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Inland Surface Water Analysis: A comparative study and their Environmental Impacts in Haryana

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ABSTRACT
Water is the most essential basic amenity of human life. Availability of water for domestic as well as commercial purpose is in the two forms i.e. ground water & Inland Surface water. As the percent of fresh water is less so it becomes very important that whatever fraction of water we are utilising it should meet the designated best use of it. In the present paper different regions of Haryana are taken & analysed with respect to physiochemical & Biological parameters given by Central Pollution Control Board (CPCB) directly indicating the designated best use of the water pertaining to different Class along with BIS standards for drinking water. The significance of this study is to get the appropriate notion regarding various Inland surface water utility in different regions of Haryana. The results obtained revealed that the surface water quality varied spatially. Water at most of the locations is not suitable for drinking purposes as per BIS guidelines. It is further suggested that some kind of treatment for TDS is immediately required in the studied areas to avoid water borne health problems in residents.

***Key Words*:** Inland Surface Water, Class of Water, Central Pollution Control Board

I. INTRODUCTION

"Surface Water" means inland waters, except groundwater; transitional waters and coastal waters, except respect of chemical status for which it shall include territorial waters."Inland Water" means all standing or flowing water on the surface of the land, and all groundwater on the landward side of the baseline from which the breadth of territorial waters are measured. So, Inland Surface Waters are non-coastal above-ground open fresh or brackish water bodies (e.g. Rivers, streams, lakes, and pools, springs), including their littoral zones.

The district's surface water bodies are classified in one of the following categories of surface water: Rivers, Lakes, Transitional waters, Coastal waters, Artificial surface water body, Heavily modified water body.

The tolerance limits for inland surface waters for various classes of water use have been published by the Central Water Commission.[1][2][3]The tolerance limits of parameters are specified as per classified use of water depending on various uses of water ranging from Class A to Class E. The various parameters covered include colour, odour, pH, total dissolved solids, hardness, alkalinity, elemental compounds such as iron, manganese, sulphate, nitrate, chloride, fluoride, arsenic, chromium, copper, cyanide, lead, mercury, zinc and coliform bacteria.

Further, the Central Pollution Control Board has classified the inland surface water into five categories A to E. On the basis of their designated best use and the desired class.[4][5][6]

Table 1.1

DESIGNATED BEST USE	CLASS OF WATER
Drinking water source without conventional treatment but after disinfections.	A
Outdoor bathing	B
Drinking water with conventional treatment followed by disinfections	C
Propagation of wild life Fisheries	D

Gurgaon, 32 km away from south-west of New Delhi, is the Cyber City of Haryana. The district has a total geographical area of 1254 square kilometres and a support a population of 8, 70,539. The climate of the district can be classified as tropical steppe, semi-arid and hot which is mainly characterized by

the extreme dryness of the Air except during monsoon months, intensely hot summers and cold winters. The present study was carried out nearby to various regions of Gurgaon.

II. METHODOLOGY

2.1 Selection of Site& Sampling points:

Eight different Inland Surface Water regions in vicinity of Gurgaon were selected for conducting this study. These regions are **Bhondsi, Palwal, DamDama Lake, Rewadi, Pali, Jhajjar, Sohna and Bhahadurgarh.** The various Inland Surface water sources were the sampling point in these regions.

2.2 Parameters Analysed:

The various physicochemical test were conducted for respective parameters which are summarised in the table below:

Parameters	Methods
TDS	Gravimetric Method
PH.	Electrometric Method
Conductivity	Electrometric Method
Turbidity	Electrometric Method
Chloride	Argentometric Titration
Temperature	Digital Thermometer
Total Hardness	Titration Method
Dissolved Oxygen	Winkler Method

In the present paper different regions of Haryana are taken & analysed with respect to physiochemical & Biological parameters given by Central Pollution Control Board directly indicating the designated best use of the water pertaining to different Class along with BIS standards for drinking water.[7][8]

III. RESULTS

THESE GRAPHS SHOW THE STATUS OF VARIOUS PARAMETERS AT DIFFERENT SITES.

