

# Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties

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**Note: It is important that you read the accompanying Explanatory Note and Guidelines document before completing this form.**

- Date this sheet was updated:** 19<sup>th</sup> August 2002
- Country:** India
- Name of wetland:** BHOJ WETLAND (Twin Lakes named Upper & Lower lakes)
- Geographical coordinates:** 77°15' – 77°26' E Longitude and 23° 13' – 23°16' N Latitude.
- Elevation:** (average and/or maximum and minimum) : 523 MSL
- Area:** (in hectares): At FTL : Upper lake – 3072 ha; Lower lake – 129 ha (Total to be designated as Ramsar site)
- Overview:** (general summary, in two or three sentences, of the wetland's principal characteristics)

The Bhoj Wetland consisting of two lakes (Upper & Lower lakes) are man made reservoirs. The Upper lake created in the 11<sup>th</sup> century by constructing an earthen dam across the kolans river and the lower lake constructed nearly two centuries ago immediately downstream of the Upper lake, have catchment of 361 and 9.6 sq.km, respectively. Upper lake is surrounded by Van Vihar, National Park on the south, human settlements on the east and north and agriculture fields on the west whereas lower lake is surrounded by human settlements from all sides.

**8. Wetland Type:** (please circle the applicable codes for wetland types as listed in Annex I of the Explanatory Note and Guidelines document)

<i>marine-coastal:</i>	A	B	C	D	E	F	G	H	I	J	K	Zk(a)
<b>Inland:</b>	L	M	N	<input checked="" type="checkbox"/> O	P	Q	R	Sp	Ss	Tp	Ts	
	U	Va	Vt	W	Xf	Xp	Y	Zg	Zk(b)			
<b>Human-made:</b>	1	2	3	4	5	<input checked="" type="checkbox"/> 6	7	8	9	Zk(c)		

**Please now rank these wetland types by listing them from the most to the least dominant:**  
6, O

**9. Ramsar Criteria:** (please circle the applicable criteria; see point 12 below)

1      2       3      4       5      6      7       8

**Please specify the most significant criterion applicable to this site:** 1

**10. Map of site included?** Please tick YES --or-- NO

(Please refer to the *Explanatory Note and Guidelines* document for information regarding desirable map traits.)

Yes

## 11. Name and address of the compiler of this form:

World Wide Fund for Nature- India,  
Seceretaryiat, 172-B, Lodi Estate  
New Delhi- 110 003  
Website: [www.wwfindia.org](http://www.wwfindia.org)  
Tel: 91(11)4616532, 4691760-62

With Inputs From:

Environmental Planning & Coordination Organisation, Z-9, Gurunanak Bhawan, Zone – 1, M.P. Nagar,  
Bhopal – 462 011

## 12. Justification of the Criteria selected under point 9, on previous page:

### (i) Criterion 1:

It is an unique man made wetland, characteristic to the Central Indian Plateau region. Upper lake was created by constructing an earthen dam across the Kolans River in the 11<sup>th</sup> Century. During the intervening 900 years the ecosystem has stabilized and presently it represent a near natural wetland.

### (ii) Criterion 3:

The wetland supports a wide variety of flora and fauna. Diverse flora provide ideal habitat in the form of food and shelter for a large number of avifauna. Due to biotic interaction and natural selection process a characteristic relationship between vegetation and the avifauna has developed. All these characteristics qualify Bhoj Wetland as a unique wetland of central India.

The wetland is rich in bio-diversity, principal components being phytoplankton, zooplankton, macrophytes, aquatic insects and avifauna (both resident and migratory). Break up of bio-diversity of Bhoj Wetland are as follows:

1	Macrophytes	106 species (Belonging to 87 genera of 46 families), including 14 rare species.
2	Phytoplankton	208 species comprising of 106 species of Chlorophyceae, 37 species of Cyanophyceae, 34 species of Euglenophyceae, 27 species of Bacillariophyceae and 4 species of Dinophyceae
3	Zooplankton	105 species (Rotifera 41 + Protozoa 10 + Cladocera 14 + Copepoda 5, Ostracoda 9, Coleoptera 11, Diptera 25)
4	Fish fauna	43 species (natural and cultured species)
5	Avifauna	27 species
6	Insects	98 species of 10 families
7	Reptiles and Amphibians	> 10 species (including 5 species of tortoise)

Under the conservation effort, a buffer zone along the fringe of the wetland has been created through plantation of 51 species of angiosperms.

