

“REVIVING STRATEGIES OF TRADITIONAL WATER BODIES AS A CATALYST TO GROWTH & DEVELOPMENT TO TOURISM OF JAISALMER CITY.”

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ABSTRACT

Cities and towns evolve and expand mainly as a result of their geographic location and physical climate. The availability of water in different forms in its natural setting contributes significantly to the improvement of the physical climate, biodiversity, and tourism. The protection of water bodies is often overlooked in construction projects. As a result, restoration, conservation, and protection are important. Water bodies are a major factor that contributes to an area's long-term growth. Furthermore, the existence of water bodies adds to the psychological importance of the environment. It entails (a) improving the aesthetic quality of the city, thereby contributing to its image, and (b) improving tourism, biodiversity, and the environment.

Objective of this paper is an attempt to:

1. Analyze water bodies which are linked together and their catchment area in Jaisalmer city.
2. Analyze the water quality and quantity and how to enhance and maintain quality and quantity of water for flora and fauna of the water body.
3. Develop strategies for enhancing and maintaining of biodiversity of water body, its environment and also for tourism.
4. Study financial feasibility of the development project.

These aspects are covered, in relation to Gadisar lake, Jaisalmer, Rajasthan.

Keywords: Tourism, Biodiversity, physical environment, water bodies, financial feasibility.

INTRODUCTION

Water Resources

The city has few large and medium sized water bodies like Gadisar Sagar, Gajroop Sagar, Amar Sagar, Gulab Sagar, Ranisar Talab, Ganga Sagar, etc. Gadisar Lake is the major

water body in the city and is linked to Rani talab through natural drainage channel. The city and surrounding areas have approximately 150 big and small ponds. Many of these ponds are interlinked with each other and need to be conserved as they play an important role in facilitating recharge of water table. Tree cover in the catchment area is minimal which increases evaporative losses from various lakes. Given the topography around the city and the fort, runoff from the region also causes erosion.

