

GOVERNMENT OF RAJASTHAN
Department of Environment

F.No.Forest (6)/ Sambhar Lake/ 2016

Jaipur, Dated 21.01.2021

To
Registrar,
National Green Tribunal,
New Delhi

Subject: Submission of Interim compliance report of the Order dated 17.03.2020 in O.A No. 1020/2019 in matter of News Item Published in "Hindustan Times" authored by Rakesh Goswami titled "Sambhar's Ecology among worst: Report".

Sir,

With reference to the above, the Interim compliance report of the order dated 17.03.2020 in O.A No. 1020/2019 in matter of News Item Published in "Hindustan Times" authored by Rakesh Goswami titled "Sambhar's Ecology among worst: Report" was submitted vide letter dated 23.06.2020. The status of progress is given below:

1. Preparation of a Comprehensive Environment Management Plan:

A Comprehensive Environment Management Plan for Sambhar Lake has been prepared by the Environment Department. The plan has been approved by the Standing Committee for Management of Sambhar Lake constituted under Chairmanship of the Chief Secretary, Rajasthan during meeting held on 06.08.2020 and State Wetland Authority in its meeting dated 15.09.2020. A copy is given at Annex.1

2. Delineation of Core and Buffer Area or Sambhar Lake Wetland Area:

A digital revenue map is being prepared by the Environment Department in consultation with Sambhar Salts Limited and Land Settlement Department with help of Satellite imagaries. Delineation of Core and Buffer area would be done and a detailed map would be submitted with details of Core & Buffer areas on map.

3. Collection of Water Samples:

Rajasthan State Pollution Control Board has collected the water samples from the Lake bed area pre and post monsoon this year. 13 Sampling location have been identified in the lake and surrounding area by RSPCB. Samples for the pre and post monsoon season have been collected.

4. Disposal of Sodium sulphate waste /sludge generated from Salt Refining Units:

The areas of Sludge and Sodium sulphate waste disposal in the Lake area generated from Salt Refining Units have been identified. These refining units have been directed and cautioned not to dispose waste in

the lake bed area by the District Collector's. A landfill site will be identified shortly by the Revenue Department for this purpose near the lake area.

Sewage Disposal:SDM, Sambhar Lake has informed that no sewage disposal is being done in the lake area in Panchayat Samiti Sambhar in village Kajipura, Narangpura, Tyod and Village Panchayat Bardoti, Korsina and Habaspura of Panchayat Samiti Dudu. Executive Engineer, NagarPalika, Sambhar Lake has informed that waste disposal is being done inland which is far from the Sambhar Lake Area. RSPCB has written to Executive Engineer, Nagar Palika, Sambhar Lake

As informed by LSG Department, Sewage Treatment Plan for the area is under process. Sambhar lake Municipality has already been declared ODF (Open Defecation Free) under Swachh Bharat Mission (Urban). All household & Community/ Public Toilets (CT/PT) in Sambhar Lake has connected with twin pits and septic tanks; For treatment of fecal sludge of twin pit/septic tank of all toilets, **a Common FSTP (20 KLD capacity) for Sambhar Lake and Phulera FSTP is under trial run and to be handed over by RUIDP to ULB.** Fecal sludge from pits and Septic tanks is being collected by sewer suction machine and disposed at FSTP for the treatment. Therefore, after running of FSTP sewage water is not being discharged in Sambhar Lake from Municipal Area.

5. Removal of Encroachment:

District Collector Nagaur regularly removing encroachments in the Sambhar lake area. There are no encroachments at present in Jaipur and Ajmer Districts.

Enclosures: As Above

Yours Sincerely



(Rakesh Mathur)
Deputy Director

GOVERNMENT OF RAJASTHAN



Management Plan for Sambhar Lake



Environment Department

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Chapter 1

Description of Sambhar Lake

Sambhar Lake is one of the largest inland saline depressions located in the western desert of India. It is situated about 60 km west of Jaipur at latitude $26^{\circ}58''$ N and longitude $75^{\circ}5''$ E on the east of the Aravalli hills. The elliptical shaped lake with its long axis running from east-northeast (ENE) to west-southwest (WSE) is India's largest Salt Lake. The lake bed varies from 359.96 to 364.77 m (1181 to 1196.76 ft) above the mean sea level (MSL) covering an area of about 230 sq. km. It is spread across three districts namely Jaipur, Nagaur and Ajmer of Rajasthan State. The lake area is surrounded by Jaipur district on south, southeast and east, and Nagaur district on its north and northwest and Ajmer district on its southwest.

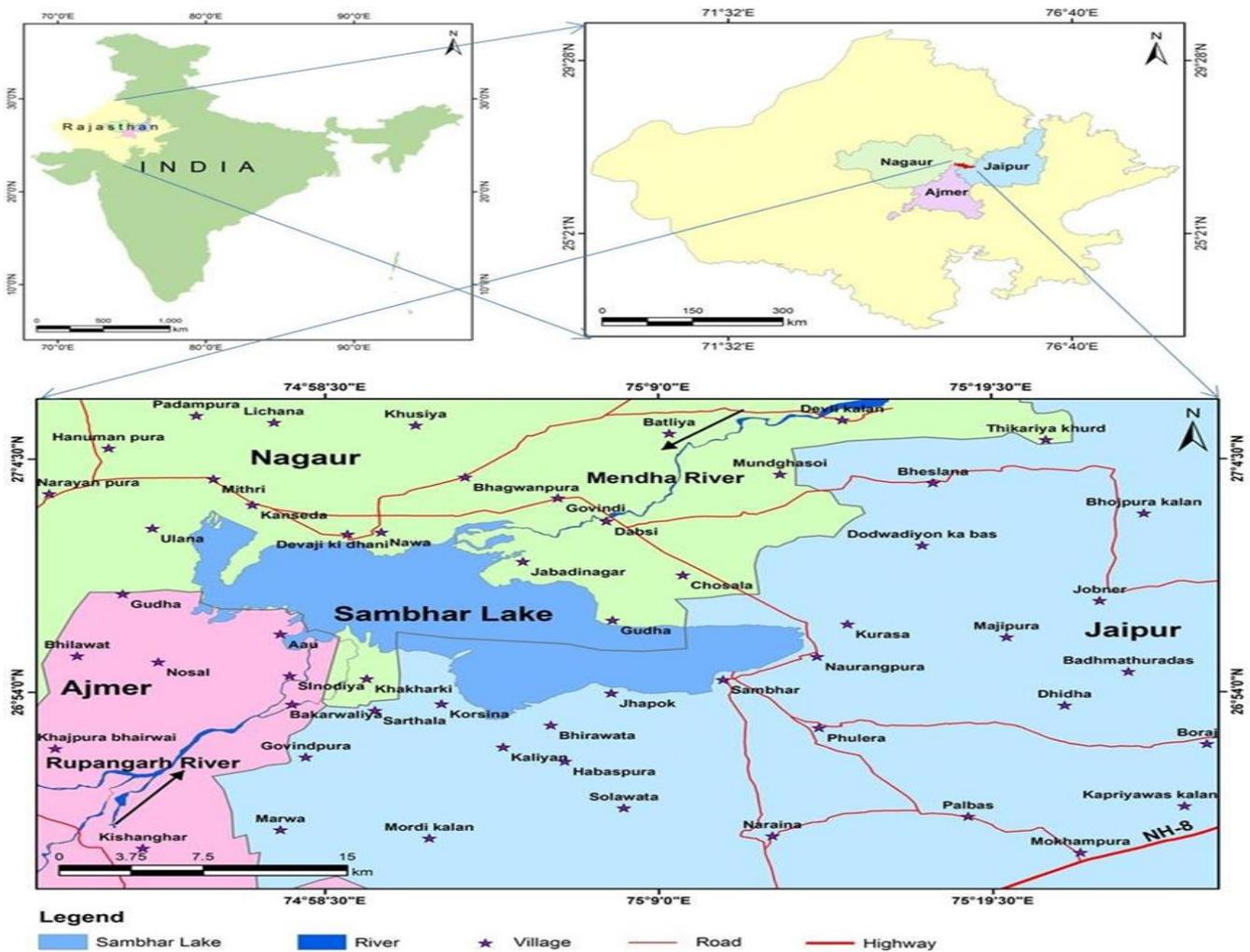


Fig.- Sambhar Lake

The saline lake has been designated as Ramsar site (wetland of international importance) since 1990 due to its biological and biotic importance and in particular because of wintering area for tens of thousands of flamingos, pelicans, and other migratory birds from northern Asia. The lake along with Phulera and Didwana salt lake forms a vast saline wetland, which constitutes the most important area for the flamingos outside Rann of Kutch. This has made Sambhar wetland a place of tourist interest.

1.1 Climatic and physiographic features of Sambhar lake

1.1.1 Climate

The area covered by the lake is spread over a transitional climatic zone with arid climate at the west and a semiarid climatic zone towards the east. The climate of the area is influenced mainly by the monsoon and the physiography of the area, i.e., the Aravalli range. The Sambhar Lake is situated on the eastern flank of the Aravalli Mountains, which is in turn is dissected by a number of wind gaps. The climate of the region is tropical monsoonal characterized with summer, monsoon (rainy season) and winter seasons. Annual average rainfall ranges from 550 to 600 mm. The area experiences rains mainly during July to September. The average annual temperature of the area is 23°C with minimum temperature of 8-10° C in winter and maximum temperature of 40-45°C in summer.