### (iii) Criterion 5:

Bhoj wetland hosts a large number of birds in its water as well as around it. The total number of species observed in the surroundings of the lake exceeds 160. These include the local, local migratory and migratory species. A total of more than 20,000 birds have been observed in Bhopal annually. Some species, which have never shown up or are rare to be seen here, gave evidential sightings. White Stork, Black necked Stork, Barheaded Goose, Spoonbill etc. are some of the species, which were rarely or never seen before. The White Stork has no records in the near history of being sighted here.

A very surprising phenomenon is of congregation of more than 121 Sarus Cranes in the lake. The largest bird of India, *Grus antigone* is known for its size, majestic flight and ever lasting partnership. According

to Dr. B.C. Chaudhary of Wildlife Institute of India who is monitoring this endangered bird for last 2 years, there are no previous records of such a big congregation of the Sarus Crane in Bhopal. Similarly, the Bank Mynah, though a common species North of Bhopal, has recently shown up in the western regions of the upper lake. The Mynah, which can be seen easily in neighboring places has no previous record in Bhopal.

Even when the maximum temperature is approaching 40°C one can still observe a total of more than 4000 birds of various species. This is a remarkable occurrence as the birds are normally observed and believed to have returned by late March. The flocks can be seen at the western region of the upper lake where the water is receding with high speed. The receding water and shallow waterlogged area hence provides an ideal feeding ground to birds feeding on fish, molluscs, shoots and weeds.

Recently a heavy congregation of white Scavenger Vultures, also known as Pharaohs chicken or Egyptian vulture in the south Eastern buffer of the Upper Lake which is a National Park has been observed.

**Criteria 8:** There are about 43 fish species depend on the wetland for food, spawning and nursery. List of fishes are given in item 18.

### **13. General Location:**

The dam over the Kolans River is located in Bhopal City, the capital of Madhya Pradesh, Central India. The part of the water spread area and the major part of the catchment however falls in adjoining Sehore district of Madhya Pradesh. The city is divided into 56 administrative wards having an area of 285.99 sq.km.

### **14. Physical features:**

The Deccan trap basalts and vindhyan sandstones are the principal rock formation of Bhopal district. Weathering of this volcanic rocks give rise to characteristic heavy soil known a black cotton soil. The Vindhyan sandstone of this area belongs to the Bhandar series (Upper Precambrian). The Bhopal City, which is on basaltic rocks, is clearly marked by its flat topography. Lava flows are generally confined to the valleys of small hills and the surrounding low lying areas is composed of black cotton soil. The trap rocks have low porosity and permeability and therefore are not ideal for ground water storage except where these are highly weathered.

#### **(i) Climate:**

The area has a dry climate except during the southwest monsoon season. The period from March to mid June is the summer season. The monsoon season is effective from June to September. Post monsoon period extends up to mid December, and winter season is up to February.

#### **(ii) Rainfall:**

The average annual rainfall for past 21years is 1179.16 mm. About 92% of the annual rainfall is received during the year.

#### **(iii) Temperature:**

May is generally the hottest month with a mean daily max. temperature of 40.7<sup>0</sup> C, and mean daily min. temperature 26<sup>0</sup> C. In the summer the max. temperature may go upto 44<sup>0</sup> C. After the withdrawal of the monsoon, by the end of September, there is slight increase in the day temperature but nights become progressively colder. After October there is a rapid drop in the temperature specially during nights. January is generally the coldest month with a mean daily max. temperature of 25.7<sup>0</sup> C and the mean daily minimum temperature of 10.4<sup>0</sup> C.

#### **(iv) Humidity:**

During the monsoon, relative humidity is usually about 70%. Rest of the year the air is generally dry and the relative humidity is less than 20%. However, in the areas adjacent to the lakes, the relative humidity is about 40%.

