

ASSESSMENT OF WATER QUALITY INDEX OF KRISHNA RIVER WATER, KRISHNA DISTRICT, A.P, INDIA

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Abstract— This research paper deals the study on Assessment of water quality of Krishna River. Water Quality Index (WQI) is one of the most effective and simplified tool to communicate information on overall quality status of water to the concerned user community and policy makers. The Krishna River has unique nature of water quality due to its subsurface. It needs greater attention of all concerned since it is of the major source. In the present study, the water quality of Krishna River has been studied. The two liter water samples are collected by Grab Sampling process at a distance of 50meters from river Catchment at five different places of Krishna River, and then analyzed in the laboratory using APHA standard procedures. With the help of analytical results, the WQI was estimated using weighted average method with the use of IS10500:2012 standards and those are compared with standard WQI values.

Index Terms— Surface water, Krishna River, Analysis, Water Quality Parameters and Water Quality Index.

1. INTRODUCTION

Water is one of the basic needs to survival on the earth. The sources of water are surface and ground water. The surface water source is precipitation and melting of glaciers. The formation of water is hydrological cycle process. The water is important for any type of industries. The 50% wastes from industries are directly released to rivers and seas. So, by that the water quality also changes. Hence it is needed to analyze the water quality of Krishna River. Here we used a predefined tool to find the Water Quality Index status. WQI is one of the most effective and simplified tool to communicate information on overall quality status of water to the concerned user community and policy makers.

2. STUDY AREA

The Krishna River is one of the biggest rivers in terms of water capacity & river catchment area in India. These are long, widen and originate at western lands of Maharashtra at elevation of 1300mts above sea level and ends at Bay of Bengal. Krishna basin is a major source of irrigation for Maharashtra, Karnataka, Telangana and Andhra Pradesh. Nearly 15% of total geographical area of country is covered by this river. To satisfy all needs so many dams and barrages are constructed on this river. So due to these heavy hydraulic structures the capacity of the catchment areas of these structures are rapidly decreasing. Due to this, Krishna River water quality may be changed. So, in this present study we would like to disclose the Water Quality of Krishna water by collecting 5 different samples within a distance 50 KM.

3. MATERIALS AND METHODS

The two liter water samples are collected by Grab Sampling process at a distance of 50meters from river Catchment at five different places of Krishna River and then analyzed in the laboratory using APHA standard procedures. Sampling stations of Krishna River are listed in Table.1. With the help of these analytical results, the WQI was estimated using weighted average method with the use of IS10500:2012 standards and those are compared with standard WQI values. The parameters which are consider for analysis are pH, Chlorides (Cl⁻), Fluorides (F⁻), Total Dissolved Solids (TDS), Total Hardness, Calcium Hardness, Magnesium (Mg), Nitrates (NO₃⁻), Nitrites (NO₂⁻), Electrical Conductivity, Sulphates (SO₄²⁻), Turbidity, Iron (Fe) and Alkalinity.

Table.1. Mixed Proportion Details

S.No	Sample Code	Sample Number	Sampling Stations	Location Point
1	SK ₁	Sample No 1	Pokkunuru	(16°40'07.8"N,80°08'33.0"E)
2	SK ₂	Sample No 2	Usthepalli	(16°41'53.1"N,80°08'57.2"E)
3	SK ₃	Sample No 3	Ramannapeta	(16°43'49.2"N,80°08'49.8"E)
4	SK ₄	Sample No 4	Kethanakonda	(16°35'26.6"N 80°26'16.8"E)
5	SK ₅	Sample No 5	Vedadri	(16°48'52.9"N 80°07'25.9"E)

4. DETERMINATION OF WATER QUALITY INDEX

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$$WQI = \sum_{i=0}^n Q_i W_i$$

Q_i = water quality rating

W_i = Unit weight age value of water

$$Q_i = 100 * \left[\frac{V_a - V_i}{V_s - V_i} \right]$$

V_a = Actual value present in water sample,

V_s = Standard value of parameter

V_i = Ideal value (0 for all except pH and DO)

$$W_i = \frac{K}{S_n}$$

K = Parameter based Constant

S_n = Standard value of parameters ($=V_s$)

$$K = \frac{1}{\left(\frac{1}{V_{s,EC}}\right) + \left(\frac{1}{V_{s,Turbidity}}\right) + \left(\frac{1}{V_{s,pH}}\right) + \dots + \left(\frac{1}{V_{s,Sulphates}}\right)}$$

