iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** IX **Month of publication:** September 2020

DOI: https://doi.org/10.22214/ijraset.2020.31323

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue IX Sep 2020- Available at www.ijraset.com

Preserving Dal: Embodiment of Million Sentiments through Ages

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I. INTRODUCTION

Water bodies are very important component of ecological and environmental structure of nature system. The first human settlement around 6000 years ago began a twofold struggle with water on the one hand people had to protect them against flood and on other hand had to ensure safe water supply for domestic use and irrigation. The earth, 2/3rd of which is covered by water, looks like a blue planet- the planet of water from space. The world's lakes and rivers are probably the planet's most important freshwater resources. But the amount the amount of freshwater covers only 2.53% of the earth's water. On the earth's surface, fresh water is the habitat of a large number of species. These aquatic organisms and the ecosystem in which they live represent a substantial sector of the earth's biological diversity. Water bodies are estimated to occupy around 8.6 million sq.km (6.4%) of the earth's surface, out of which about 4.8 mill sq.km are found in the tropics and sub tropics.

II. STUDY AREA

Dal Lake is situated in the north-east of Srinagar at mean latitude of $34^0 7'$ N latitude and longitude of $74^0 52'$ E at an altitude of 1584 m.s.l is one of the most beautiful lakes in India and second largest lake in J & K. the lake is probably of fluvial origin formed from the ox-bows of river Jhelum. Around 1200 A.D, the lake spread over an area of 75 sq.km. At present, it covers about 1.1sq.km and has maximum depth of 5.4 m and a shoreline of 15.4 km. Of the total area, only about 11.4 sq.km is open water and the rest is under floating gardens most of which have now settled permanently. The lake has a large mountainous catchment spread over 316 km^2.

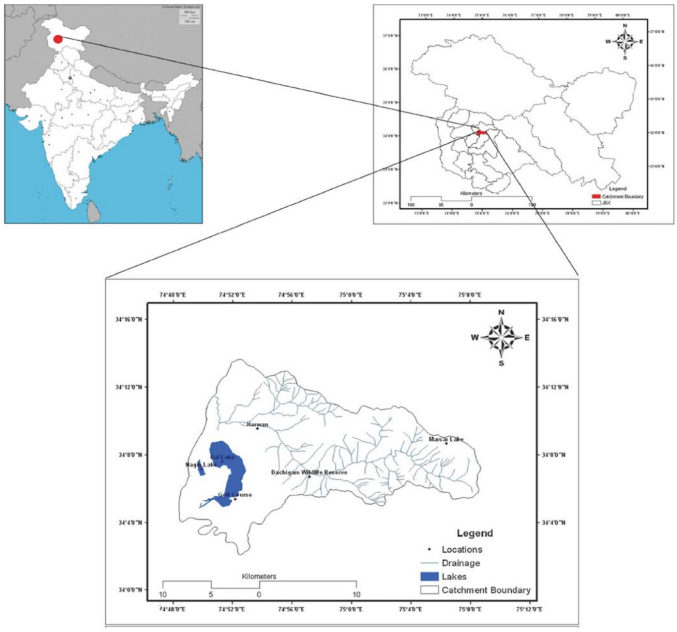


Figure 1 location of the study area

A. *Objectives*

1) To identify various factors responsible for degradation of Dal Lake.
2) To find out the existing environmental/ecological status of Dal Lake.
3) To suggest some remedial for the conservation and management of Dal Lake.

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97

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III. METHODOLOGY AND DATABASE

The present study entitled "management plan of Dal Lake" was carried out by employing data from secondary sources. The data base of the study is mainly secondary sources which includes mainly books, book-lets, magazines, journals, internet, dissertations, research papers etc published by various organizations and individuals. The data thus obtained has been compiled and analyzed with the help of various statistical and cartographic techniques in the form of tables and statistical figures.

A. Land Transformation in Dal Lake

Dal Lake is ecologically, economically and socially an important lake for Srinagar city. The study focuses on 5 prominent land use/cover classes existing in and around the lake waters. This includes lake area (the water body), marshy area, residential (the settlements), plantation/orchard. Among these classes, marshy land and lake area recorded decreases where as area under residential, plantation/orchard and agriculture have increased during the study period. The growing populations of Hanjis and their increased demand for their economic sustenance and settlement have led to these changes. The analysis suggests that there were significant land transformation and interchange of land within different land use classes. The marshy areas in and around the lake has been converted to built-up land and floating vegetable gardens/floating gardens (locally known as Radh).