1.1.2 Topography

The lake bed is almost flat, with a slope of less than 10 cm per km. The lake basin is divided in to two unequal parts by a 5.16 km long stone dam between the settlements of Jhapok in the south and Gudha in the north. The top level of the dam is 366.67 m (1203 ft) above MSL. The western part is a natural undisturbed continuous lake area that covers 155.4 sq km area. The eastern part (area 77.4 sq. km) contains two large reservoirs (area 12.95 sq km) and is exclusively used for salt extraction. After attaining a particular density considered optimal for crystallization, brine from vast western side of dam is pumped via sluice gates to eastern side of the dam, which serves as a reservoir for salt extraction. Salt pans, popularly known as Kyar, and canals are separated with narrow wedges. Maximum length of lake is 22.5 km (ENE-WSW) whereas its width widely ranges from 3.2 to 11.2 km. Depth of lake ranges from few centimeters to maximum depth of about 3 m (9.8 ft). Average depth of lake during monsoon period is about 0.6 m (2 ft).

1.1.3 Geology and Mineralogy

The lake is situated in the eastern part of the Thar Desert (Rajasthan) and southeast of the Aravalli mountain ranges comprising rock formations of early and middle Proterozoic age. The lake basin is on a stretch of flat sand sheet concealing the underlying structural and lithological features. Geomorphologically, the lake playa is surrounded by aeolian deposits except in the west and northwest where hillocks comprising of gneisses and schist are found. The surrounding uplands are made of rocks of Delhi Super Group (early to middle Proterozoic age) consisting of jointed and foliated micaceous quartzites, which have prominent outcrops in the Govindi-Nawa area to the north of the lake, and schist and gneisses at places. Nodules of limestone/ marble with underlying mica schist form the basement below a thick layer of sand, which is overlain by a zone of saliferous silt. Outcrops of Aravalli Range (500 MSL) are found in northern (north of Nawa) and northwestern parts (around Palri, Gudha etc.).

Quaternary unconsolidated lacustrine sediments along with aeolian sand deposits overlie these hard rocks. The clastic sediments consist of quartz, alkali feldspar, mica chlorite, amphibolite and weathered products including kaolinite and goethite whereas the nonclastic evaporites are mainly halite and calcite. Thenardite, Kieserite and Polyhalites are the dominated minerals below 5.5 m depth while gypsum is the major mineral below this depth.

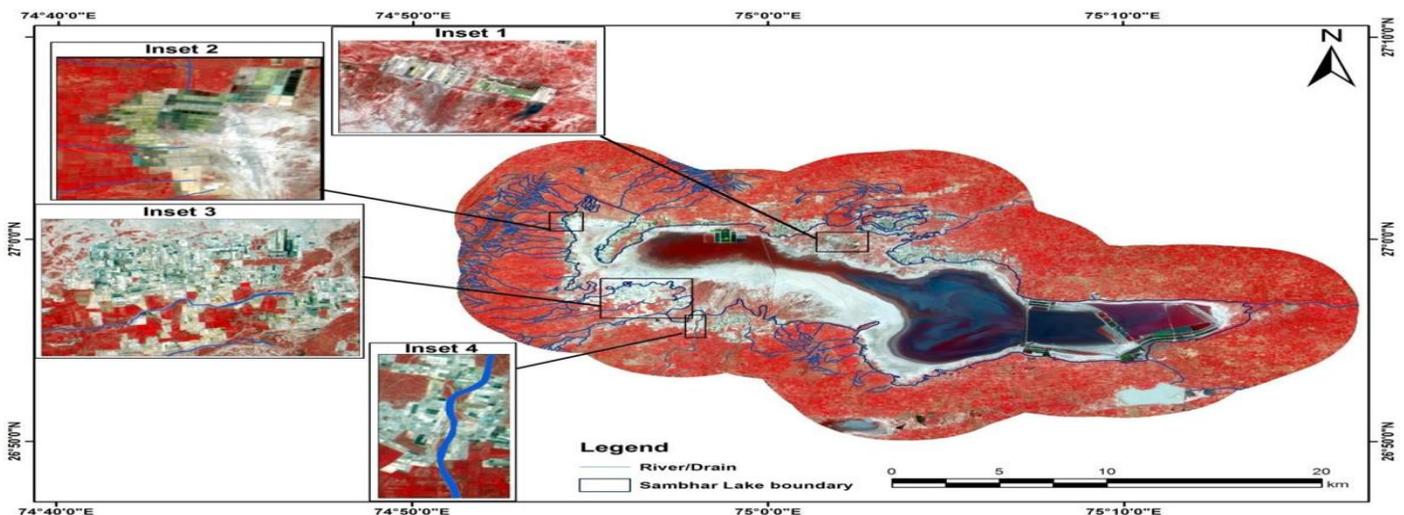
1.1.3.1 Major soils

Mainly four types of soils can be found in Sambhar Lake area, namely clay, clay loam, sandy loam and sandy soil. The general texture of the soil in the area is sandy loam to clayey loam which is further classified into “*Barani*” or unirrigated and “*Chahi*” or irrigated soil.

1.1.4 Hydro geo-morphology

1.1.4.1 Drainage

The Sambhar is an elliptical and shallow lake. The catchment area of Sambhar Lake spreads over the four districts, i.e., Jaipur, Ajmer, Sikar and Nagaur of the Rajasthan state in India. The total catchment area of the lake is 7,560 sq. km, most of which lies to the north and northeast. Sambhar lake is located centrally in its catchment. The Salt Lake has plane wet land topography of about 64 km to the west of Jaipur. The Sambhar basin has centripetal drainage pattern as streams drain towards the lake. The Salt Lake is mainly fed by four fugacious streams namely Mendha, Rupangarh, Kharain and Khandel, and numerous streamlets debouched from the Aravalli hills and surface run-off. Mendha river, the largest feeder stream (catchment area 3600 sq. km) originates in the northeast of the lake (in Sikar district), flows towards southwest and then towards west and finally enters the lake from north forming a small delta at the mouth. Most of the catchment area of river Mendha is sandy, undulating plain, framed to the north, west and east by residual Aravalli outcrops. Rupangarh river originating in the south near Ajmer city runs north-northeast and enters the lake from south after draining about 625 sq. km hilly areas. Kharain and Khandel, two other smaller streams, enter the lake from the northwest and east, respectively. They drain a limited area before entering the lake basin.



1.1.4.2 Rainwater Harvesting Structures

Various structures namely anicuts, and other surface embankments such as bunds, gabion structures and silt trap can be observed and traced in the catchment of Sambhar lake. Anicuts and similar structures were observed in more numbers in the Rupangarh river as compared to Mendha river. The collection of water at such structures on a considerable scale reduces the downstream flow towards the lake, the number of anicuts has increased over the years resulting in to the scarcity of water in the lake. Given that the number of anicuts or any such structures in the area was far less in the olden times, there can be a relation between the rise in number of these surface embankments and the following reduction in the discharge of incoming rivers (Mendha, Rupangarh and their tributaries) in the Sambhar lake. Apart from the salt making in the vicinity of the lake, these rainwater harvesting structures pose additional risk to the sustainability of Sambhar lake.

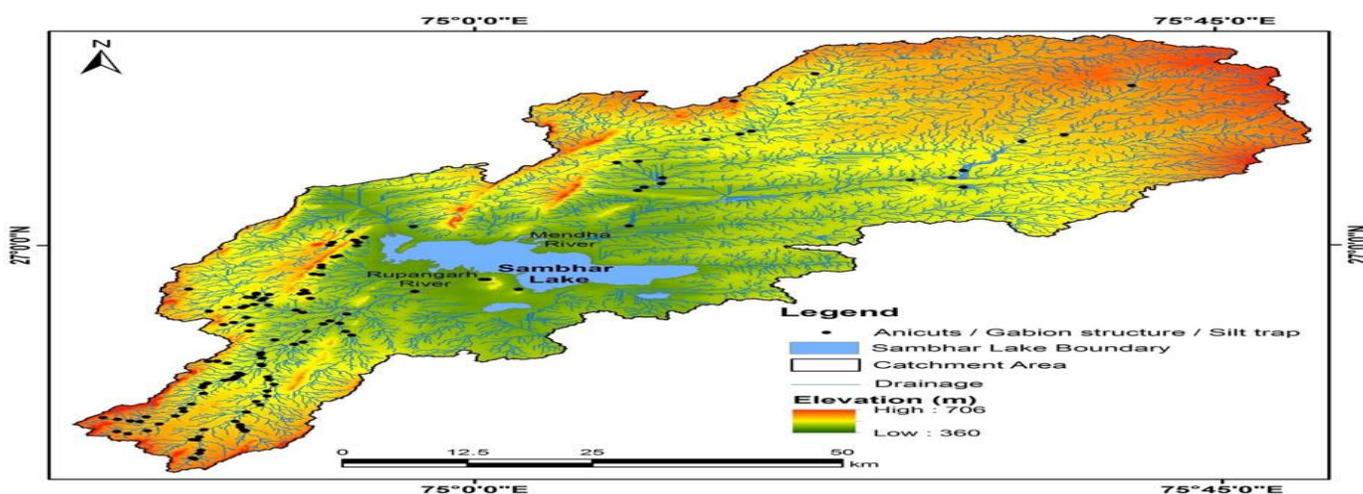


Fig: Digital Elevation Model (DEM) of catchment area of Sambhar lake and location of rainwater harvesting structures in the catchment

1.1.4.3 Ground water

The principal ground water reservoir in the area occurs both in unconsolidated Quaternary formations and consolidated formations of Delhi Super-group and Aravalli group of rocks. The consolidated formations comprise of schist, gneiss, quartzite and phyllites of Precambrian metamorphic rocks. Metamorphic are normally impervious except in presence of a few weak planes, joints and weathered zones which contain moderate and limited quantity of ground water. Ground water occurs under unconfined to semi-confined conditions in weathered and fractured part of the consolidated formation.

