



# Analysis of Annual Variations of Physico-Chemical Characteristics of Deepor Beel, Assam, India

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## Abstract:

The objective of the study is to analyse the yearly variations of Water Quality Index parameters around the Deepor Beel area. Assessment of yearly changes in surface water quality is an important aspect for evaluating earthly variation of water pollution level due to natural inputs of point and non-point sources. For this study, the data were collected from the year 2013 to 2017 from the Pollution Control Board, Assam. The data for two sites i.e. Dharapur and Boragaon were available in PCBA as the Dharapur is the area where fishing activity is done and Boragaon is the area of dumping of municipal solid wastes. Hence the analysis of yearly variation of WQI parameters of the Beel is done for those two sites only. The data are described by using of tables and graphs. In this study, the physico-chemical parameter of water such as Temperature, pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Dissolved Solids (TSS), Hardness, Alkalinity, Conductivity, Calcium, Magnesium, Chloride and Turbidity are considered for analysis. For calculating the Water Quality Index (WQI) and analysis of variations of Water Quality Index parameters we have taken average value of the parameters. The calculation of Water Quality Index was done by using arithmetic index method. The WQI plays an important role as a basis for environmental assessment of a watercourse in relation to pollution load categorization and designation of classes of beneficial uses. The WQI value of these samples ranges from 1-820 which shows that water in all the sites are not within the suitable mark for drinking. Thus proper treatment is highly needed to conserve its water body from future foulness, impurity and surrounding pollutions. Moreover the analysis shows that a parameter that is the most important in assessing yearly variations for one year may not be important for another year.

**Keywords:** Assam, Deepor Beel, yearly variation, Water Quality Index, Physico- Chemical Parameters, Arithmetic Index Method.

## I. INTRODUCTION

Water is one of the most important substances on earth for living life. Water quality is fundamental for good wetland health. Water quality in a body of water influences the way in which communities use the water for various activities the composition of water is affected by natural processes and human activities and is controlled by dissolved as well as suspended constituents. Water is renewable natural resources. Knowledge of water, chemical composition and its properties is necessary for the solution of scientific and applied problems concerned with water use for human domestic and other activity such as water supply, fish-breeding, hydraulic engineering etc. Despite its importance, water is the most poorly managed resources in the world. The existing tendency of industrialization and urbanization may contribute greatly to the poor quality of water through indiscriminate disposal of solid waste, industrial effluents and other toxic wastes which are the major environmental issues posing threats to the existence of human life. Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year, including during the growing season. It takes on the characteristics of a distinct ecosystem. But according to WWF-India, wetlands are one of the most threatened of all ecosystem in India. Thus, the safety of wetlands now becomes a burning issue. Deepor Beel is freshwater lake of international importance on the outskirts of Guwahati. It spreads over an area of 40.1 sq. km, the lake which is listed in the Ramsar Convention. It supports livelihood of over 1200

families living in 12 villages around it. Unfortunately, today pollution carries threaten to Deepor Beel existence. Hence it is necessary to safeguard the Beel as it performs vital ecological functions including storm water storage, flood mitigation, erosion control etc. We have selected the locations for sample water around the Deepor Beel, on the basis of point source and nonpoint source along it. Point sources are like wastewater effluent from municipal and industrial, runoff from industrial sites, storm water outfalls from cities etc. And the non-point sources are atmospheric deposition over a water surface runoff from agriculture, construction sites, pasture and range etc.

