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Strategies for wetland Conservation: Asset to Natural Infrastructure – Case of Surinsar-Mansar wetland in Jammu region of Jammu and Kashmir

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ABSTRACT: Natural infrastructure is a crucial component of provincial and national climate change strategies. Urban forests contribute greatly in reducing greenhouse gas emissions by absorbing and storing carbon dioxide in tree biomass, vegetation and soils. Urban trees also help us adapt to and cope with climate change impacts by shading communities during periods of extreme heat. The unique, multi-purpose benefits of living infrastructure make it an incredibly valuable tool for cities and towns to improve resiliency in the face of climate change. Recognizing wetlands as infrastructure assets opens up new ways to assess their value and justify investment in their maintenance. Unlike grey infrastructure, such as storm water pipes, which depreciate with time. One of the important wetland Surinsar-Mansar Lakes, in the Jammu region of J&K , it comprises of Freshwater composite lake, adjoining the Jhelum Basin with catchment of sandy conglomeratic soil, boulders and pebbles. With rapidly increasing population and development, these wetlands are being threatened. The aim of the paper is to understand how best can we conserve these fast depleting wetlands while also ensuring a good quality of life for residents as well as the tourists in the long term. This conservation can be done by integrating wetland as a part of natural infrastructure by understanding its natural topography and unique features to build a sustainable environment.

I. INTRODUCTION

Wetlands are amongst the most productive ecosystems on the Earth (Ghermandi, 2008), and provide many important services to human society (ten Brink, 2012). However, they are also ecologically sensitive and adaptive systems (Turner, 2000). As per the Ramsar Convention definition most of the natural water bodies (such as rivers, lakes, coastal lagoons, mangroves, peat land, coral reefs) and man-made wetlands (such as ponds, farm ponds, irrigated fields, sacred groves, salt pans, reservoirs, gravel pits, sewage farms and canals) constitute the wetland ecosystem. Only 26 of these numerous wetlands have been designated as Ramsar Sites (Ramsar, 2013) in India.

Natural Infrastructure and Green Infrastructure

With the present phenomenon of Climate Change the building of green infrastructure, help us to mitigate and adapt to climate change. In the past, public investments have largely been directed to only grey infrastructure, (roads, bridges, water treatment plants etc). But now it's time for change. Green infrastructure provides incredible value over time – and now more than ever we need to be planning our cities around the changing realities of climate, water availability, and growing global population.

Fig. 1. Identified Ramsar sites in India.

Fig. 2. Ramsar sites in J&K.

All the vegetation that provides benefits to humans called natural infrastructure or green infrastructure. Natural infrastructure can be defined as any piece of nature that provide important benefit to those in a city but is located outside the city limits (a wilderness area) and less affected by the human intervention. Green infrastructure refers to constructed wetlands and other landscape areas located within the urban area and are manipulated by the human according to their needs. In short the term green infrastructure can be used to designate, that, while vegetation is key to the infrastructure functioning, it is an area fundamentally designed by the people whereas, the critical natural habitat can be referred to as Natural Infrastructure.

II. OBJECTIVES

To understand the importance of Surinsar-Mansar wetland as natural infrastructure.
To identify the issues that are imposing threat to Surinsar-Mansar wetlands.
Understand and learn the issues and solutions implemented at the sites of similar significance in other part of the country.
To provide recommendations for Surinsar-Mansar site to maintain ecological balance of the area.

III. STUDY AREA

Surinsar-Mansar Lakes, (a Ramsar site) located in the winter capital of the state of Jammu and Kashmir, is one of the major natural resources in the Jammu region, it comprise of Freshwater composite lake. Surinsar-Mansar lake can be assessed from Jammu through Jammu-Surinsar road (Jammu-Surinsar=33km; Jammu-Mansar = 48km) and also by Samba Mansar Udhampur road (Samba-Mansar=25km; Samba-Surinsar=40km).

Surrounded by thickly wooded mountain ranges, it is a popular picnic spot. Surinsar Lake and Mansar Lake are considered to be twin lakes.