Most of the open dug wells and tube wells in the area are tapping alluvial aquifers and weathered/fractured portion of underlying Delhi Super Group of rocks. Sambhar Salt Limited has constructed many surface wells and tube wells for ground water withdrawal for salt manufacturing by simple evaporation process. Out of these some wells are abandoned because of mechanical failure or declining ground water levels. While open dug wells are in the eastern part of the lake, tube wells are in operation in the western part. Numbers of total production wells in different production areas of Sambhar Salt Limited.

1.1.4.4 Ground water level, transmissivity, and storage coefficient

The water level (below ground water level; BGL) in pre-monsoon season ranged from 1.70 to 32.55 m and in post-monsoon season ranged from 1.11 to 30.85 m. M/s Sambhar Salt Limited has constructed 81 tube wells for ground water withdrawal for salt manufacturing by simple evaporation process. The depth of wells generally varies from 3 to 50 m in alluvium and 50 to 200 m in combination/consolidated formation areas. The specific capacity of wells varies from 58 to 500 lpm/m. There could be other non-registered operational units as well. Private sector units are allowed to operate one tube well per 10 acres (4.05 ha) of production area. However, due to non-availability of secondary information the total number of wells in existence and operation are not precisely known.

1.1.4.5 Estimation of water withdrawal for domestic use

Drinking water is being provided in all village area through organized piped water supply by the government agency / industrial sector to meet regular water needs for both human as well as cattle population. In some villages drinking water is being supplied by water tankers. As per information obtained from local authority, on an average the villagers get potable water supply every day through the distribution system. As far information and observations collected during the field surveys there is no ground water extraction for drinking purpose from sources like open dug wells, tube wells/ bore wells and hand pumps.

1.1.5 Physicochemical characteristics of Bittern

The wastewater from salt manufacturing process, i.e., the left-over mother liquor called "Bitterns". The toxic elements namely As, Cd, Co, Cr, Ni, Pb and Zn are either below detectable limit or present in extremely low concentration.

1.2 Baseline status of biotic components in Sambhar Lake

Biotic components, i.e., the living organisms play an important role in the ecosystem. Studies on biological aspects of ecosystems are important in view of the conservation of environmental quality and safety of natural flora and fauna. In aquatic ecosystem, phytoplankton, the producers (for example, algae) and aquatic plants produce food that is consumed by other organisms in food chain. Invertebrates such as zooplankton, molluscs, crustaceans and insects consume nutrients from the primary producers and pass it on to the next level of consumers, namely, the vertebrates such as fish and birds. Water quality in ecosystems determines the structure of biological communities.

1.2.1 Phytoplankton

Phytoplankton of 19 algal genera from 4 groups was identified Chlorophyceae dominated the population followed by Bacillariophyceae.

- *Chlorella*, *Cosmarium*, *Ulothrix*, *Coelastrum*, *Dunaliella* and *Ankistrodesmus* can be observed among the Chlorophyceae
- The diatom species *Nitzschia*, *Navicula*, *Achnanthus*, *Phacus*, *Fragillaria*, *Gomphonema* and *Cyclotella* belong to Bacillariophyceae group.

- Cyanophyceae includes species like *Anabaena*, *Oscillatoria*, *Microcystis*, *Spirulina*, *Chroococcus* and *Arthrospira*.
- Only one genus namely *Phacus* was recorded from the Euglenophyceae group.
- Blue green algae namely *Dunaliella*, *Oscillatoria* and *Spirulina* and diatoms such as *Navicula* and *Nitzschia*, holobiontic species, which are common in inland saline waters and thrive at higher alkalinity and pH, in Sambhar lake.
- The phytoplankton total count ranged from 71 to 587 per ml.
- The estimated Shannon–Wiener Diversity Index (SWI) values that increase with increase in both the richness and evenness of the community were in the range 2.28 - 3.17 indicating that the water quality of the ecosystem supports moderate diversity of phytoplankton.
 - According to Palmer Pollution Index (PPI) (1969), a total score of 15 or more in a sample is an indicator of organic pollution.
 - Palmer's Pollution Index (PPI) values are in the range of 6-19 with an average of < 15 indicating no organic pollution Dominance of Chlorophyceae and Bacillariophyceae indicates moderate level of organic pollution which is also supported by the estimated SWI and PPI values.

Table: List of algal species in Sambhar lake

Sr. No.	Phytoplankton groups	Genera
1.	Bacillariophyceae	<i>Nitzschia sp.</i>
		<i>Navicula sp.</i>
		<i>Achnanthus sp.</i>
		<i>Cyclotella sp.</i>
		<i>Fragillaria sp.</i>
		<i>Gomphonema sp.</i>
2.	Chlorophyceae	<i>Chlorella sp.</i>
		<i>Cosmarium sp.</i>
		<i>Ulothrix sp.</i>
		<i>Coelastrum sp.</i>
		<i>Dunaliella sp.</i>
3.	Cyanophyceae	<i>Anabaena sp.</i>
		<i>Oscillatoria sp.</i>
		<i>Microcystis sp.</i>
		<i>Spirulina sp.</i>
		<i>Chroococcus sp.</i>
4.	Euglenophyceae	<i>Arthrospira sp.</i>
		<i>Phacus sp.</i>

1.2.3 Zooplankton

The species identification indicates that Copepoda represented by *Cyclops sp.*, *Diaptomus sp.* and *Nauplius larva* dominated the fauna being 47% of the total zooplankton population followed by Rotifera (36%) represented by *Brachionus*, *Asplanchna*, *Euclanis*, *Monostyla*

and Cladocera (17%) represented by *Moina sp* of these 8 species *Brachionus* and *Moina* can be regarded as halobiont species. *Moina* occurs in moderate saline water. The zooplankton density ranged from 4600 to 137333 per m³. Shannon–Wiener Diversity Index (SWI) values, ranged between 1.6 to 2.9, indicate moderate diversity of zooplankton. Among the benthic zooplankton Sambhar lake is rich in chironomid larval forms.

Table: List of zooplankton species observed in Sambhar lake

Sr. No.	Zooplankton groups	Genera
1	Rotifera	<i>Brachionus sp.</i>
		<i>Asplanchna sp.</i>
		<i>Monostyla sp.</i>
		<i>Euclanis sp.</i>
2	Copepoda	<i>Cyclops sp.</i>
		<i>Diaptomus sp.</i>
		Nauplius larva.
3	Cladocera	<i>Moina sp</i>

1.2.4. Benthic invertebrates and fisheries

Absence of fishes in the lake had also been observed by the local inhabitants. The brine shrimp *Artemia* which were known to dominate the lake waters previously is lost. The Sambhar lake covers a wide range of salinity. The number of algae in the lake decreases as the salinity of the lake increases. Due to high salinity, the biodiversity is restricted to salt tolerant species only with a very little faunal background leading to shorter food chain. Also, the plankton and faunal diversity in the lake represents that of a typical of a wetland ecosystem.

1.2.5 Avifauna

- Sambhar Lake is an ideal habitat for water birds inviting large number of wetland avian species to over winter every year.
- The algal blooms and variety of zooplankton fauna make it more opulent to birds to feed in the lake.
- According to the Asian Water bird Census (AWC) on 16 January, 2014 by Wetlands International South Asia with active support from Rajasthan Wildlife Department the lake has been degrading fast and losing its habitat for aquatic biodiversity and especially water birds.
- 30 species of both Indian resident and long distant migratory species of water birds of good population including flamingos at Sambhar lake and adjacent few smaller water bodies were recorded account of this census along with the species recorded by the CSIR-NEERI team during the study.

- Greater Flamingo, Lesser Flamingo, Black-winged Stilt, Red-wattled Lapwing, Grey Wagtail and White-throated Kingfisher were the species observed by the CSIR-NEERI team. Dominance of Lesser Flamingo and Black-winged Stilt as the common variety of birds were observed in lake side.