## 15. Hydrological Values:

The hydraulic features of the Upper & Lower lakes are given in Appendix 1. The Upper lake has a water spread area at FTL is 30.72 km. The storage capacity is 101.6 million cu.m. and maximum and mean depth being 11.7 and 6 m, respectively.

Outflow from the Upper lake, which receives water mainly through the Kolans River drains into Kaliasot River and finds its way to Yamuna River through the Betwa River. Lower lake which receives seepage water from the Upper lake and drainage from several canals and streams drains into Patra river and then into Halali River before entering into Yamuna River.

The Kolans River feeding the Upper Lake, being a seasonal river flows for few days immediately after heavy rains. Some of the rivulets were joining the river during monsoon also dryup in other seasons. A waste weir at Bhabhada controls overflow and these by facilitate flood control.

Sedimentation: The total silt load from the catchment area is estimated to be 0.36 million cu.m.

Shoreline stabilization: A buffer zone of green plantation on the north, south and western fringe of the lake helps in soil erosion control.

## Water Quality

Upper Lake – From the times water supply scheme for the Bhopal city was constructed in the late 19<sup>th</sup> Century using the Upper lake as the primary source of water, until the mid 20<sup>th</sup> century, the water had been supplied without filtration. This suggests that the lake water was then considered to be within permissible limits for drinking directly. However, gradual pollution of the lake had become noticeable thereafter. In general, the lake is mesotrophic. However, certain pockets and the shallow portion of the lake could be categorized as eutrophic. As per WHO and Bureau of Indian Standards, the water is not suitable for human consumption without treatment.

Lower Lake – The quality of water in the Lower lake has deteriorated even further. Surrounded by the busy and congested city on all sides, movement of free air and restricted sunlight has compounded the problems. Lower lake receives its water mainly from seepage from the Upper lake and 28 sewage filled nallahs. Regular commercial washing of clothes/linen also adds considerable quantity of pollutants to the lake. The whole lake is eutrophic. The quality of water is below the environmentally safe standards for healthy aquatic systems.

## 16. Ecological Features:

Wetland could be divided into perennial water covered area, marshy zones and submerged cum dry zones (transition zones). Due to shallow nature of the last zone it becomes exposed from post monsoon period to summer season. Therefore wetland supports mainly 3 types of vegetation consisting of more than 100 terrestrial/marshy plant species and 34 aquatic species. The aquatic species could be categorized as floating forms (10 in number), submerged forms (14 in number) and emergent forms (10 in number).

## 17. Noteworthy Flora: (indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc.)

All the macrophytes growing within the lake or in its catchment have medicinal values.

However, following are rare or less abundant/endangered in the eco-system:-

1. *Centella asiatica*
2. *Hygrophiza aristata*
3. *Trigonella occulta*
4. *Vernonia elegnifolia*

5. *Aponogeton natans*
6. *Desmodium diffusum*
7. *Fimbristylis ferrusima*
8. *Heliotropium strigosum*
9. *Hydrocharis dubia*
10. *Hydrophila polysperma*
11. *Malvastrum cuspidatum*
12. *Phyllanthus fraternus*
13. *Potamogetan perfiliatus*
14. *Utricularia flexuosa*

**18. Noteworthy Fauna** (indicating, e.g., which species are unique, rare, endangered, abundant or biogeographically important; include count data, etc.)

List of fish and avifauna dependent on Bhoj Wetland are as follows:

UPPER LAKE FISH FAUNA	LOWER LAKE FISH FAUNA
<p><b>A. WEED FISH</b></p> <p><i>Barilius bola</i>  <i>Chanda nama</i>  <i>Cnada ranga</i>  <i>Esomus danricus</i>  <i>Gadusia chapra</i>  <i>Neemachilus botia</i>  <i>Ostebrama cotio</i>  <i>Oxygaster baicala</i>  <i>Puntius sarana</i>  <i>Puntius sophore</i>  <i>Puntius ticto</i>  <i>Rashora daninoconius</i>  <i>Xenentodeon cancella</i></p>	<p><b>A WEED FISH</b></p> <p><i>Chanda nama</i>  <i>Chanda ranga</i>  <i>Chela larbuca</i>  <i>Colisa faciatus</i>  <i>Gadusia chapra</i>  <i>Osteabrama cotio</i>  <i>Oxyaster baicala</i>  <i>Punitius sarana</i>  <i>Punitius ticto</i>  <i>Rasbora daniconious</i>  <i>Xenentodon cancella</i></p>
<p><b>B. PREDATORY FISH</b></p> <p><i>Calrias batrachus</i>  <i>Channa gachuna</i>  <i>Chama leucopunctatus</i>  <i>Channa marulius</i>  <i>Channa punctatus</i>  <i>Channa straiatus</i>  <i>Glossogobius giuris</i>  <i>Heteropneustes fossilis</i>  <i>Maccognathus aculeatum</i>  <i>Mastocembelus pancalus</i>  <i>Mystus aor</i>  <i>Mystus bleekeri</i>  <i>Mystus cavasius</i>  <i>Mystus seenghala</i>  <i>Nandus nandus</i>  <i>Notopterus notopterus</i>  <i>Ompak bimaculatus</i></p>	<p><b>B PREDATORY FISH</b></p> <p><i>Channa gachua</i>  <i>Channa punctatus</i>  <i>Clarius batracus</i>  <i>Gorra gotula</i>  <i>Glossobobius giuris</i>  <i>Hetropneaustus fossils</i>  <i>Mestacembalus armatus</i>  <i>Nandus nandus</i>  <i>Notopterus notopterus</i></p>

**COMMONLY CULTURABLE FISH IN UPPER AND LOWER LAKES**

- Catla catla*  
*Cairrhinus mrigala*

*Cyperinus carpio*  
*Labeo rohita*

#### OTHERS IN UPPER AND LOWER LAKES

*Cirrihnus reba*  
*Labeo bata*  
*Labeo dussuniere*  
*Labeo calabasu*  
*Labeo gonius*  
*Lepulocephalichthyx*  
*Trichogaster faciatus*

#### LIST OF AVIFAUNA

Scientific name	Common name	Family
<i>Phalacrocorax niger</i>	Little Cormorant	Phalacrocoracidae
<i>Ardea cineria</i>	Grey heron	Ardeidae
<i>Eqretta gulris</i>	Reef heron	
<i>Ardeala grayii</i>	Pond heron	
<i>Bublecus ibis</i>	Cattle egret	
<i>Egretta garzetta</i>	Little egret	
<i>Anas crecca</i>	Common teal	Anatidae
<i>Anas poecilorhynca</i>	Spot bill	
<i>Anas Penelope</i>	Wigeon	
<i>Anas clypeata</i>	Dhoveller	
<i>Netta rufina</i>	Red crested pochard	
<i>Aythya nycrca</i>	White eye pochard	
<i>Podiceps ruficollis</i>	Dabchick	
<i>Sarkidiornis metanotos</i>	Comb duck	
<i>Vanellus indicus</i>	Red wettled lapwing	Charadriidae
<i>Anhinga rufa</i>	Indian darter	Anhingidae
<i>Threkionis aethiopica</i>	White ibis	Threkiornithidae
<i>Grus antiqone</i>	Sarus Crane	Gruidae
<i>Porphyrio porphyrio</i>	Purple moorhen	Rallidac
	Indian moorhen	
<i>Fulica atra</i>	Coot	
<i>Gallinago galinago</i>	Common spipe	Scolopacidae
<i>Himantopus himantopus</i>	Black winged stilt	Recuvirostridae
<i>Peeryle rudis</i>	Pied king fisher	Alccdinidae
<i>Alcedo atthis</i>	Small blue king fisher	
<i>Halcyon smyrnensis</i>	White breasted King fisher	

**19. Social & Cultural Values:** (e.g. fisheries production, forestry, religious importance, archaeological site etc. )

Ever since the lake was constructed in the 11<sup>th</sup> century the Bhopal city has grown around it. Life of the people of Bhopal is very much centralized in and around these two lakes and the people are sentimentally attached to the lakes. The meet their needs as mentioned below:-

- i) Daily potable water supply
- ii) Immersion of Idols (Ganesh and Durga) and Tazias
- iii) Washing of cloth in lower lake
- iv) Cultivation of water chestnut in Upper lake and lotus in lower lake.
- v) Pisciculture

The Takia island in Upper lake has a tomb of the Shah Ali Shah Rahamatullah Allaih, which has religious and archaeological significance.