Mansar and Surinsar Lakes have high significance for their religious importance. Apart from this, the lakes form an ideal habitat and breeding ground for many endangered and threatened species like avifauna and aqua fauna. The Surinsar Mansar Wildlife Sanctuary is nestled in the midst of both the lakes and supports 3 mammalian species and 15 avifauna species including crane. Owing to their origin to the Mahabharata period, these lakes were separated by an aerial distance of 10 km representing the typical micro-climate of the area. Therefore, they are treated as two components of one composite wetland. Mansar lake is formed on a structural high called as an Anticline in geological parlance. Anticline means an arch of rocks with its high turned upwards. Same is true for its sister lake called as Surinsar, situated Northwest (N55W) of Mansar lake. The core of this anticline has a number of fractures or faults, including cross-faults. It is these fractures or faults which have resulted in spring activity in the lake basins (Mansar and Surinsar) yielding perennial source of lake waters. Most of the lake waters are coming from below, welling up as copious springs along the fracture planes, in what is called as artesian conditions. (Singh R, Sharma VK, 1999).

The Mansar Lake is a semi-oval shaped water body having an average width of 680 m and a depth of 37.8 m. The Surinsar Lake is oval shaped having max. depth of 24.04 m. Max. length of 888 m and a breadth of 444 m. Other than this Surinsar is also rain-fed without permanent discharge, and Mansar is fed by surface run-off and partially by mineralized water through paddy fields. With rapid increasing population and development, these wetlands are being threatened in two principle ways: a) Through direct conversion of wetlands, both planned or unplanned, leading to acute problems associated with polluted drainage, direct habitat loss, overexploitation of wetland plants and animals. b) Through the watershed□related impacts of development, including increased demands for water, increasing diffuse and point source pollution.

IV. ISSUES

A. Encroachment on the Lake Fringe Area

Both Mansar and Surinsar lakes are religious and tourist destinations and are surrounded by temples, parks and recreational area. Although some of the area is well planned but majority of the surrounding areas has organic growth encroaching up to the lake. No proper buffer area between the water body and the built mass and reduction in water spread area.

