

Report on Status of Wetland in Madhya Pradesh

Preface

Madhya Pradesh is blessed with large number of water bodies, which suffices the need of drinking, irrigation and industrial requirements of water to its people. However like elsewhere in the country, almost all the water bodies of the state especially in urban areas are under serious environmental stress and therefore draw urgent attention for their conservation and sustainable management. The changes in climatic pattern in past few decades have often resulted in scanty rainfall in some parts of the state causing acute shortage of water therein. Usually the urban areas on account of their location face a number of environmental problems. However in recent years in rural part of the state also, deterioration in water quality has been witnessed due to growing anthropogenic pressure. In view of this, the water quality of 120 water bodies in 51 districts of the state which have significant socio-economic & cultural aspects are being analyzed as part of Wetland Rejuvenation Project of Ministry of Environment Forests & Climate Change (MoEF&CC, GOI) to understand the existing limnological status so that these water bodies could be suggested for their best uses as per CPCB best uses standards. In Phase-1 , analysis of 70 water bodies has been completed, while in Phase-2 water quality of 30 water bodies of 17 districts has been done (one time analysis) to ascertain the existing status based on few indicative parameters.

Introduction

Reverence for water resources and their conservation is an age-old practice in India. Former rulers have contributed significantly by constructing large number of impoundments/dams, lakes etc for providing drinking water to the people in their capitals and elsewhere. This was particularly necessary in arid, semi arid and other regions of the country with highly erratic rainfall. The state of Madhya Pradesh is bestowed with large number of such water bodies. Most of the water bodies in the state are manmade impoundments which suffice to fulfil the needs of potable water, irrigation, fisheries, industrial and all the other daily needs of the residents of the state with wise uses. However in spite of having innumerable water resources is often facing scarcity of water at many places due to increasing anthropogenic pressure and therefore in order to keep up the pace of over growing demand of water, attention is being drawn towards conservation of impoundments constituted over the periods. The burgeoning population has not only put pressure on the water resources and but also resulted in degradation of water quality as well as shortage of water in almost every urban and rural settlements of the state including many sub urban /rural areas. A big deficit between the demand and supply of water in urban centres is felt which despite all efforts is on a constant rise. Further, the unplanned development of the most of the cities is exerting environmental pressure on the existing aquatic resources, polluting them to an extent that they are no longer usable for human consumption. As a result the quantity of usable water is on a constant decline and on the other hand, the demand is on a constant rise. It is therefore

the need of the hour to conserve the existing water bodies of the state and ensure their sustainability so that the water crisis could be dealt with better management.

Methodology

Standard procedures as given in APHA, 2010 were used for the sample collection and analysis of water sample.

In order to ensure uniformity in the data, three samples were collected each from all the water bodies Table-1, & Fig-1), one from the inlet site, one from pelagic zone and the third one from the outlet site.

Table-1: List of water bodies in different districts of Madhya Pradesh

S. No	District	Name of Water body	S. No	District	Name of Water body
I	Agar Malwa	1.Ratna Sagar, Agar	XI	Shahdol	18.Badi Bheeth Talab
II	Barwani	2.Barwani Talab	XII	Seoni	19.Hanuman Sagar
		3.Borlay Talab			20.Bhartendani Talab, Chhapara
III	Dhar	4.Jetpur Talab	XIII	Chhindwara	21.Gudhanamal Talab
IV	Jhabua	5.Boda Talab, Meghanagar			22.Kabadiya Talab
		6.Rana Sagar, Ranapur	23.Nunkhadak Talab		
V	Alirajpur	7.Borekhad Talab,	XIV	Narsinghpur	24.Saikheda Talab, Saikheda NP
		8.Gadat Talab	XV	Dindori	25.Chargaon Talab
VI	Burhanpur	9.Dawadiya Pani Lake	XVI	Mandla	26.Dulhari Talab
		10.Malfalya Lake			27.Babuda Talab, Bamhani Banjar
VII	Khandwa	11.Ardala Talab, Pandhana Town	XVII	Balaghat	28.Sagar Talab, Bamhani Banjar
VIII	Khargone	12.Bhagwanpura Talab, Bagarda			29.Sarathi Reservoir, Tekadi
		13.Segaon Talab, Mahugaon	30.Vari Reservoir, Lanji		
IX	Ujjain	14.Rudra Sagar			
		15.Gowardhan Sagar			
		16.Purushottam Sagar			
X	Anuppur	17.Dulha Talab			

