



INTERPRETATION AND CORRELATIVE STUDY OF WATER SIMULATION IN SURFACE WATER BODIES

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ABSTRACT

Surface water bodies has number of benefits and they are major reasons for the settlement of human beings and the development of good habitation around the water bodies they provides water for drinking irrigation and also for all other purposes like for power generation, industrial sectors, navigation purpose ,recreational uses. Apart from these they can be used for waste disposal without crossing contamination levels of pollutant concentration in aquatic ecosystem. The major source for the contamination of any surface water body is activities of human beings as part of various daily activities, apart from the human activities through natural process like weathering, different types of erosions, catastrophic effects like floods, cyclones also contributes lake pollution. The behaviour of surface water bodies majorly influenced by toxic substances of untreated effluents from nearby textile, pharmaceutical and other types of industries. As the foreign materials are entering into the lakes they will loss the balance of ecosystem and effects self cleaning capacity of lakes. By keeping this in view we carried out this study to find out the water simulation in large surface water bodies with respect to concentration of various pollutants to promote sustainable development.

Key words: Surface water, water, ecosystem, water quality

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1. INTRODUCTION

The authors carried out this study to find out the water simulation in large surface water bodies with respect to concentration of various pollutants to promote sustainable development. The analysis reveals water samples consists high concentration of total dissolved solids and chlorides. There is no big difference in quality of water with respect to concentration of other parameters as the rainfall is minimum during the period of study.

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Major sources of water contamination in surface water bodies

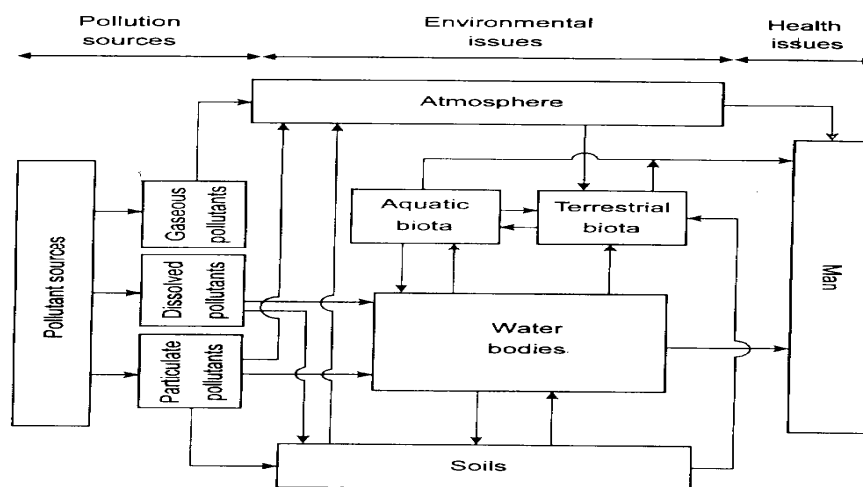


Figure 1

Source: Deborah Chapman 1996, Water quality assessment (UNESCO)

2. DISCRPTION OF THE STUDY AREA

The Kolleru Lake is the largest fresh water body in India, situated between the deltas of two major rivers krishna and Godavari in Andhra Pradesh, having different kind of flora and fauna. It was announced as bird sanctuary under wild life protection Act; it serves as a natural flood balancing catchment for Krishna and Godavari rivers having number of diverting canals and streams passing through it. It is surrounded with 46 island villages approximately 76 shoreline villages having more than two lakh habitats and it also serve as good breeding and feeding spot for wide variety of birds across the country. The excess water from the lake will discharge in to Bay of Bengal.