Flamingos in Sambhar Lake

The lake supports a large number of avifauna most notably Flamingoes. The cause of concentration of Flamingoes in Sambhar Lake can be attributed to the following reasons:

- a. The algae and benthic communities of the water body as the source of food.
- b. The vast expanse of Sambhar Lake and availability of food has given opportunity to this bird to breed in this region.

Out of the world's six Flamingo species, *Lesser Phoenicopterus minor* and *Greater Phoenicopterus ruber* regularly visit Sambhar Lake. About 23000 Flamingos have been recorded in the recent years.

It is the second largest wintering and breeding ground for Flamingoes in India other than Great Rann of Kutch. Since the water recedes very quickly in the Sambhar Lake the Flamingoes have also adapted to simplify the nest building process. The birds scoop the soil in the circular form thereby leaving central place as elevated portion for laying eggs.

With respect to the above points, Sambhar Lake has a great potential to support large number of Flamingoes in addition to other water birds and faunal diversity.

1.2.6 Mammals

Blue bull (*Boselaphus tragocamelus*), is well known to occur in surrounding areas of Sambhar lake.

1.2.7 Vegetation in the catchment area

The natural vegetation in the catchment area is Northern Tropical Dry Mixed Deciduous Forests and Thorn Forest. A list of common vegetation recorded includes Dhok (*Anogeissus pendula*), Salar (*Boswellia serrata*), *Capparis sp.* with some bushy vegetation.

The plain area is dominated by *Acacia nilotica*, *Acacia senegal*, *Salvadora persica* etc. Other species recorded include *Azadirachta indica*, *Prosopis cineraria* and *Prosopis juliflora*.

The degraded areas in the catchment and areas surrounding the lake are having *Prosopis juliflora* as major vegetation. Though in saline condition other species does not survive easily the growth of *Prosopis juliflora* is in abundance.

Table: Vegetation in Sambhar lake and in its catchment

Trees	Grasses	Shrubs	Herbs
<i>Acacia nilotica</i> *	<i>Cenchrus Penniseliformi</i>	<i>Acacia jacquemontii</i>	<i>Aerva persica</i>

	s			
<i>Acacia senagal*</i>	<i>Cenchrus ciliaris</i>	<i>Calotropis procera</i>	<i>Ageratum conyzoides</i>	
<i>Azadirachata indica*</i>	<i>Cenchrus setigerus</i>	<i>Capparis deciduas</i>	<i>Argemone mexicana</i>	
<i>Boswellia serrata*</i>	<i>Chloris dolichostachya</i>	<i>Euphorbia royleana</i>	<i>Amaranthus spinosa</i>	
<i>Maytenus emarginatus</i>	<i>Dactyloctenium aegyptium</i>	<i>Leptadenia pyrotechnica</i>	<i>Celosia argentea</i>	
<i>Phoenix sylvestris</i>	<i>Aristida adscensionis</i>	<i>Salvadora oleoides</i>	<i>Evolvulus alsinoides</i>	
<i>Prosopis cineraria*</i>	<i>Melanocenchris jacquemontii</i>	<i>Salvadora persica*</i>	<i>Digera mutica</i>	
<i>Prosopis juliflora*</i>	<i>Saccharum spontaneum</i>	<i>Sericostema paciflora</i>	<i>Phyllanthus sp.</i>	
<i>Tamarix diocia</i>	<i>Sporobolus sp.</i>	<i>Crotolaria burhia</i>	<i>Leucas aspera</i>	
<i>Tecomella indulata</i>	<i>Sporobolus helvolus</i>	<i>Tephrosia purpurea</i>	<i>Launea sp.</i>	
	<i>Perotis indica</i>		<i>Polygala irregularis</i>	
	<i>Tetrapogon tenellus</i>		<i>Tribulus terrestris</i>	
	<i>Eragrostis ciliaris</i>			<i>Vernonia cinerea</i>
				<i>Commelina bengalensis</i>
				<i>Farsetia hamiltonii</i>
				<i>Indigofera cordifolia</i>
				<i>Corchorus trilocularis</i>
				<i>Portulaca oleracea</i>
				<i>Mollugo cerviana</i>
				<i>Euphorbia hirta</i>
				<i>Cressa cretica</i>
				<i>Salsola foetida</i>
			<i>Zygophyllum simplex</i>	
	<i>Trianthema triquetra</i>			
	<i>Launea nudicaulis</i>			
	<i>Cleome brachycarpa</i>			

Source: Conservation planning of Sambhar Lake, Rajasthan using satellite remote sensing and GIS.

1.2.8 Health Card of Sambar Lake

	Indicator	Desired Value	Actual Value	A	B	C	D	E	Score
Area (24296 ha)	% wetland converted to non-wetland use since 2000	0%	0%	0	1-5%	6-10%	11-20%	More than 20%	A
Hydrology and Catchments	Ratio of Catchments number of natural inlets choked and diverted to total number of natural inlets	<0.2	Features	0-0.2	0.3-0.4	0.4-0.6	0.7-0.8	More than 0.8	A
	Ratio of number of natural outlets choked and diverted to total number of natural outlets	<0.2	0.0	0-0.2	0.3-0.4	0.4-0.6	0.7-0.8	More than 0.8	A

Bio Diversity	Biological oxygen demand	Between 3-6 mg/l	78-203 mg/l	80-100% sample meet the criteria	60-80% sample meet the criteria	40-60% sample meet the criteria	20-40% sample meet the criteria	Less than 20% sample meet the criteria	D
	% wetland area covered by invasive macrophytes	<10%	16%	<10%	11%-20%	21%-30%	31%-40%	More than 40%	B
	Annual water bird count as a proportion of average count of last 5 years	0.7	0.77	more than 0.7	0.6-0.7	0.5-0.6	0.4-0.5	less than 0.5	A
Governance	Clearly demarcated wetlands map	Wetlands map prepared and approved by State Wetlands Authority	Wetland Map under preparation	Wetlands map prepared and approved by State Wetlands Authority	Wetlands map prepared and approved by State Wetlands Authority	Wetlands map prepared and approved by State Wetlands Authority	Wetlands map prepared	Approved Wetland map not prepared	E
	Wetlands management plan	Management plan prepared and approved by State Wetlands Authority	Management Plan Under Preparation	Management plan prepared and approved by State Wetlands Authority	Management plan prepared and submitted to SWA	Management plan prepared and submitted to SWA	Management plan under preparation	No Management plan	D
	Wetlands Notification	Wetlands notified under extant regulation	notification under process	Notification under wetland rule 2017	Draft notification	Regulation under process	Regulation planned process initiated	No regulation	D

	<u>Frequency</u>	<u>Assigned weight</u>	
Number of indicators in Rank A	4	1.0	4.0
Number of indicators in Rank B	1	0.8	0.8
Number of indicators in Rank C	0	0.6	0.0
Number of indicators in Rank D	3	0.4	1.2
Number of indicators in Rank E	1	0.2	0.2
	9	Total	6.2

Wetland Score		0.68	C-
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Remarks

- A+ If indicator score between 1 to 0.95
- A- If indicator score between 0.90 to 0.95
- B+ If indicator score between 0.85 to 0.90
- B- If indicator score between 0.80 to 0.85
- C+ If indicator score between 0.75 to 0.80
- C- If indicator score between 0.70 to 0.75

CHAPTER -2

Threats to Sambhar Lake

Conservation of natural resources requires in-depth knowledge of area along with relationship between activities, which are responsible for degradation and development. The analysis of the area reveals that Sambhar lake and its surrounding areas have been in process of degradation for quite some time compounded by climate change reducing the lake spread. The major issues that could attribute to the threatening of wetland eco-system of Sambhar lake were as follows:

2.1 Landscape degradation-

The lake and the surroundings areas have undergone significant transformation over the years. Change in land use in the lake area and in the surroundings/catchment has increased aridity and is posing threats to the sustainability of the lake.

2.2 Salt production-

The dependency of local population on lake resources has increased due to demand of salt and more and more people are relying on salt making business for their livelihood leading to desertification. The salt making activities around the lake have increased and such activities are mostly carried out within one kilometer from the lake boundary.

2.3 Loss of agriculture land-

Some lands kept aside for agricultural activities have been converted to salt pans, causing the land unsuitable for agriculture.

2.4 Ground water exploitation-

Indiscriminate extraction of ground water around the lake for salt manufacturing and in the catchment for agricultural purposes alone accounts for the largest threat to the Sambhar lake system. This has made the area over exploited against ground water availability.

2.5 Unsustainable aquifer recharge and adversely affected hydrology-

Indiscriminate extraction of water, diversion of surface water inflows in the lake's catchment and construction of rainwater harvesting structures in the flow path of the rivers and drains feeding the lake for existing irrigation practices compounding with climate change results in inadequate recharge of the aquifer and change in hydrological pattern of the area.

2.6 Declining water levels-

The effects of declining water levels are not limited to gross chemical and biological changes, many other physicochemical and environmental changes such as changes to the local climate, dust blown from exposed lake beds, changes in vegetation to drought resistant and salinity resistant species resulting in loss of biodiversity etc. may follow.