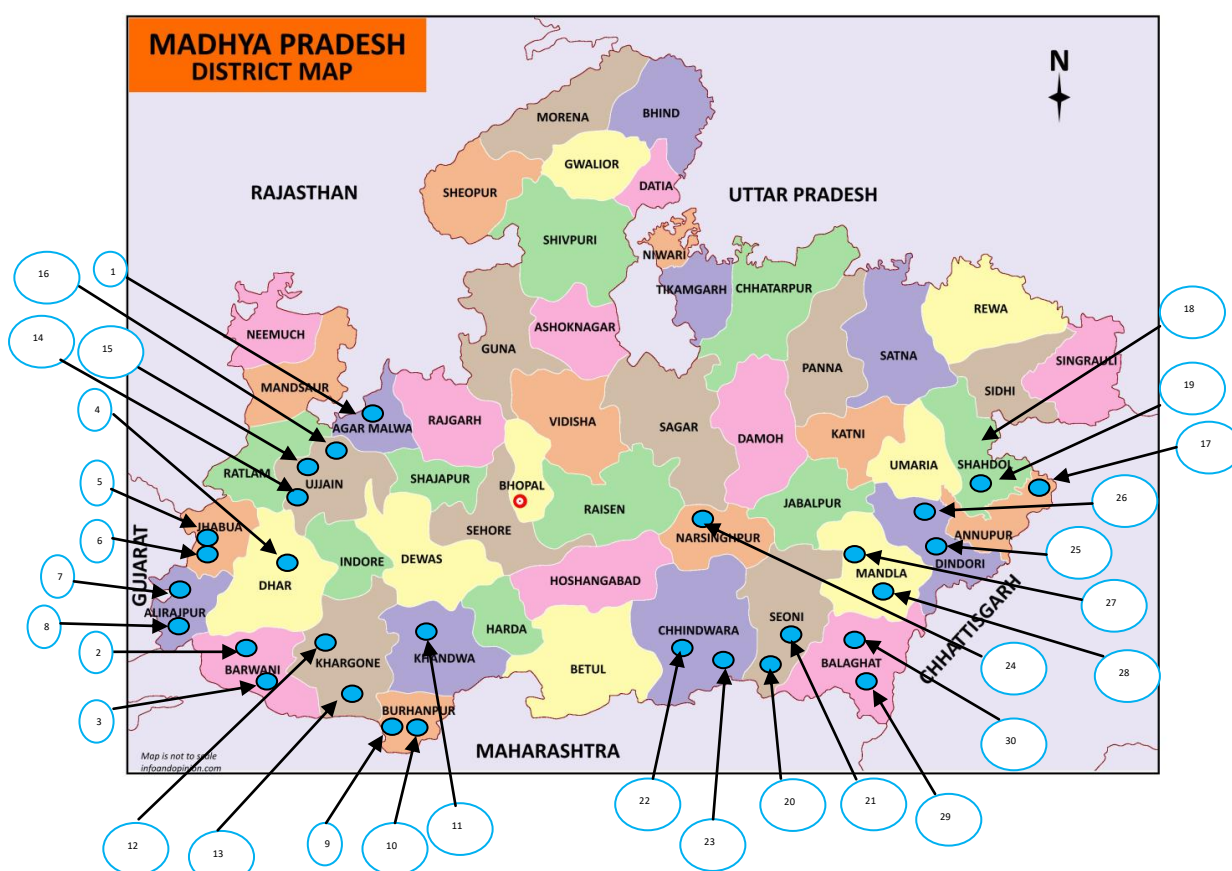


Fig-1 Location of water bodies (Not to Scale)

Source : Google map

As stated above water samples were collected from 30 water bodies situated in 17 districts. Most of the water bodies during present investigation are from eastern, southern and western part of Madhya Pradesh. All the water bodies were identified based on their socio-economic, cultural, historical, religious importance besides ecological significance. Most of the water bodies investigated during present study situated in rural part of the district and are primarily used for secondary purpose viz. bathing, washing /nistar and also ritual practices.