Table 1 Land transformation of Dal Lake

Water body	Area in 1980(ha)	Transformations	Area in 2010(ha)
DAL LAKE	Residential(5.5)		Residential(53)
	Plantation/orchards(8)	Plantation/orchard to agriculture(8)	Plantation/orchard(28)
	Agriculture(36)		Agriculture(749)
	Marshy(862.5)	Marshy to agriculture(591) Marshy to water body(27) Marshy to residential(16) Marshy to plantation/orchard(13)	Marshy (315)
	Water body(1538)	Water body to agriculture(122) Water body to marshy(94.5) Water body to residential(31.5) Water body to plantation/orchard(12)	Water body(1305)

Source: Fazal and Amin, 2012

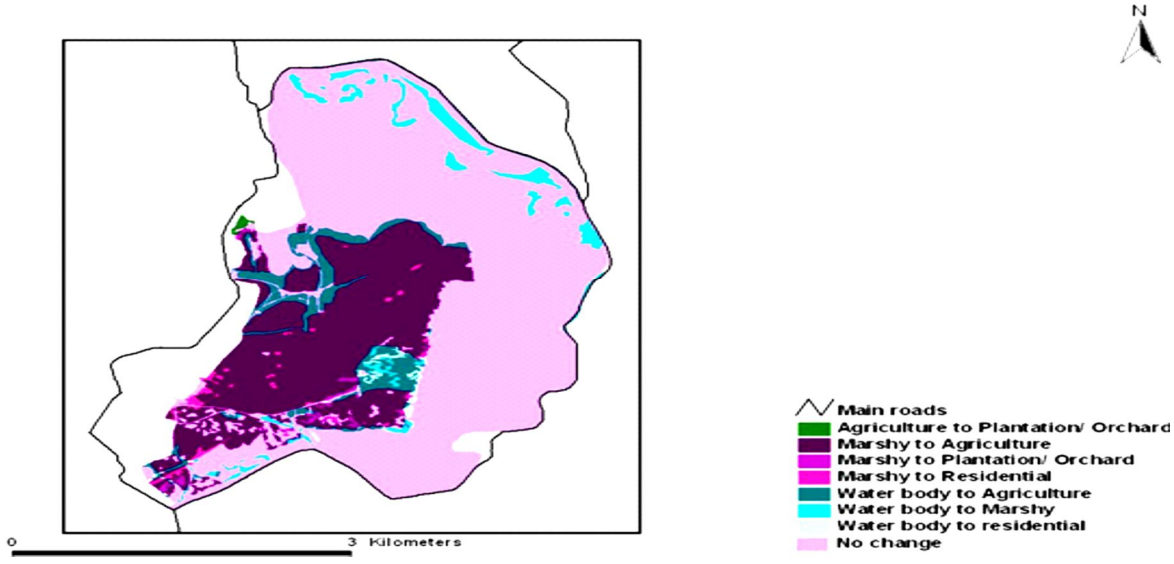


Figure 2 Land transformation of Dal Lake

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While marshy area recorded decrease in its area, losing land to agriculture, lake water, residential and plantation/orchard, while it acquired area from lake water. Similarly, area under lake water has decreased during the study period, losing area to agriculture, marshy, residential and plantation/orchard. This clearly shows that there is a pattern of land transformation, where lake water is converted to marshy lands which subsequently converted for agriculture, orchards and residential uses (Fazal and Amin, 2012).

B. Changes in Population

Dal Lake is experiencing mushrooming of both permanent and mobile settlements. Largely these settlements are occupied by Hanjis for residence and over the years with increases in their population, these settlements have expanded as well as become denser. At present Dal lake provides shelter to about 50 hamlets with a population of over 50,000 people, who have property rights over 300 ha(6,000 kanals) of agricultural land and 670 ha (13,400 kanals) of lake water area. Besides this, a large number of commercial and residential buildings such as hotels, guest houses and restaurants have sprung up in and around the Dal Lake. Overall percentage of these catchments including Dal dwellers has been computed to be 40.66% for the last two decades (1991-2001).