2.7 Degradation of waterfowl habitat-

There is progressive waterfowl habitat degradation in last few decades.

2.8 Overgrazing by domestic livestock-

Soil erosion, increased sediment loads and changes in run-off patterns can be the result of other catchment activities, including overgrazing by cattle and sheep and excessive clearance of natural vegetation.

2.9 Pollution from surrounding towns, villages and watershed-

Human settlement in the surrounding may gradually lead to domestic sewage and sullage and solid waste pollution. However, such discharges were not observed during the field visit.

2.10 Vehicular transportation-

Top soil removal, air and noise pollution due to vehicular trespass by the villagers in the main lake area, especially in summer and winter, is a threat not only to the lake ecology but also for the biota to withstand the adversity. The road between Nawa to Khakarkki through the lake has been made dividing the main lake area in to two unequal parts. These may severely affect the winter congregation of flamingoes and other avian migrants to the lake. Ramps from the road to the lake area have also been constructed for easy access to lake area. During field monitoring it was observed that vehicles are using these ramps making the main lake area as short cut routes to commute between south and north part of the lake. The lake is also used to commute between Gudha and Sambhar.

2.11 Large spread and different regulation-

Large spread of the lake over three districts with different regulation makes the uniform management of the lake impossible. Concentration of private salt manufacturers in Ajmer and Nagaur districts is mainly due to the fact that salt manufacturing by private parties is not allowed in Jaipur district.

2.12 Lack of ecosystem management-

Intervention is needed to integrate the requirement of local communities with that of conservation and developmental activities, alternate resource utilization, creating awareness among local people and direct involvement of people in conservation activities.





Fig.-Unauthorized Bore wells and Unauthorized Electric Cables /Motors and Pipelines

Chapter 3

Recommendations in various Reports

Several reports have been prepared by various agencies on Sambhar Lake from time to time. The main recommendations of their reports are as follows:

3.1 NEERI Report (2016):

The National Environmental Engineering Research Institute (NEERI) was requested to develop effective management strategies based on scientific studies recommending measures for restoration and protection of the Sambhar wetland by the Environment Department. A report was submitted by NEERI on 27.07.2016 in which following recommendations were proposed:

3.1.1 Conservation and restoration of ground water

As far as the ground water quality is concerned, large tract of the area is covered by saline areas with the Sambhar lake covering ~ 230 sq km.

- In view of the high salinity, bore wells and hand pumps are not installed by the villagers for potable purpose.
- The area has scant rainfall (400-600 mm annual rainfall) and there is large scale withdrawal of ground water by industries as well as for agricultural purposes causing lowering of water table often below 50 m and leading to drying of many shallow wells.
- The present stage of ground water development in the area is about 158% which indicates that the scope of ground water development is already exhausted and it comes under over-exploited/ critical category the Central Ground Water Board (CGWB) [Central Ground Water Board (CGWB), District ground water brochure: ground water scenario; Jaipur (2007); Ajmer (2008), and Nagaur (2009)]. However, it does not take into account the saline areas.
- The present annual ground water withdrawal is estimated at 112.42 MCM (industrial draft only) as against the annual ground water availability of 20.05 MCM (ground water level fluctuation method).

3.1.2 Ground water conservation measures

- Under any circumstances ground water withdrawal should not exceed the availability of ground water, i.e., 20.05 MCM per year.
- In order that the withdrawal does not exceed 20 MCM, optimal pumping of ground water is mandatory. The pumping pattern has to be drastically restricted and it can be maintained to three hours (03 h) per day for all the industrial pumping wells in the region.
- As shown below the annual ground water withdrawal for industries estimated @ 06 hours per day for 240 days per year is 42.42 MCM.

Salt producing center	Number of operational wells	Pumping hours/day	Total discharge @ 6 h per day (cum/day)	Total discharge @ 240 days per year (cum/year)
Sambhar Salt Ltd.	81	6	9,272.88	22,25,491.20
Nagaur region (private operators)	1,130	16	1,29,362.40	3,10,46,976.00
Ajmer region (private operators)	333	16	38,121.84	91,49,241.60
Total				4,24,21,708.80 = 42.42 MCM/year

- However, it should be noted that the actual pumping rate is not just 6 hours per day. With longer pumping hours per day (as shown in section 7.1.2) and increase in number of operational wells the annual ground water withdrawal for industries will be even more.
- But the annual ground water availability of the area as estimated by ground water level fluctuation method is 20.05 MCM.
- It is estimated that the annual withdrawal will not exceed 20.21 MCM provided the pumping is restricted to three (03) hours per day for the given number of pumping wells (81+ 1130+ 333=1544) in the region.
- However, with increase in number of pumping wells in the region the pumping hours per day must be decreased accordingly so that the annual withdrawal does not exceed the annual ground water availability (20.05 MCM).
- Thus the pumping pattern has to be drastically restricted for the sustainable development of ground water resources in this region.
- It is, therefore, necessary that a proper inventory of operational wells in the salt manufacturing industries be prepared and no further permission be given for operating new well.
- It is also mandatory that water meters be installed at all the salt manufacturing units to regulate the use of ground water for industrial purpose.

- Construction of rainwater harvesting trench having depth of few feet around the periphery as defined and demarcated by the competent authorities is advisable. This will help to replenish ground water and will also eradicate illegal pipelines drawing lake water for salt production.
- Piezometres (depth up to 100 m) should be installed near the cluster of salt manufacturing units in the region and regular monitoring (every month) of the ground water level should be carried out by a competent authority. Biodiversity conservation including waterfowl habitat improvement-

3.1.3 Biodiversity conservation measures

- Protection of the Lesser Flamingo and other water birds at their habitats include appropriate management of key sites and increasing public awareness of the need for protecting the Lesser Flamingo and its habitats.
- Appropriate management of key sites includes,
 1. Eluding salt mining or other activities within an area of 500 m buffer surrounding the lake and the dry lake bed. If at all new leased areas for salt mining are essential it should be allowed beyond this zone.
 2. Restricting excessive water withdrawal as a Sambhar lake conservation strategy, and no permission should be given for water withdrawal within the buffer zone.
 3. Impeding unregulated human tourism near the breeding grounds of Flamingoes particularly at the center of Sambhar Lake.
 4. Increasing public awareness about regulation of free flow of river water and feeding the river without any encroachment.
 5. Avoiding construction of small dams in catchment area of the lake.
- Regulatory agencies should identify and form a Sambhar lake management cell for biomonitoring, ecological conservation and for all type of data collection for the water birds and their habitat. Experts in biological sciences from universities should be invited as members of the management cell.
- An action plan as per the Agreement on the Conservation of African- Eurasian Migratory Water birds (AEWA) and International Single Species Action Plan format prepared by Bird Life International should be prepared to provide a framework for the conservation of the Lesser Flamingo in all of its primary range states. The International Single Species Action Plan has been developed using internationally agreed standards including the monitoring and evaluation of implementation, linking threats, actions and measurable activities.
- The long-term goal of the plan is to upgrade the Lesser Flamingo from a “near-threatened” species to a species of “least concern” in the IUCN Red List of Threatened Species. The short

term goal is to maintain the species' current population and range, while the medium-term goal is to promote an increase in population size and range.

- Because the Lesser Flamingo is an itinerant species dependent on a network of sites in several countries, successful implementation of the plan will require effective international coordination of organization and action.
- It is imperative that the conservation strategies be implemented and strict surveillance be in place to observe and guard the lake from the anthropogenic activities, and to support large population of flamingos, other water birds and faunal diversity.

3.1.4 Legal and institutional changes

- As a priority a special authority must be constituted or the Sambhar Wetland Authority as proposed to be constituted should review the existing laws to identify and recommend the ways in which existing legal and institutional measures can be better harmonized with conservation without the need for new laws or regulations.
- If it is not feasible to harmonize an existing law and conservation then Sambhar Wetland Authority should identify such legal and institutional measures that need to be removed.
- The Authority should start working for high prioritize areas where laws and institutions should be upgraded or consolidated or where new legislative or economic instruments should be developed.
- The Authority must arrange to have the periphery of the lake be identified and demarked.
- Illegal pumping wells in the region, if any, must be identified and stopped with immediate effect.
- Ground Water Legislation should be implemented with high priority for regulation and control of ground water.
- Long term police camping within the lake/ along the boundary with construction of watch towers is recommended to stop any infringement or illegal activity such as excess and illegal pumping of lake water, encroachment of the lake area, disturbances to waterfowls, and plying motor vehicles across the lake.

3.1.5 Soil and moisture conservation

- The major LULC classes are fallow land, scrubland, vegetation and crop land (in post-monsoon) apart from the dry lakebed. The drainage concentration is more in these areas.
- Except for the dry lake bed all these LULC classes need soil and moisture conservation works.
- Different engineering and vegetative measures can be used according to the need of the situation.

3.1.6 Forestry development-

- The indirect importance of forests for lake conservation is that they work as the protective sheet from soil erosion. Hence higher the forest density lesser will be the soil erosion.

- It also contributes to biomass creation to meet fuel wood and fodder requirement of local people.
- Therefore, locally available useful species should be introduced in the catchment area.