Location Map

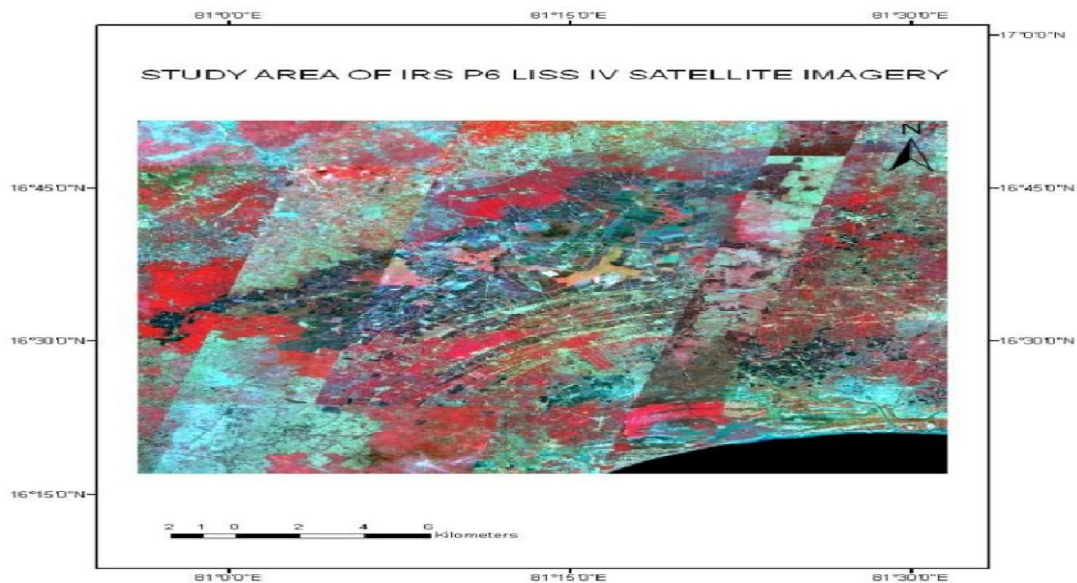


Figure 2 Satellite image of study area

3. OBJECTIVES

- Collection of water samples
- Analyzing pollutant concentration of water
- Proposing controlling measures to bring down water contamination

4. METHODOLOGY

- Comprehensive study on existed conditions of lake to identify water sampling locations
- Collecting water samples from all the corners and centre point of the lake
- Correlating water quality with surface water quality standards.

Table 1 Methods for water quality analysis

Test Conducted	Units	Principle of the method
Temperature	$^{\circ}\text{C}$	Precision thermometer, measured in situ
Electrical conductivity	Mhoms	Digital conductivity meter
Turbidity	NTU	Turbidity meter
Total Solids	mg l^{-1}	Evaporation
Total Dissolved and suspended solids	mg l^{-1}	Filtration and evaporation
pH		Digital pH meter
Total Alkalinity as CaCO_3	mg l^{-1}	Titration with std. H_2SO_4 P-alkalinity + MO – Alkalinity ----- x 100 ml of sample taken
P-Alkalinity as CaCO_3	mg l^{-1}	Vol. Of H_2SO_4 required in presence of phenolphthalein x 1000 ----- ml of sample taken
MO-Alkalinity as CaCO_3	mg l^{-1}	Vol. Of H_2SO_4 required in presence of methyl orange x 1000 ----- ml of sample taken
Chlorides	mg l^{-1}	Titration with stand. AgNO_3 using $\text{K}_2\text{Cr}_2\text{O}_7$ as indicator
Total Hardness	mg l^{-1}	EDTA titrimetric method
Biochemical Oxygen Demand BOD	mg l^{-1}	Sample measured for 5 days at 20°C

Source: American Public Health Association (APHA) 1998)

5. ANALYSIS OF WATER QUALITY

Based on the comprehensive report of surface water body total eight sampling locations were identified by covering all the corners including center part of the lake. Samples were collected for three times during the study period and the analysis was done by standard methods

Table 2 Physico chemical analysis of lake water in November month

S.NO	PARAMETERS	NOVEMBER							
		S1	S2	S3	S4	S5	S6	S7	S8
1	pH	7.9	8.4	6.5	7.9	7.2	8.4	7.8	8.2
2	Alkalinity	142	215	175	184	240	212	185	174
3	Total solids	390	494	532	484	542	476	514	535
4	TDS	614	472	615	714	714	616	518	514
5	Chlorides	156	234	274	188	194	232	241	262
6	Dissolved oxygen	2.4	2.8	3.4	2.6	3.2	2.2	2.4	3.6
7	BOD	265	355	225	315	278	230	349	284