Demarcation Of All The Water Bodies Of Jaisalmer

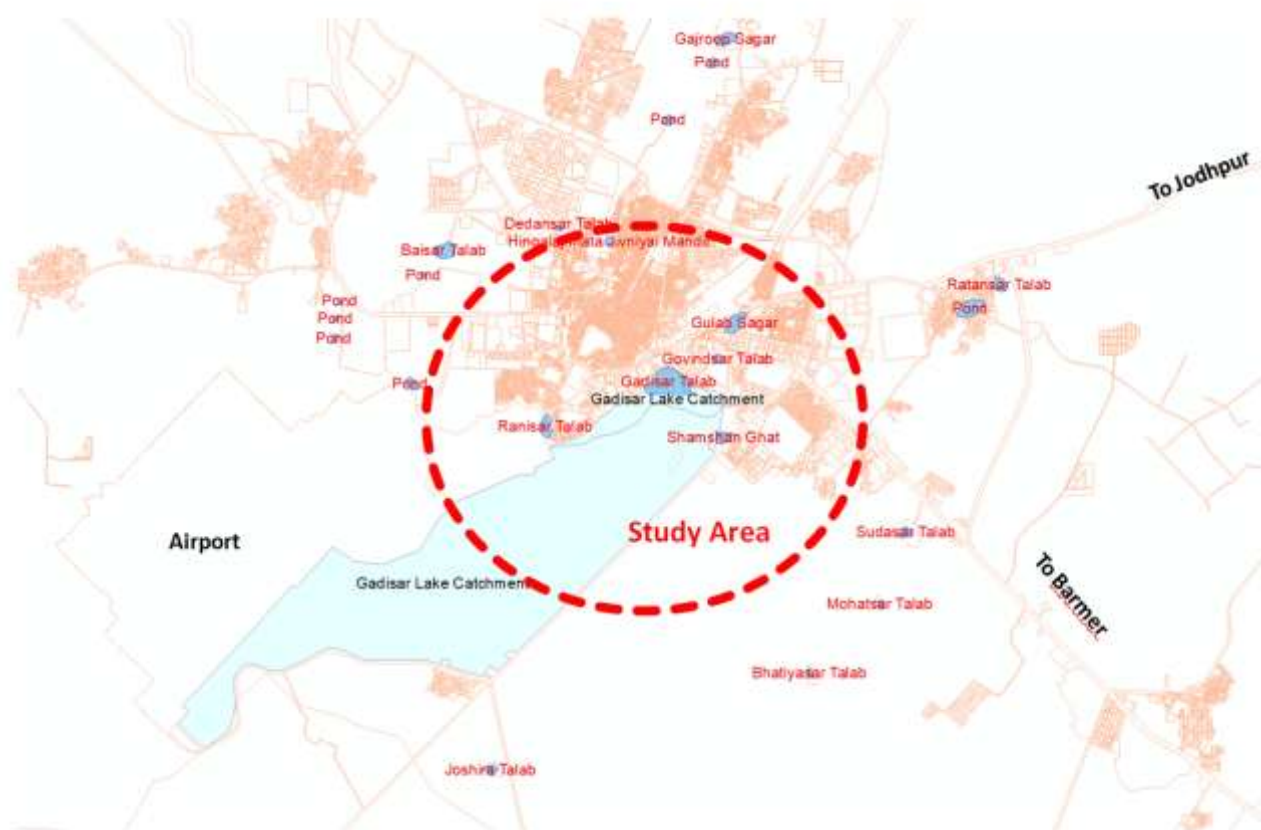


Figure 1 Demarcation Of All The Water Bodies Of Jaisalmer (self created on GIS)

Gadisar Lake & Connecting Water Bodies and their khasra number

Table 1 Water Bodies & Khasra Number, Jaisalmer (Source: Primary Data From Municipal Council, Jaisalmer)

S.No	Water Body	Khasra Number
1	Gadisar talaab	Khasra no. 488, 489, 494
2	Govind sagar	Khasra no. 475, 476
3	Gulab nagar	Khasra no. 407, 406

Gadisar Lake

Historical Importance

Gadisar Lake is a man-made lake that was founded in 1400 AD by Raja Rawal Jaisal, the first king of Jaisalmer. It was later redesigned during Maharwal Gadsingh's reign. The lake was built to store water that was later used to provide water to the entire town of Jaisalmer. In the current times, the original idea of supplying the lake water to the town is not true, the lake still retains enough rain water throughout the year. The lake also attracts several birds. It is noticed that birds of some species like doves; ducks etc. are seen visiting Gadisar lake during the winter months. Some part of embankment of the lake has ghats, Verandahs, halls, offices, and much more are all decorated. People came to enjoy festivals and attend music and dance performances. All shared ownership of the talab, and everyone was responsible for keeping it clean. The rainwater accumulated in this lake flowed for miles. It was constructed in such a way that when the lake was complete, the excess water drained into a lower-level lake. When that became too full, the extra water flowed into the next lake.

Importance of Gadisar Lake

- Originally used as a source of drinking water for Jaisalmer town.
- Now used only as a source of recreation and observation of religious rites.
- Attracts migratory birds during winters.
- The catchment hosts flora and fauna (wildlife).
- Has potential to become a major tourist attraction.



*Figure 2 Gadisar Lake in Master Plan (Source: Created With
The Master Plan 2031)*

METHODOLOGY

- Identification of the topic rationale.
- Data collection form primary sources, secondary sources.
- Site Analysis & Issue identification related with water bodies.
- Study of geography and catchment areas.
- Relevant case studies.
- Analysis and inferences, Proposals, Recommendations.