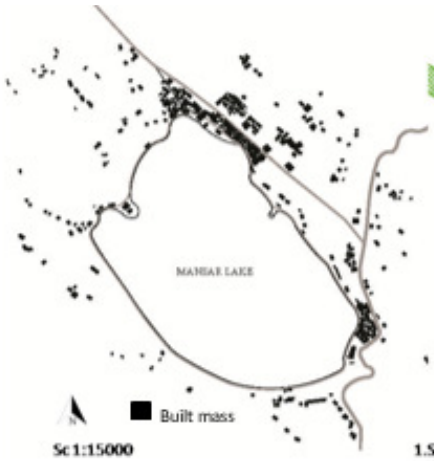


Fig-1a Built open layout – Mansar lake

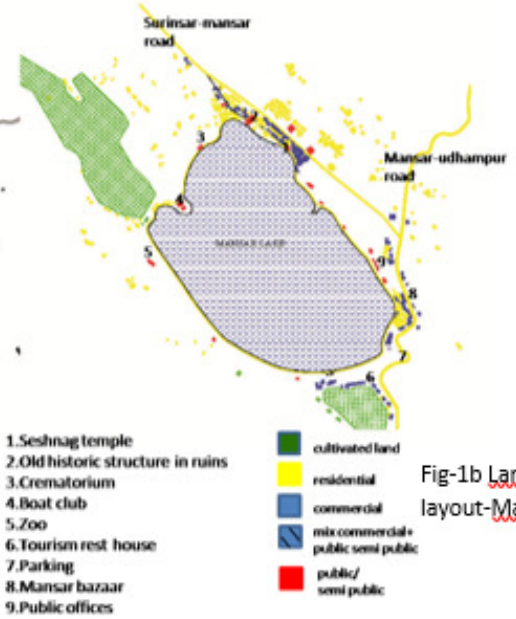


Fig-1b Landuse layout-Mansar lake

Surinsar Lake

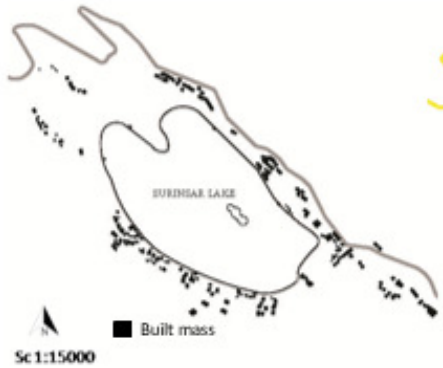


Fig-2a Built open layout-Surinsar lake

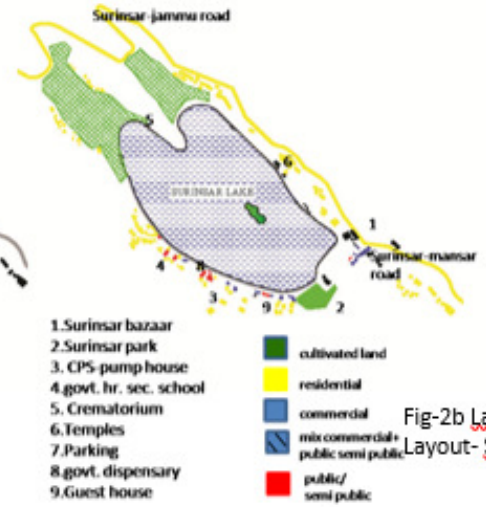


Fig-2b Landuse Layout- Surinsar lake

B. Deterioration of Water Quality

Religious ritual waste and idols immersens leads to sever threats. Both Surinsar-Mansar lake are famous religious tourist destination with tourist coming throughout the year for performing various religious rituals. Pilgrimages arrive to perform ritual bathing ceremonies in the lake each year. Some religious sects come here to perform the ritual first haircut of their sons. Agriculture-over use of fertilizer and poisonous pesticides reaches lake as runoff from fields.

C. Development Pattern & Land Use

Inappropriate development in and around wetlands may affect the ecological character of wetlands .Construction activities – have led to deforestation, habitat destruction, filling of natural tanks and reservoirs conversion of lands for agriculture, overgrazing etc. As per the fig1&2 the development activities along both Mansar and Surinsar lake have encroached the buffer space along the water body. In case of Mansar lake the situation in south eastern part of the lake near Mansar bazaar is such that the built mass have come up to the level of water. In short, in Surinsar-Mansar wetland increasing demand of grey infrastructure had started overshadowing the natural infrastructure.

Tourism. Apart from scenic beauty and tempting environment, Mansar has enviable religious history behind it which makes it all the more a sacred lake for the believers.

The temples of deities along the lakes give an element of sacredness. It is this element that maintained the ecology of the lake for centuries at end. But modern life and changed values have given a big set back to the development of the site as a tourist spot. Although Mansar-Surinsar Development Authority has taken over the charge of maintaining the two lakes, the fact of the matter is that the Tourism Department has shown only scant enthusiasm to develop Mansar Lake a real tourist spot. The State of affairs at this otherwise beautiful water body is sordid and painful.

Fig. 3. Area along Seshang Temple.

Fig. 4. Parikarma encircling at Mansar lake.

Fig. 5. Development along the Surinsar lake with no proper buffer between the lake and its surrounding.

Fig. 6. Purani Haveli- a old dilapidated structure in Mansar lake.

The site is without proper and regular electric power which makes the place look dreary after dusk. Provision of sanitation facilities and safe drinking water for tourists in Surinsar- Mansar lake are poor.

V. CASE STUDY

BHOJ WETLANDS, M.P, INDIA

A. Background and problems

Bhopal city, the capital of the state of Madhya Pradesh, is endowed with several man

made lakes created through the centuries. The Upper Lake, created in 11th century AD, and Lower Lake, created in the late 18th century AD, are by far the most important. The Upper and Lower Lakes of Bhopal, together called the Bhoj Wetlands. The Upper Lake has special significance since it has been a source of piped water supply to the city of Bhopal for over 75 years. Even now, the lake accounts for some 40% of the city's water supply. Lower Lake is mainly a recreational site.