All units are in mg/l except pH

Table 3 Physico chemical analysis of lake water in December month

S.NO	PARAMETERS	DECEMBER							
		S1	S2	S3	S4	S5	S6	S7	S8
1	pH	8.2	8.5	8.4	7.3	7.5	7.9	7.4	7.5
2	Alkalinity	168	219	176	184	244	195	182	145
3	Total solids	453	518	536	524	419	456	486	514
4	TDS	634	589	624	689	715	618	534	486
5	Chlorides	181	214	274	176	195	226	249	256
6	Dissolved oxygen	2.6	2.2	2.9	3.4	2.9	3.1	3.4	3.1
7	BOD	266	336	244	322	245	213	313	285

All units are in mg/l except pH

Table 4 Physico chemical analysis of lake water in January month

S.NO	PARAMETERS	JANUARY							
		S1	S2	S3	S4	S5	S6	S7	S8
1	pH	7.9	7.6	8.4	8.5	7.2	7.4	7.1	8.4
2	Alkalinity	169	199	186	174	234	167	185	154
3	Total solids	452	520	532	523	502	497	498	523
4	TDS	624	524	612	676	765	612	524	574
5	Chlorides	182	218	265	179	215	210	235	246
6	Dissolved oxygen	2.6	2.5	3.6	2.9	2.7	2.9	3.1	2.9
7	BOD	259	312	246	314	285	212	314	249

All units are in mg/l except pH

6. CORRELATIVE STUDY OF WATER QUALITY

The obtained results were correlated with surface water quality parameters to find out the pollutant concentration of the study area.

Table 5 Surface water quality classification

S.No	Water quality parameter	Characteristic of water body				
		A *	B *	C *	D *	E *
1	Dissolved Oxygen (DO) mg/l (minimum)	6	5	4	4	3
2	Biochemical Oxygen Demand (BOD), mg/l (max)	2	3	3	-	-
3	Total Coliform organisms ** MPN/100ml (max)	50 **	500	500	-	-
4	Total Dissolved Solids (TDS) mg/l (max)	500	-	1500	-	2100
5	Chlorides (as Cl ⁻) mg/l (max)	250	-	600	-	600
6	Colour, Hazen units (max)	-	10	300	300	-
7	Sodium Absorption Ratio (max)	-	-	-	-	20
8	Boron (as B), mg/l (max)	-	-	-	-	-
9	Sulphates (as SO ₄ ²⁻), mg/l (max)	400	-	400	-	1000
10	Nitrates (as NO ₃ ⁻) mg/l (max)	20	-	50	-	-
11	Free Ammonia (as NH ₃) mg/l (max)	-	-	-	1.2	-
12	Conductivity at 25°C micro mhos/cm (max)	-	-	-	1000	2500
13	pH value	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.5
14	Arsenic (as As), mg/l (max)	0.05	0.2	0.2	-	-
15	Iron (as Fe), mg/l (max)	0.3	-	-	0.5	-
16	Fluoride (as F), mg/l (max)	1.5	1.5	1.5	-	-
17	Lead (as Pb), mg/l (max)	0.1	-	0.1	-	-

Source: CPCB 1979 and bureau of Indian standards 1982

Note: * Classes of water use:

- A Drinking water source without conventional treatment but after disinfection
- B Outdoor bathing (organized)
- C Drinking water source with conventional treatment followed by disinfection.
- D Propagation of wild life, fisheries.
- E Irrigation, industrial cooling, controlled waste disposal.

** If the coliform is found to be more than the prescribed tolerance limits, the criteria for coliforms shall be satisfied if not more than 20 percent of samples show more than the tolerance limits specified and not more than 5 percent of samples show values more than 4 times the tolerance limits. There should be no visible discharge of domestic and industrial waste into class "A" waters. In case of classes "B" and "C" the discharge shall be so regulated / treated as to ensure maintenance of the stream standards.

7. RESULTS AND DISCUSSIONS

As part of study the water quality was assessed three months to find out the simulation of water with respect to pollutant concentration in surface water body, in this study by considering surface water quality standards total seven parameters were analyzed by adopting standard methods at eight sampling locations. The above analysis reveals water samples consists high concentration of total dissolved solids and chlorides. There is no big difference in quality of water with respect to concentration of other parameters as the rainfall is minimum during the period of study. Periodical cleaning measures must be initiated in and around the surface water bodies to restore lake Atmosphere, there should be continues

monitoring and limits on discharge of effluents in to the water bodies apart from these government should take up awareness programs on importance of protecting surface water bodies to promote sustainable development at study area.

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