# Need for the conservation of wetland ecosystems : A case study of Ansupa Lake (Orissa, India) using remote sensing based data

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## Abstract

Freshwater basins are vulnerable to human-induced change for a number of reasons. The change detection study of Ansupa lake, Orissa was carried out by using multi-temporal satellite data clearly indicates the decrease in wetland area. Due to high anthropogenic pressure, the wetland is shrinking day-by-day. Finally, for restoration efforts to be successful, local communities must participate actively in cooperation with local governments in accordance with the principle of co-management.

(Keywords :  wetland ecosystem/remote sensing/ conservation/ Ansupa lake/Orissa)

Wetlands compromise only three to six percent of the earth's land surface area, but they provide human populations with a host of goods and services, including water quality maintenance, agricultural production, fisheries, and recreation[1]. Despite these proven advantages, wetland conversion to other land uses has been a problem historically and continues to the present day. The wetland ecosystems have not received deserved attention from planners and policy makers, although such systems have potential of high biodiversity. India by virtue of its extensive geographical extent, varied terrain and climatic conditions, support and sustain diverse and unique wetland habitats. According to Space Application Centre (SAC) report, 7.58 million ha wetlands are in India, which includes 3.56 million ha freshwater wetlands[2]. However, in SACON wetland report, nearly 7 million ha freshwater wetlands are in India[3]. The rapidly growing human populations, large-scale changes in land use/land cover, burgeoning development projects and the improper use of watersheds have caused a substantial decline in wetland resources of the country.

Ansupa lake is located between 85° 35' 45" E to 85° 36' 30" E latitude and 20° 26' 39" N to 20° 28' 35" N longitude. It is one of the two freshwater lakes found in Orissa and famous because for its picturesque landscape[4] (Fig. 1). On the lap of Saranda and Bishnupur hills and fringed by mango orchards, this pictorial lake has assumed international importance as it is a home to several migratory as well as domiciled birds. It covers an area of about 317 ha. The lake is surrounded by Mala-biharipur, Ostia, Subarnapur and Anandpur villages. There is one sluice gate, which regulates the flow of water[5]. The length of the lake is more than 3.4 km in north-south direction and the maximum width is less than 1 km. In recent years, anthropogenic pressures have created an ecological imbalance to a great extent[6]. Heavy exploitation of vegetation around Ansupa accompanied by silta-

tion and increased growth of water hyacinth and algae is turning the lake into a swamp[7].



Fig. 1- Landscape of Ansupa lake.

Therefore, it is necessary to reclaim and develop this wetland ecosystem for its optimum potential use. For rapid area estimation, conventional surveys are laborious and time consuming process. Remote Sensing (RS) could contribute to this in cost effective manner, for instance through rapid assessment and mapping of wetland cover for sustainable wetland management. Hence, use of remote sensing data in wetland mapping has been attempted by several workers in India[8-13]. In the present study, an attempt has been made to know the extent of the lake and to monitor changes in the lake area over a period of 31 years (1973-2004).

The land use/land cover map of Ansupa lake ecosystem was prepared by using muti-temporal satellite imagery. Landsat multi-spectral scanner (MSS) data of path 150-Row 45, dated 18 January 1973 and Indian Remote Sensing satellite P6 (IRSP6-Resourcesat) Linear Imaging Self Scanner III (LISS-III) data of path 106-Row 58, dated 8 January 2004 were analyzed. All the datasets were geometrically corrected. For geo-referencing, IRS P6 LISS III data was co-registered to Survey of India (SOI) topographic map at 1:50,000 scale using ground control points (GCPs). All the datasets were brought into WGS datum and UTM projection. The

satellite data were on-screen visually interpreted using ERDAS IMAGINE 8.7 image processing software. Area of interest (AOI) for Ansupa lake along with its surroundings was separated out from the full scene in both the imageries. The resultant classified maps were prepared and compared with each other. The area under waterbody was calculated for both January 1973 and 2004. Increase and decrease in the area under the different land cover categories were also calculated.