3.1.7 Catchment management-

The catchment of Sambhar Lake is very huge having typical terrain. Two main seasonal rivers, Mendha and Rupangarh that feed the lake run through this catchment. Therefore, conservation of the whole catchment is important, and should be considered for complete solution of lake survival through the following measures:

- Any development in the catchment must be planned considering its impact on the lake.
- The main requirement of lake is 'water'; hence free flow of water to the lake is essential. A detail database of structures on the main flow of the river that are restricting river water to reach the lake should be prepared, and strategies for making such structures in the catchment should be revised.
- Except Forest department which does the developmental work keeping the conservation aspect in mind other Government departments such as Irrigation, Revenue, Agriculture & Soil Conservation etc. have their activities with less concern to the conservation of the area. Therefore, decision making at the apex level and implementation of plan at ground level should be given to a separate body such as the proposed Sambhar Wetland Authority which will apply conservation plan effectively.
- The entire catchment should be divided under priority classes for development activities.

3.1.8 Public outreach and education

A major challenge for salt lake wetland conservation is a lack of public understanding of the value and significance of the lake. The public, landowners and decision-makers must prioritize the importance of salt lake wetland, and take more informed decisions in relation to conservation of wetland.

- Awareness program at Panchayat level should be conducted to educate about conservation of precious ground water resources and training on rainwater harvesting will be beneficial to check decline in water level and justified use.
- It is also necessary to increase public support for wetlands conservation and to emphasize the connection between wetland conservation and bird conservation.
- Traditional rainwater harvesting structures like 'Tankas', roof top rain water storage should be encouraged for day to day requirements which will reduce ground water draft.
- Use of water saving devices, drip irrigation, close field distribution channels etc. should be promoted.
- Modern agricultural management techniques have to be adopted for effective and optimum utilization of the water resources. This can be achieved by maintaining irrigation through minimum pumping hours as per minimum requirement of water by the crop, and also by selecting most suitable cost effective crop pattern.

- Salt resistant crops can be sown in the area having brackish to saline ground water.

3.2 Vinod Kapoor Committee (2010):

The State Government vide order dated 10.03.2010 of the Industries department directed Shri Vinod Kapoor to enquire and inspect as below:

1. Illegal encroachments made by private production units in Sambhar Salt Area.
2. Assess number of bore wells dug around the lake area and laying of electrical lines for salt production in and around sambhar salt area.
3. Assess number of the illegal electric connections for illegal salt extraction in sambhar lake area.

The Committee submitted its report on 20.04.2010. The recommendations are as follows:

- Sambhar Salt Ltd. (SSL) may prepare new map with reference to revenue demarcation on ground
- SSL will fund for establishing 1 SHO post for protection of Sambhar
- SSL to have trenches around their demarcated boundary to avoid any future illegal activities
- Illegal encroachments to be removed by joint team of revenue/ police/SSL & Ajmer VVNL
- Ajmer VVNL to ensure no further illegal electricity usage in bore wells & salt extraction.
- A 2- tier committee to be formed at State (under ACS Industries), District (under Collector Jaipur) & Sub-division (under SDM) level for permanent monitoring & problem solving
- Permanent watch towers to be set up at identified sites
- Ample vigilance staff & security team may be deployed by SSL
- Brine availability status to be verified before any further land conversion, & new rules to be formulated for this purpose
- No land conversion for salt extraction to be given in Jaipur district
- Other directions to SSL for regulated checking & monitoring of the leased areas.

3.3 MoEF&CC Recommendations (2017):

In compliance of the Hon'ble NGT Central Bench Bhopal directions in OA 54/2015 Babulal Jajoo Vs President and State of Rajasthan, OA No. 72/ 2016 Ajay Dubey (Wetland Authority) Vs State of Rajasthan, and OA no. 92/2016 Villagers of Sinodiya & 3 Ors Vs UOI MoFF & CC deputed a team consisting of following members for site visit:

1. Dr H.S.Singh Member Board of Wildlife.
2. Dr B.C Choudhary Expert Member Central wetlands Regulatory Authority.
3. Dr M Ramesh , Scientists "D" NRCD, MoEF & CC.

The Committee submitted its report is October 2017 as under:

1. Salt production should be regulated
2. Illegal withdrawal of salt water may be stopped immediately
3. The salt preparation activities of the SSL through private parties may be examined under prevailing laws.
4. No new permission should be granted to the private persons by the revenue authority
5. Sustainability of salt production should be decided after scientific studies
6. A nodal agency for coordinating integrated management may be established, which will function under SWA.

7. Management plan should aim to restore the naturalness of the lake.
8. Ecotourism may be developed.
9. Boundary of the lake may be demarcated on ground.
10. Status of surface water inflow may be monitored.
11. Capacity building training program may be organized.
12. Integrated Management Plan to be submitted to National Wetland
13. Committee along with recommendations of SWA.

3.4 Report of MoEF & CC (2019):

On request of the State Government, MoEF & CC constituted a team vide letter dated 21.11.2019 to assess and enquire the matter of mass death of birds in Sambhar Lake area. The Team consisted of:

1. Deputy Inspector General of Forests (WL) MoEF & CC
2. Scientist WII Dehradun
3. Scientist IVRI Bareilly

Recommendations of the team are as follows:

1. Salt production should be regulated.
2. Illegal withdrawal of salt water may be stopped immediately.
3. The salt preparation activities of the SSL through private parties may be examined under prevailing laws.
4. No new permission should be granted to the private persons by the revenue authority
5. Sustainability of salt production should be decided after scientific studies
6. Nodal agency for coordinating integrated management may be established, which will function under SWA.
7. Management plan should aim to restore the naturalness of the lake.
8. Ecotourism may be developed.
9. Boundary of the lake may be demarcated on ground.
10. Status of surface water inflow may be monitored.
11. Capacity building training programme may be organized.
12. Integrated Management Plan to be submitted to National Wetland Committee along with recommendations of SWA.

3.5 Recommendations of Co-ordination Workshop by Forest Department, Government of Rajasthan:

A Workshop was held at Jaipur on 24.11.2019 involving all scientific agencies and concerned departments such as Animal Husbandry Department, Forest Department, Local administration, RAJUVAS etc. Following observations were made:

- ▶ Sambhar Lake not being under direct administrative control of Forest or Animal Husbandry Department, responsibility of ownership & day to day management needs to be decided.
- ▶ Regular surveillance & monitoring is needed on site for at least a month to check further incidences.

- ▶ Exit policy needs to be finalized for withdrawal of emergency staff deployed at site by Forest & Animal Husbandry Department.
- ▶ NEERI management plan needs to be finalized & implemented on ground.
- ▶ State Wetland Authority to be made functional for long term effective monitoring.
- ▶ Checking of pollution & control of illegal activities need to be monitored at regular intervals to be done by RSPCB/ Sambhar Salt & Revenue Authorities.
- ▶ Avian botulism is non-contagious to human, thereby no need of panic.
- ▶ Deep burial & pit burning both are equally effective for carcass disposal, as per Ramsar Wetland Disease Manual, Technical Report No. 4.

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Chapter 4

Recommendations on basis of Reports and Departmental Inputs

The lake is under tremendous anthropogenic pressure due to wrongful utilization of its resources. Over utilization of lake water for salt making and degradation of agricultural land, natural degradation and waterfowl habitat degradation are the major concerns that need to be tackled in a systematic manner. Management measures and strategic options for conservation and restoration of Sambhar Lake recommended on the basis of reports and departmental inputs are as follows:

4.1 Separate authority for Sambhar Lake management and close coordination between various stakeholders (Environment Department)

- A separate authority namely Sambhar Wetland Authority for management of the wetland is needed.
- Sambhar Wetland Authority should be a completely separate authority involving all sections of the government which will have the complete authority and empowerment as far as restoration, protection and conservation of Sambhar lake (wetland) and implementation of management measures are concerned.
- Sambhar Wetland Authority should lay down a proper regulatory framework to prevent depletion of wetlands wherein two more different committees namely a) Technical Committee and b) Community Consulting Committee will function at different levels to ensure proper implementation of the management measures and receiving feedback with regard to the management measures taken and work executed at site.
- Wetlands involve several authorities such as industries, irrigation, forest, pollution control board etc. Therefore, all relevant departments, civil society and scientific community should be involved for developing effective institutional mechanisms for integrated management of Sambhar Lake.
- In view of this the Technical Committee should comprise of experts from various state and central government departments such as Department of Environment and Forest, State and Central Groundwater Boards, Department of Irrigation, Department of Tourism, Pollution Control Board, Universities or National Institutes working in the related field.
- The Community Consulting Committee should be constituted with representatives from Department of Industries and Revenue, Salt Commission of India, Salt manufacturers, Village Panchayats, Local MLAs and MPs and Police etc.
- The Technical Committee will oversee all technical aspects of management measures and policies.
- The Technical Committee should frame all technical policies related to watershed conservation, restoration of lake hydrology, pollution control, regulation of ground water extraction, conversion of land in and around the Sambhar lake and submit to the Sambhar Wetland Authority.
- The Community Consulting Committee should work as an interface between the two other committees and local community.