1) PH test

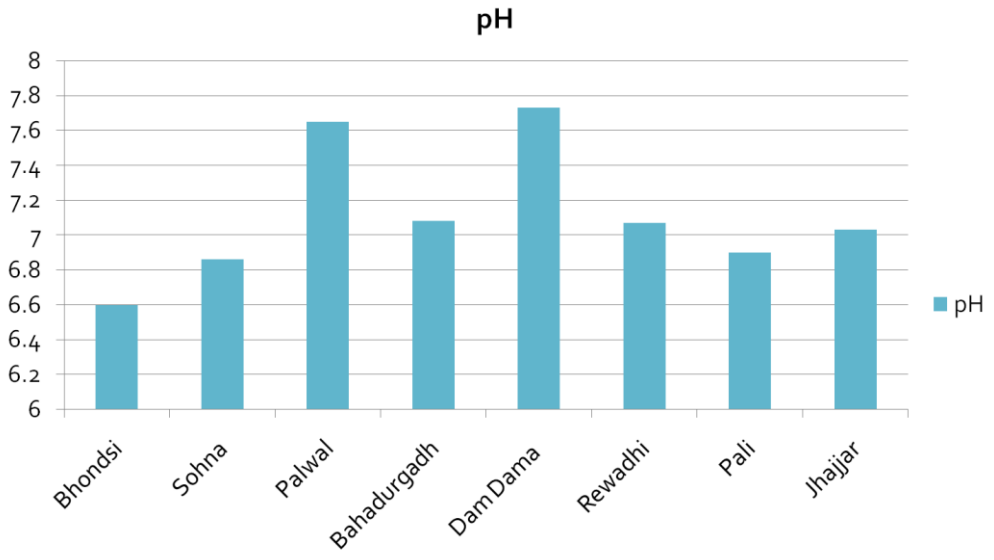


Table 3.1

Location	pH
Bhondsi	**6.60**
Sohna	**6.86**
Palwal	**7.65**
Bhahadurgarh	**7.08**
Dam Dama Lake	**7.73**
Rewadi	**7.07**
Pali	**6.90**
Jhajjar	**7.03**

2) TDS

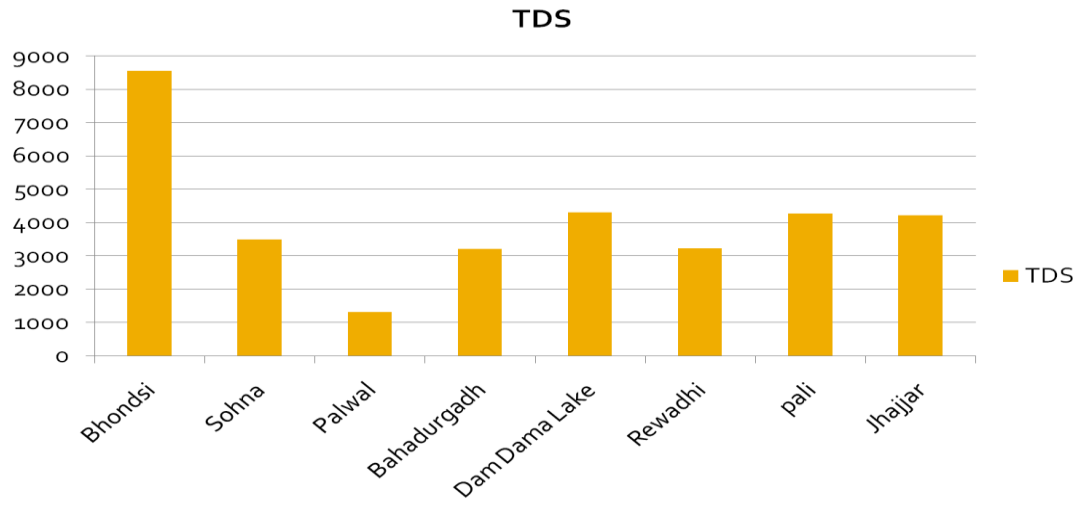


Table:

Table 3.2

LOCATIONS	TDS
Bhondsi	8540
Sohna	3488
Palwal	1314
Bhahadurgarh	3200
Dam Dama Lake	4290
Rewadi	3212
Pali	4260
Jhajjar	4200

