Lake Management Strategies for Dal Lake, Srinagar, India

Country: India  
Land use:  
Scale: Regional  
Objectives:  
Ownership: Govt.  
Intervention: Project/Policy/Plan

Lake Area: 25 sq. km.  
Catchment Area: 337 sq. km

Background
The Dal Lake located in the city of Srinagar, Jammu & Kashmir. It is spread across an area of 25 sq. km., which is comprised of open water area, floating garden, built-up land masses with human settlements, houseboat areas etc. The catchment area of the lake is 337 sq. km., out of which 13.6% is built-up area.

The lake is known as a tourist attraction and it also provides drinking water, fish and vegetables, and recreational opportunities to the local population. The lake is divided into three basins (1) Hazratbal (northern basin), (2) Bod-Dal (southern basin), and (3) Nigeen (western basin). Large areas of the lake are covered by floating gardens, which are land masses used for vegetable cultivation.

Chronology of lake conservation activities
The lake is a natural formation, estimated to be formed in this period. The lake has always been an aesthetic jewel near the human settlements, providing various environmental, social and economic activities. Mughal gardens can be considered as the first planning and designing exercise to use Dal Lake as a recreation hotspot.

Mughal Gardens are developed around the lake.

Srinagar started to expand, into the lake, with increased prevalence of tourism activities. Increased urbanization has negative impact on lake ecosystem, with decreasing lake area and increasing pollution levels. Exponential increase in tourism activities in and around the lake, which results in further deterioration of lake complex.

1972
Lake Area Masterplan by Stein

1978
ENEX Consortium Report
  - Reforestation
  - Construction of settling basin
  - Diversion of sewage from existing development
  - Prevention of uncontrolled urban development
  - Sealing of nutrient rich catchment areas from main waters
  - Nutrient removal and control of water flow
  - Solid waste management

1997
J&K Lake and Waterways Development Authority is constituted

2000
DPR on Conservation and Management of Dal Lake
  - Catchment Management Plan
  - Sewage and Sewage Treatment
  - Solid Waste Management
  - Works on Telbal Nallah
  - Hydrology Works
  - Dredging and Desilting
  - Resettlement and Rehabilitation Plan
  - Research, Monitoring and Data Management
  - Public Awareness Plan
  - Eco-restoration and development of Wetland Reserve

DPR prepared by Alternate Hydro Energy Center (AHEC), IIT Roorkee (erstwhile Roorkee University)

2005
Dal Lake receives funds under NLCP to implement the project
### Spatial Implications of lake conservation activities

Projects implemented under the various strategies for conservation of Dal Lake and post-project activities have had various spatial implications for the lake, its catchment area, and the city of Hyderabad. These are explained in four categories below:

#### In-lake activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Details</th>
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<tbody>
<tr>
<td>De-weeding</td>
<td>- Selective de-weeding in the lake. Use of chemicals is not recommended as the lake has multiple uses ranging from boating, and fishing, to water supply.</td>
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<tr>
<td>Dredging</td>
<td>- Selective dredging in various locations, specially to widen and deepen the blocked channels. Large scale dredging is not recommended.</td>
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#### Shoreline / Buffer area activities

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</table>
| Construction of settling basin at Telbal Nallah | - Telbal Nallah is main source of sediments in the lake  
- Construction of a settling basin at the mouth of the nallah  
- Water flows over a 70m long weir, before entering the lake |
| Development of Telbal Nallah and Wetland Reserve | - Develop 50m wide green strip, with think plantation along Telbal Nallah, for 7 km stretch from the settling basin to the upstream Dachigum Nallah  
- Develop 47.5 Ha of Wetland Reserve, which is a low-lying water-logged area on the left bank of the Telbal Nallah  
- Settlements in these areas to be relocated |
| Delineation of Buffer area                    | - Draft Masterplan for Srinagar Metropolitan Region, 2035 provides for buffer zone around Dal Lake, ranging from 50m to 100m. |

#### Catchment area activities

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| Catchment Management Plan                     | Lake catchment divided into six zones and sediment yield which can flow into the lake is estimated to range from 49,708 – 67,844 tons/year. Strategies to control the sediment yield are:  
- Restoration of degraded forests through plantation, contour hedgerows 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, R.C.C. drop structures, Retards, Gabions, Stone walls, Trenching, Fencing, Water Tanks and Troughs and Wetting  
- Forage production through Silvi-pasutre, pasture development and on-farm fodder development  
- Beneficiary participation through entry point activity. |
| Sewerage system                              | - Sewage inflow in Dal Lake is estimated at 40 MLD  
- Sewerage system divided into three zones with six STPs planned and constructed of FAB technology, having a total capacity of 36.7 MLD  
- The sewer network is supported by 15 pumping stations  
- It is estimated that 40% of 36.7 MLD treated sewage will enter the lake |
### Solid waste management
- Nature of solid waste generated is analysed. The study observed high generation of vegetable waste, plastic and polybags.
- Three methods of waste disposal were analysed: incineration, composting and sanitary landfill
- Composting on pilot basis is recommended to cater to vegetable waste
- Provision of proper community bins, garbage gobblers, etc.