## II. LITERATURE REVIEW

Joseph P.V. et al.,(2010) Investigated Some physicochemical characteristics of a fresh water wetland (Pennar River) in Kerala & the analysis was carried out for a period of two years & the study indicated that water in Pennar river is highly contaminated and not safe for drinking. Luharia N.M. et al.,(2016) In this paper they study the physico-chemical parameters of Gawrala and Vinjasan lake of Chandrapur district & they found that the higher value of carbon dioxide, total alkalinity, sulphate and nitrate in Gawrala lake indicates its polluted nature hand, the lowest values in Vinjasan lake show its non-polluted nature. Mallin et al., (2006) investigated physical, chemical and biological variables contributing to BOD in the 17 North Carolina lotic and lentic water bodies affected by mild to severe hypoxia. Shukla Devangee et al(2013) Analyse the water quality parameters of four different

lakes of Ahmadabad: Kankariya Lake, Malav Lake, Vastrapur Lake, Chandola Lake and they found that maximum number of physical and chemical parameter were within the desirable limit, as suggested by WHO (1971) and BIS (1991).

### III. MATERIALS AND METHOD

In this study, yearly variations of physico-chemical characteristics of Deepor Beel were studied. The data for 13 parameters (Temperature, pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Dissolved Solids (TDS), Hardness, Alkalinity, Conductivity, Calcium, Magnesium, Chloride and Turbidity) were collected from the year 2013 to 2017 from the Pollution Control Board, Assam. The data for two sites i.e. Dharapur and Boragaon were available in PCBA.

### IV. RESULTS AND DISCUSSION

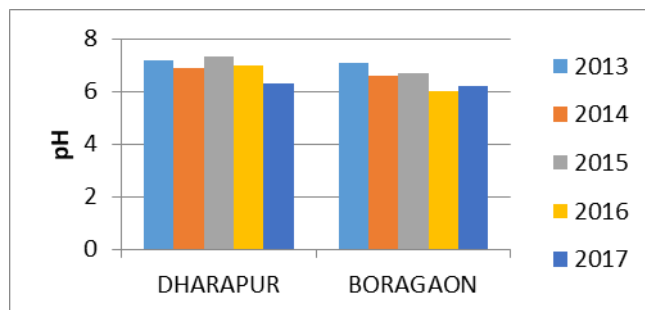
The data collected from the year 2013 to 2017 from Pollution Control Board, Assam for Dharapur and Boragaon are shown in Tables I and Table II

**Table .1. W.Q.I parameters for dharapur, deepor beel**

Year/Month	2017		2016	2015	2014	2013
	Sept.	Oct.				
pH	7.68	7.17	7	7.3	6.9	7.2
Temperature	31	28	28	26	25.5	25.6
Conductivity	108.6	109.37	185	214	331	221
T.D.S	69.50	70	118	144	154	126
Turbidity	13	15	3	3	1	8.4
D.O	3	2.9	8.2	5.9	5.3	7.2
B.O.D	4	3.52	3.5	5.6	3.2	4.1
C.O.D	20.85	17.6	17.42	16	9.4	18
Chloride	26	16	8	30	20	13
Alkalinity	100	84	80	64	104	63
Total Hardness	96	90	78	88	96	80
Calcium	60	58	60	60	64	50
Magnesium	8.78	7.81	4.39	6.83	7.81	7.32

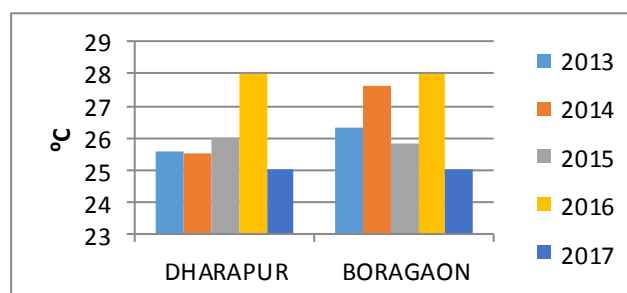
**Table.2. W.Q.I parameters for boragaon, deepor beel**