3) CONDUCTANCE

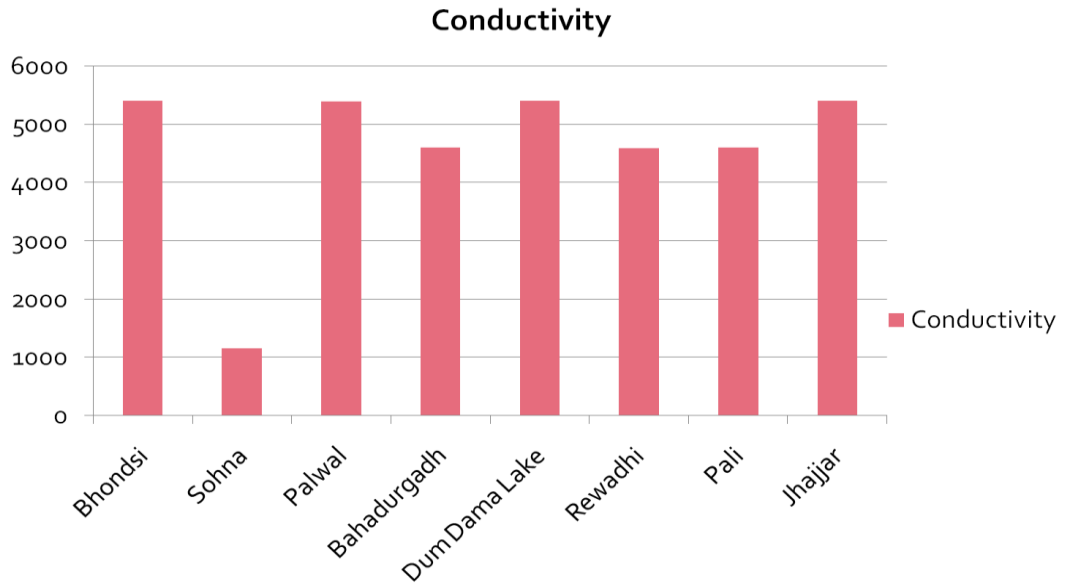


Table: 3.3

LOCATIONS	CONDUCTANCE
Bhondsi	5410
Sohna	1162
Palwal	5400
Bahadurgadh	4611
Dam Dama Lake	5410
Rewadhi	4600
Pali	4610
Jhajjar	5411

4) Turbidity

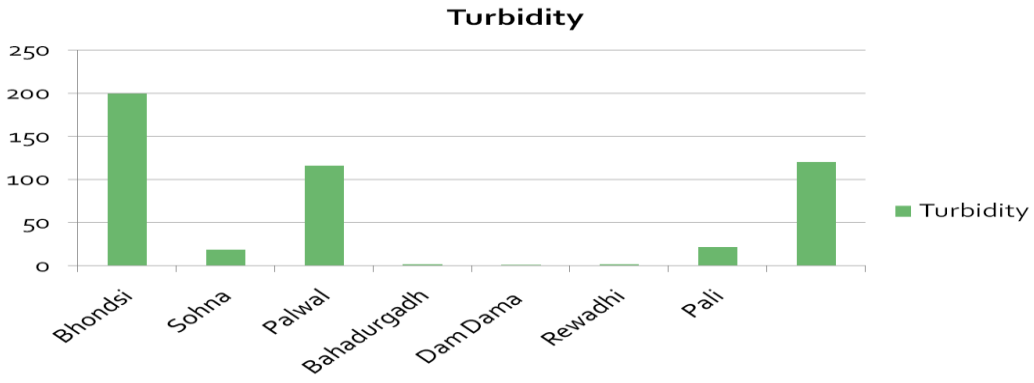
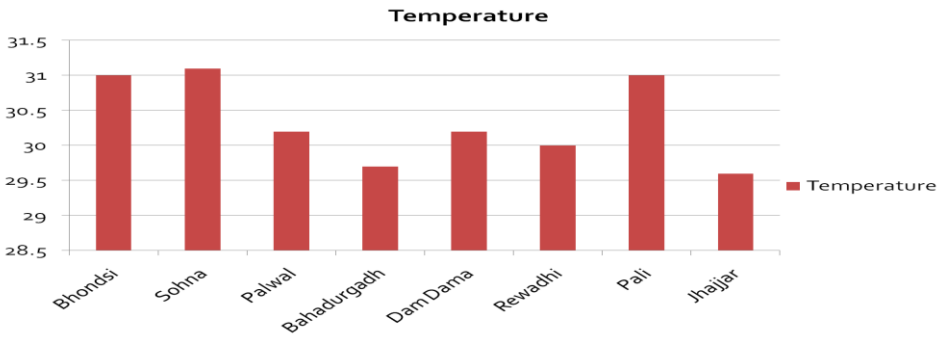


Table: 3.4

Locations	Turbidity
Bhondsi	199
Sohna	19
Palwal	116
Bhahadurgarh	2
Dam Dama Lake	1
Rewadi	2
Pali	22
Jhajjar	120

Location	Temperature
Bhondsi	31
Sohna	31.1
Palwal	30.2
Bhahadurgarh	29.7
Dam Dama lake	30.2
Rewadi	30
Pali	31
Jhajjar	29.6