It should specify the feasibility of implementing the policies recommended by the Technical committee considering all socio-economic and socio-cultural aspects of the development and submit their observation to the Technical Committee for further consideration. They should also be responsible for raising public awareness about the management measures to be implemented.

- The Technical Committee and the Community Consulting Committee should work in close coordination within a framework closely linked with livelihoods.

4.2 Ground water conservation, restoration/ recharge (Ground Water Department/ Directorate of Watershed Development and Soil Conservation/ Water Resources Department/ Environment Department)

- Hydrology being considered important for irrigation but not for conservation of wetlands is wrong. In case resource utilization has to continue it should be brought within sustainable limits in line with the 'wise use' principle of the Ramsar convention. A balance between water for agriculture from anicuts as well as provision of water supply to the wetlands for maintaining diversity is necessary.
- Thus, a water allocation policy amongst Sambhar Lake and anicuts etc. being used as recharge structures or irrigation etc. is absolutely necessary.
- Water allocation policy should harmonize human uses with biodiversity requirements.
- Notification of area under the Central Ground Water Authority (CGWA), constituted under Section 3 (3) of the Environment (Protection) Act, 1986 to regulate and control development and management of ground water resources should be considered.

4.3 Restoration of flow in seasonal rivers through efficient irrigation and control of soil erosion in watersheds (Water Resources Department)

- Restoration of inflows of surface water from seasonal rivers and rivulets to the lake bed is absolutely essential for conservation of the wetland and its biodiversity especially as a migratory water bird habitat.
- Assessment and mapping of watershed, specifically for degradation, water infrastructure and changes in hydrology is mandatory.
- Study on cropping pattern, water requirement and water budgeting in the watershed is necessary.
- Based on these findings existing government programs and policies related to irrigation and agriculture need to be reevaluated and reframed to harmonize the human interest and sustainable environment.

4.4 Ban on any destruction/ disturbance to the lake bed (Local Administration and Sambhar Salt Limited)

- Extraction of clay from the lake, grazing, vehicular traffic etc. in the lake area should be banned.

4.5 Data collection for regular monitoring and evaluation of management efforts (Rajasthan State Pollution Control Board)

- Continuous effort must be made for collecting and analyzing data for regular monitoring of ground water quality, water table, existing biodiversity and status of management efforts.

4.6 Incorporation of socio-economic aspects of settlements- (Local Administration and Revenue Department)

- Socioeconomic impact assessment studies should be carried out and revenue map of the area should be generated to harmonize the interest of people and environment, and conservation of the lake.

4.7 Waste management in nearby towns (LSG Department and Department of Rural Development and Panchayati)

- Municipal waste management is an integral part of municipal planning. Such plan for the nearby towns and villages needs to be in place and should be evaluated for effective and long term management of municipal wastes.
- In case a gap is noted suitable remedial measures should be suggested and implemented by the local municipality/ government.

4.8 Encouraging research studies (Forest and Environment Departments)

- Establishment of research and ecological studies by academic and specialized institutions should be supported.
 - Setting up of a Biological Research Station at Sambhar specifically to study impacts of climate change on migration of birds and to study the ecology of the area would support the conservation and management of water bird habitat.
- 4.10 Awareness generation regarding values of the lake

Both preventive and developmental measures (restoration) through hydrological intervention and participatory watershed management involving local community at all levels of planning and implementation should be integrated.

- Villagers should be made aware of the uniqueness of Sambhar Lake and villagers' involvement in Eco-restoration through village level committees is a must.
- Rural conscience for the issues related to the importance of wetlands and their benefits through participation in conservation efforts should be raised.
- Development of awareness programs through organizing workshops, campaigns, print materials, media, street plays and festivals etc. aimed at inculcating a sense of pride among the local people should be organized around the wetland at village level.

CHAPTER -5

Management Plan

S.N.	Department	Task to be done	Time Line
1.	District Administration (Ajmer, Jaipur and Nagaur)	<ul style="list-style-type: none">• District Collectors will form Committees for surveillance and patrolling in the Sambhar Lake Area to monitor illegal encroachments, illegal electric connections and bore wells. Industries, Nagar Palika, LSG and PR Departments will depute officers for district teams.• Assistance to concerned agencies for removal of illegal encroachments/electric connections/bore wells in the Sambhar area.• Generate awareness for conservation of Sambhar Lake conservation and protection in adjoining areas.• Assist Forest and Animal Husbandry Departments in rescue of birds in case of injury/ disease.• Ban removal of clay, grazing and vehicular traffic in the lake bed area.• Demarcation of Lake Boundary after survey.	Throughout the year
2.	Industry Department	<ul style="list-style-type: none">• Review mining leases in the Sambhar Lake area and prepare a policy regarding issues of leases keeping in view conservation and protection considerations.• Assess requirement of CETP and other Waste disposal facility for disposal of industrial waste.• Nominate officer to District Committee for surveillance and patrolling.• Check disposal of sludge and other industry waste in the Sambhar Lake bed.	Throughout the year
3.	Forest Department	<ul style="list-style-type: none">• Establish a temporary Rescue Centre for immediate health care of injured and diseased birds.• Establish a temporary Chowki for surveillance and patrolling in the area.• Constitute a dedicated team for surveillance.	October to March (migratory season)

		<ul style="list-style-type: none"> • Mobilization of NGOs for awareness generation about conservation. • Coordinate with GOI agencies like: WII, BNHS, SACON, NIHSAD, IVRI for research, rescue etc. 	
4.	Animal Husbandry Department	<ul style="list-style-type: none"> • Set up dispensaries in all three districts for immediate treatment of injured and rescued birds. • Supply of medicine and other equipment for rescue and treatment of birds. • Depute officer to District Committees for surveillance and patrolling works. 	October to March(migratory season)
5.	RSPCB	<ul style="list-style-type: none"> • Take water samples at strategic and specific locations in the Sambhar Lake area to assess water quality. • Check and monitor the compliance of the conditions stipulated in the permissions given to industrial units under the Water and Air Acts. • Prescribe regulatory standards/ norms for industries around Sambhar Lake and ensure compliance. • Assess requirement of CETP for disposal of industrial waste. 	Pre and Post monsoon for water samples and throughout the year for checking compliance.
6.	LSG Department	<ul style="list-style-type: none"> • Set up special teams in all ULBs in the lake area for monitoring waste management. • Constitute rescue team (with volunteers, equipment etc) during any rescue operation. • Check sewerage and Industrial waste flow in the lake bed. • Nominate officers to the District Committees for surveillance and patrolling. 	Throughout the year
7.	Panchayati Raj Department	<ul style="list-style-type: none"> • Set up special teams for waste management in the panchayats in the Lake area. • Constitute rescue team with (volunteers, equipment etc) during any rescue operation. • Check sewerage and Industrial waste flow in the lake bed. • Nominate officers to the District Committees for surveillance and patrolling. • Check watershed conservation works which hinder in flow of water into the Sambhar Lake. 	Throughout the year

8.	JVNL/ AVNL	<ul style="list-style-type: none"> • Check for illegal electric connections laid down by mining units for salt production. • Remove illegal electric connections in the area. 	Throughout the year
9.	Sambhar Salt Limited	<ul style="list-style-type: none"> • Constitute a special surveillance team for regular monitoring of illegal mining and electric connections in Sambhar Salt area. • Assist all wings of the State Government in surveillance, maintenance, and rescue operations. 	Throughout the year
10.	Water Resources Department	<ul style="list-style-type: none"> • Ensure inflow of water in the lake area from the catchment area. • Check construction of anicuts in the catchment area. 	Throughout the year
11.	Ground Water Department	<ul style="list-style-type: none"> • Check and regulate ground water extraction from the lake bed. 	Throughout the year
12.	Tourism Department	<ul style="list-style-type: none"> • Promotion of destination as an Eco-tourism site. • To check & regulate film shooting activities in the area and not allow vehicular movement in the Lake. • Management of tourist inflow keeping in view the conservation of the Sambhar Lake. • Develop Tourism festivals to promote site as an ecological destination. 	Throughout the year
13.	Environment Department	<ul style="list-style-type: none"> • Prepare a digitalized revenue map of Sambhar Lake Area with the help of the Settlement Department. • Coordinate with all departments for implementation and monitoring of the Management Plan & SOP. • Secretariat for the Standing Committee on Management of Sambhar Lake. 	Throughout the year

NOTE- All Departments to develop their departmental SoPs and issue them by September 2020.