Water Quality Test Report of Gadisar Lake, Jaisalmer

Table 2 Water Quality Test Report of Gadisar Lake, Jaisalmer (Source: Primary Data Water Sample Testing Report)

CHEMICAL ANALYSIS					
S. No.	Parameters	Results	Test Method	Units	Limits Max. As per MOEF
1.	pH	6.95	IS : 3025 (P-11)	NA	5.5 to 9.0
2.	Total Dissolved Solids	150	IS : 3025 (P-16)	mg/l	---
3.	Total Suspended Solids	40	IS : 3025 (P-17)	mg/l	100
4.	Oil & Grease	BDL(<5)	IS : 3025 (P-39)	mg/l	10
5.	Chemical Oxygen Demand	20	IS : 3025 (P-58)	mg/l	250
6.	Biochemical Oxygen Demand	4	IS : 3025 (P-44)	mg/l	30

Monthly rate of evaporation and evapo-transpiration (mm)

Table 3 Monthly rate of evaporation and evapo-transpiration (mm) (Source: Central Ground Water Board)

Month	Evaporation	Evapo-transpiration	July	349.0	247.6
January	108.0	70.6	August	297.00	210.7
February	134.0	91.6	September	251.00	192.0
March	232.0	153.2	October	210.0	147.0
April	324.00	203.5	November	140.00	83.7
May	388.0	281.0	December	107.00	64.1
June	349.0	313.4	Total	2768.0	2062.4

Site Analysis & Problem Identification

Gadisar Lake has historically played a significant role in the growth of social fabric of the city as well as in fulfilling the basic requirements of the city's residents; however, with the advent of modern amenities and growth of urban sprawl, the lake has faced major challenges in maintaining its form and significance.

The study identifies the challenges and threats faced by Gadisar Lake in current context; thereby exploring the possibilities of steps that can be taken to conserve the lake along with enhancement biodiversity & tourism.



Figure 3 Parking & Entrance of Gadisar Lake (Source: By Primary Survey)



Figure 4 Upper Pal & Catchment Area of Gadisar lake (Source: By Primary Survey)

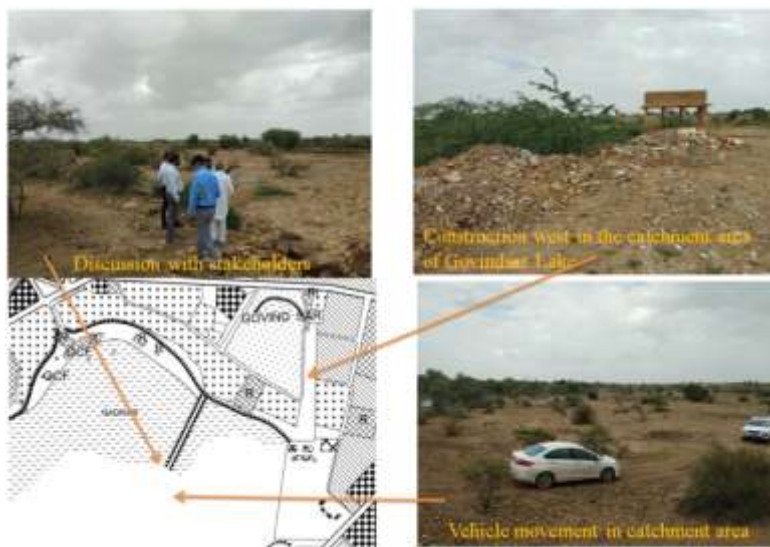


Figure 5 Discussion with Stakeholder (Source: By Primary Survey)

Timeline Google Imagery of Gadisar Lake:

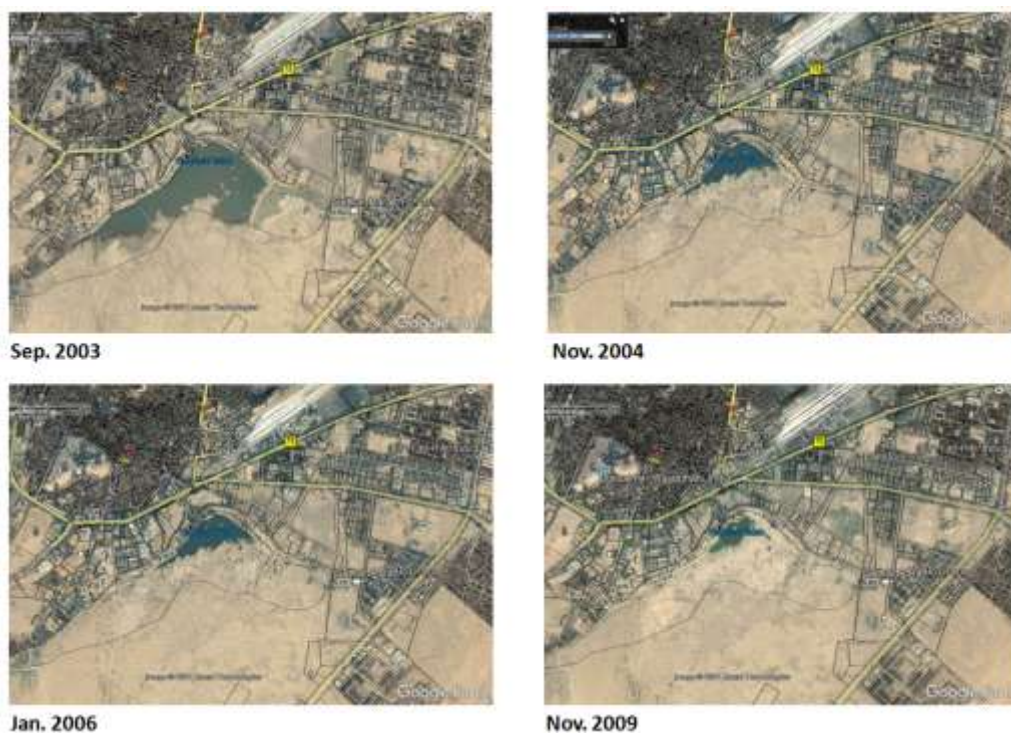


Figure 6 Timeline Google Imagery of Gadisar Lake (Source: Google Earth Year 2003 To 2009)

Issue Identification:

- Instances of drying of lake even during peak tourist season (between the month of November to march)
- The lake occasionally over flows flooding the town (in case of heavy rain).
- Connections to other water bodies have been harmed due to development pressure, thereby leading to instances of flooding of city.
- No support for seasonal migratory bird leading to reduction of visiting birds.
- Shore line is unsightly (due to cremation ground)
- No Shore line development from the perspective of tourists/ local resident's recreation.
- Congestion and lack of parking at entry point of Gadisar lake during peak tourist season(in the month of November to march).
- No administrative/political interest in conservation/revival due to lack of funding and sustainable financial model.

Average rainfall Jaisalmer, India*Table 4 Rainfall Data in mm (Weather Department)*

Station	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
Fatehgarh	333.0	44.5	324.0	148.0	190.0	527.0	187.0	342.0	97.0	396.0	493.0	280.14
Jaisalmer	321.0	63.0	178.0	47.3	220.5	512.8	195.2	173.5	91.0	309.0	277.0	217.12
Nokha	155.0	48.0	209.0	91.0	275.0	59.0	385.0	181.0	175.0	395.0	326.0	209.00
Pokaran	294.3	48.5	194.0	85.0	154.0	141.0	401.0	423.0	84.0	540.0	487.0	259.25
Ramgarh	121.0	9.0	212.0	29.0	57.0	157.0	178.0	139.0	100.0	386.0	162.0	140.91
Sam	79.0	51.0	163.0	77.0	114.0	256.0	184.2	88.0	64.5	226.5	104.0	127.93
Average	217.2	44.0	213.3	79.6	168.4	275.5	255.1	224.4	101.9	375.4	308.2	205.73

The district experiences arid type of climate. The southwest monsoon, which arrives in the district in the first week of July and leaves in the middle of September, accounts for nearly 90% of the total annual rainfall.