5)Temperature



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6) Chloride

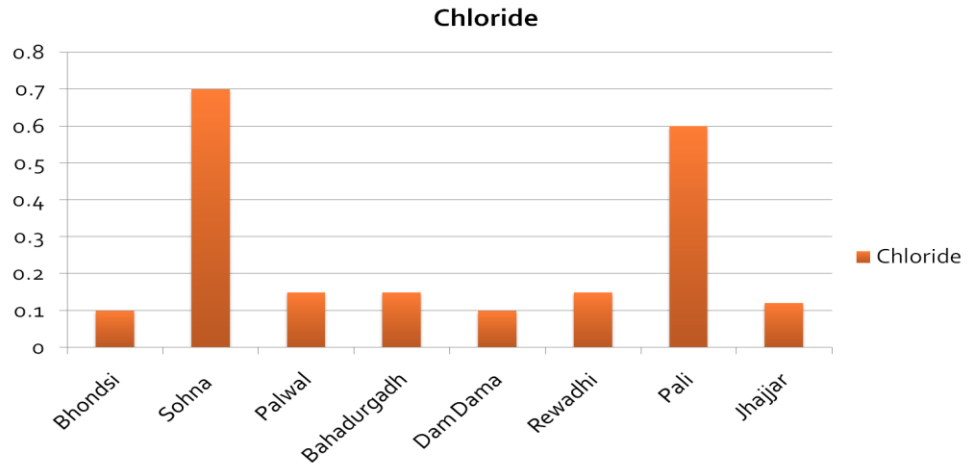
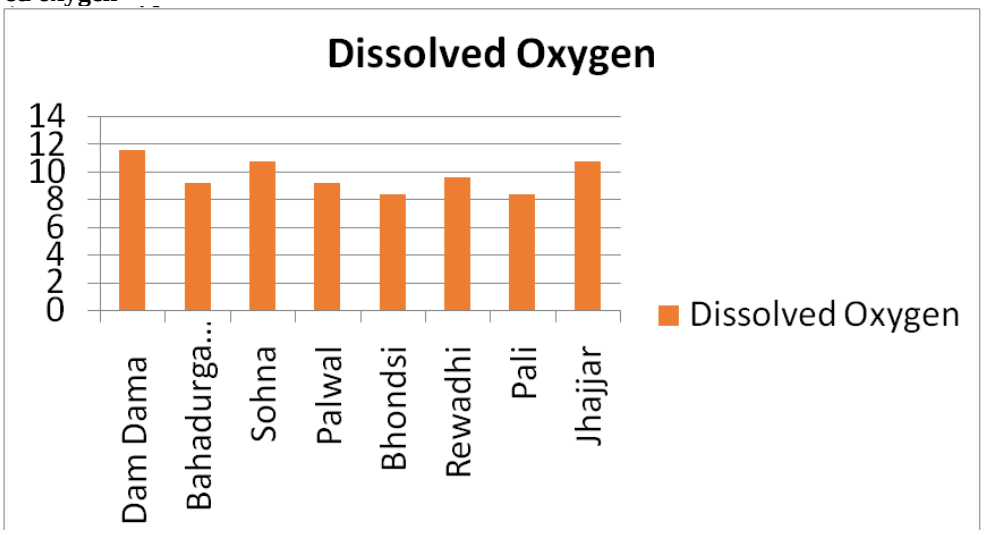


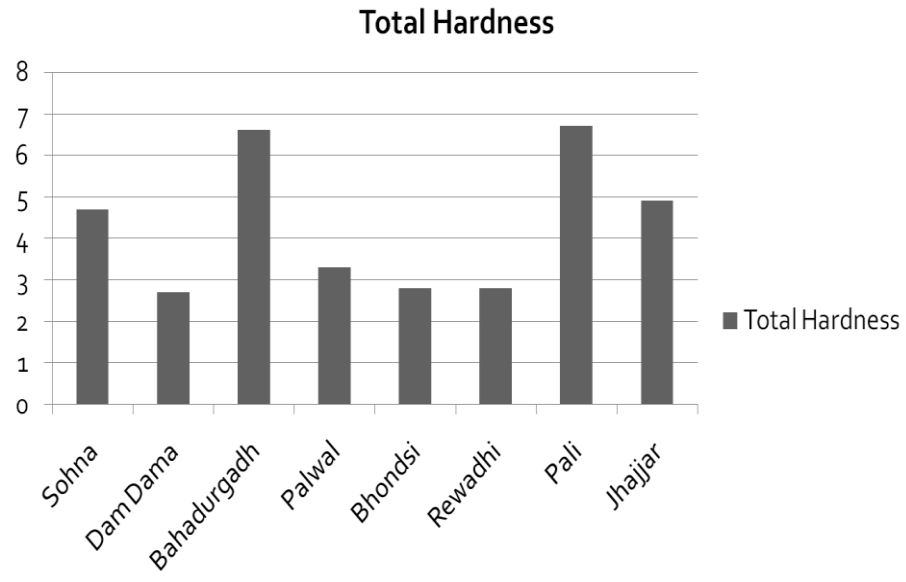
Table:

locations	Chloride
Bhondsi	**0.1**
Sohna	**0.7**
Palwal	**0.15**
Bhahadurgarh	**0.15**
Dam Dama lake	**0.1**
Rewadi	**0.15**
Pali	**0.6**
Jhajjar	**0.12**