Table 2: Water quality parameter, standards and weight age values

Parameter	Standard Values ($V_s = S_n$)	Weight age (W_i)	Parameter	Standard Values ($V_s = S_n$)	Weight age (W_i)
E C	300	0.000130	Magnesium	30	0.001304
Turbidity	1	0.039124	Iron	0.3	0.130413
pH	7.5	0.005217	Fluorides	1	0.039124
TDS	500	0.000078	Chlorides	250	0.000156
TH	200	0.000196	Nitrites	0.05	0.782480
Alkalinity	200	0.000196	Nitrates	45	0.000869
Calcium	75	0.000522	Sulphates	200	0.000196

5. RESULTS AND DISCUSSIONS

5.1. Analysis of Samples

From the APHA standard procedure the concentration of parameters in various samples are tested and given in Table.3.

Table.3. Concentration of various parameters present in Samples

Parameter	SK ₁	SK ₂	SK ₃	SK ₄	SK ₅
E C	780	812	760	680	764
Turbidity	4	2	3.2	2.8	4.2
pH	7.3	7.4	7.3	7.2	7.4
TDS	507	528	494	442	497
TH	176	180	172	164	176
Alkalinity	96	100	92	80	92
Calcium	68	68	68	64	68
Magnesium	26	27	25	24	26
Iron	0.06	0.08	0.06	0.08	0.32
Fluorides	0.4	0.4	0.4	0.4	0.4
Chlorides	112	120	108	84	108
Nitrites	0	0	0	0	0
Nitrates	14.6	15.2	15	10.5	13.4
Sulphates	32	34	31	30	32

*Turbidity in NTU, Electrical Conductivity in mhos and remaining all parameter in mg/lit

a. Electrical conductivity:

All the samples overcome the standards and the high value of electrical conductivity was present in SK₂, 812mhos.

b. pH:

As per standards some samples have high concentration and some are within the limits. The greater pH noted was 7.4 in SK₂ and SK₅

c. Turbidity:

As per standards all the samples except SK₅, contains high concentrations of turbidity. The highest turbidity was noted has 4.2 NTU in SK₅.

d. Total dissolved solids:

As per standards the total dissolved solids content in water samples was within the limits the highest TDS was noted has 528 mg/lit in SK₂.

e. Total Hardness:

The total hardness content in water samples was within the limits. The highest was noted as 180 mg/lit in SK₂.

f. Alkalinity:

As per standards the alkalinity content in water samples was within the limits the highest alkalinity was noted has 100 mg/lit in SK₂.

g. Calcium hardness:

Calcium hardness content in water samples was within the limits the highest was noted as 68 mg/lit in SK₁, SK₂, SK₃ and SK₅

h. Magnesium:

The highest magnesium was noted has 27 mg/lit in SK₂. All samples contain concentration of Magnesium within the limits.

i. Iron:

As per standards the iron content in water samples was within the limits except SK₅, the highest iron was noted as 0.32 mg/lit in SK₅.

j. Fluorides:

As per standards the fluorides content in water samples was within the limits. And all the samples contain same fluorides and it was noted as 0.4 mg/lit.

k. Chlorides:

Chlorides are also available within the limits in all the samples, the highest chlorides was noted as 120 mg/lit in SK₂.

l. Nitrates:

As per standards the nitrates content in water samples was within the limits the highest nitrates was noted as 15.2 mg/lit in SK₂.

m. Sulphates:

As per standards the sulphates content in water samples was within the limits the highest sulphates was noted has 34 mg/lit in SK₂.

n. Nitrites:

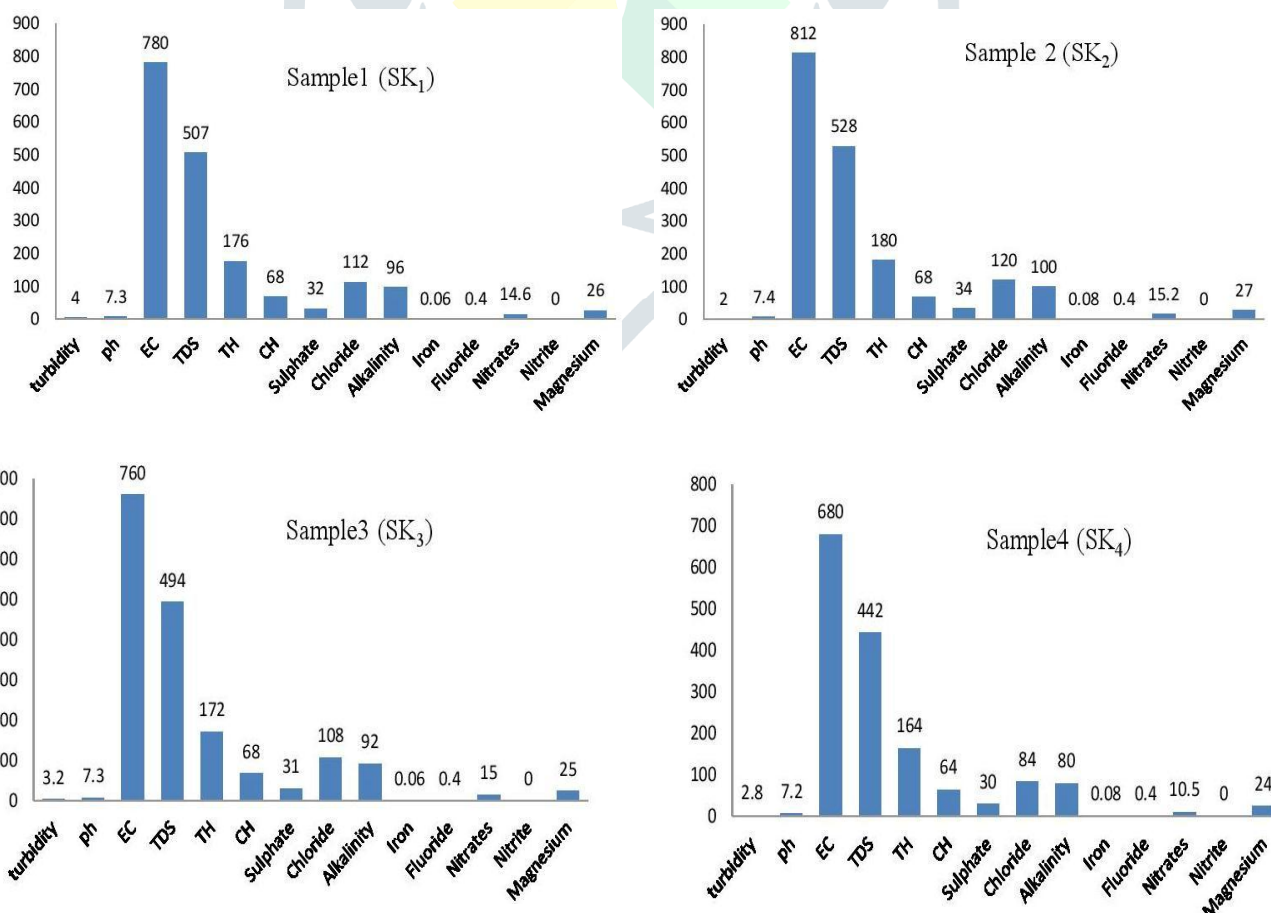
These are absent in all the samples.

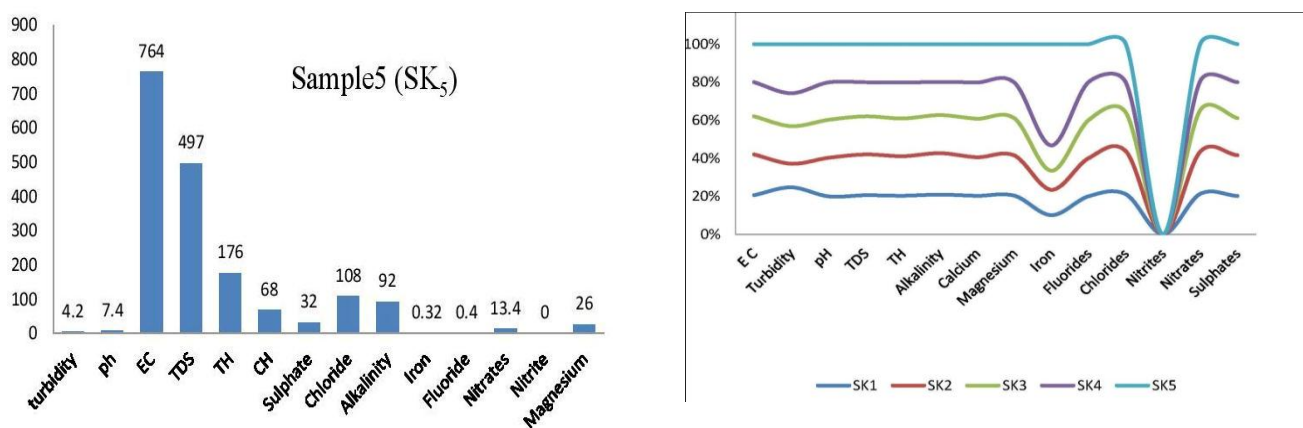
The analyzed data was plotted on sample wise and those are shown in Graph.1. With the use of above mentioned formulae and data noted in Table.1, 2&3, WQI values are obtained. The predicted WQI values and standard WQI values are shown in Table.4.