B. Issues

The major issues are described below:

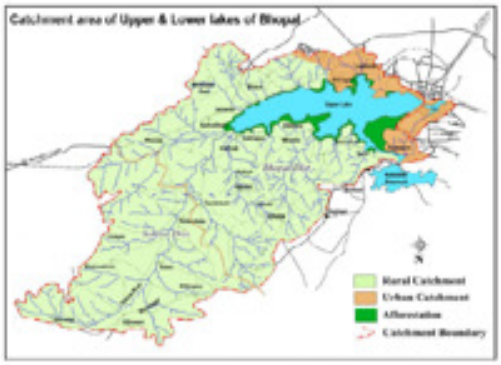
1. Reduction of water storage capacity of the lakes. 2. Obstructions to smooth flow of water through the Upper Lake's spill channel, resulting in a threat to the stability of the earthen dam. 3. Deterioration of water quality. 4. Flourishing growth of invasive aquatic plants. 5. Reduction of water spread area.

Fig. 7. Uncontrolled development next to lake edges; parking vehicles on "Parikarma" in Mansar lake.

C. Decision & Action taken

Efforts to manage the lakes had been implemented in a piecemeal manner since 1988.The project initially envisaged 14 sub-projects under the major topics of:

1. Desilting and Dredging
2. Catchment Area Treatment
3. Prevention of Pollution (Sewerage schemes);
4. Shoreline and Fringe Area Management; and
5. Improvement and Management of Water Quality



D. Outcomes

1. Interception and treatment of Sewage: An infrastructure has been developed that comprises an 86.7 km pipeline with 8 sewage pump houses and 4 treatment plants.

Diversion and treatment of 56 MLD domestic sewage has been developed.

2. Dredging and desilting of lakes: About 85,000m3 silt was removed from the Lower Lake via the dredging operation. Resulting in 4% increase in lake storage capacity.

3. Weed removal: Removal of different types of weeds, and an assemblage of submerged weeds, was started in a systematic manner since January 1999.A total of 1022 ha of shoreline and emergent weeds and 101351mt of submerged weeds were removed.

4. Catchment area treatment: To control the inflow of silt, agricultural residues and other wastes into the lakes,75 check dams 2 silt traps having a cumulative silt trapping capacity of 0.36 million m^3, have been constructed across 31 inlet channels

5. Prevention of pollution due to washing activities: Washer men shifted outside the catchment of the Lower Lake, with rehabilitation sites for 250 washer men. Thus leading to reduction in input of detergents and improvement in water quality.

VI. CONSERVATION STRATEGIES FOR SURINSAR-MANSAR LAKES

Need to Focus upon:

A. Environmental features or Natural features- water quality, hydrology, catchment area, flora and fauna species.

Mapping of water-bodies: The mapping of these smaller water-bodies, along with their catchments needs to be conducted involving also the local Biodiversity Management Committees.

Documentation of biodiversity and Protection of riparian and buffer zone vegetation: The biodiversity that lie between Mansar and Surinsar lake has presence of endemic, rare and endangered species. A locally implementable conservation plan has to be prepared for such species. There is an urgent need for creating a `Data Bank' through inventorisation and mapping of the aquatic biota.

B. Physical growth and Development pattern- Public activities , land dealings , buffer zones

Carrying capacity studies: Unplanned development in and around the wetland has telling impacts on local ecology and biodiversity, like decline of water bodies, vegetation, increase in pollution levels (land, water and air), traffic bottlenecks, lack of appropriate infrastructure, etc. There is a need to adopt holistic approaches in regional planning considering all components (physical, ecology, economic and social aspects). In this regard, carrying capacity studies should be carried out before implementing any major projects in and around the Surinsar and Mansar wetland.

