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Citizens Role in Ecological, Limnological, Hydrological Conservation of Udaipur Lake System

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ABSTRACT

Udaipur is city of lakes having world famous six big lakes like Pichhola, Fatehsagar etc and around hundred small lakes. The lake system of Udaipur support and sustain ground water recharge, drinking ,agricultural, industrial ,ecological water availability and employment to 60% population through tourism. The main threats to the lake system are:- catchment area degradation, dumping of solid , liquid waste, encroachments, destruction of submergence areas, over exploitation of water, poor governance and lack of citizens, stakeholders participation in management of lakes. Many of small lakes are now extinct.

The efforts to save lakes for the future started in 1980, but due to poor technical and scientific footings, the unorganized citizens movements were not achieving desired results .A group of volunteers realized this and constituted a committee namely "Jheel Sanrakshan Samiti(lake conservation society) in the year 1992.

JSS complied details on morphology, sources and status of pollution, aquatic life, stream flow pattern, lake water balance etc .To maintain minimum conservation pool level in Pichhola and Fatehsagar, hydrological researches by JSS paved the way for the government to implement the water augmentation schemes . Water hyacinth was eradicated through Biological measures. Sewerage plan was prepared by the JSS, part of which has been implemented. The Government has sanctioned conservation work. The importance of small water bodies located on percolation zones, is scientifically explained and now almost thirty six small lakes have been earmarked for restoration. The watershed basins are in the process of systematic destruction but efforts are on to protect them through legal efforts.

The citizen movement of Udaipur is probably unique throughout the world working for ecological, hydrological and limnological conservation of lakes as per the "world lake vision" with absolutely NO funds .The present paper underlines the strength, successes, failures, and authors' role in it.

Keywords: Lakes, big, small, problems, citizens, voluntarism, movement, successes

UDAIPUR LAKE SYSTEM:

Udaipur (24 35' latitude & 73 42' longitude) lies at an altitude of 578 mtrs. above sea level. It has three main lakes in its upper catchment area, six lakes within its municipal boundary, one lake in downstream. There are around 100 small lakes like Roopsagar, Nela, Jogi Ka Talab etc.

The Udaipur lake system, arising out of the river Berach (Banas Basin) and its tributaries, is an integral component of the upper Berach basin .The upper Berach basin is a part of the Gangetic river system, wherein the river Berach meets Ganga through the rivers Banas, Chambal & Yamuna. More than three-fourth portion of the region is a part of the oldest mountain ranges of Aravalis from where originate the different tributaries of the Berach River .

The general slope of the basin is eastward. However from Madar to Udaisagar it is in southeasterly direction . The average height of the area is between 650 to 900 meters.

Description of Water Bodies of Udaipur Lake System :

The Udaipur Lake System can be divided into the following categories:

1. Upper lakes :- Lake Badi , Chhota Madar & Bada Madar.
2. City Lakes - Lake Pichhola, Fateh Sagar, Swaroop Sagar, Rang Sagar, Kumharia Talab , Goverdhan Sagar.
3. Downstream Lake :- Lake Udai Sagar
4. River :- River Ahar.
5. Small Lakes in north and south of Ahar River.

Watershed (Catchment Areas) :-

1. Bada Madar : 8780.48 ha
2. Chhota Madar : 2987.23 ha
3. Badi Lake : 1906.55 ha

These three lakes drain into

4. Fateh Sagar Lake : 4325.35 ha
5. Pichhola Lake : 14610.63 ha
   Drain into Udaisagar
6. Goverdhan Sagar : 814 ha
7. Ahar River : 16484 ha
8. Udaisagar Lake : 19684 ha

Udaipur City Lakes

Fateh Sagar:

This medium-sized perennial reservoir is somewhat pear-shaped in its outline. It is situated in the north of the Udaipur city as a part of western lake frontage. This lake was first constructed in the year 1678, and later renovated in 1889 by Maharana Fatehsingh & Duke of Connaught . The dam of the reservoir is 720 meters in length and lake comes from another reservoir called Madar situated at a higher altitude, about 15 kms away. Besides this, several seasonal nallah's runoffs and nallah(water channel) from lake Bari also contribute to the impoundment of the lake. The length of the shore line is 8.5 kms.