Table.4. Predicted WQI and Standard WQI Values

WQI Standard Values		Predicted WQI Values		
(WQI) Value	Status	Sample	WQI	Status
0-24	Excellent	SK ₁	20.4	Excellent
25-49	Good	SK ₂	13.5	Excellent
50-74	Poor	SK ₃	17.3	Excellent
75-100	Very Poor	SK ₄	16.38	Excellent
>100	Unfit for Drinking	SK ₅	32.5	Good
*****		Average	20	Excellent

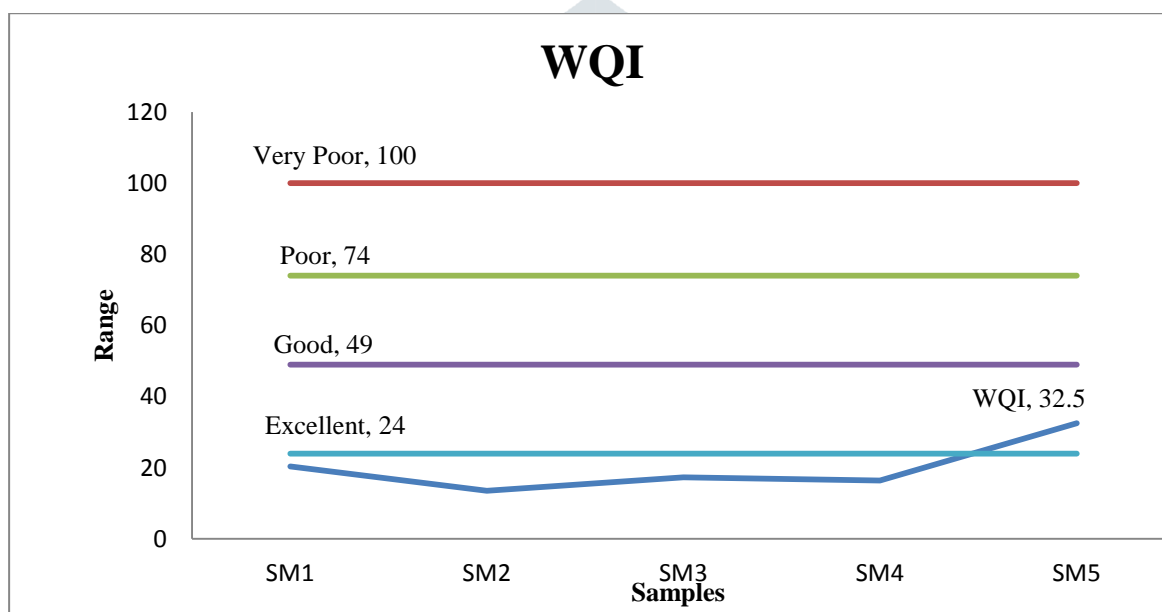
The water quality index was found to be Good in the SK₅ sample. It is found to be Excellent WQI in SK₁, SK₂, SK₃ and SK₄ samples. The average WQI of all samples is also come under the status of Excellent which is 20. The results shown in Table 3 are plotted and given in Graph.1.





Graph.1. Analysis of all samples and parameter

The predicted WQI Values are tabulated in Table.4. and are shown in Graph.2. From the graph, the WQI values of sample 5 are in the good region and remaining is in excellent Quality region.



Graph.2. Analysis WQI of all samples

6. CONCLUSIONS

This research paper deals the study on Assessment of water quality of Krishna River. With the help of analytical results, the WQI was estimated using weighted average method with the use of IS10500:2012 standards and those are compared with standard WQI values. The Krishna River Water has **Good Water Quality**.

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