

## Comparative Studies of Physico-Chemical Parameters of Two Reservoirs of Narmada River, MP, India

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### ABSTRACT

The present study was carried out for a period of one year from January 2012 to December 2012 to enumerate the various Physico-chemical parameters of Narmada River at Indra Sagar Dam and Omkareshwar Dam. Water samples were taken from sampling stations every month and were analyzed as per standard methods. At Punasa Dam Maxima of Chloride and Sulphate were observed during June, BOD and T.D.S in August, Total hardness in November, Temperature in May and PH was highest in March and April. At Omkareshwar Dam Maxima of BOD and Total hardness were recorded in October, Chloride in November, Sulphate in August, T.D.S and Temperature in July, Maxima of PH was recorded in February.

**Key words:** Narmada River, BOD, T.D.S, Omkareshwar Dam, Punasa Dam, Total hardness.

### INTRODUCTION

Narmada is originated from eastern Madhya Pradesh at Amarkantak (Situated at 20°40', 80°45' E), flows towards west and finally joins Arabian sea at Broach (Situated at 21°43', 72°57' E). Dams, built to change natural flow regimes, are one of the most significant human interventions in the hydrological cycle. The construction of dam results in physical, chemical and biological changes to natural ecosystems. The construction of a series of dams in Narmada basin is continuously bringing about changes in microclimate of the region. A free flowing river, when arrested behind dams, is subjected to different ecological dynamics and biogeochemical cycles. The reservoirs created behind the dams are different aquatic ecosystems compared to a free flowing river. Reservoirs act as thermal regulators so that seasonal and short-term fluctuations in temperature, that are characteristic of many natural rivers, are regulated. The chemical composition of water released from reservoirs can be significantly different to that of inflows. Changes occur in pH and salinity as well as in the concentration of nutrients. The changes caused by

dams directly and indirectly influence a myriad of dynamic factors that affect habitat heterogeneity and successional trajectories and, ultimately the ecological integrity of river ecosystems (Ward and Stanford, 1995).

### MATERIAL AND METHOD

The present study was conducted at two selected sampling stations viz., Indra Sagar Dam (Punasa) = S1, Omkareshwar Dam (Omkareshwar) = S2 in the Narmada River for the period of one year from January 2012 to December 2012 by taking the samples monthly with a view to assess the nature and degree of pollution. The sampling was done usually in morning hours between 8 a.m. to 11 a.m. and samples were collected from just below the water surface. At each of the station, three types of water samples-first from 200 m upstream, second from the confluence and third from 200 m downstream- were collected, for all physico-chemical analysis.

In the analysis of the physico-chemical properties of water, standard method prescribed in

Table 1: Monthly variations of values of physico chemical parameters at Punasa Dam (S1) from January 2012 to December 2012.

S. No.	Name of Variant at (S1)	Months											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	BOD	0.74	0.9	1	0.97	1.4	1.33	0.6	1.5	0.8	0.9	0.7	1
2	Chloride	18.3	22.1	19.3	28.5	23.3	43.3	20	23	20	21.6	21.5	21.8
3	Temperature	20.2	27.9	27.5	29	30	26	26.1	26.1	25.8	28.8	25	24
4	Ph	8.1	8.3	8.4	8.4	8.1	8.2	8.2	7.9	7.8	7.9	8.3	8.1
5	Sulphates	4.4	2.2	4.9	4.5	5.4	5.5	5.2	1.6	3.9	2.4	4.8	2.5
6	T.D.S	186.3	201.6	206.6	188.3	206	242.3	269	287.6	239.6	160.6	209.3	196
7	Total hardness	124	130	149.3	151.3	148.6	145.3	97.3	136.6	163.3	156.6	187.3	180

Table 2: Monthly variations of values of physico chemical parameters At Omkareshwar Dam (S2) from January 2012 to December 2012.