Table-2 Salient Features

S. No	District	Name of water body	Type Rural / Urban	Nature of Water Body (Perennial / Temporal)	Location Details		Use of the Water body
					Latitude	Longitude	
1	Agar Malwa	Ratna Sagar, Agar	Urban	Temporal	-	-	Fish Culture
2	Barwani	Barwani Talab	Urban	Temporal	-	-	Irrigation
		Borlay Talab	Rural	Temporal	-	-	Secondary use
3	Dhar	Jetpur Talab	Rural	Temporal	-	-	Irrigation, Fish Culture
4	Jhabua	Boda Talab, Meghanagar	Urban	Temporal	-	-	Irrigation, Fish Culture, Crematorium
		Rana Sagar, Ranapur	Urban	Perennial	-	-	Secondary use
5	Alirajpur	Borekhad Talab,	Urban	Temporal	-	-	Drinking, Fish Culture
		Gadat Talab	Rural	Perennial	-	-	Secondary use
6	Burhanpur	Dawadiya Pani Lake	Rural	Temporal	21°44'11"74 N	76°03'55"43 E	Irrigation
		Malfalya Lake	Rural	Temporal	21°53'84"82 N	75°96'08"25 E	Drinking, Irrigation
7	Khandwa	Ardala Talab, Pandhana Town	Rural	Temporal	21°65'08"46 N	76°13'54"16 E	Irrigation, Fish Culture
8	Khargone	Bhagwanpura Talab, Bagarda	Rural	Temporal	21°76'3" N	75°74'2" E	Irrigation, Fish Culture, Crop cultivation
		Segaon Talab, Mahugaon	Rural	Temporal	21°75'9" N	75.44'0 E	Irrigation, Fish Culture, Drinking
9	Ujjain	Rudra Sagar	Urban	Perennial	23°10'48.9"N	75°46'45.07"E	Religious, Secondary use
		Gowardhan Sagar	Urban	Perennial	23°11'36.2"N	75°45'50.0"E	Religious, Secondary use
		Purushottam Sagar	Urban	Perennial	23°12'11.1"N	75°46'45.7"E	Religious, Secondary use
10	Anuppur	Dulha Talab	Urban	Perennial			Secondary use
11	Shahdol	Badi Bheeth Talab	Rural	Temporal	23.18'31N	81.22'05"E	Secondary use
		Hanuman Sagar	Urban	Temporal	23.68'53N	81.38'90"E	Secondary use
12	Seoni	Bhartendani Talab	Urban	Perennial			Irrigation
		Gudhanamal Talab	Rural	Temporal			Secondary use
13	Chhindwara	Kabadiya Talab	Urban	Temporal			Secondary use
		Nunkhadak Talab	Rural	Temporal	22°17'86"37 N	78°32'5705 E	Irrigation
14	Narsinghpur	Saikheda Talab, Saikheda NP	Urban	Perennial	22°96'04"64 N	78°57'81"9 E	Fish Culture
15	Dindori	Chargaon Talab	Rural	Temporal	23°15'62"52 N	80°69'52"88 E	Secondary use
		Dulhari Talab	Rural	Temporal	23°04'0839 N	80°58'11"65 E	Secondary use
16	Mandla	Babuda Talab, Bamhani Banjar	Urban	Perennial	80°36'41" N	22°47'71" E	Fish Culture, Secondary use
		Sagar Talab, Bamhani Banjar	Urban	Temporal	80°22'14"52 N	22°28'48"96 E	Secondary use
17	Balaghat	Sarathi Reservoir, Tekadi	Rural	Perennial	-	-	Irrigation ,Secondary use
		Vari Reservoir, Lanji	Rural	Perennial	-	-	Irrigation