- The average amount of annual precipitation is: 210.0 mm (8.27 in)

Wind speed, temperature, humidity of Jaisalmer

The average wind speed in Jaisalmer is 3.9 m/s with the maximum wind speed of around 14 m/s. The average ambient temperature remains 28.4°C, varies from 7.1°C to 47.3°C. The average relative humidity remains around 41.2%, varies from 4% to 92%. Wind blow from the SSW - about 20.46% of all wind directions.

Tourism

The Department of Tourism has listed ten tourism circuits in the state of Rajasthan. The ten circuits span the entire tourism spectrum, including history, religion, culture, adventure, and eco-tourism.

Desert Circuit: Jodhpur-Jaisalmer-Bikaner

The desert circuit is made up of three districts in western Rajasthan: Jodhpur, Jaisalmer, and Bikaner, which rise out of the Thar Desert's golden sands. The circuit is designed to take you to the most popular tourist attractions in each of these three districts (commonly referred to as the Desert Triangle).

Year wise tourism inflow in Jaisalmer:

Table 5 Year Wise Tourism inflow in Jaisalmer (Source: Primary Data from Tourism Department, Jaisalmer)

Tourist Data								
Month	2017		2018		2019		2020	
	Indian	Foreign	Indian	Foreign	Indian	Foreign	Indian	Foreign
Jan.	45690	11609	57716	9530	58260	10230	33290	9604
Feb.	35567	10302	51660	11519	60320	12142	36788	10403
March	31200	9133	47290	10976	40210	10611	30210	5745
April	30316	8412	40402	8963	22119	4708	0	5
May	28807	5074	35740	7900	26290	12142	0	1
June	25720	5606	30410	6120	10923	720	73	6
July	32239	8259	37714	9708	12320	2717	200	9
August	35740	9230	42411	10803	16354	5992	698	15
September	41205	10344	45160	11609	12192	4207	1090	15
October	55530	12105	58600	12860	21293	7991	1500	44
November	61236	13877	65530	15908	29945	11449	12500	67
December	70505	18900	80115	20510	35298	7987	28550	100
Total	493755	122851	592748	136406	345524	90896	144899	26014

Flora and Fauna

Flora

Since the whole area is covered in blown sand, only scattered vegetation can develop. As a result, no botanical divisions can be drawn for this area.

This area's vegetation can be classified as tropical thorn forest. The majority of the flowering plants in the region are shrubs and wild grasses, which only live for a few months after the rains. The main varieties of trees are:

Table 6 List of Trees (Source: Rajasthan District Gazetteer Of Jaisalmer)

S.NO	Botanical Name	Local Name
1	Acacia Nilotica	Babul
2	Acacia Senrgal	Kumta
3	Azadirachta indica	Nim
4	Capparis Aphylla or Capparis decidua	Jal or Karer or Karira
5	Commiphora Mukul	Guggul
6	Prosopis Spicigera	Kabuli Kikar
7	Salvadora Oleoides	MithaJhal or Barapilu
8	Salvadora Persica	Khari Jhal or Chhotapilu
9	Tecomella Undulata	Rohira or Rugtrora
10	Ziziphus Mauritiana	Ber

Prominent trees found in the area are Nim (Azadirachta indica), Babul (Acacia Nilotica) and khejri (prospplspicigera).

Shrubs

The shrubs include the Aernatomentosa (Bui), Calotropsprocera (Safed ak or Akra), CalligonumPolygonoides (Phog), Euphorbia tirucill cum bugeeseBoirs (Jahrbuti) or (Lana), Mimosa rubicaulis (Hajern) and Trianthemmonogyna (Santhi).