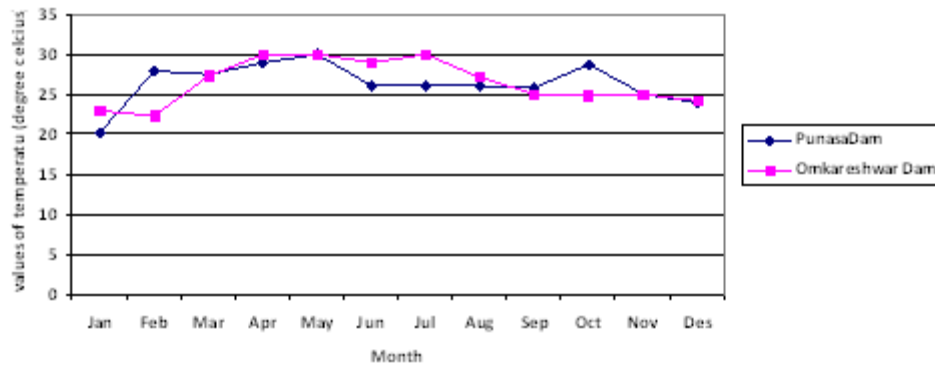
S. No	Name of Variant at(S2)	Months											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	BOD	1.1	0.8	0.8	0.7	0.8	1.0	0.9	1.1	1.2	1.4	1.0	0.9
2	Chloride	22.3	24	25.4	23.1	21.8	25.6	22.3	20.8	18.8	24.2	26.1	23.6
3	temperature	23.0	22.4	27.4	30.0	30.0	29.0	30.1	27.1	25.0	24.9	25.0	24.3
4	Ph	8.2	8.4	8.4	8.1	8.2	8.2	8.2	8.0	7.9	8.1	7.9	8.1
5	Sulphates	1.6	1.6	2.7	3	2.4	2.7	2.9	2.9	1.9	1.3	2.4	1.4
6	T.D.S	177.6	183.0	164.6	175.3	182.0	184.6	204.3	220.6	201.6	160.3	190.6	186.6
7	Total hardness	157.3	108.6	161.6	117.3	190.6	106.6	101.3	114.1	143.6	203.3	183.3	195.3

limnological literature were used. Temperature and pH were determined at the site while total hardness, chlorides, sulphates, BOD and T.D.S. were determined in the laboratory. The physico-chemical parameters were determined adopting methods given by APHA (2002) and Golterman (1991).

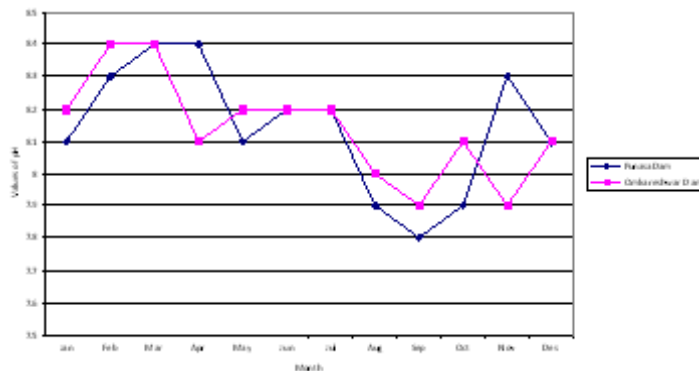
**Temperature**

Temperature is one of the most important

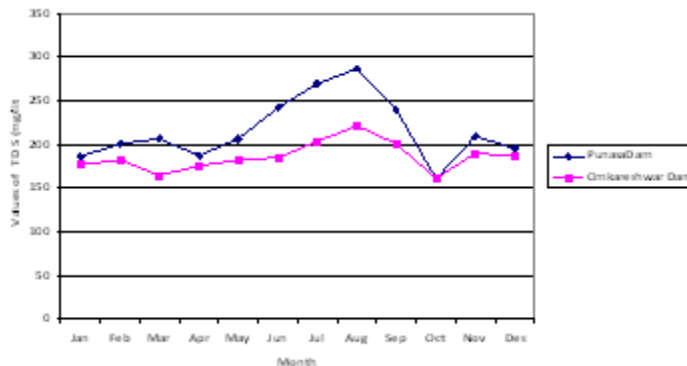
parameters that influence almost all the physical, chemical and biological properties of water and thus the water chemistry. It never remains constant in rivers due to changing environmental conditions. In present study the temperature of river water ranged between 20.0 & 30.3 degree (Fig-1). The minimum temperature was recorded in the month of January at S1 and maximum was recorded in the month of July at S2. Maximum values of water