Table-4 Status of existing Water Quality

S. No	District	Name of water body	pH			Dissolved Oxygen (mg/L)			TDS (mg/L)			BOD mg/L			COD mg/L			Total Alkalinity mg/L			Total Hardness mg/L			Nitrate mg/L			Phosphate mg/L				
			St-1	St-2	St-3	St-1	St-2	St-3	St-1	St-2	St-3	St-1	St-2	St-3	St-1	St-2	St-3	St-1	St-2	St-3	St-1	St-2	St-3	St-1	St-2	St-3	St-1	St-2	St-3		
1	Agar Malwa	Ratna Sagar, Agar	7.5	7.6	7.6	5.2	6.8	7.2	214	266	237	1.2	0.8	1.6	10	10	12	108	106	102	108	98	90	2.11	2.04	2.08	1.02	1.04	1.10		
2	Barwani	Barwani Talab	8.0	8.2	8.3	7.6	8	8.8	268	244	269	0.8	0.4	0.8	14	10	12	102	88	110	88	90	102	2.24	2.17	2.22	1.96	1.84	1.60		
		Borlay Talab	8.1	8.3	8.2	8	9.6	7.6	209	187	211	1.8	1.2	1.2	20	12	14	96	104	90	110	96	92	2.09	1.98	1.92	1.07	1.02	1.04		
3	Dhar	Jetpur Talab	8.0	8.2	8.3	6.8	6.8	7.6	236	219	277	1.2	0.4	0.8	12	10	12	118	120	112	86	82	88	2.17	2.04	2.11	1.11	1.07	1.18		
4	Jhabua	Boda Talab, Meghanagar	7.6	7.8	7.5	5.2	6.8	6.4	196	187	169	2.4	0.8	1.2	24	22	18	108	110	104	80	76	82	2.44	2.19	2.37	1.15	1.08	1.21		
		Rana Sagar, Ranapur	7.7	8.1	8.3	5.6	8	8.8	138	144	131	0.8	0	1.2	12	8	12	122	118	116	106	98	102	1.97	1.88	1.74	0.98	0.92	0.88		
5	Alirajpur	Borekhad Talab,	8.2	8.4	8.5	7.2	8.0	7.6	221	257	239	1.8	1.4	1.2	16	12	12	107	111	104	102	112	104	2.31	2.09	2.11	1.13	1.04	1.11		
		Gadat Talab	8.1	8.3	8.4	7.6	8.4	8.0	224	189	207	1.4	0.4	1.2	22	18	14	114	110	108	90	84	88	2.11	2.01	2.19	1.04	0.87	1.13		
6	Burhanpur	Dawadiya Pani Lake	Lake was Dry: Sample couldn't be collected																												
		Malfalya Lake		7.8			8.0			528			1.6		1.6		14					76					1.37			0.82	
7	Khandwa	Ardala Talab, Pandhana Town	7.7	7.6	7.5	7.2	6.8	7.2	291	295	292	1.6	0.4	1.2	12	14	10	108	110	104	84	82	78	2.98	2.79	2.81	1.44	1.32	1.51		
8	Khargone	Bhagwanpura Talab, Bagarda	7.6	7.7	7.8	7.2	7.6	7.2	507	492	498	0.4	0	0.4	18	20	16	116	112	120	106	102	98	1.96	1.92	1.90	1.04	1.02	1.06		
		Segaon Talab, Mahugaon	7.7	7.6	7.7	6.8	6.8	7.2	481	431	647	1.6	0.8	1.6	20	14	18	112	108	110	106	100	108	2.14	2.11	2.26	1.67	1.64	1.59		
9	Ujjain	Rudra Sagar	9.3	9.1	8.9	NIL	NIL	3.2	2742	1866	1238	12	16	12	30	42	28	176	182	162	184	190	186	4.22	4.58	4.66	2.19	2.38	2.32		