Year/Month	2017		2016	2015	2014	2013
	Sept.	Oct.				
pH	6.89	6.33	6	6.7	6.6	7.1
Temperature	32.5	29	28	25.8	27.6	26.3
Conductivity	97.1	104.68	149	602	613	583
T.D.S	62.14	67	96	820	540	792
Turbidity	14	21	35	41	23	3.8
D.O	0.5	0.6	6.5	4.5	6.3	5.3
B.O.D	7	10.2	3.8	9.4	8.4	11.4
C.O.D	36.15	47	19	26	84.6	63.1
Chloride	30	14	10	232	164	240
Alkalinity	100	72	108	110	48	240
Total Hardness	92	92	56	310	156	318
Calcium	55	50	38	176	98	194
Magnesium	9.02	10.248	4.39	134	58	124



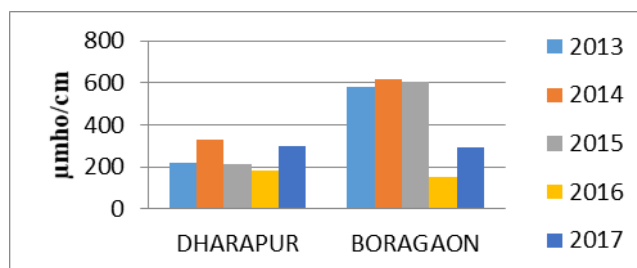
**Figure.1.Ph For Yearly Variation**

At Dharapur, the pH values of water are ranged from 6.3-7.3 as shown in the figure 1. The highest pH value was found to be 7.3 in the year 2015 and the lowest pH value was found to be 6.3 in the year 2017. At Boragaon, the pH values of water are ranged from 6-7.1 as shown in the figure 1. The highest pH value was found to be 7.1 in the year 2013 and the lowest pH value was found to be 6 in the year 2017.



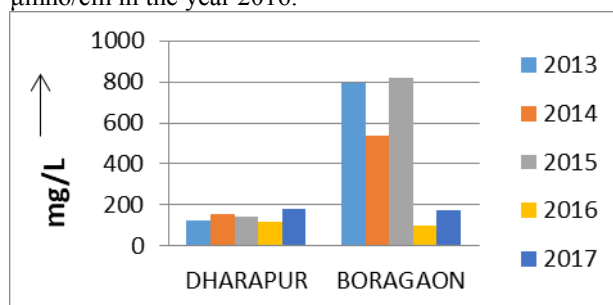
**Figure.2. Temperature for yearly variation**

At both the places i.e. Dharapur and Boragaon the temperature values are ranged from 25<sup>o</sup> C -28<sup>o</sup> C as shown in the figure 2. The values vary in same manner during that 5years i.e. maximum in 2016 and minimum in 2017.



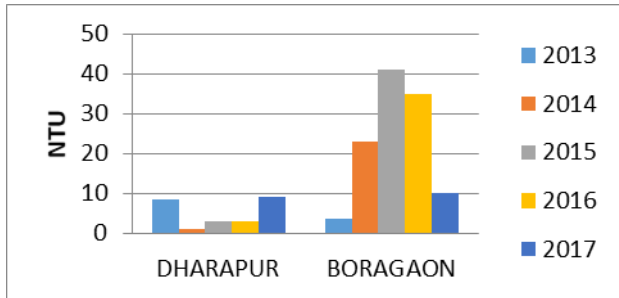
**Figure.3. Conductivity for yearly variation**

At Dharapur, the conductivity values of water are ranged from 185  $\mu\text{mho/cm}$ -331  $\mu\text{mho/cm}$  as shown in the figure 3. The highest conductivity value was found to be 331  $\mu\text{mho/cm}$  in the year 2014 and the lowest conductivity value was found to be 185  $\mu\text{mho/cm}$  in the year 2016. At Boragaon, the conductivity values of water are ranged from 149  $\mu\text{mho/cm}$  - 614  $\mu\text{mho/cm}$  as shown in the figure 3. The highest conductivity value was found to be 614  $\mu\text{mho/cm}$  in the year 2014 and the lowest conductivity value was found to be 149  $\mu\text{mho/cm}$  in the year 2016.