The total area of the lake covered by waterbody in January 1973 was found to be 317 ha (Fig. 2) and it is gradually decreased to 176 ha in January 2004 (Fig. 3). In all, 141 ha have been converted to different land cover by several anthropogenic pressures. Waterbody area has been progressively decreased due to land mass formation by siltation (7.8 ha), infested by weeds (37.7 ha) and conversion to agricultural fields (95.5 ha) (Table 1). Rapidly growing water hyacinth (*Eichhornia crassipes*), algae and other weedy vegetation (*Ipomoea carnea, Hydrilla verticillata, Typha angustata, Pistia stratiotes, etc.*) causing serious problems to the wetland (Fig. 4).
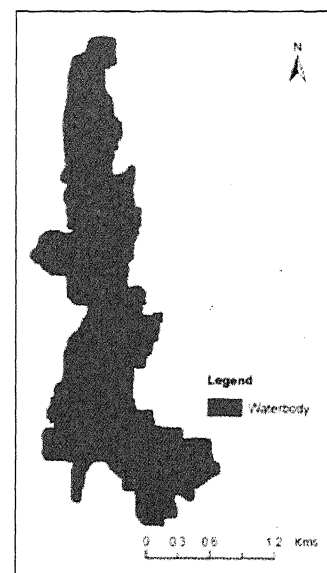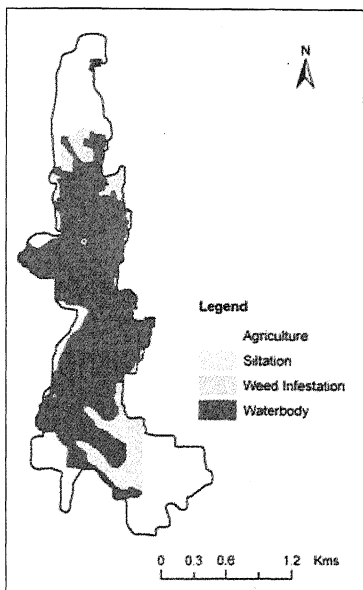


Fig. 2- Classified map of Ansupa lake (1973).
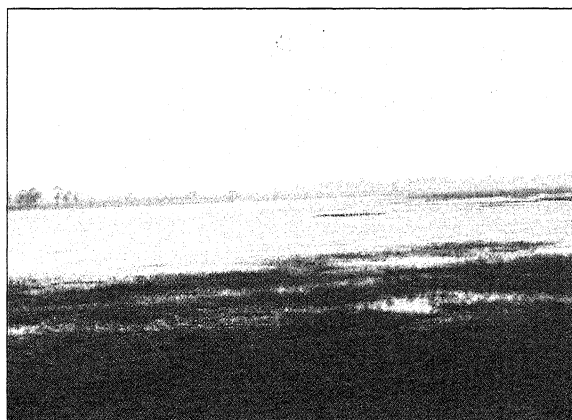
Fig. 3– Classified map of Ansupa lake (2004).



Fig. 4– Infestation by weeds

**Threats to the wetland ecosystem**

Some of the major threats to the decrease in wetland area are discussed below.

1) Large-scale deforestation in Saranda hill causes severe soil erosion in the catchment area.

2) Heavy siltation has reduced the erstwhile lake to a shallow wetland. Major amount of silt is deposited in the monsoon season when heavy

rain wash down the soils from the hill slopes and nearby barren lands.

3) Nutrients through fertilizers, toxic pesticides and other chemicals mainly from agricultural run-off causing water pollution and eutrophication.

4) Organic pollution from human settlements spread over area along the periphery of the lake.

5) Intensive spreading of common water hyacinth.

6) Over-exploitation of fish resources and poaching of waterbirds by local villagers.

All these threats have resulted not only in shrinking of the lake area but also deteriorated the natural environment for the survival of birds. These unfavorable conditions have forced the migratory birds to drift away from Ansupa lake. The situation might have further worsened subsequently, as the lake reclamation for fishing and agriculture is going unhindered. Therefore, some urgent conservation measures required to save the wetland ecosystem.

Table 1-Conversion of waterbody area into several land use categories (2004)

| Category | Area in Ha (2004) | % of total area |
|---|---|---|
| Siltation | 7.8 | 2.5 |
| Weed infestation | 37.7 | 11.9 |
| Agriculture | 95.5 | 30.1 |
| Water | 176 | 55.5 |
| Total | 317 | 100.0 |

**Conservation measures**

In this disquieting situation, restoration of the unique wetland ecosystem is very important. The following conservation measures should be taken immediately to restore the dyeing wetland.

1) Eradication of weeds and algal blooms by manual, biological and mechanical methods.

2) Maintenance of water level in all the season and opening of sluice gate during monsoon.

3) Regular monitoring of water quality for various physico-chemical and biological parameters.

4) Afforestation in the lake basin or catchment area.

5) Stringent law should be enforced for violators.

6) Alternative livelihood options should be provided to local people that depend on the lake.

7) Proper embankments, dikes or canals should be made by state government for irrigating the nearby agricultural fields, so that they never rely on lake water for irrigation.

8) Conducting environmental education programme and creating awareness among local villagers.

The data presented in this study is an important step towards establishing a baseline for further monitoring and tracking changes to the Ansupa lake ecosystem in the future. So, periodic monitoring and above mentioned deterrent measures should be implemented immediately to save the lake before it becomes extinct forever.

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