7) Dissolved oxygen



8) Total Hardness



8) Total hardness

IV. DISCUSSION

The importance of evaluating all the above mentioned parameters have been discussed below.

1) PH Test :

The pH test is an important preliminary test. Small changes in pH (0.3 units or even less) are usually associated with relatively large changes in other water qualities. Most natural waters will have pH values from pH 5.0 to pH 8.5. The acidic, freshly fallen rain water may have a pH value of 5.5 to 6.0. If it reacts with soils and minerals containing weak alkaline materials, the hydrogen ion concentration will decrease. The water may become slightly alkaline with a pH of 8.0-8.5. Waters more acid than 5.0 and more alkaline than 8.5 to 9.0 should be viewed with suspicion. Sudden changes in pH values serve as warning signals that water quality may be adversely affected through the introduction of contaminates.

2) TDS:

Total dissolved solids (TDS) is a measure of the combined content of all inorganic and organic substances contained in a liquid in molecular, ionized or micro-granular (colloidal sol) suspended form. Generally the operational definition is that the solids must be small enough to survive filtration through a filter with two-micrometer (nominal size, or smaller) pores. Total dissolved solids are normally discussed only for freshwater systems, as salinity includes some of the ions constituting the definition of TDS. The principal application of TDS is in the study of water quality for streams, rivers and lakes, although TDS is not generally considered a primary pollutant (e.g. it is not deemed to be associated with health effects) it is used as an indication of aesthetic characteristics of drinking water and as an aggregate indicator of the presence of a broad array of chemical contaminants.

3) Conductance :

Conductivity is a measure of how well a solution conducts electricity. Water with absolutely no impurities (which really does not exist) conducts water very poorly. In real life, the impurities in water increase its conductivity. Because of this, if we measure the conductivity of water, we have some estimate of the degree of impurity. The current is actually carried almost entirely by dissolved ions. The ability of an ion to carry current is a functions of its charge and its mass or size: Ions with more charge conduct more current; larger ions conduct less.

4) Turbidity :

Turbidity is the cloudiness or haziness of a fluid caused by suspended solids that are usually invisible to the naked eye. The measurement of Turbidity is an important test when trying to determine the quality of water. It is an aggregate optical property of the water and does not identify individual substances; it just says something is there.

5) Chloride:

Chlorides can corrode metals and pipes. It can affect the taste of food products, cause nausea and vomiting. Therefore, water that is used in industry or processed for any use has a maximum Chloride level. Chlorides can also contaminate fresh water streams and lakes, leading to death of aquatic

life. So the chloride test is done to measure the level of contamination in water.

6) Dissolved Oxygen:

The Winkler test is used to determine the concentration of dissolved oxygen in water samples. Dissolved oxygen (D.O.) is widely used in water quality studies and routine operation of water reclamation facilities. An excess of manganese(II) salt, iodide (I^-) and hydroxide (OH^-) ions is added to a water sample causing a white precipitate of $Mn(OH)_2$ to form. This precipitate is then oxidized by the dissolved oxygen in the water sample into a brown manganese precipitate. In the next step, a strong acid (either hydrochloric acid or sulphuric acid) is added to acidify the solution. The brown precipitate then converts the iodide ion (I^-) to iodine. The amount of dissolved oxygen is directly proportional to the titration of iodine with a thiosulfate solution.

7) Total Hardness:

In this test, total hardness will be determined. Total hardness is defined as the sum of calcium and magnesium hardness 1, in mg/L as CaCO3. In addition to total hardness, the test described here will allow you to determine the concentration of Mg2+, in mg/L.

V. CONCLUSION

On the basis of physico-chemical analysis of the studied water sources in eight different areas of Haryana (India), it has been concluded that the surface water quality varied spatially. Water at most of the locations is not suitable for drinking purposes as per BIS guidelines. It is further suggested that some kind of treatment for TDS is immediately required in the studied areas to avoid water borne health problems in residents.

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