		Gowardhan Sagar	9.4	8.6	8.7	5.2	NIL	NIL	3142	1216	2682	2.4	20	16	18	46	32	166	172	148	176	182	180	4.11	4.06	4.22	2.44	2.39	2.22		
		Purushottam Sagar	9.5	9.2	9.2	8.0	7.6	6.4	1842	1854	1852	0.4	0.4	0.8	12	10	12	128	116	124	168	170	166	3.22	3.41	3.07	1.98	2.04	2.19		
10	Anuppur	Dulha Talab	9.2	8.9	8.8	11.6	10	7.2	284	282	302	0	0	1.2	10	12	16	112	116	108	112	110	104	1.98	1.44	1.57	0.92	0.88	0.82		
11	Shahdol	Badi Bheeth Talab	9.7	9.0	8.5	8.8	8.4	6.8	217	287	281	0.8	0.4	1.2	10	14	12	126	118	120	110	102	106	1.64	1.58	1.82	0.76	0.68	0.84		
		Hanuman Sagar	8.8	8.7	8.5	7.2	8.0	5.6	222	211	221	0.8	0	0.4	18	12	16	112	120	122	104	112	110	1.87	1.59	1.71	0.84	0.79	0.82		
12	Seoni	Bhartendani Talab, Chhapara	8.8	8.8	8.4	10.4	11.2	10.0	320	309	306	0.4	0.4	0.8	12	12	10	108	114	112	78	80	76	1.56	1.39	1.32	1.09	1.02	1.11		
		Gudhanamal Talab	8.8	8.6	8.7	12.0	8.0	8.8	344	356	357	1.6	1.2	1.6	26	20	22	127	128	120	86	82	80	2.11	1.90	1.89	1.05	1.03	1.07		
13	Chhindwara	Kabadiya Talab/kanhargaoon	8.8	8.8	8.9	7.6	8.0	6.4	296	277	278	1.2	0.4	1.2	18	20	16	120	104	118	92	88	90	2.22	2.18	2.19	1.44	1.28	1.26		
		Nunkhadak Talab	9.3	9.2	9.1	6.4	8.0	7.6	84	81	79	2.4	1.2	1.6	24	20	18	107	110	114	84	80	78	2.19	1.98	2.13	1.67	1.13	1.44		
14	Narsinghpur	Saikheda Talab, Saikheda NP	11.7	11.8	11.8	18.0	30.0	30.4	535	542	558	1.2	1.2	1.6	12	10	18	136	142	138	104	112	108	2.98	2.86	2.89	1.56	1.44	1.31		
		Chargaon Talab	9.7	9.8	9.8	6.0	8	6.4	237	226	222	2.8	2.0	2.8	16	20	24	107	109	114	66	68	56	2.09	2.01	1.98	1.17	1.14	1.22		
16	Mandla	Dulhari Talab	9.5	9.6	9.6	6.0	8.4	7.2	265	266	266	1.6	0.8	1.2	18	12	14	112	110	118	72	70	66	2.13	2.11	2.14	1.22	1.09	1.11		
		Babuda Talab, Bamhani Banjar	10.2	10.3	10.4	17.6	21.6	23.2	920	928	929	2.4	3.6	1.6	22	16	20	136	142	144	102	98	108	3.19	3.11	3.24	1.97	1.84	1.81		
17	Balaghat	Sagar Talab, Bamhani Banjar	8.8	9.6	9.6	7.2	5.6	2.4	716	650	666	2.0	2.4	5.6	12	16	16	128	122	130	86	78	80	2.96	2.78	2.82	1.89	1.72	1.64		
		Sarathi Reservoir, Tekadi	9.3	9.2	9.1	8.8	8.4	7.6	152	152	156	2.4	1.6	2.0	18	20	16	124	116	118	76	70	72	2.06	2.01	2.11	1.67	1.51	1.72		
		Vari Reservoir, Lanji	9.0	9.2	9.4	7.6	8.0	8.0	144	106	107	1.2	0.8	1.6	14	14	12	120	114	118	68	66	60	2.37	2.29	2.21	1.66	1.64	1.68		