Delineation of the boundary of water bodies: Maximum Water Level mark should form the boundary line of the water body. In addition, a specified width, based on historical records/ survey records etc. may be considered for marking a buffer zone around the water body. In this case such records are not available, so the buffer zones should be marked afresh considering the flood plain level and also maximum water levels. The buffer zone should be treated as inviolable in the long term interests of the water body and its biodiversity. Regulate the activity which interferes with the normal run-off and related ecological processes – in the buffer zone (200 m from lake boundary / flood plains is to be considered as buffer zone). All the structures that are situated within the buffer area both in Mansar and Surinsar lakes should be rehabilitated to peripheral areas and strict bylaws to be framed to regulate all the activities within the buffer area. In case of Mansar lake major concern should be in redevelopment of Mansar Bazaar area and area around the Seshnag temple and Purani haveli. And in case of Surinsar Lake the area along the north-eastern shore should be redeveloped.

Preparation of regional plans and management plans :

These areas should be incorporated in the regional plan so as to channelize the development of the area in the holistic manner with the whole region .Land use planning in & around the lakes can help in providing ecological basis for improving the quality of lakes. It is also necessary to prepare separate management plans for individual water bodies i.e Mansar lake and Surinsar lake. Conversion of land around the lakes for any kind of development must be totally banned.

Formulation and Implementation of Design Guidelines: Due to increasing haphazard growth around the Surinsar-Mansar lakes it is very important to formulate design guidelines for development along these water-bodies keeping in mind the serenity of the lakes and also strict enforcement of the same. Design guidelines include:

Building height: A maximum building height for principal buildings of 9.1m/30ft (as measured from ground to roof peak) should be in effect in all areas identified within the Surinsar-Mansar development authority. This has been set to lower the impact of taller buildings within the area.

Character: Built-mass along the buffer area should reflect the heritage and culture of the region and emphasis should be given to locally available material.

Informal sector: street vendors roaming on the Parikarama should be allowed on specified areas in Parikarma since this will reduce the littering of waste.

Heritage conservation: historic structure near Seshang temple in Mansar lake also called Purani haveli should be conserved in order to showcase the traces of heritage available in this region.

Lesuire walkway: Parikarma which is encircling the lakes are presently in the state of ruins. It should be developed as a leisure walkway. This will facilitate the religious tourist as well as promote recreational activities.

Implementation of sanitation facilities: It was noted with grave concern that these water bodies are polluted with sewage, coliform bacteria and various other pathogens. This involves: Preserving the purity of waters and safeguarding the biodiversity and productivity, dumping of waste has to be prohibited. In addition to this, all the settlements alongside the water body should be provided with sanitation facilities so as not to impinge in anyway the quality of water. Also sanitation facilities for the tourists should also be provided along the 'Parikrama' in both the water bodies.

Management of polluted lakes: This programme needs priority attention. This involve: Implementation of bioremediation method for detoxification of polluted water bodies.

Warning boards to be displayed around the water bodies. Collection of any biomaterials from such water bodies should be prohibited. The concept of polluter pays, a mechanism to set up efficient effluent treatment plants [ETP], individual or collective, to reduce the pollution load.

C. Economic trends

Tourist trends and activities, optimum utilization of resources for economic benefits Valuation of goods and services: Goods and services provided by the individual water bodies and the respective species to be documented, evaluated through participatory approach and be made part of the Biodiversity Registers. If in any case the traditional rights of the local people are adversely affected by lake conservation they should be adequately compensated.

Regulation of boating and other economic activities along these lakes: Economic activities should be limited to restricted area and carrying capacity of the water body. Such as: boating during the periods of breeding and congregations of birds should be banned etc.

VII. CONCLUSION

Holistic and Integrated Approaches for Conservation and Management of activities with the common interest for effective implementation of management, restoration, sustainable utilization and conservation of SURINSAR-MANSAR wetland. This necessitates: Management and maintenance of lakes to be decentralized involving stakeholders, local bodies, institutions and community participation without any commercialization or commoditization of lakes. Alteration of topography in lake / river catchments should be banned. Appropriate cropping pattern, water harvesting, urban development, water usage, and waste generation data shall be utilized and projected for design period for arriving at preventive, curative and maintenance of aquatic ecosystem restoration action plan (AERAP).

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