C. Management Plan For Dal Lake

During the past 25 years more than 12 project reports have been prepared on the conservation of Dal Lake, about 250 crores of rupees spent on various engineering works and an independent Lake Authority created, there is hardly any improvement in the lake environment. It is important to develop complete co-ordination between various government agencies. The full use of existing knowledge should be made and the staff that monitors the ecosystem should be fully trained. There is also need to integrate management policies into planning process. Application of multi-disciplinary approach is of paramount importance (Zutshi, 2004).

D. Management Tools

1) *Reforestation and Control of Grazing:* It is the need of the hour that the reforestation programs be accelerated and that positive steps be taken to control grazing on the slopes which are prone to soil erosion for this social forestry program will be more effective.
2) *Changes in Agriculture Practice:* Agriculture is a major source of non-point pollution reaching Lake Ecosystem. The transitional littoral zone may be able to absorb this pollution, but only to a limited extent. It should therefore be considered a major management tool to change the agricultural practice to attempt to reduce the non-point pollution from this source.
3) *Control of land Reclamation and other Encroachments:* Further encroachments in the lake area should be totally stopped. An effective moratorium on the construction of new houseboats, hotels and restaurants within the lake should be declared, which of course needs legal sanction.
4) *Sewerage System:* Construction of low cost sanitation latrines with twin leech pits for the local population residing on the peripheral areas of Dal Lake and in houseboats, in order to minimize the direct disposal of raw human refuse into the lake.
5) *Control of Siltation and Sedimentation:* In view of the difficulties of ensuring effective measures for control of soil erosion in the steep areas at the head of the catchment situated above the vegetation (tree) line, it is necessary to construct a settling basin prior to the entry of Telbal Nallah into the Dal Lake to settle out the bulk of the sediment load and insoluble nutrients.
6) *Zoning:* The importance of shore zone(transition zone) has been emphasized throughout the world. The littorals and supralittorals play important roles as filters, buffer zones, nesting areas etc. the shore is a filter for undesired releases into the lake and a buffer zone, which levels out the impacts on the lake coming from its surroundings.
7) *Monitoring of the Lake Environment:* A meaningful interpretation of the causes and mechanisms of perturbations in the lake is only possible if periodic surveys of different ecological aspects are carried out. This emphasizes the need to monitor the lake's environment on regular basis.
8) *Weed Control:* Macrophytes are able to take up not only nutrients but also pesticides and heavy metals. Since macrophytes lakes lock up a large proportion of nutrient supply it is obvious that if large-scale deweeding is done, nutrient level may rise to deleterious proportions in the water, leading to the formation of algal blooms (Pandit.A.K, 2000).

IV. CONCLUSION

The environs of Dal Lake have got severely affected during these years, once a huge water body having an area of 75 sq.km is now reduced to only 11 sq.km. There are clear indications of decay in Lake Environment, the lake area is shrinking, the quality of water is deteriorating and the exploitation of resources is increasing.

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The changing land system strongly affects the response of hydrological patterns like runoff, erosion and sediment loadings. Increased anthropogenic interventions, unplanned urbanization, deforestation in the catchment are identified as the driving forces that led to the land use/cover change in the catchment. About 90% of the Dal dwellers are dependent on Dal Lake and have a very poor socio-economic base and make out their modest living from agricultural activities, mat weaving, tourist related activities like paddling of shikaras and deweeding of weeds. A major proportion of the population was found to be engaged in vegetable and nadru (Nelumbo nucifera) cultivation. As per the information furnished by the Dal Dwellers' Zamindar Union, vegetables worth 35 crores are cultivated and supplied from the lake every year. A comprehensive, result-oriented method for the resettlement and rehabilitation is lacking as the land is being acquired in piecemeal manner compelling the dwellers to stay inside the lake and not move permanently. It Dal dwellers and population living in the catchments of the lake are major cause for the degradation of Dal Lake. The untreated sewage from the houseboats, households and agricultural land goes directly into the lake and pollutes it.