Result and Discussion

As most of the water bodies in MP are used for multiple purposes, therefore understanding the existing status of the water body is of utmost importance so that an effort can be made for their designated best use viz. potable, irrigation, industrial, tourism etc on the basis of indicative parameters. Hence it is very important to assess the water quality before it is used for drinking, domestic, agricultural or industrial purpose etc. Considering this the present study was conducted to understand the existing status in terms of usability.

The objective of the present study as stated above is to obtain first hand information towards preparation of a "Health Card" based on site visits and scientific investigation through selective indicative parameters. The rationale of the study is to understand the cumulative effect of urbanization vis-a-vis, consequent anthropogenic activities like bathing, washing, religious, agriculture farming including natural variables on water quality of the identified water bodies. The outcome of the study is based on one time analysis of few indicative parameters hence may not be considered as a comprehensive investigation for arriving at any in-depth conclusion. The results obtained are discussed below.

During the field investigation most of this rain fed water bodies were found in rural areas and are relatively free from any significant anthropogenic impacts. Barring few water bodies which are used for drinking, all others are basically used for secondary proposes like, bathing, washing, irrigation and fisheries activities (Table-2). The impact of different factors, geo-climatic, anthropogenic etc. of varying degree was observed to affect the water quality in the identified water bodies. The cumulative effect of these variables was observed in few indicative parameters like pH, Dissolved Oxygen (DO), turbidity, conductivity etc.

Hydrogen ion concentration in almost all the identified water bodies was observed to be within basic ranges. Various factors bring about changes in the pH of water. The higher pH values in some water bodies observed also suggests that carbon dioxide, carbonate–bicarbonate equilibrium is affected more due to change in physico-chemical condition. In some cases exceptionally high values of pH were observed (Saikheda Talab, Babuda Talab, Chargaon Talab etc) which can be attributed to very high bio geochemical process due to eutrophication.

Higher values of pH also reflect the productivity of a water body and often correlated with dissolved oxygen concentration. In few water bodies exceptionally high values of dissolved oxygen were recorded (Saikheda Talab Babuda Talab) which are rarely observed in situation like supersaturating under extremely compelling circumstances. These two water bodies may have attained a stage of hypertrophication with excessive inputs of nutrients and organic masses.

In some water bodies higher values of TDS were recorded (Rudra Sagar, Gowardhan Sagar, Purushottam Sagar, Saikheda Talab, Babuda Talab, Sagar Talab) which could be because of geochemical characteristics of the catchments inflow of sewage and silts besides. TDS is an important parameter for productivity of the aquatic environment. Barring these water bodies a moderate values of TDS & Conductivity have been observed in

almost all other water bodies. Higher values of TDS often increase the nutrient load in an aquatic system and may influence dissolved oxygen concentration of the water body. The distribution of oxygen during the period of investigation depicted a moderate concentration in almost all the water bodies. In some water bodies viz. Rudra Sagar, Gowardhan Sagar, Purushottam Sagar, Nil/lower values obtained may be because of depletion of oxygen content during metabolic activities due to inflow of sewage and nutrient load from its catchment.

Biochemical Oxygen demand in almost all the identified water bodies were observed to be in moderate range except in few lakes (Rudra Sagar and Gowardhan Sagar in Ujjain) where the values were very high compared to rest of the water bodies.

While compiling the above indicative parameters with that of **Designated Best Use for surface water resources of CPCB Criteria**, it can be concluded most of the water bodies undertaken under present investigation are relatively free from significant water quality deterioration and can be included either in Class A or B (Table-5). Although all the designated parameters as suggested in the guideline could not be addressed and some of the parameters are overlying (acceptable in multiple categories) but the preliminary investigation conducted during Feb- March 2021 suggests that these water bodies in general can be utilized for drinking after conventional treatment and other restricted secondary uses like gardening, irrigation etc.

Table-5 Categorization of water bodies under **Designated Best Use for surface water resources of Central Pollution Control Board, New Delhi**.