**20. Land Tennure/Ownership:**

- (a) **Site:** Govt. land under the control of Bhopal Municipal Corporation (Urban Administration & Development Deptt., (Govt.of M.P.)
- (b) **Surrounding area:** About 85% of the fringe of lake (about 100 m strip above FTL) is Govt. land and the rest is private land.

**21. Current land use:**

- (a) **Site:** Being mostly under submergence is used for potable water supply and fisheries.
- (b) **Surroundings/Catchment:** The 85% of the catchment of Upper lake is either agricultural, land with scrub or without scrub and barren rocky/stray. The details of land use of catchment area has been provided under Annexure – III. Buffer zone plantation (in approximately 900 ha area) along northern, southern and western fringe of Upper lake has been done.

**Catchment area land use pattern:**

The catchment area of both the lakes display a complete range of urban activity with varying intensities. The break up of land use pattern is as follows:-

1.	Built up area	20.855 (Sq.km.)
2.	Crop land	219.05 (Sq.km.)
3.	Plantation	0.90 (Sq.km.)
4.	Open Forest	5.225 (Sq.km.)
5.	Land with scrub or without scrub	90.292 (Sq.km.)
6.	Barren rocky/stony	8.465 (Sq.km.)
7.	Lakes/Pond	16.175 (Sq.km.)
8.	Aquatic Veg.	5.852 (Sq.km.)

**22. Factors (past, present or potential) adversely affecting the site’s ecological character, including changes in land use and development projects: (a) at the site) (b) around the site**

The water of the Upper lake was used for drinking purposes up to year 1947 without any treatment which proves that the water quality was very good. After Bhopal become the capital of Madhya Pradesh in 1956 it noticed tremendous population inflow and consequent rapid urban development which adversely affected the twin lakes. The environmental problems faced by these lakes are as follows:

**UPPER LAKE**

(A) AT THE SITE:

**LOWER LAKE**

- |      |  |  |
|------|--|--|
| (i)  | Reduction of Storage Capacity and Water spread | Reduction of Storage Capacity, due to siltation as well as encroachment of fringe areas. |
| (ii) | Inflow of Sewage/Waste (50.47 MLD)             | Inflow of Sewage/Waste (31.63 MLD)   |

(iii)	Trapa (water chestnut) Cultivation	Lotus Cultivation
(iv)	Growth of Aquatic Weeds	Growth of Aquatic Weeds
(v)	Immersion of Idols	Immersion of Idols
(vi)	Unmanaged Fishery	Unmanaged Fishery
(viii)	Boating, Bathing & Washing of vehicles	Boating, Bathing & Washing of Cloths and vehicles.

(B) AROUND THE SITE

(i)	Encroachment in Catchment Area	Encroachment & Slum Development
(ii)	Intensive Agriculture in Catchment Area	-
(iii)	Grazing of Cattles	-
(iv)	Dumping of Solid Waste	Dumping of Solid Waste

**23. Conservation measures taken:** (national category and legal status of protected areas – including any boundary changes which have been made; management practices; whether an officially approved management plan exists and whether it has been implemented)

The Ministry of Environment & Forests, Govt. of India has recognised Upper and Lower Lakes of Bhopal as wetland of national importance and designated them as Bhoj Wetland. Concerned with the deteriorating status of the two lakes, the Housing and Environment Department, Govt. of Madhya Pradesh through Environmental Planning and Coordination Organisation prepared a preliminary project report and accordingly the conservation measures for the restoration of these lakes was started in 1989.

Now a comprehensive Management Action Plan is being implemented under the Lake Bhopal Conservation and Management Project with financial assistance from OECF of Japan since 1995. The action plan basically aim at the improvement, conservation and management of Bhoj Wetland environment through arresting the root causes of pollution and environmental degradation. Under this Action Plan 15 sub-projects categorised as under are being implemented by various divisions of EPCO, Bhopal Municipal Corporation, Capital Project Administration and MPFDC under overall administrative control of Housing and Environment Deptt., Govt. of M.P.

