

# **FINAL REPORT**

**PROJECT TITLE: Biomonitoring Studies Of Certain Wetlands Of  
Central Gujarat With Reference To Nutrient Status**

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## **FINAL REPORT OF THE WORK DONE**

### **INTRODUCTION**

Wetland is a generic term for water bodies of various types and includes diverse hydrological entities as marshes, swamps, bogs, and similar areas. Wetlands (like other ecosystems) are continuous with other aquatic and terrestrial environments; hence some scientists have described them as a transition zone between terrestrial and aquatic environments, suggesting that wetlands are some “halfway aquatic world” in transition toward the terrestrial environment. Thus have a significant and sensitive ecological role especially in terms of bio-geo-chemical cycling of elements and heavy metals. Pollution of the aquatic environment by heavy metals is worldwide problems since these are conservative contaminants are not easily biodegradable chemically or biologically. They are therefore permanent chemical overload in the environment. When these metals are present in significant quantities in the environment, they constitute source of pollution and pollutants and pose threat to the environment, human, animal and aquatic lives.

### **BRIEF OBJECTIVE OF THE PROJECT**

1. Variation of hydro chemical properties was examined
2. Geochemical properties were analyzed
3. Heavy Metals were studied

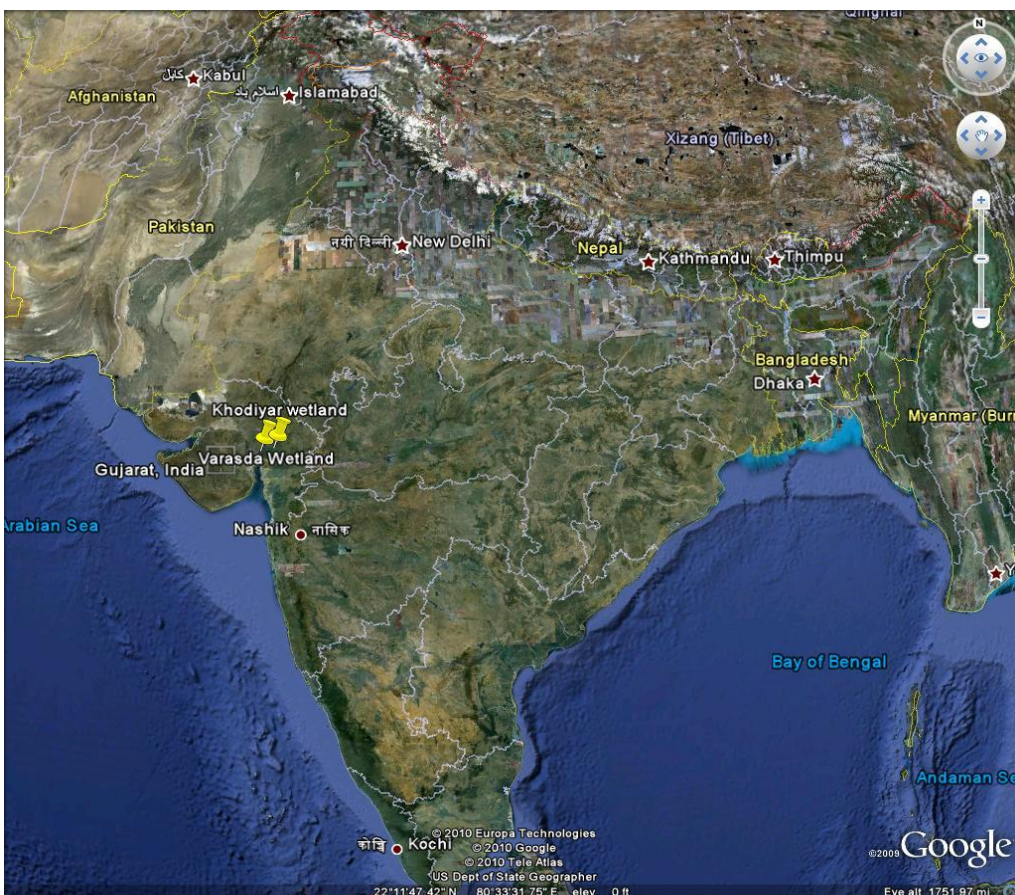
4. Biological components were studied.
5. Identification of anthropogenic stresses
6. Framing conservation strategies based on the above observations.

The aforesaid objectives were carried out for two selected study areas Khodiyar and Varasda wetlands.

## MATERIALS AND METHODS

### STUDY AREA

During current study, investigations were made in two tropical wetlands Khodiyar and Varasda situated in Central Gujarat. Both the wetlands belong to distinct ecosystems. The wetland Khodiyar is sewage-fed wetland which receives urban (Anand and Vallabh Vidyanagar) and agricultural sewages whereas Varasda is a fresh water wetland with household wastes and run-off from surrounding village pockets. The climate in the study areas is dry tropical, summers are hot and dry, monsoons are wet and winters are cool without rains. Three sites from each wetland earmarked for the present study.



### FIELD STUDY

Hydro-chemical parameters such as temperature, pH and dissolved oxygen were measured on site. All equipment used was backpacked in allowing measurements to be taken at the study site. For determination of hydro-chemical characteristics, surface water samples were collected from each selected site of both study areas. The samples were collected monthly, in two liter plastic bottles for determination of hydrochemical parameters. For determination of geo-chemical characteristics, bottom sediment samples were collected from each selected site of both study areas and preserved in air-dry plastic bags. Each plastic bag was labelled carefully and brought to the laboratory for further analysis. Enumeration of biota (avifauna, macrophytes) was carried out on site. Plankton collection was carried out using plankton net.

