

Engineering Interventions for Dal Lake Conservation

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ABSTRACT

In the present paper an attempt has been made to assess the outcome of engineering interventions for Dal Lake conservation.

Dal Lake has been the centre of Kashmir civilization and is one of the most beautiful spots of tourist attraction. This shallow-post glacial freshwater body is bounded on southwest and west by Srinagar city, and its remaining sides are surrounded by gentle terraced slopes at the base of precipitous mountains. The Dal Lake lies in the flood plains of river Jehlum whose broad meanders have cut swampy low lands out of the Karewa terraces.

The inflow Telbal nallah channel enters the lake from the north bringing water from the high altitude Marsar lake. During its downward journey the inflow stream collects large quantities of silt from the denuded catchment and deposits it in the lake. Numbers of ephemeral water channels, surface drains enter the lake from the human settlements discharging large quantities of wastes. An estimated load of $12.30 \times 10^6 \text{ m}^3$ of liquid waste with 18.17 tons and 25 tons of Phosphorus and inorganic nitrogen is enriching the lake annually.

1.2 What makes the Dal Lake unique among world lakes?

I. Floating Gardens:

II.habitation within the Lake:

III.Presence of Houseboats

Key Issues: *The major issues confronting Dal Lake are identified as:*

- 1) Excessive inputs of nutrients and organic matter, from point and non-point sources,leading to eutrophication.**
- 2) Hydrological and physical changes.**
- 3) Siltation from inadequate erosion control.**

Of these three major classes of stresses, the stress problems related to nutrient, over enrichment and excessive plant production is probably the most common.

5.1.1 Catchment Management

The main objective of the catchment management plan of Dal lake is to check soil erosion and degradation process in the catchment area and thus arrest and bring down the sediment and nutrient flow to the lake to the minimum. The catchment management plan so envisages the specific measures for catchment treatment in identified zones which include:

- Restoration of degraded forests through plantation contour hedgerow and in situ moisture conservation.
- Fuel, wood and fodder plantation of indigenous exotic species.
- Drainage line treatment through properly designed structures such as Check Dams, RCC-Drop structures, retards, Gabions Stone walls, trenching, fencing, water tanks and troughs and wetting.
- Forage production through Silvi-Pasture, Pasture development and on-farm fodder development.
- Beneficiary participation through entry point activity.

5.1.2 Siltation and Sedimentation: Control measures:

The silt inflow from Telbal Nallah has also carried nutrients to the lake from the catchment and as per the estimates 15 tons of phosphate and 322 tons of nitrogen are added to the lake ecosystem every year, which gets locked up in the aquatic plants or deposited in the already enriched lake sediment. In order to control silt and sediment, it has been proposed to construct a settling basin and its allied works. The settling basin shall act as silt arrester and would not allow sediments to enter into the lake.

5.1.3 Marginal Dredging for improvement of water circulation.

The removal of marshy areas including solid land masses which have been established over a period of time on lake shores including encroachments with delineation of boundaries and increasing the area of open water to improve navigation, dredging to a few specific location where it will improve water circulation.

5.1.5 Improvement of lake Hydrology and Hydraulics

- Construction of gated regulators along Boulevard, which consist of structures of grit removal chamber, bio-filters of masonry and gated regulators which can be operated to shut off the flows to the lake during receding of high water levels as also preventing raising of water levels in the hinter lands when the lake levels are high. The regulatory gates shall also control sediment inflow and nutrient leaching during recession.

- Removal of Kabutar Khana Bund and Ishbar Bund, since these bunds result in segmentation of the lake and also impede the wave action and mixing of water of compartmentalized lake, hence stand removal for good.
- A pipe line bund carrying drinking water supply from Nishat Bagh to city interior over a bund needs to have cuts to improve water circulation.
- Improvement to Nallah Amir Khan outlet by way of having lock channel and flow control structure and to enhance the carrying capacity of Nallah from 4.25 cumecs as to 37.66 cumecs.

5.1.6 Sewerage and Sewage treatment:

Sewerage and sewage treatment constitutes a major component of the Dal lake conservation plan for preventing the pollution of the lake. An integrated garland sewer was proposed to arrest all the effluents entering the Dal and Nigeen lake (fig.). from its immediate catchment.

5.1.8 Deweeding

The most sound and reasonable management approach is to control their growth. In Dal Lake the Lake dweller have been doing deweeding through traditional pole method where in they would whirl the wooden pole in such a skilled way that they would extract the weeds and use them for preparation of vegetation gardens or as bio fertilizers. They would also take out the bottom muds and use it for vegetable garden preparations. But when the weed infestation in the lake basins increased beyond proportion the authorities concerned had to deploy mechanical harvesters.

5.1.10 Water Quality Assessment

Water quality of the Dal Lake has been seriously altered over a period of time because of human interventions which include agricultural activities within and on the periphery of the lake, urbanization and mushrooming of hotels besides waste discharge .The lake thus has turned Eutrophic and is under great stress.

5.1.11 House Boat Sanitation

For creating the needs of houseboat sewage, the Enex (1978) have investigated the three alternative proposals which include:

- (a) Chemical toilets.
- (b) Holding tanks with periodic collection by specially constructed tanker barges.
- (c) A reticulum collection system of sewers and pumping station followed by treatment in an oxidation pond before discharge.

5.1.12 Algal bloom control-Aeration

Since artificial re-oxygenation by bubbling air or pure oxygen into polluted waters is a technique with increasing application for lake restoration; based on this concept, number of floating aerators have been installed to combat algal blooms.

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