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From the Director's Desk

This is the second issue of newsletter for the year 2014-15, that was to be published by June 2014 but due to some local problems followed by floods in September in Kashmir Valley this got delayed. But I am sure that it will give an insight into the water resources of the state of Jammu & Kashmir. The state has vast potential & all its water bodies needs to be preserved as many of them are under the pressure of pollution, encroachment, silting, construction activity or urbanization. They are the main flood basins around our cities. Our population depends on these for drinking water, fishing, livelihood etc. Flash floods in the month of September 2014 are an indicator that our water bodies are not being managed properly and we need to restore their glory for the future generations.

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ENVIS Newsletter

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WATERBODIES OF JAMMU & KASHMIR

J&K ENVIS Centre

Department of Ecology, Environment & Remote Sensing,
Jammu and Kashmir



Introduction

Jammu and Kashmir also known as heaven on earth is the northern most state in India comprising three distinctive divisions Jammu, Kashmir and Ladakh. It has two capitals - Jammu, the winter capital and Srinagar - the summer capital. The state is home to lot of Himalayan glaciers, lakes and rivers. Jhelum, Indus, Tawi, Ravi and Chenab are the major rivers flowing through the state. Dal, Wular, Mansar, Surinsar and Pangong lakes are the main attractions of the state. Some of the major pilgrimage centers of the nation are located in the state, the two most important being the Shri Amarnath Ji Cave and Shri Mata Vaishno Devi shrine.

Origin of Lakes

There are a number of natural processes that can form lakes. A recent tectonic uplift of a mountain range can create bowl-shaped depressions that accumulate water and form lakes. The advance and retreat of glaciers can scrape depressions in the surface where water accumulates, example of such lakes are Kousarnag, Tarsar, Marsar etc.

Lakes can also form by means of landslides or by glacial blockages such as Gangabal, Kishansar, Vishansar and Nagputan lakes located in Ganderbal District.

Salt lakes (also called saline lakes) can form where there is no natural outlet or where the water evaporates rapidly and the water has a higher than normal salt content. Examples of salt lakes include Pangong Lake in Ladakh.

Small, crescent-shaped lakes called oxbow lakes can form in river valleys as a result of meandering. Examples of ox bow lakes are Waskur, Ahansar, Khushalsar and Gilsar lake etc.

Crater lakes are formed in volcanic craters and calderas which fill up with precipitation more rapidly than they empty via evaporation. An example is Dal Lake in Srinagar District and Wular Lake in Bandipora District.

Types of Lakes

Glacial Lake: A lake with origins in a melted glacier such as Sheeshnag Lake located in District Anantnag.

Artificial Lake: A lake created by flooding land behind a dam, called an impoundment or reservoir, by deliberate human excavation e.g., Harwan reservoir in Srinagar, Yusmarg reservoir in Budgam.

Endorheic Lake: Example of such type of lake is Tsomorori in Ladakh. Such lakes are most common in desert locations.

Peri-glacial Lake: Example Keger tso in Ladakh.

Sub-glacial Lake: Example Drung drung, Shafat glacial lakes in Zaskar.

Fjord Lake: A lake in a glacially eroded valley that has been eroded below sea level.

Oxbow Lake: A lake which is formed when a wide meander from a stream or a river is cut off to form a lake. They are called "oxbow" lakes due to the distinctive curved shape that results from this process. e.g., Hokarsar, Haigam located in Baramulla etc

Rift Lake or Sag pond: A lake which forms as a result of subsidence along a geological fault in the Earth's tectonic plates. Examples include the Tsomorori and Pangong lakes in Ladakh.

Underground Lake: A lake which is formed under the surface of the Earth's crust. Such a lake may be associated with caves, aquifers or springs.

Crater Lake: A lake which forms in a volcanic caldera or crater after the volcano has been inactive for some time. Water in this type of lake may be fresh or highly acidic, and may contain various dissolved minerals. Some also have geothermal activity, especially if the volcano is merely dormant rather than extinct.