## EXPERIMENTAL

- ❖ Hydrochemical analysis
  - Practical methods in ecology and environmental science by Trivedy et al. (1987)
  - American Public Health Association APHA (2000)
- ❖ Geochemical analysis
  - Practical methods in ecology and environmental science by Trivedy et al. (1987)
  - Handbook of methods in Environmental Studies, Vol: 2, by S.K. Maiti (2003)
- ❖ Macrophytes
  - Fresh Water Biology by W.T. Edmondson (1963)
  - Flora of Gujarat State by G.I. Shah (1978)
- ❖ Phytoplankton
  - Cyanophyta by T.V. Desikachary (1959)
  - Fresh-Water Biology by W.T. Edmondson (1998)
  - Indian Freshwater Microalgae by N. Anand (1998)
- ❖ Zooplankton
  - Fresh-Water Biology by W.T. Edmondson (1998)
  - Freshwater Zooplanktons of India by S. K. Battish (2000)
- ❖ Waterbirds
  - The Book of Indian Birds by Salim Ali (2002)
  - Birds of India by A. Samarpan (2006)
  - Pocket Guide to the Birds of Indian Subcontinent by Grimmett et al. (1999)

The heavy metal contamination of Cr, As, Pb and Cd from selected four native aquatic macrophyte species *Nelumbo nucifera* Gaerth, *Typha angustata* Bory & Chaub, *Ipomoea aquatica* Forsk and

Hydrilla verticillata (L.f.) Royle, and their components (roots, stems, leaves, flowers) in comparison with sediment and water samples were studied using ICP, available at SICART, VV Nagar.

## RESULTS OBTAINED

### HYDROCHEMICAL PARAMETERS

- The nutrient status (Chlorides, Sulphates, Phosphates, Nitrates) of water pointed towards higher concentration during 2008-09.
- Free CO<sub>2</sub> and DO showed positive correlation with each other but demonstrated negative correlation with all other studied hydro chemical parameters.
- Rest of the studied hydro-chemical variables (Total Solids, Acidity, Alkalinity, Hardness) exhibited positive correlations amongst themselves.

### GEOCHEMICAL PARAMETERS

- The values obtained indicated an increase in the values of studied geochemical variables in the second year of study.
- All the studied geo chemical parameters (pH, Available Phosphorus, Nitrate –Nitrogen, Chlorides) are positively correlated with the other studied geochemical parameters with a high degree except total organic matter.

### MACROPHYTES

- Nine species of macrophytes viz *Eichhornia crassipes*, *Ipomoea aquatica*, *I. fistulosa*, *Typha angustata*, *Alternanthera philoxeroides*, *Azolla pinnata*, *Nymphaea stellata*, *Ceratophyllum demersum* and *Potamogeton nodosus* were recorded at Khodiyar wetland.
- Thirteen species of macrophytes viz *Hydrilla verticillata*, *Vallisnaria spiralis*, *Najas gramineae*, *N. minor*, *Azolla pinnata*, *Eichhornia crassipes*, *Marsilea quadrifolia*, *Ipomoea aquatica*, *I. fistulosa*, *Nelumbo nucifera*, *Nymphaea stellata*, *Typha angustata* and *Polygonum glabrum* were recorded .
- The dominancy of macrophytes was observed in winters during both years of study period.
- Rich proliferation of *E. crassipes* was registered especially at Khodiyar indicate, influx of nutrients was more.

### PLANKTONIC STUDY

Phytoplankton community at Khodiyar wetland: 56 species, represented by 31 genera

- Cyanophyceae - 23 species, belonging to 12 genera .
- Chlorophyceae - 18 species, belonging to 10 genera .
- Bacillariophyceae - 9 species that belonged to 7 genera.

- Euglenophyceae - 6 species belonging to 2 genera.

Zooplankton community at Khodiyar wetland: 46 species, represented by 45 genera

- Rotifera - 10 species
- Cladocera - 10 species
- Copepoda - 9 species
- Rhizopoda - 8 species
- Zooflagellates(2), Ciliophora(3), Ostracoda(2), Callanoids(1), Herpacticoids (1)

Phytoplankton community at Varasda wetland: 60 species, represented by 38 genera

- Chlorophyceae - 25 species, belonging to 16 genera.
- Cyanophyceae - 24 species, belonging to 14 genera.
- Bacillariophyceae - 8 species that belonged to 7 genera.
- Euglenophyceae - 3 species belonging to 1 genera.

Zooplankton community at Varasda wetland: 36 species, represented by 36 genera

- Rhizopoda - 12 species
- Cladocera - 6 species
- Ciliophora - 5 species
- Copepoda - 3 species
- Rotifera - 5 species
- Others: Zooflagellates (2), Ostracoda (1), Callanoids( 1) ,Herpacticoids (1)

## AVIFAUNA

- 71 species of water birds belonging to 48 genera and 15 families were documented at Khodiyar wetland.
- 29 species of water birds belonging to 27 genera and 11 families were documented at Varasda wetland.

## HEAVY METAL STUDIES

The concentrations of the elements were far higher in the sediments than in the wetland water. Of the elements analyzed Cr was the most abundant both in sediments and water. It was followed by Pb, other metals (As and Cd) exhibit the receding trend in both sediments and water. The metal composition of different components roots, stems and leaves of three native plant species *Nelumbo nucifera*, *Typha angustata* and *Ipomoea aquatica* was analyzed, however, *Hydrilla verticillata* was collected intact without sorted into different parts due to its incoherent phenophases from Varasda. The heavy metals in studied plant samples could be arranged in a decreasing order based on their contents as follows: Root system > Shoot system > Leaf system > Flower. Moreover, the mean concentration values of the elements in the plants declined according to this sequence: Cr > Pb > As > Cd.