Pichhola :-

The lake was initially constructed by a "banjara" (Nomads) chieftain towards the end of 14th century and its embankment was further raised by Maharana Udaisingh in 1559 ad. The water spread of the lake is 696 ha. The river Sisarma, a tributary of river Kotra, is the chief source of the water for this lake. The maximum depth of the lake is 10.50m.

Rangsagar :

Constructed in 1668, this lake has a length of 1030mtrs. and a width of 245 mtrs.It has a maximum depth of 7 m. It is a small lake with water spread of 13.6 ha, along the western waterfront of Udaipur.

***Kumharia Talab* :-**

The portion between Rangsagar and Pichhola is known as Kumharia talab .

Swaroopsagar :

Northward to the Rangsagar is the ultimate part of Pichhola lake known as Swaroopsagar , which provides wastewear for Pichhola. Swaroopsagar is connected to Fatehsagar through a link canal, which is used to draw water in Fatehsagar during monsoon when Pichhola maintains a higher water level. On the eastern side there is a masonry dam .

Goverdhan Sagar :

Towards the southeast of pichhola, there is a very small lake known as Goverdhan Sagar. This lake has not received any attention from the conservation point of view.

Many small lakes.-

There are around hundred small lakes north and south to Ahar river. These small lakes act as flood control and ground water recharge basins and play an important role in ecological balance.

Present Status of Pollution .

Catchment Area Degradation :

Catchments areas are sources of water for the lakes and also for the underground reservoirs. The continuous degradation of these catchments areas has resulted in depletion of useful flora & fauna of the region Soil erosion has caused deposition of sediments in the Lakes. The degradation of the catchments area disturbs the whole eco- system of the area.

The vegetative cover in almost entire catchments areas is very poor.Forest area less than 10 % ; not sufficient to meet the food, fuel, fodder and other requirements of the human as well as live-stock population of the area.

The high velocity run-offs, coming from barren hills and degraded areas have also been severely damaging the arable lands situated in the valleys and lower reaches. The catchment areas are highly degraded and ground water has depleted to alarming level: Badgaon & Girva blocks are Overexploited and Gogunda block as Critical.

Pollution of Lakes :

The upper lakes like Chhota Madar ,Bada Madar & Badi are free from any significant anthropogenic pollution. But in last three years, there hydrological regime has been severely damaged and disturbed due to construction of national highway project. The city & downstream lakes are heavily polluted and are facing an imminent danger of irreparable degeneration.

The small lakes are facing the threats of encroachments. The physical setting of the Udaipur city enhances the flow of pollutants into the lakes. Most of the hotels (more then 100 in numbers) along with 6000 residential houses accommodating 33000 populations are located on the lake slopes. Around 100 thousand populations, residing in the vicinity of lakes, release all sorts of dirt and drain waste water into the lakes. The garbage collected from the roads, dirt thrown from the houses, debris of the dilapidated houses, and dead animals are thrown on the banks of the lakes. 73 Ghats (used for bathing and washing), 42 garbage spots, 45 drain spots and 118 open defecations spots, all of which release a shocking quantity of pollutants into the lakes. The people

living in the walled city look towards the lakes for bathing and sanitary facilities.

The people perform their religious rituals and ablutions at the lakeside. Muslims and Hindus submerge their religious creations (Tajias & idols) into the lakes.The lakes are subjected to heavy organic contamination. The increased commercial activities have also contributed considerably to the water pollution. There are more than 30 brick kilns which have encroached upon the lakebed, some of them are removed recently. The total outcome of the above activities is the heavy loading of lake waters with phosphate and nitrates. These two elements basically increase the botanical fertility of lake water. This is the main reason of intermittent, but luxurious growth of Water Hyacinth. The lake bottom is also covered with a thick mat of submerged vegetation. In some portions of the lakes, there is presence of floating micro algae which are detrimental to the public health, and harbor varieties of harmful organisms. In the catchment area of Fatehsagar Lake, effluents from synthetic fiber mills and soft drink plant etc are discharged. Apart from bathing, vehicles are also washed in Lake Fateh Sagar.There is prolific growth of foul-smelling Blue Green algae, which is neuro toxic and cannot be eradicated by normal filtration.