Comparative Statement of Water Sample of Sambhar Lake district Ajmer

S. No.	Point of Collection	Date of Collection	pH	COD	BOD	Amm. N	Free Ammonia	PO4	Resi. CL	S-	TSS	Cu	Zn	Ni	Pb	T. Cr	Fe	Cd
1	Sambhar Lake Near Village Aau, Tehsil- Roopangarh, District- Ajmer	21.11.2019	9.2	209	22	2.8	1	0.8	NA	NA	84	NT	0.359	NT	0.07	NT	2.3	NT
2	Sambhar Lake Near Village Aau, Tehsil- Roopangarh, District- Ajmer	21.11.2019	9.06	101	13	2.2	0.67	0.5	NA	NA	107	NT	0.344	NT	0.09	NT	2.19	NT
3	Sambhar Lake Near Village Aau, Tehsil- Roopangarh, District- Ajmer	15.06.2020	8.81	56	5.3	NT	NT	0.5	NT	NT	95	NT	NT	NT	NT	NT	3.92	NT

S. No.	Point of Collection	Date of Collection	Cl	SO4	TH	CaH	MgH	Ca	Mg	F	TDS	Cond. In μ s	T. Alk.	DO	Salinity gm/kg	TKN	Faecal Coliform	Total Coliform	Na	K	Bio-Assay Test
1	Sambhar Lake Near Village Aau, Tehsil- Roopangarh, District- Ajmer	21.11.2019	10519	2817	176	88	88	35	21	3.1	23850	24500	624	4.2	19.02	3.92	<3	<3	8500	60	60% survival of fish after 96 hrs in 50% effluent
2	Sambhar Lake Near Village Aau, Tehsil- Roopangarh, District- Ajmer	21.11.2019	8815	1778	176	108	68	43	17	2.59	20138	21100	496	4.8	15.94	3.36	<3	<3	9265	61	80% survival of fish after 96 hrs in 50% effluent
3	Sambhar Lake Near Village Aau, Tehsil- Roopangarh, District- Ajmer	15.06.2020	6500	1189	88	NA	NA	NA	NA	0.868	15472	22400	220	2.75	11.8	NT	<3	<3	NA	NA	NA

Comparative Statement of Water Samples of Sambhar Lake , District Nagaur

S. No.	Point of Collection	Date of Collection	pH	COD	BOD	Amm. N	Free Ammonia	PO4	Resi. CL	S-	TSS	Cu	Zn	Ni	Pb	T. Cr	Fe	Cd
1	Gudha Kyaar, Sambhar Lake, Tehsil- Nawa, District- Nagaur	17.11.2019	9.65	472	31	NT	NT	0.5	NT	NT	143	0.072	0.288	0.019	0.019	NT	1.84	NT
2	Sambhar Lake, Village- Mohanpura, Tehsil- Nawan, District- Nagaur	18.11.2019	9.21	236	11	NT	NT	1.2	NT	NT	81	0.052	0.287	0.16	0.058	NT	2.91	NT
3	Opposite site of Sambhar Salt Limited, Nawa City, District- Nagaur	18.11.2019	9.18	378	22	NT	NT	0.5	NT	NT	103	0.051	0.286	0.066	NT	NT	3.88	NT
4	Outlet from recirculation tank of M/s Sambhar Salt Ltd., Plant- Refinery, Nawa City, District- Nagaur	17.11.2019	8.49	1968	55	4.48	0.65	1	NT	NT	886	0.368	0.238	0.191	0.08	NT	3.1	NT
5	Jhapok Dam Near Pump House, Sambhar Lake	17.11.2019	9.49	331	20	NT	NT	0.5	NT	NT	87	0.05	0.223	0.099	NT	NT	4.65	NT
6	Water of Tubewell near Sambhar Lake, Village-	18.11.2019	7.54	2881	118	NT	NT	0.9	NT	NT	436	0.303	0.28	0.143	0.083	NT	1.3	NT
7	Water of Tubewell near Sambhar Salt Refinery, Nawa	18.11.2019	9.1	1212	38	12.88	3.9	1.5	NT	NT	488	0.284	0.259	0.05	0.098	NT	1	NT
8	Jhapok Dam Near Pump House, Sambhar Lake	15.06.2020	8.77	1667	98	7.84	2.3	5.5	NT	NT	2460	0.102	0.041	0.339	0.442	0.013	3.72	0.018
9	Gudha Kyaar, Sambhar Lake, Tehsil- Nawa, District- Nagaur	15.06.2020	9.17	397	33	5.6	2.9	6.5	NT	NT	312	0.135	NT	0.18	0.135	NT	3.25	NT
10	Water of Open Well, Near office of Manager Sambhar	15.06.2020	8.79	873	61	31.4	9.5	10	NT	NT	1267	0.225	NT	0.351	0.225	0.014	2.52	0.011
11	Outlet from recirculation tank of M/s Sambhar Salt Ltd., Plant- Refinery, Nawa City, District- Nagaur	15.06.2020	8.89	635	51	NT	NT	8.5	NT	NT	1055	0.157	NT	0.451	0.157	0.012	3.6	0.01
12	Water of Tubewell near Sambhar Salt Refinery, Nawa	15.06.2020	8.4	794	59	NT	NT	6	NT	NT	386	0.105	NT	0.111	0.105	NT	1.87	NT
13	Opposite site of Sambhar Salt Limited, Nawa City,	15.06.2020	9.21	1111	71	3.4	1.8	11.5	NT	NT	632	0.204	NT	0.441	0.204	NT	2.97	0.012

S. No.	Point of Collection	Date of Collection	Cl	SO4	TH	CaH	MgH	Ca	Mg	F	TDS	Cond. In μ s	T. Alk.	DO	Salinity gm/kg	TKN	Faecal Coliform	Total Coliform	Na	K	Bio-Assay Test
1	Gudha Kyaar, Sambhar Lake, Tehsil- Nawa, District- Nagaur	17.11.2019	11471	3333	Not analysed	3.86	19824	22900	680	1.82	20.7	NT	<3	9	7300	66	80% survival of fish after 96 hrs of 25% effluent				
2	Sambhar Lake, Village- Mohanpura, Tehsil- Nawan, District- Nagaur	18.11.2019	7020	2400	Not analysed	2.36	14938	19860	408	3.36	12.7	NT	9	14	5000	50	90% survival of fish after 96 hrs of 100% effluent				
3	Opposite site of Sambhar Salt Limited, Nawa City, District- Nagaur	18.11.2019	6529	2500	Not analysed	2.31	13936	19240	380	3.09	11.81	NT	<3	<3	4800	47	100% survival of fish after 96 hrs of 100% effluent				
4	Outlet from recirculation tank of M/s Sambhar Salt Ltd., Plant- Refinery, Nawa City, District- Nagaur	17.11.2019	145000	70778	Not analysed	5.16	313380	360000	570	0.82	262	5.04	<3	<3	85500	205	40% survival of fish after 96 hrs in 5 % effluent				
5	Jhapok Dam Near Pump House, Sambhar Lake	17.11.2019	8196	2622	Not analysed	3.05	17098	19200	536	1.91	14.8	NT	<3	<3	6000	53	50% survival of fish after 96 hrs in 25 % effluent				
6	Water of Tubewell near Sambhar Lake, Village- Mohanpura, Tehsil- Nawa, District- Nagaur	18.11.2019	70196	32833	Not analysed	1.36	144736	190800	1380	1.27	126.7	NT	<3	<3	46000	396	30% survival of fish after 96 hrs in 10 % effluent				
7	Water of Tubewell near Sambhar Salt Refinery, Nawa City, Tehsil- Nawa, District- Nagaur	18.11.2019	72255	25722	Not analysed	10.6	150988	199600	6000	1.18	130	14	<3	<3	54000	250	10% survival of fish after 96 hrs in 5 % effluent				
8	Jhapok Dam Near Pump House, Sambhar Lake	15.06.2020	147500	17933	84	Not analysed	Not analysed	Not analysed	Not analysed	6.73	333088	411000	6570	NT	266	9	<3	<3	Not analysed	Not analysed	Not analysed
9	Gudha Kyaar, Sambhar Lake, Tehsil- Nawa, District- Nagaur	15.06.2020	30500	5478	80	Not analysed	Not analysed	Not analysed	Not analysed	5.1	72332	97800	1270	0.78	55.1	6.7	4	7	Not analysed	Not analysed	Not analysed
10	Water of Open Well, Near office of Manager Sambhar Salt Ltd., Gudha, Tehsil- Nawa, District- Nagaur	15.06.2020	118000	15144	88	Not analysed	Not analysed	Not analysed	Not analysed	3.78	267292	324000	2990	0.39	213	34.7	<3	<3	Not analysed	Not analysed	Not analysed
11	Outlet from recirculation tank of M/s Sambhar Salt Ltd., Plant- Refinery, Nawa City, District- Nagaur	15.06.2020	146500	10911	656	Not analysed	Not analysed	Not analysed	Not analysed	1.07	314892	389000	3420	NT	264	NT	<3	4	Not analysed	Not analysed	Not analysed
12	Water of Tubewell near Sambhar Salt Refinery, Nawa City, Tehsil- Nawa, District- Nagaur	15.06.2020	52300	8722	76	Not analysed	Not analysed	Not analysed	Not analysed	1.59	122320	166000	2840	1.57	94.4	NT	<3	<3	Not analysed	Not analysed	Not analysed
13	Opposite site of Sambhar Salt Limited, Nawa City, District- Nagaur	15.06.2020	83100	8456	100	Not analysed	Not analysed	Not analysed	Not analysed	4.77	183628	222000	2910	NT	150	4.5	<3	<3	Not analysed	Not analysed	Not analysed