Lava Lake: A pool of molten lava contained in a volcanic crater or other depression. Lava lakes that have partly or completely solidified are also referred to as lava lakes.

Former: A lake which is no longer in existence. Bodsar is an example of a former lake.

Ephemeral Lake: A seasonal lake that exists as a body of water during only part of the year.

Intermittent Lake: A lake with no water during a part of the year.

Shrunken: Examples are Barinambal, Kushhalsar, Anchar, Gilsar located in Srinagar and Hokarsar, Haigam in Baramulla.

Eolic Lake: A lake which forms in a depression created by the activity of the winds.

Water bodies of J&K

Water bodies are one of the most important natural resources of water in our state. Apart from being most valuable natural habitat for a number of Flora and Fauna, these water bodies are also life line for a large number of people and act as part of vital hydrological cycle.

As the state is well known for its charming scenery, comprising beautiful springs, lakes, rivers and their tributaries, all these add to its scenic beauty. As per data prepared by Department of Ecology, Environment & Remote Sensing, J&K, there are 1230 lakes and water bodies in the state with 150 in Jammu region, 415 in Kashmir region and 665 in Ladakh. On the basis of altitudes these have been divided into two categories.

- **High Altitude Lakes:** Gangabal, Vishan Sar, Kishan Sar, Sheesh Nag, Nilnag, Kausarnag etc.
- **Valley Lakes:** Wular, Dal, Manasbal, Anchar, Ahansar, Hokarsar, Haigam etc.



Gangabal Lake

Classification of Water bodies as per Wetland Land rules 2010 of Ministry of Environment and Forests

The classification of Wetlands as per the Wetlands Rules 2010, as finalized by Ministry of Environment and Forests Govt. of India is as follows:

“The classification system besides all the wetlands incorporates Reservoirs, Ash ponds/Cooling ponds, and abandoned Quarries.”

The Ministry of Environment and Forests has notified the Wetlands (Conservation and Management) Rules, 2010. These Rules have been drafted by the Ministry of Environment and Forests to ensure better conservation and management and to prevent degradation of existing wetlands in India. The water bodies of the state have been divided into following types:

Table 1: Classification of Lakes/Water Bodies of J&K State as per Wetland rules 2010

Lakes & Water Bodies	J&K	Kashmir	Jammu	Ladakh
Total	1230	415	150	665
Above 2500m (m.s.l)	1023	240	119	664
Below 2500m (m.s.l)	207	175	31	1
Having area more than 5 hectares	330	137	29	164
Having area less than 5 hectares	900	278	121	501
Having area more than 500 hectares & below 2500m m.s.l	4	4	Nil	Nil
Within Forest Boundary	381	233	116	Nil
Outside Forest Boundary	881	182	34	Nil

Table 2: Altitude wise number of Lakes/Water bodies of different districts (Old) Kashmir Division

District	No. of lakes/waterbodies above 2500 m (a.m.s.l)	No. of lakes/waterbodies up to 2500 m (a.m.s.l)
Anantnag	95	3
Baramulla	79	45
Budgam	22	11
Kupwara	3	63
Pulwama	4	16
Srinagar	37	37
Total	240	175

Table 3: Area wise number of Lakes/Water bodies of different districts (Old) Kashmir Division

District	No. of lakes/waterbodies having area above 5 hectares	No. of lakes/waterbodies having area up to 5 hectares
Anantnag	38	60
Baramulla	48	76
Budgam	15	18
Kupwara	1	65
Pulwama	4	16
Srinagar	31	43
Total	137	278

Table 4: Altitude wise number of Lakes/Water bodies of different districts (Old) of Jammu Division

District	No. of lakes/waterbodies above 2500 m (a.m.s.l)	No. of lakes/waterbodies up to 2500 m (a.m.s.l)
Jammu	Nil	15
Kathua	Nil	1
Poonch	22	Nil
Rajouri	5	Nil
Udhampur	5	14
DODA	87	1
TOTAL	119	31

Table 5: Area wise number of Lakes/Water Bodies of different districts (Old) of Jammu Division