The lakes are continuously facing the threat of illegal construction despite the Government's notification of "No Construction Zone "(17-01-1997) and High Courts interventions. Over the last 25-30 years, massive deforestation and faulty land-use practices have severely degraded the catchments of the lakes of Udaipur, resulting in increased inflow of sediments into these water bodies. The solid waste disposal around the periphery is further worsening the situation. Further, the rate of organic matter production by water hyacinth leads to silting @ 0.7 cm per year. The continuous sedimentation has not only reduced the water holding capacity but the quality of water is also being deteriorated severely. Silting has reduced the original depth of lakes and thus a significant part of water (nearly 20%) gets evaporated, due to increased water spread. Sediment-depositions in Udaipur city lakes, which are having 25.77 mcm gross storage capacity, are of the order of 10 mcm i.e. around 40 % capacity has been already reduced.

There are around 13 deep borewells in Fateh Sagar Lake . The water supply department(PHED) takes water from two intakes in FS and from one intake in Pichhola. Authorities draw water even after the water goes far below the sill level. Frequent drying up of the lakes is now a general feature.

Eutrophication :

The deposition of the sediments & continuous organic loading have not only affected the quality of water originally retained by the lakes but has drastically deteriorated the quality also. The whole lake eco system is in great danger.

The deposition is having a high percentage of nutrients, it has severely disturbed the natural ecological balance of the lakes. This eutrophic state clearly indicated that there is not much life-span left for these lakes. It is relevant to mention here that the Udaipur lakes are in an advanced stage of eutrophication .

Drinking Water Quality :

The bacteriological analysis of sediments, conducted by Jheel Sanrakshan Samiti revealed that the deposits have a very high contents pathogenic organisms. It is found that Udaipur lakes, specially Pichhola , harbor *citrobactter* and *strepto faecaii*,in addition to *E.coli*. The most concerning matter is the occurrence of ova of *Ascaris, cysts of E.histolytica, Giardia and Trichuria trichuria* in Udaipur lakes. This means that any amount of chlorination and treatment by other available chemicals will not make the water potable.

Even short time boiling of water may not kill the cysts and ova of these harmful organisms; therefore, a large part of the local residents is suffering from water borne diseases like *paratyphoid, typhoid, dysentery, infective colitis, gastro enteritis, hepatitis etc.*

Destruction of small lakes:

The lake beds are encroached upon, The embankment and outlet structures are severely damaged and Inlet Channels are destroyed. JSS objected the ongoing destruction of small lakes. JSS filed a PIL in the Rajasthan High Court in the year 2005 and court has instructed the government to restore the small lakes. Now, Government has undertaken 36 small lakes under conservation plan. Keeping its citizens role, JSS has submitted a detailed conservation plan to the Government.

JHEEL SANRAKSHAN SAMITI :

The Jheel Sanrakshan Samiti (JSS) grew out of socially sensitive voluntarism and committed nongovernmental organizations working over decades in a public spirited way in the city of Udaipur. The JSS(The Lake Conservation Society) was formally constituted in the year 1992 and got registered in the year 1995. The society is also registered with Global Water Partnership. In its concept it was committed to arrest and reverse the fast deterioration of the lakes of southern Rajasthan .Today, the JSS has attained the status of one of the leading NGO on lakes throughout the India. The JSS consists of concerned citizens from different walks of life including lake conservation professionals. All members are committed for long term and sustainable conservation of lakes and wetlands and

are contributing honorarily.JSS carry the faith that beyond constitutional rights , a democracy requires citizens committed towards sustainable development.JSS has won respect for itself as an honest pressure group and efficient scientific body for the conservation of wetlands. The JSS is constructive, responsible and cooperative but it has also been vigilant and critical where there are administrative neglect, suspected corruption and such ulterior commercialization which threatens future of wetlands.The JSS organizes rallys,seminars,street plays,etc regularly. It has worked on many lakes of southern Rajasthant. JSS has organized an important seminar to prepare management plan for the conservation of small and big lakes of south Asia in collaboration with GWP.

