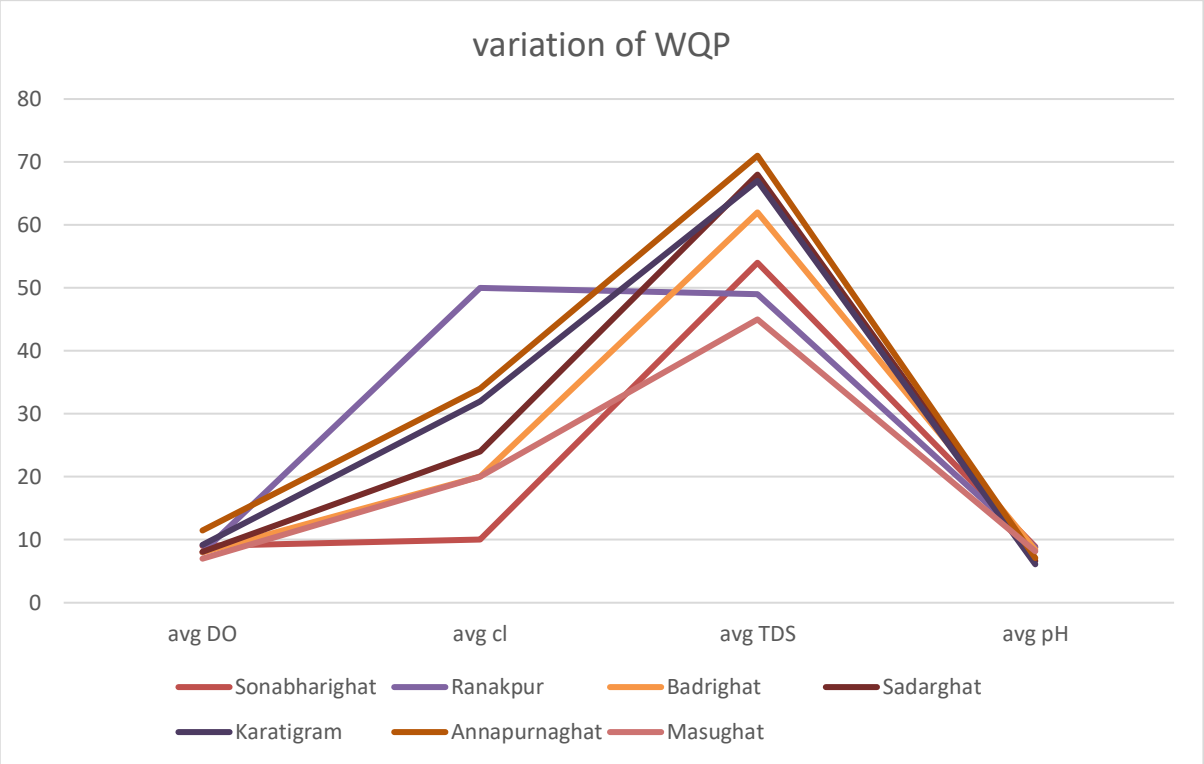

7. SUGGESTION

The river is not much polluted but sediment flow is much and due to turbidity the water cannot be used directly for drinking purposes without primary conventional treatment.

8. CONCLUSION

From the study it is observed that stations Karatigram and Sonabarighat showed excellent water quality and all other stations Kanakpur, Badrighat, Sadarghat, Annapurnaghat and Machughat showed good water quality index.

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