District	No. of lakes/waterbodies having area above 5 hectares	No. of lakes/waterbodies having area up to 5 hectares
Jammu	1	14
Kathua	Nil	1
Poonch	5	17
Rajouri	2	3
Udhampur	1	18
DODA	20	68
TOTAL	29	121

Table 6: Altitude wise number of Lakes/Water Bodies of different districts (Old) of Ladakh Division

District	No. of lakes/waterbodies at an altitude below 2500m(m.s.l)	No. of lakes/waterbodies at an altitude above 2500m(m.s.l)
Leh	1	520
Kargil	Nil	144
Total	1	664

Table 7: Area wise number of Lakes/Water Bodies of different districts (Old) of Ladakh Division

District	No. of lakes/waterbodies having area above 5 hectares	No. of lakes/waterbodies having area up to 5 hectares
Leh	149	372
Kargil	15	129
Total	164	501

Findings

The mapping of lakes and water bodies using Liss III satellite data set of 2009 revealed that a total of 149 and 431 lakes were present in Jammu and Kashmir region respectively and 665 in Ladakh region. In comparison to the earlier study of the lakes and water bodies published in 1998 by Department of Ecology, Environment and Remote Sensing in which the information was generated using SURVEY OF INDIA TOPOGRAPHICAL MAPS on a scale of 1:50,000(excluding 15 no: of SOI Topo sheets of Srinagar, Doda, Rajouri, Poonch & Anantnag Districts), the total number of lakes and water bodies was about 1248.

The present status of some of the lakes and water bodies which have either disappeared or have shrunken due to the human interference and fast urbanization is given below. The extensive field study

was carried out in Jammu and Kashmir division which shows that many of the lakes which were present in 1967 (refer Directory of lakes and water bodies published in 1998) have either perished or reclaimed for different land use activity or some have disappeared due to natural causes like glacial action, low precipitation, or are on the verge of extinction as shown in different places in the report are summarized district wise as below.

Table 8: Comparison of Status of Lakes and Water bodies

District	No. of Lakes and Water bodies	
	SOI Toposheets of 1967	LISS III Dataset of 2009
Anantnag	88	98
Baramulla	163	124
Budgam	25	33
Doda	13	88
Jammu	15	15
Poonch	46	22
Rajouri		5
Pulwama	61	20
Kathua	1	1
Kupwara	111	66
Ladakh	637	665
Srinagar	52	74
Udhampur	36	19
Total	1248	1230

Prominent Lakes of State

Dal Lake

It is a world famous lake lying east of Srinagar city. It is kidney shaped with an area of 11.20 Sq.kms. as determined through the satellite imageries of the year 1994 and 1995. The area determined through G.T. sheets of 1965 survey is 15.86 sq.kms. The area figure adopted for Dal Lake is 11.20 sq.kms.



Dal Lake

Mansar Lake

Mansar Lake is a very small and lies amid low hills of Jammu and is about 1.6 km in length but is very deep. This lake is considered to be a very holy place and one of the best tourist destinations of Jammu region.



Mansar Lake

Surinsar Lake

It is situated to the north east of Jammu city at a distance of 40 kms. It's a fresh water warm monomictic lake with a river damming origin. Surinsar & Mansar lakes are interconnected & are great tourist attractions.



Surinsar Lake

Pangpong Tso Lake

Pangpong tso lake, also known as Pangong lake is an endorheic lake in the Himalayas, situated at a height of about 4,350 m (14270ft). It is 134 km long and 5 km wide. Approximately 60% of length of lake lies in Tibet. It is a saline water lake.



Pangpong Tso Lake

Ramsar Convention

The Convention on Wetlands of International Importance, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

The Ramsar Convention is the only global environmental treaty that deals with a particular ecosystem. The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world".

List of Wetlands of International Importance of J&K under Ramsar Convention

Surinsar - Mansar Lakes

Ramsar site no.: 1573

Date of Declaration: 08/11/05

Area: 350 ha

Location: 32°45'N 075°12'E

Importance: Wildlife Sanctuary, Hindu sacred site.