Hydrological Conservation of Lakes:

Catchment area conservation:

1. Pichhola water shed project of Rs 34.2 million was formulated by district administration. Under this project, 4600 ha land was to be put under different treatment measures.
2. 16 villages, covering an area of 12702 ha, were covered under this project, which was sanctioned by the Government of India in 1995-1996, as a result of the efforts of Jheel Sanrakshan Samiti.(Lake Conservation Society, an NGO).
3. Jheel Sanrakshan Samiti prepared a detailed plan for the conservation of catchment areas. The plan for the big lakes has been approved by the Government of India.
4. JSS is happy to share that high court has upheld most of the suggestions and directed the Government of Rajasthan to conserve the catchment areas of small and big lakes.
5. JSS has prepared a puppet show and street play in local language to educate the village community about conservation of forest and water. The show is conducted in villages of catchment area.
6. Due to poor construction the sewerage man holes were leaking. The lake water was draining into the sewer line. Every day around two mld water was flowing out of the lakes, endangering the hydrological balance of the lakes.JSS raised the issue, identified the leakages points and presented the repairing plan to the Government. The problem was almost solved with the active participation of citizens.
7. On the suggestion of JSS, Lining of Madar Feeder Canal carrying rain water to Fatehsagar lake, was completed in June 2005,improving its carrying capacity.
8. The Government of Rajasthan has decided not to develop any industrial area in the immediate catchment of Udaipur city Lakes.

(1) ***Water Augmentation: -***

Over the last 10 years, because of less rainfall & degradation of the catchment, the maximum & minimum water levels are continuously receding.. Lakes were totally empty from 1998 to July 2005. Lakes are the source of tourism attraction & ground water recharge. Ground water contribution to Udaipur water supply is around 25%which is from 83 local wells, more than 2000 hand-pumps & 3000 domestic wells, which are mainly recharged by seepage from the lakes. The dry lakes impose direct adverse impact on tourism. NO Water – No Tourists. Considering the social, economic (revenue generation out of tourism is of the order of Rs. 15000 million), historical, cultural & ecological importance of Udaipur lakes ,JSS campaigned and prepared detailed technical reports to augment the water of these lakes by transferring the surplus water of nearby Sabarmati Basin. General public, administrative departments and political leaders were educated that by doing such inter-basin transfer of surplus waters , the lakes will at least have water above sill level throughout the year & ground water level of the city would be maintained at fairly high level minimizing the consumption on electricity in fetching the water from less depth and maintaining the ecological balance. A movement was started to implement such schemes for maintaining the hydrological balance of the lakes & sustainability of the entire lake eco system. JSS approached the High court also which passed the desired orders. Ultimately, Government of Rajasthan approved and sanctioned Mansiwakal and Dewas schemes. .The water of Mansiwakal reservoir is supplied for drinking water supply whereas the water of Dewas reservoirs will be brought to Pichhola lake.

Conservation of small lakes: JSS objected the ongoing destruction of small lakes .Besides strong public movement against destruction, JSS filed a PIL in the Rajasthan High Court in the year 2005 and court has instructed the government to restore the small lakes. Now, Government has undertaken 42 lakes under conservation plan. Keeping its citizens role, JSS has submitted a detailed conservation plan to the Government.

(1) JSS organize silt removal programs on regular basis.
(2) JSS is in the process of developing reservoir operation policy so as to keep and maintain the minimum conservation pool level of at least 10% of the total storage capacity the lakes at all times.

Ecological Conservation Works:

1. JSS prepared Master Plan of Udaipur lakes, showing complete details of polluted areas, drain spots, garbage points etc.
2. On the basis of this Plan, in the year 1993, "Clean Lake Project" was formulated by the U I T, but could not be implemented due to paucity of funds.
3. National Lake Conservation Plan includes a proposal of sewerage system, costing 140 million Rs. around the lakes of Udaipur.(The pre-feasibility report was prepared by the JSS in 1995).
4. On the basis of draft plan prepared and submitted by the JSS,In the year 1997-1998, Rs 120 million sewerage project was sanctioned. Work got started in year 2000.Around 23 km sewerage lines with 1800 main holes have been laid.
5. On the suggestion of JSS, high flood levels (HFLs)of the lakes have been marked and stone pillars have been put on the ground. On the demand of JSS,the Govt of Rajasthan, in January 1998 notified the khasaras (land blocks) lying in HFL limits under article 4 of Rajasthan Land Acquisition Act, for survey etc., details of which are as under:
6. On the recommendation of concerned citizens, Government of Rajasthan declared "no construction zone" around the lakes, through detailed notification dated 17-01-1997. This notification is based on guidelines of NLCP, Supreme Court Directives & suggestions made by NGOs & PUBLIC REPRESENTATIVES .Rajasthan High court in its decision dated 6th Feb. 2007 has maintained this notification as such.
7. NLCP :- National Lake Conservation Plan was formulated by the Ministry of Environment & Forests, Govt of India, in 1994-95.The 21 most polluted urban lakes were selected for their conservation .Udaipur lakes fortunately found a place among the first 10 lakes taken in first phase. The feasibility reports were prepared by JSS & AIC Watson & submitted to the ministry. The Udaipur Lake Project got technically approved with a financial layout of 1480 millions.. JSS requested in person to the Prime Minister of India to intervene in this matter in July 2006. This resulted in preparation of detailed project report by the state government. As per the conditions of the plan, financial sharing would be - State Govt. 10%, local bodies – 10 %, public participation 10% and central govt. – 70%.
8. JSS requested the Government to lay Sewerage lines around other lakes also and to establish sewerage treatment so as not to pollute river and downstream Udaisagar lake. On the request of JSS, the Government Rajasthan has cleared the proposals of sewerage lines and STP.
9. Since village Sisarma, which is just upstream of Pichhola, is directly draining into the lake, JSS prepared the design of an Oxidation pond for this and submitted it to the Government for implementation. On the basis of consistent requests of JSS, The military area people, just south of the Pichhola have constructed an oxidation pond to treat the waste water of military cant area.

Limnological Conservation Works:

1. Hyacinth controlling Bio Agents: -Water hyacinth belongs to Family Pontederiaceae, which is an entirely aquatic group found only in fresh water. The plant is enormously productive; it propagates by vegetative and sexual methods. It has been estimated that one acre of the weed can produce up to 60 tons of dry organic matter annually. The seeds of Water Hyacinth can remain viable for as long as 20 years. The plants can double their number in 10 days. It increases the losses of water up to 10% through evapo-transpiration. Water Hyacinth has been a great problem for the lakes .It impairs the quality of water, imparts obnoxious smell and serves as alternate host of destructive pathogens & mosquito larvae. It makes the water unfit for human consumption.
2. The public of Udaipur is greatly aware of this problem and has, several times, participated in the campaign of removal of water hyacinth in the last 25 years.JSS found that biological control of W.H. is the only permanent and cost effective solution. Two types of Weevils namely N. Eichhorniae & N. Bruchi from ICHR Bangalore were released in the year 1996.One more unit of insects was released in the year 1998 by the efforts of the then Collector.

   JSS conducted a detailed study on performance of insects in the first week of January 1999 and found that the length of the plant & the density of the biomass (Weight per Sq meter) were reduced by 50 to 80 %. Number of plants in one square meter area was also reduced significantly.
3. Bio control of other aquatic Weeds: Though the local citizens groups associated with JSS remove the surface and submerged aquatic weeds like hydrilla,vallisneria and lemna on every Sunday, only biological control and reversal of eutrophication can solve this

menace. JSS prepared a technical plan to introduce and maintain grass carp fishes in the lakes .On the request of JSS grass carp fishes will be released into the Pichhola Lake on the inauguration day of world lake conference 2007. JSS is of the opinion that the protection of native fish species & rejuvenation of certain conservatory type fishery plays an important role in the water quality control, conservation & upkeep of the entire lake system. In Udaipur waters the biodiversity in fish population is fairly good. Almost all the species available in northern India were present in Udaipur water. However, because of the changing ecological scenario, several species have disappeared from Udaipur lake system, including some of the most promising commercial and game fisheries. The bigger sized Indian major carps are also fast disappearing .

Institutional mechanism and governance issues for the conservation of lakes.