**Fig 1: Monthly variations of values of temperature (degree Celsius) of water during January 2012 to December 2012 at different stations.**



**Fig 2: Monthly variations of values pH of water during January 2012 to December 2012 at different station.**



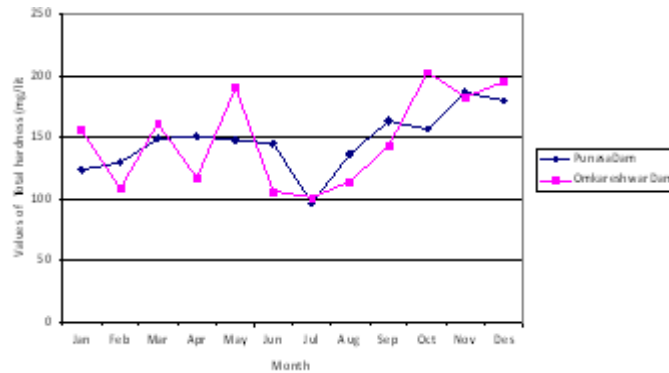
**Fig 3: Monthly variations of values of TDS (mg/lit) of water during January 2012 to December 2012 at different station.**

temperature were observed in summer season and minimum in winter season. These types of observations, in river Narmada, have also reported by Palharya and Malviya (1988).

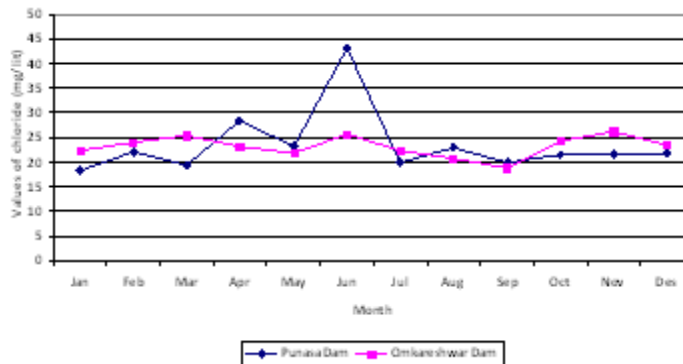
**pH value**

pH is one of the most important factors in measuring water quality. It indicates the concentration of hydrogen ions. Natural waters

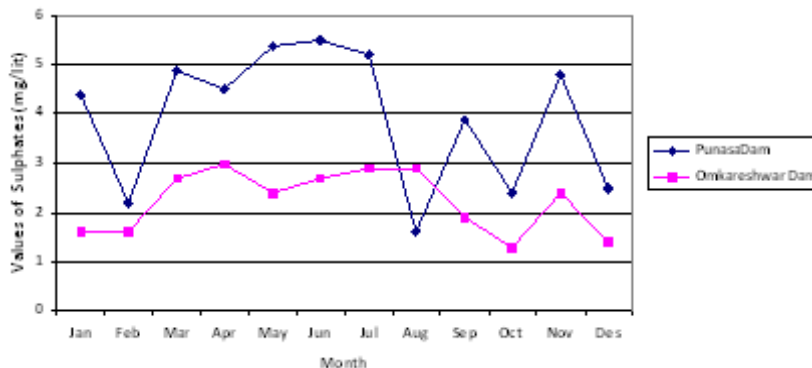
generally have been found to range from pH 5.5 to 8.6 because of the presence of bicarbonates and carbonates of alkaline earth metals. The water in river Narmada was always alkaline during the period of present study like most of the other Indian rivers as reported by Mitra (1982). The lowest pH i.e., 7.4 was observed at S2 in the month of April and highest, 8.8 at S2 in January, February and at S1 in November (Fig-2). The similar pH ranges were