Surinsar is rain-fed without permanent discharge, and Mansar is primarily fed by surface run-off and partially by mineralised water through paddy fields,

with inflow increasing in rainy season. The site is socially and culturally very important with many temples around owing to its mythical origin from the Mahabharata period. Although the lakes support variety of fishes, fishing is discouraged for religious values. The main threats are increasing visitors, agricultural runoff, bathing and cremation rituals. Conservation is focused on awareness-raising.



Surinsar - Mansar Lakes

Hokersar

Ramsar site no.: 1570

Date of Declaration: 08/11/05

Area: 1,375 ha

Location: 34°05'N 074°42'E

Importance: Located at the northwest Himalayan biogeographic province of Kashmir, back of the snow-draped Pir Panchal (1,584m asl.), Hokera wetland is only 10 km from scenic paradise of Srinagar. A natural perennial wetland contiguous to the Jhelum basin, it is the only site with remaining reed beds of Kashmir and pathway of 68 waterfowl species like Large Egret, Great Crested Grebe etc.



Hokersar

Wular Lake

Ramsar site no.: 461

Date of Declaration: 23/03/90

Area: 18,900 ha

Location: 34°16'N 074°33'E

Importance: The largest freshwater lake in India with extensive marshes of emergent and floating vegetation, particularly water chestnut, that provides an important source of revenue for the State Government and fodder for domestic livestock. Human activities include rice cultivation and tree farming.



Wular Lake

Tsomoriri

Ramsar site no.: 1213

Date of Declaration: 19/08/02.

Area: 12,000 ha.

Location: 32°54'N 078°18'E.

Importance: Wetland Reserve.

A freshwater to brackish lake lying at 4,595m above sea level, with wet meadows and borax-laden wetlands along the shores, in Ladakh region.



Tsomoriri

Government Authorities for conservation of Water bodies

LAWDA

Lakes and Waterways Development Authority has been created by the Government of J&K as an autonomous body under development Act, 1970 AD

vide Government order No.117 of HUD dated 11.04.1997 to serve a one point agency to look after, Manage and Conserve the waterbodies and Waterways of the state of J&K. World famous Dal/Nigeen Lakes in the city of Srinagar at the moment form the core areas of attention of J&K LAWDA. The Authority has a whole time mandate to conserve and Manage the Dal/Nigeen Lakes under National Lake Conservation Plan of the Government of India, under the aegis of Ministry of Environment and Forests (GOI). The mission is to ensure the restoration of the ecological balance of the Dal/Nigeen lakes to serve the purpose of retaining their natural beauty, economic potential in the form of eco tourism and also to serve as a perpetual source of safe drinking water for the citizens of Srinagar City.

Manasbal - Wular Development Authority (MWDA)

The state government has recently constituted Manasbal and Wular development authority (MWDA) under the aegis of tourism Department. The MWDA has identified 21 action points for development of wular and manasbal lakes. This authority is mainly looking after Tourism infrastructure. This authority is engaged in providing facilities around Manasbal Lake, mainly pertaining to maintenance of parks, pathways etc.

Lately, there has been concern about environmental improvement and overall sustainable management of Lake Ecosystem. Department of forest and remote sensing has undertaken several activities for lake conservation which included catchment conservation and some limited environmental management in the lake area. Keeping in view the immense ecological and cultural value of Wular the state government has planned massive intervention for eco restoration and rehabilitation of the lake, catchment and their ecosystem.

Wular Conservation and Management Authority (WUCMA)

Wular Conservation & Management Authority has been constituted and a comprehensive management action plan for conservation and management of Wular Lake has been prepared. The technical committee has been entrusted to

implement the following works:-

- Removal of Willow Plantation.
- Lake de-siltation
- Linkage of Jehlum River Conservation Project and Wular Management Action Plan.
- Notifying additional bird Sanctuaries.
- Institutional arrangements.
- Monitoring and Evaluation Mechanism.