The conservation & protection of Udaipur Lake System is multidisciplinary task of wide magnitude. It invites cooperation, coordination & accountability of various agencies. Right from 1992, the JSS is campaigning hard to constitute "Lake Development Authority". On the desire of the then Chief Secretary of Government of Rajasthan, JSS prepared a detailed draft of LDA and submitted it to the Chief Secretary in February 1995.

In the year 1995, the Lake System of Udaipur was included in the National Lake Conservation Plan of Ministry of environment & Forest. & The need of LDA was stressed upon as per the direction of the MOEF for effective & integrated implementation of the project. The matter regarding creation of the LDA was then taken on record in the 43rd meeting of Committees of Secretaries, Administrative Reforms & Coordination Department, Govt. of Rajasthan, held on 6th march 1996.The COS discussed the matter in detail and following decision was taken- "Matter regarding creation of LDA will be examined by the UDH department in the light of the Municipal Act and matter be put up to consideration of C.O.S".

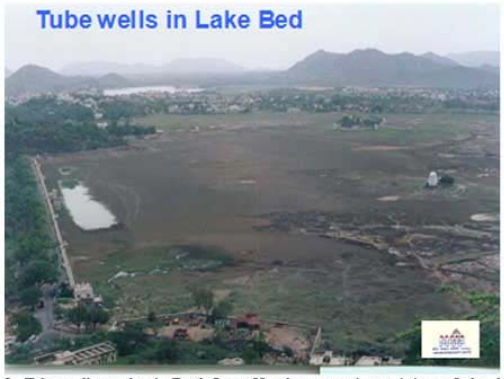
In the year 1997(29-08-1997), a Task Force was constituted by the divisional commissioner Udaipur, which comprised of 10 district level officials & a representative of JSS. It was decided that the task force will undertake periodic inspections, at least once in a week and take all possible actions to ensure the protection of the city lakes.

In a meeting held under the chairmanship of Secretary, Environment on 12-11-1997, Govt. of Rajasthan, discuss the issues related to discuss the issues related to NLCP for Udaipur Lake System. The Following decisions were taken

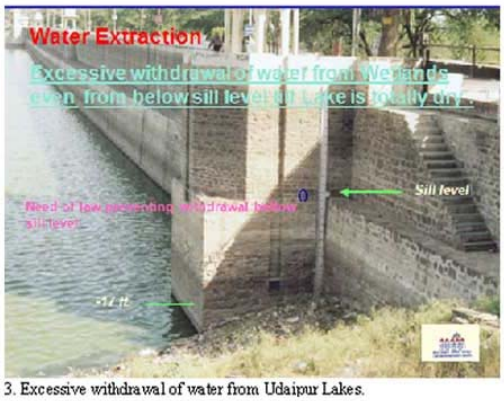
a. As per the direction of the Ministry of Environment & Forests, Govt. of India, A Lake Authority at the district level should be constituted under the chairmanship of the Collector for the integrated implementation of the project.
b. The district level officers of the implementing agencies will be the members of this Authority.
c. The proposals for the constitution & working of the LDA should be prepared by the Collector, Udaipur and be submitted to Environment Department for further action at the level of state Govt.
d. The committee of experts at the regional level should be constituted at the level of Divisional Commissioner.

Present Ad-hoc Arrangement: -

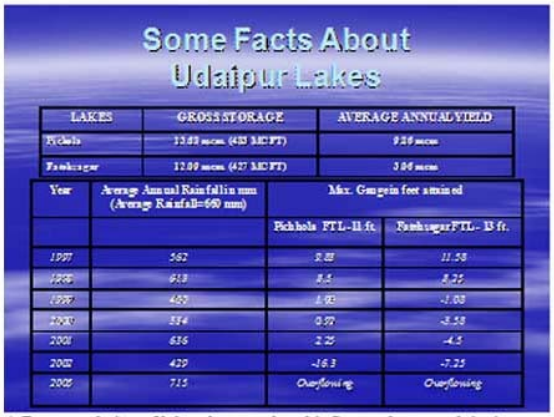
A city level LAKE DEVELOPMENT SOCIETY named "Jheel Samverdhan & Vikas Society" (JSVS) was constituted in the year 2000 under the Chairmanship of Divisional Commissioner, Udaipur with Secretary UIT (Urban Improvement Trust) as its Secretary General & chief executive Officer. Further, on the basis of public interest litigations (PIL nos.3687/97 & 4271/99) filed in the Hon'ble High court of Rajasthan by JSS, the High Court on 8th may 2000 gave administrative and financial powers to this committee.JSS is still trying hard to have LDA not only for the Udaipur but for whole of the state . JSS has also drafted a bill for the management of lakes and ponds of the Rajasthan and submitted it to the Government. The High Court, in its final judgment on 6th Februarys 2007 has upheld the request and directed the government to constitute the LDA for Udaipur.