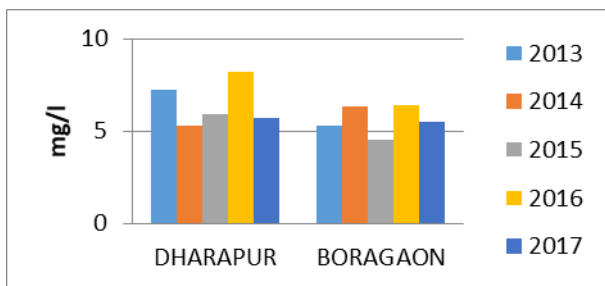
**Figure.4. T.D.S. For yearly variation**

At Dharapur, the TDS concentrations are varied from 118 mg/l-180 mg/l as shown in the figure 4. The highest TDS concentration was found to be 180 mg/l in the year 2017 and the lowest TDS concentration was found to be 118 mg/l in the year 2016. At Boragaon, the TDS concentrations are varied from 96 mg/l - 792 mg/l as shown in the figure 4. The highest TDS concentration was found to be 792 mg/l in the year 2013 and the lowest TDS concentration was found to be 96 mg/l in the year 2016.



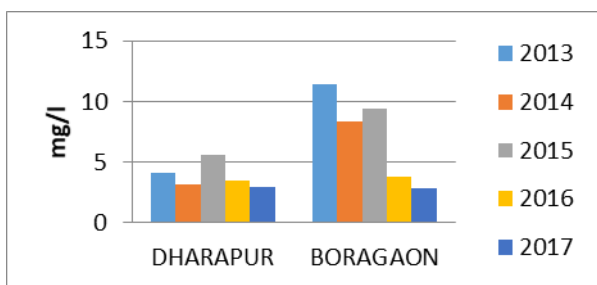
**Figure.5. Turbidity for Yearly Variation**

At Dharapur, the turbidity values of water are fluctuated from 1 NTU-9 NTU as shown in the figure 5. The highest turbidity value was recorded as 9 NTU in the year 2017 and the lowest turbidity value was recorded as 1 NTU in the year 2014. At Boragaon, the turbidity values of water are fluctuated from 3.8 NTU-41 NTU as shown in the figure 5. The highest turbidity value was recorded as 41 NTU in the year 2015 and the lowest turbidity value was recorded as 3.8 NTU in the year 2013.



**Figure.6. D.O. For yearly variation**

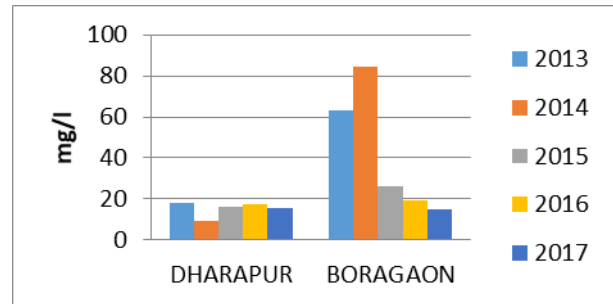
At Dharapur, the dissolved oxygen concentrations of water are ranged from 5.3 mg/l-8.2 mg/l as shown in the figure 6. The highest DO concentration was found to be 8.2 mg/l in the year 2016 and the lowest DO concentration was found to be 5.3 mg/l in the year 2014. At Boragaon, the dissolved oxygen concentrations of water are ranged from 4.5 mg/l-6.4 mg/l as shown in the figure 6. The highest DO concentration was found to be 6.4 mg/l in the year 2016 and the lowest DO concentration was found to be 4.5 mg/l in the year 2015.