Tourism/Biotic pressure on Water bodies of J&K

Tourism is essentially a service industry, depending almost entirely on natural ingredients like aesthetic beauty of mountains, hills, lakes, water-bodies, sylvan canopy, flora, fauna and bracing climate.

The state of Jammu and Kashmir, especially the Valley of Kashmir is characterized with some beautiful lakes like the Dal, Wular, Manasbal, Nigeen Lake Etc. The ecosystem of these lakes is degrading fast.

For example the Dal Lake of Srinagar, well known for its geographical setting and splendid beauty, is facing problems. Its crystal-clear water has become polluted, giving an obnoxious odour. It has become the victim of eutrophication, siltation, encroachment, sewage, vegetables cultivation in floating fields, and sewage disposal.

In order to accommodate more tourists in their houseboats and houses, more and more Hanjris are increasing their infrastructure of boats.

In the mid-1970s, with tourism becoming a key industry for Jammu and Kashmir, the pressure on the lake multiplied. There were less than a hundred houseboats on the Dal and Nagin lakes at the turn of the century, but their number grew to a staggering 1,400 by 1981. The 1981 census recorded that hamlets around the lake had a population of 24,500, an increase of over cent percent since 1973.

The Lakes and Water Development Authority (LAWDA) believes that about 45,000 people are residents on the houseboats and hamlets, and assuming just about 5,000 tourists live on them through the year, the lake bore the burden of about 50,000 people.

Ways to Save Water bodies

- If you live on a lake, stream or wetland, plant a buffer strip of native plants along the boundary of the water body. If you have a lawn, keep it small and don't use fertilizers and pesticides.
- Take great care not to overuse pesticides and fertilizers. This will prevent runoffs of the material into nearby water sources.
- By having more plants in your garden you are preventing fertilizer, pesticides and contaminated water from running off into nearby water sources.
- Don't use the lake as a bathtub. Soaps and shampoos contain nutrients and pollutants that are harmful to the lake and organisms living in it.
- Don't throw litter into rivers, lakes or water bodies. Help clean up any litter you see on banks of rivers and lakes, make sure it is safe to collect the litter and put it in a nearby dustbin.
- Learn as much as you can about lakes and the threats they face.

Recent Flood in J&K and Role of Water bodies in Flood

Jammu and Kashmir has faced unprecedented floods of the century. Incessant rains in the first week of September lead to massive floods in the valley as well as in Jammu region.

A report prepared by Department of Environment, Ecology and Remote Sensing (DEERS) in collaboration with Hyderabad-based National Remote Sensing Centre, ISRO reveals that the floods in Jammu and Kashmir are a result of High rainfall in the catchments over short period of time, which were not less than cloud bursts and is a combine effect of the extreme event due to climate change and less capacity of our drainage system that failed to hold the quantum of water and it overflowed, which ultimately lead to floods.

There were incessant rains on September 4. For continuous 30 hours and in three days the rainfall touched 450 mm which was very unusual. Normally, rains take place in J&K from July to mid-September. On September 3 there was a rainfall deficit of 32 percent but on September 8 it showed excess of 18 percent i.e. a change of 50 percent in five days.

Lidder catchment received the maximum rain fall of 277 mm with adjoining catchments receiving around

200 mm of rainfall, this was way above normal. Various catchments like Vishu, Sandran, Bringi, Kuthar, Arbal, Rambiarra Gazan, Doodhganga received very heavy rainfall leading to floods.

The report indicates that in all 557 sq km area was inundated. Out of this 444 sq km was agriculture land, 20 sq km horticulture land, 67 sq km built up area, 3 sq km forest area, 21 sq km wasteland and 2 sq km others. An approximate population of 22 lakh was affected covering 287 villages.

The report also suggests strategy to protect the cities from floods in future like feasibility study for construction of parallel flood channel from Sangam/Kandizal to Wular. Dredging on regular intervals, monitoring of sediments, land use, land cover, maintaining sanctity of Wetlands and Water bodies, climate change adaptation and mitigation etc have been suggested. It also suggests need for a multidisciplinary team to study hydrological response of each catchment.

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