2. Tube wells are dug in Fateh Sagar.Hotel construction activity on Lake shore.



3. Excessive withdrawal of water from Udaipur Lakes.

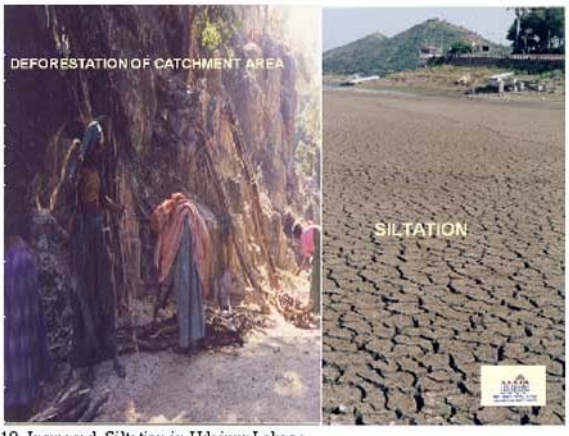


4. Frequent drying of lakes due to reduced inflow and overexploitation

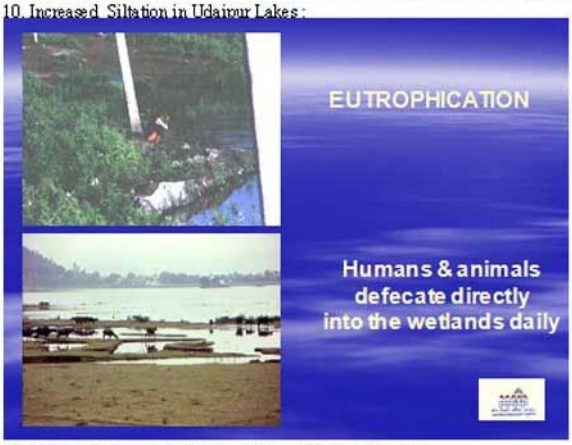
5. There is no single and accountable agency for conservation of Lakes.

8. Attempt to construct Road in Roopsagar Lake (Another small lake)

9. Destruction of Naila Lake

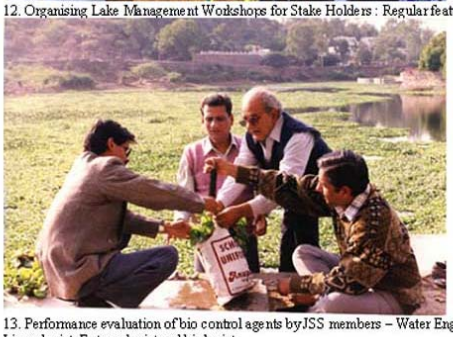


10. Increased Siltation in Udaipur Lakes :



11. Udaipur Lakes are in Advance Stage of Eutrophication

12. Organising Lake Management Workshops for Stake Holders : Regular feature of JSS.



13. Performance evaluation of bio control agents by JSS members – Water Engineer, Limnologist, Entomologist and biologist.

14. Eradication of Water Hyacinth by the efforts of JSS

15. Prime Minister Dr. Manmohan Singh and President Smt. Pratibha Patil (The Then Governor of Rajasthan) visiting J.S.S. contribution in Exhibition at Vidhya Bhawan, Udaipur.

16. Felicitation of Chief Minister of Rajasthan Smt. Raje, Water Resource Minister and Home Minister by JSS on the occasion of Lake Water Augmentation (Devas) Scheme .

6. Colonisation in Rundela Lake (A small Lake)

7. Indiscriminate Marble Slurry Dumping in the Main Drainage Valley of Roop Sagar Lake