**1. Desilting and Dredging:**

- 1.1 Desilting and Dredging of Lakes
- 1.2 Deepening and Widening of Lakes
- 1.3 Restoration of Takia island

**2. Catchment Area Treatment:**

- 2.1 Afforestation, Creation of Buffer zones
- 2.2 Construction of Check dams, Silt traps, Toe walls and Cascadings
- 2.3 Construction of Garland drain

**3. Prevention of Pollution (Sewerage) Scheme**

**4. Management of Shoreline and Fringe areas:**

- 4.1 Link Road from Retghat to Lalghati
- 4.2 Solid Waste Management
- 4.3 Prevention of Pollution from Dhobighat

**5. Improvement and Management of Water Quality:**

- 5.1 Deweeding
- 5.2 Biological Control through Aquaculture
- 5.3 Installation of Floating fountains
- 5.4 Monitoring of Water Quality

Work on sub-project like Restoration of Takia Island and Deepening and Widening of spill channel have been completed. Whereas other sub-projects are in various stages of implementation. The project is expected to be completed by March 2001.

**24. Conservation measures proposed but not yet implemented:** (e.g. management plan in preparation; official proposed as a protected area etc.)

None

**25. Current scientific research and facilities:** (e.g. details of current projects; existence of field station etc.)

Under the Lake Bhopal Conservation and Management Project regular water quality monitoring of both the lakes are being done. For this purpose 18 stations in Upper Lake and 14 stations in Lower Lake have been fixed. Physico-chemical and biological parameters are regularly analysed. Besides occasional studies during Idol and Tazia immersion are done at identified sites to assess the environmental impact with emphasis on heavy metal contamination of lake.

**26. Current conservation education:** (e.g. visitors centre, hides, information booklet, facilities for school visits etc.)

Under the Public Participation and Environmental Awareness sub-project emphasises has been given to ensure people's participation for the Conservation of twin lakes. Activities like workshop, Training courses, Lecturers, Rallies, Debates, Street Theatres, Open Forum, Public meetings, Birth watching camp, Eco Camp etc. are being carried out.

**27. Current recreation and tourism:** (state if wetland is used for recreation/tourism; indicate type and frequency/intensity)

Boating.

**28. Jurisdiction:** (territorial e.g. state/region and functional e.g. Dept of Agriculture/Dept. of Environment etc.)

Urban Administration & Development Deptt., Govt. of Madhya Pradesh.

**29. Management Authority:** (name and address of local body directly responsible for managing the wetland)

Bhopal Municipal Corporation, Bhopal, Madhya Pradesh, India.

**30. Bibliographical references: (scientific/technical only)**

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- Wanganeo, A. *et.al.* (1997) : Summer dissolved oxygen regimes in a tropical vindhyan lake in relation to the conservation strategy. *Bionature* 17 (1) : 7-11.

## Essential statistics of the Upper lake and Lower Lakes:

<b>STASTICS</b>	<b>UPPER LAKE</b>	<b>LOWER LAKE</b>
Period of Construction	11 <sup>th</sup> Century A.D.	1794
Type of Dam	Earthen	Earthen
Location: Latitude Longitude	23 <sup>o</sup> 12' – 23 <sup>o</sup> 16' N 77 <sup>o</sup> 18' – 77 <sup>o</sup> 23' E	23 <sup>o</sup> 14' – 23 <sup>o</sup> 16' N 77 <sup>o</sup> 24' – 77 <sup>o</sup> 25' E
Catchment Area (Sq.km.)	361	9.6
Submergence Area at FTL (Sq.km.)	36.54	0.90
Full Tank level (MSL) (m)	508.65	499.88
Dead Storage Level (MSL) (m) x	503.53	499.88
Storage capacity (Million Cu.m.)	117.05	4.3
Maximum Depth (m)	11.7	9.4
Designed flood discharge (Cu.m./Sec)	2208	—
Source of water	Rain water	Seepage from Upper Lake and Domestic Sewage
Main use of water	Potable water supply	Washing and Boating
Inflow points (Nos.)	31	28
Sewage water inflow	50.47	31.63