### Resettlement and Rehabilitation Plan
Five options recommended for relocation of lake dwellers, with possibility of partial relocation. Strategy for implementation based on:
- Choosing hamlets, which cause greater pollution/degradation or need to be vacated for aesthetic considerations
- Identifying the families willing to shift and making arrangements for them only
- Determining and securing the resources required like finances, residential plots and agricultural land, institutional loans, settling people in business and handicrafts etc.
- The number of people to be shifted in any phase should be in accordance with the resources secured
- Relief and Rehabilitation carried out to the satisfaction of shifted people, even if their number is small, is likely to result in the reduction of the population in the lake and ultimate achievement of the objective of lake conservation.

### Management Strategies

<table>
<thead>
<tr>
<th>Research, Monitoring and Data Management Programme</th>
<th>Report highlights the need for holistic monitoring and management of lake and its surroundings.</th>
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<tbody>
<tr>
<td></td>
<td>Plan future research programmes, which can modify current restoration initiatives</td>
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<td>Recommends constitution of a Scientific Advisory Committee, to oversee various aspects of lake management</td>
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<tr>
<th>Public Awareness Plan</th>
<th>Awareness programmes increasing general awareness regarding the need for conservation of the lake and popularizing the conservation plan objectives</th>
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<td></td>
<td>Inform the general public about the progress of the plan as well as how everyone can actively participate in cleaning the lake and its sustained conservation</td>
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</table>
**Institutional set-up for lake management**

The various organisations involved in the implementation of projects related to Dal are mentioned below, along with their respective roles:

<table>
<thead>
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<th>Organisation</th>
<th>Role</th>
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<tbody>
<tr>
<td>Town Planning Organisation (TPO), J&amp;K</td>
<td>• Preparation of Development Plan for Srinagar Metropolitan Region</td>
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<td>Srinagar Development Authority</td>
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<td></td>
<td>• Development of residential, commercial and institutional areas</td>
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<tr>
<td>Srinagar Municipal Corporation</td>
<td>• Implementation of projects related to Solid Waste Management,</td>
</tr>
<tr>
<td></td>
<td>residential projects</td>
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<tr>
<td>J&amp;K Lake and Waterways Development Authority (LAWDA)</td>
<td>• Prepare and implement lake management plan / strategies for Dal</td>
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<td></td>
<td>Lake</td>
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<td></td>
<td>• Providing permission for construction activities</td>
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<td></td>
<td>• Develop recreation facilities</td>
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<tr>
<td></td>
<td>• Implementation of projects related to sewerage and solid waste</td>
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<td></td>
<td>management</td>
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<tr>
<td></td>
<td>• Monitoring and evaluation, including generation of scientific data</td>
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<tr>
<td></td>
<td>and public awareness</td>
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<tr>
<td>PHED, J&amp;K</td>
<td>Implementation of projects related to sewerage</td>
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<tr>
<td>Forest Dept., Govt. of J&amp;K</td>
<td>Implementation of afforestation and social forestry projects</td>
</tr>
<tr>
<td>Tourism Department, Govt. of J&amp;K</td>
<td>Implementation of strategies related to tourism development</td>
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<tr>
<td>MoEFCC, Govt. of India</td>
<td>Providing funds to J&amp;K LAWDA under NLCP</td>
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<td>Private Consultants</td>
<td>Hired in order to prepare DPRs</td>
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<td>NGOs</td>
<td>Aiding stakeholder review and community participation</td>
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**Key Takeaways:**

- Dal Lake is a prominent international tourist and recreational spot, and it also supports the livelihoods of various sections of the local community, ranging from fisher-folk, to houseboat operators. Lake conservation strategies reflect the sensitivity of socio-economic impacts, with a separate rehabilitation plan, under the lake management strategies.
- J&K LAWDA is the nodal organization for planning and implementing lake management strategies for Dal Lake. In addition to this, it also has the power to issue building permissions. This provides an opportunity to keep planned encroachments in check.
- Apart from this, LAWDA also has responsibilities or sewage collection, and solid waste management, which can compensate the gaps in the Srinagar Municipal Corporation.
- It is observed that the implementation of the projects is delayed due to various govt., political and security reasons, which has resulted in various PILs being filed in court.
- Establishing the Scientific Advisory Committee provides opportunity for regular monitoring and quality check.

**References**

Research.

- J&K LAWDA website URL: [http://jklda.org/](http://jklda.org/)