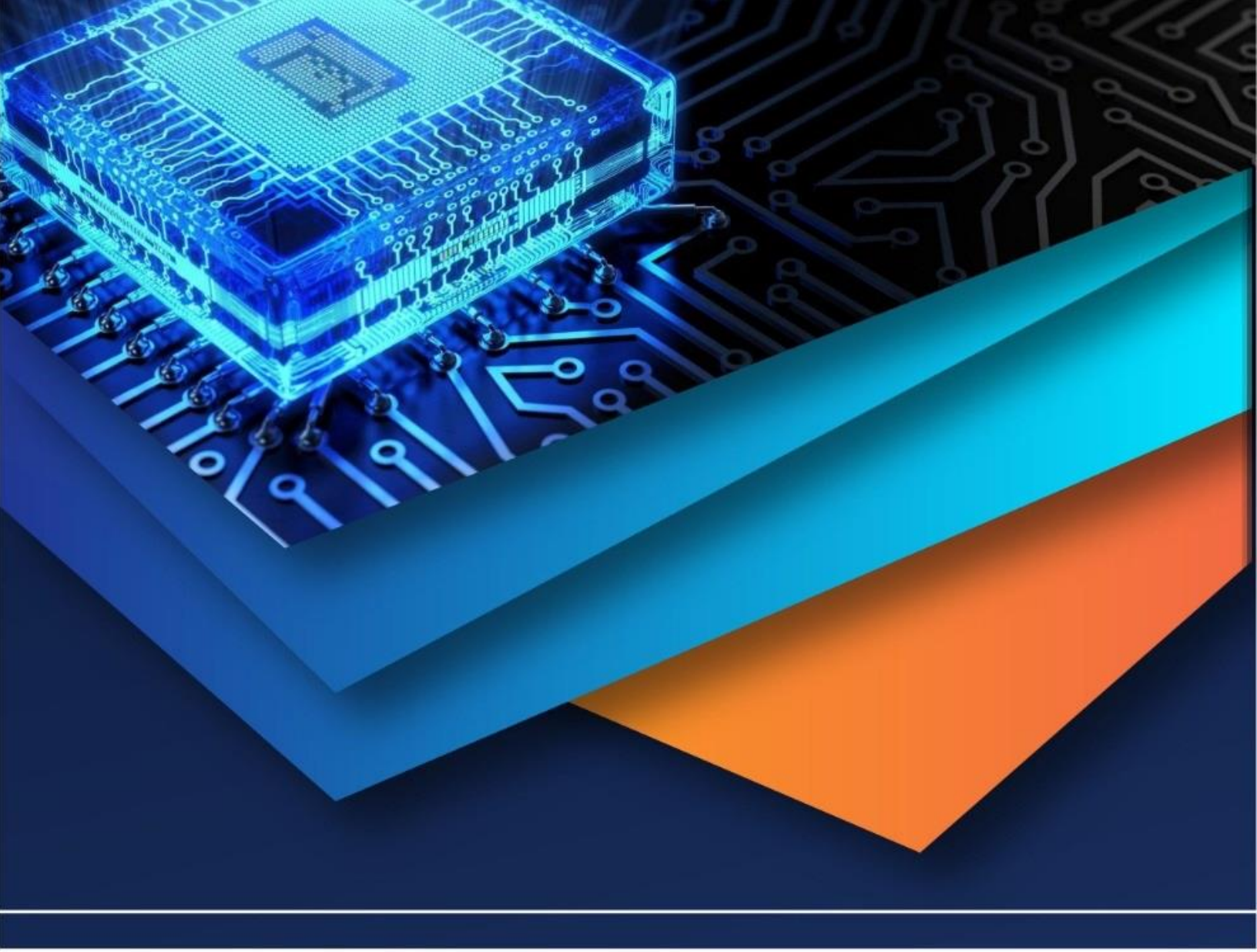
V. SUGGESTIONS AND RECOMMENDATIONS

A. Rehabilitation and resettlement program of the Dal dwellers needs to be given top most priority.
B. Land use in the catchment should be regulated so as to prove best for the lake.
C. An effective and comprehensive rehabilitation and management system should be evolved by irrigation engineers and planners for regular monitoring of lake.
D. To ensure sustainable development of the lake and environs as well as recreational value, the growth of uncontrolled natural vegetation (aquatic weeds) should be stopped.
E. The water reservoir capacity of the lake has been considerably reduced. Therefore, large scale dredging should be carried out to retain its original position.
F. Water quality monitoring should be done with greater frequency and results should be made public.
G. Aeration of lake where the water remains stagnant in order to check algal bloom and removal of Dal bunds at Nishat which bifurcated the Dal basin in order to increase the circulation of lake water in all basins of Dal Lake.
H. There must be sincere efforts to perform deweeding and dredging activities on periodic basis in the affected water bodies to maintain water clean. But while deweeding and dredging, some basic precautions are required as mechanical deweeding instead of uprooting the macrophytes results in their trimming, which promotes their quick and luxuriant growth.

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