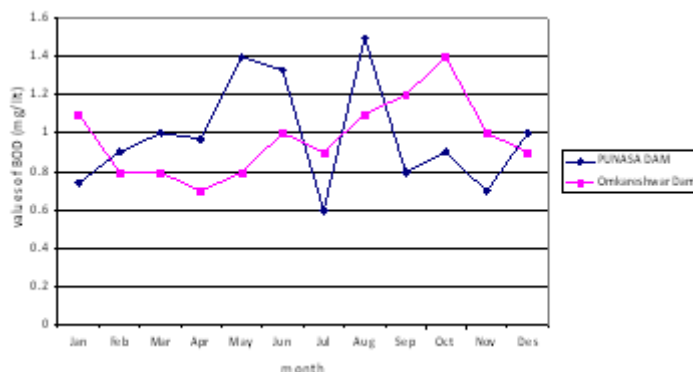
**Fig 4: Variations of values of Total hardness (mg/lit) of water during January 2012 to December 2012 at different stations.**



**Fig 5: Monthly variations values of Chloride (mg/lit) of water during January 2012 to December 2012 at different stations.**



**Fig 6: Monthly variations of values of Sulphates (mg/lit) of water during January 2012 to December 2012 at different stations**



**Fig 7: Monthly variations of values of BOD (mg/lit) of water during January 2012 to December 2012 at different stations.**

also recorded by Gautam *et al.*, (2000) in river Ganga at Rishikesh, Sharma *et al.*, (2004) in pond, Verma (2006) in river Narmada.

#### Total dissolved solids (TDS)

The TDS content of fresh water generally ranges from 10 to 500 mg/lit. The maximum permissible limit of TDS for drinking water is 500 mg/lit. In present study TDS, 136 mg/lit was the lowest value recorded at S2 in May and 360 highest value recorded at S1 in August (Fig-3). Verma (2006) noted that in Narmada water 990 mg/lit TDS was the highest value recorded in August and 123 mg/lit was the lowest value noted in September.

#### Total hardness

In present investigation the lowest value of total hardness 92.0 mg/lit recorded at S1 and S2 both in July and February, March respectively and Highest, 208 mg/lit at S2 in October (Fig- 4). Highest value In post monsoon might be due to settlement of anions and cations. Similar result was also reported by Zahoor *et al.*, (2012).

#### Chloride

Chloride is one of the major inorganic anion in water and waste water. It is stored in most fresh water algal cells. Contamination of water from domestic sewage can be monitored by chloride essays of the concerned water bodies. In present study the values of chloride varied between 15.30 mg/l to 50.0 mg/l with minimum in September at S2 and Maximum in June at S1 (Fig-5). High values of chloride was seen in summer months. Present

summer increases in chloride are in conformity with the earlier observations of Harshey *et al.*, (1982).

#### Sulphate

The sulphate ion,  $SO_4$  is usually second to carbonate as the principal anion in freshwaters, although chloride sometimes surpasses it. Atmospheric sources of sulphate have increased with man's industrial activities. Man now contributes about ten times more  $SO_2$  than the annual contribution from volcanoes. In present study the values of sulphate varied between 0.43 mg/l to 7.1 mg/l with minimum in October at S2 and Maximum in April at S2 (Fig-6). This finding matched with observation of Verma (2006) in Narmada River.

#### Biological oxygen demand (BOD)

The biochemical oxygen demand, abbreviated as BOD, is a test for measuring the amount of biodegradable organic material present in a sample of water. The acceptable BOD level in the raw water meant for treatment is 3 mg/lit while more than 2 mg/lit BOD indicated the non suitability of river water for domestic use as per Indian standards. In the present investigation the BOD was very low, 0.40 mg/lit, at S1 in November and was high, 2.14 mg/lit at S2 in May (Fig-7). In the present study usually the BOD values were obtained maximum in summer months at all sampling stations, which might be due to high temperature, this intern promotes microbial activities and minimum BOD values obtained in winter might be due to low temperature and sufficient amount of water in the river. Similar observations were confirmed by many other workers such as Pathak and Mudgal (2005).

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