**Figure.7. B.O.D. For yearly variation**

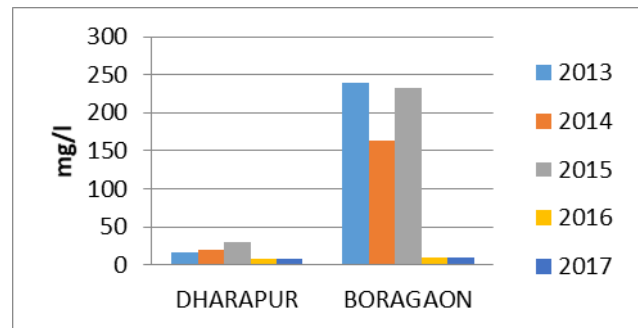
At Dharapur, the BOD concentrations of water are ranged from 3 mg/l-5.6 mg/l as shown in the figure 7. The highest BOD concentration was found to be 5.6 mg/l in the year 2015 and the lowest BOD concentration was found to be 3 mg/l in the year 2017. At Boragaon, the BOD concentrations of water

are ranged from 2.8 mg/l-11.4 mg/l as shown in the figure 7. The highest BOD concentration was found to be 11.4 mg/l in the year 2013 and the lowest BOD concentration was found to be 2.8 mg/l in the year 2017.



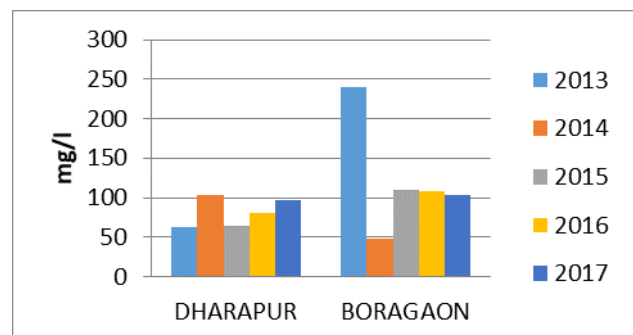
**Figure.8.c.o.d. For yearly variation**

At Dharapur, the COD concentrations of water are ranged from 9.4 mg/l-18 mg/l as shown in the figure 8. The highest COD concentration was found to be 18 mg/l in the year 2013 and the lowest COD concentration was found to be 9.4 mg/l in the year 2014. At Boragaon, the COD concentrations of water are ranged from 14.8 mg/l-84.6 mg/l as shown in the figure 8. The highest COD concentration was found to be 84.6 mg/l in the year 2014 and the lowest COD concentration was found to be 14.8 mg/l in the year 2017.



**Figure.9. Chloride For Yearly Variation**

At Dharapur, the chloride values of water are varied from 8 mg/l – 30 mg/l as shown in the figure 9. The highest chloride value was recorded as 30 mg/l in the year 2015 and the lowest chloride value was recorded as 8 mg/l in the year 2016 & 2017. At Boragaon, the chloride values of water are varied from 10 mg/l – 240 mg/l as shown in the figure 9. The highest chloride value was recorded as 240 mg/l in the year 2013 and the lowest chloride value was recorded as 10 mg/l in the year 2016 & 2017.



**Figure.10. Alkalinity for yearly variation**

At Dharapur, the alkalinity values of water are fluctuated from 63 mg/l – 104 mg/l as shown in the figure 10. The highest alkalinity value was recorded as 104 mg/l in the year 2014 and

the lowest alkalinity value was recorded as 63mg/l in the year 2013. At Boragaon, the alkalinity values of water are fluctuated from 48 mg/l – 240 mg/l as shown in the figure 10. The highest alkalinity value was recorded as 240 mg/l in the year 2013 and the lowest alkalinity value was recorded as 48 mg/l in the year 2014.