S. No	Name of water body	pH (Range Value)	Designated Class as per CPCB best use Criteria**	DO mg/l (Range Value)	Designated Class as per CPCB best use Criteria**	Overall	Remark
1	Ratna Sagar, Agar	7.5-7.6	A/B	5.2-7.2	B	B	A. Drinking Water Source without conventional treatment but after disinfection
2	Barwani Talab	8.0-8.2	A/B	7.6-8.8	A	A	
3	Borlay Talab	8.1-8.2	A/B	7.6-9.6	A	A	
4	Jetpur Talab	8.0-8.2	A/B	6.8-7.6	A	A	
5	Boda Talab, Meghanagar	7.5-7.8	A/B	5.2-6.4	B	B	
6	Rana Sagar, Ranapur	7.7-8.3	A/B	5.6-8.8	B	B	
7	Borekhad Talab,	8.2-8.5	A/B	7.2-8.0	A	A	
8	Gadat Talab	8.1-8.4	A/B	7.6-8.4	A	A	
9	Dawadiya Pani Lake						B. Outdoor bathing (Organized)
10	Malfalya Lake	7.8-8.1	A/B	8.0	A	A	
11	Ardala Talab, Pandhana Town	7.5-7.7	A/B	6.8-7.2	A	A	
12	Bhagwanpura Talab, Bagarda	7.6-7.8	A/B	7.2-7.6	A	A	C. Drinking water source after conventional treatment and disinfection
13	Segaon Talab, Mahugaon	7.6-7.7	A/B	6.8-7.2	A	A	
14	Rudra Sagar						
15	Gowardhan Sagar	8.7-9.4	C	0-5.2	D	D	
16	Purushottam Sagar	9.2-9.5	C	6.4-8.0	D	D	
17	Dulha Talab	8.8-9.2	C	7.2-11.6	C	C	

18	Badi Bheeth Talab	8.5-9.7	C	6.8-8.8	C	C	<i>D. Propagation of Wild Life and Fisheries</i>	
19	Hanuman Sagar	8.5-8.8	C	5.6-8.0	B	C		
20	Bhartendani Talab, Chhapara	8.4-8.8	C	10.0-11.2	C	C		
21	Gudhanamal Talab	8.6-8.8	C	8.0-12.0	C	C		
22	Kabadiya Talab/Kanhargaon	8.8-8.9	C	6.4-8.0	C	C		
23	Nunkhadak Talab	9.1-9.3	C	6.4-8.0	C	C		<i>E. Irrigation, Industrial Cooling, Controlled Waste disposal</i>
24	Saikheda Talab, Saikheda NP	12	C	18-30.4	D	D		
25	Chargaon Talab	9.7-9.8	C	6.0-8.0	C	C		
26	Dulhari Talab	9.5-9.6	C	6.0-8.4	C	C		
27	Babuda Talab, Bamhani Banjar	10	C	17.6-23.2	D	D/E		
28	Sagar Talab, Bamhani Banjar	8.8-9.6	C	2.4-7.2	D	D/E		
29	Sarathi Reservoir, Tekadi	9.1-9.3	C	7.6-8.8	C	C		
30	Vari Reservoir, Lanji	9.0-9.4	C	7.6-8.0	B	B		

**** Designated Best Use for surface water resources (Source CPCB):**

Class of Criteria based on parameter

pH	Class A	Class B	Class C	Class D	Class E
	6.5-8.5	6.5-8.5	6-9	6.5-8.5	6.0-8.5
DO	Class A	Class B	Class C	Class D	Class E
	6mg/l or more	5 mg/l or more	4mg/l or more	4mg/l or more	

Inference

In Madhya Pradesh most of lakes, tanks, ponds etc. situated in urban area are in the state of eutrophication. Thus, availability of the utilizable water has declined sharply in urban centers of the state. Fortunately in rural part of the state the situation is not that grave as has been reflected in present investigation. However due to increased anthropogenic activities even in rural areas there may be considerable increase in generation of waste water which might find its place in adjoining rural water resources. Few of the water bodies were observed to have similar environmental problems as commonly witnessed in urban lakes. All the water bodies have common symptoms of sewage inflow, dumping of solid wastes, and encroachment in the fringe area, siltation, weed infestation and religious activities. These ill effects are visible in few water bodies of the state especially in Ujjain as revealed by this study. It is therefore essential to conserve these important aquatic resources with appropriate conservation measures and promoting awareness activities. The present study gives a first insight on the water quality of these precious aquatic resources. These water resources are the precious assets of the state and the wider vision of "Atmanirvar" of the state needs to incorporate the conservation and preservation of these aquatic water resources too. Some of the water bodies covered under the study are in pathetic environmental condition and require immediate attention.

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