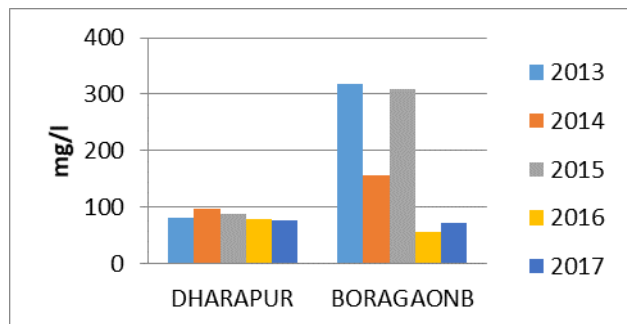


Figure .11. Total hardness for yearly variation

At Dharapur, the total hardness concentrations of water are fluctuated from 76 mg/l to 96 mg/l as shown in the figure 11. The highest total hardness concentration was recorded as 96 mg/l in the year 2014 and the lowest total hardness concentration was recorded as 76 mg/l in the year 2017. At Boragaon, the total hardness concentrations of water are fluctuated from 56 mg/l to 318 mg/l as shown in the figure 11. The highest total hardness concentration was recorded as 318 mg/l in the year 2013 and the lowest total hardness concentration was recorded as 56 mg/l in the year 2016.

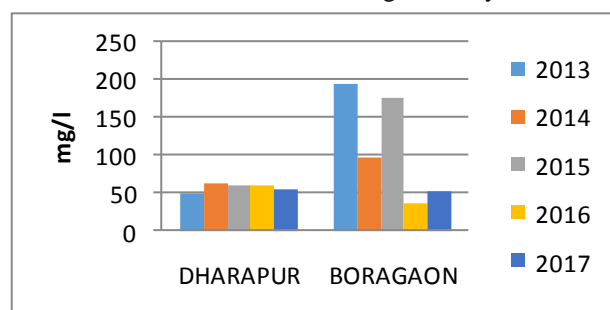


Figure.12. Calcium for yearly variation

At Dharapur, the calcium hardness concentrations of water are fluctuated from 50 mg/l to 64 mg/l as shown in the figure 12. The highest calcium hardness concentration was recorded as 64 mg/l in the year 2014 and the lowest calcium hardness concentration was recorded as 50 mg/l in the year 2013. At Boragaon, the calcium hardness concentrations of water are fluctuated from 38 mg/l to 194 mg/l as shown in the figure 12. The highest calcium hardness concentration was recorded as 194 mg/l in the year 2013 and the lowest calcium hardness concentration was recorded as 38 mg/l in the year 2016.

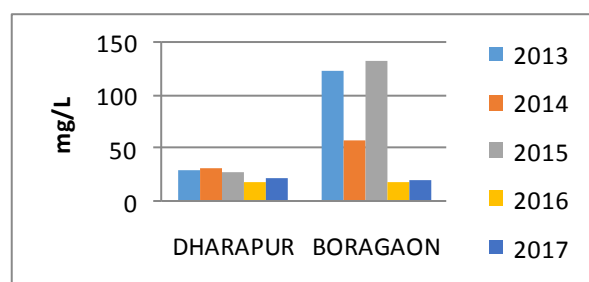


Figure.13. Magnesium for yearly variation

At Dharapur, the magnesium hardness values of water are fluctuated from 18 mg/l – 32 mg/l as shown in the figure 13. The highest magnesium hardness value was recorded as 32

mg/l in the year 2014 and the lowest magnesium hardness value was recorded as 18 mg/l in the year 2016. At Boragaon, the magnesium hardness values of water are fluctuated from 18 mg/l – 134 mg/l as shown in the figure 13. The highest magnesium hardness value was recorded as 134 mg/l in the year 2015 and the lowest magnesium hardness value was recorded as 18 mg/l in the year 2016.

## V. CONCLUSIONS

From the study, it is revealed that there are variations in water quality in different years in a same site. Boragaon have the highest WQI parameters values and found to be more polluted as compare to Dharapur site due to dumping of municipal solid wastes. The values of WQI parameters are less in the year 2017 than the previous years but still it is beyond the permissible limit. Hence it is a high time to take a strong step further to protect its water for the entire development of the community.

## VI. ACKNOWLEDGEMENT

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