Grasses

Following a good rain, the field transforms into a lush green pasture with an abundance of wild grasses. The following are the names of the more important species:

Table 7 List of Grass (Source: Rajasthan District Gazetteer Of Jaisalmer)

S.NO	Local Name	Botanical Name
1	Lamp	<i>Aristida depressa</i>
2	Dhaman	<i>Pennisetum cenchroides</i>
3	Doob	<i>Cynodont dactylon</i>
4	Motha	<i>Cyperus longus</i>
5	Gharaniagas	<i>Chloris virgata</i>
6	Morant	<i>Chloris roxburglina</i>
7	Bharut	<i>Cenchrus catharticus</i>
8	Ganthil	<i>Dactylocteniumaegyptium</i>
9	Phalis	<i>Panicum crusgalli</i>
10	Sivan	<i>Panicum frumentaceum</i>

Fauna

Birds

The birds of this district, which is located in a desert area, are not as numerous as those found in other, more preferred areas of the state. The house crow, jungle crow, pigeon, peacock, parrot, myna, blue jay, hoopoe, bulbul, and robin are among the most common birds. Domesticated birds such as cocks and hens can also be found. The paler coloration of the birds in this area is a distinguishing feature. One distinguishing feature of the birds in this area is that they are paler in colour than their counterparts in the state's eastern districts.

Case Studies

Selected Historic Water Bodies as Case Studies:

1. Mansagar Lake (Jal Mahal), Jaipur
 - Beautification, Development & Restoration, PPP model
2. Anasagar Lake, Ajmer
 - Beautification, Shoreline Development
3. Kankaria Lake, Ahmedabad.
 - Traffic management plan, Shoreline Development & Beautification
4. Hussain Sagar Lake, Hyderabad

Infrastructure development, solution related to water pollution.

Mansagar Lake (Jal Mahal), Jaipur

Problems

- City sewage to the lake through the drains.
- Growth of aquatic weed like water hyacinth.
- Dry up in the summer.
- The aquatic life of the lake deteriorated and migratory birds stopped arriving to this natural habitat.

Solution

- Working on a strategy to clean up and revive Lake.
- Sedimentation basin constructed.
- the dredging of the lake bed. This increased the lake's depth from 1.5 meter to more than 3 meters, which helped in increasing the storage capacity of the lake.
- Two sewage treatment plants were also constructed to treat 7 million liters of waste water daily and discharge the treated water into the lake.
- To attract flora and fauna, five nesting islands were created to attract migratory birds,
- Giant bubblers were installed for aeration of the lake.

Anasagar Lake, Ajmer

Problems

- increased soil erosion and sedimentation due to increased velocity of rain runoff.
- Continuous reduction in vegetation cover and increase in human settlement in lake catchment.
- Sewage from lake catchment.

Solution

- Afforestation, construction of check dams at appropriate locations.
- Strict enforcement of rules and regulations and environmental laws is necessary to control human induced activities like illegal constructions, encroachments.
- Establishment of sewage treatment plant (STP) to treat waste water and sewage.

Kankaria Lake, Ahmedabad

Problems

- It suffered due to heavy vehicular traffic encircling the lakeside road.
- Unorganized and informal activities in the area as well as an unkempt environment.

Solution

- Developing an outer ring road by strengthening the existing road network.
- Enhancing recreational potential by improving public facilities, preserving historic buildings and encouraging overall development within the precinct.
- The pedestrian promenade is lined with gardens, food courts and organized vending spaces.

Hussain Sagar Lake, Hyderabad

Problems

- Solid Waste Dumping in Nalas – Leading into Lake
- Slums areas.
- Commercial Establishments
- Dried Flower and Garlands – Puja material
- Immersion of Ganesh and Durga Idols Internal
- Nutrient rich sediments in the lake bed.

Solution

- Floating material and Shoreline Cleaning
- Stoppage of inflows (Interception and Diversions)
- Sewage Treatment Plants – Maintain Water Balance
- Dredging of Sediments
- Aeration and Oxidation
- Protection of Lakes and Nalas in Catchment Areas
- Public Awareness / Peoples Participation / Peoples Movement

Inferences

Comparative analysis of all the case studies with respect to Gadisar lake

Table 8 Comparative Analysis Of All The Case Studies

Item	Case study-1 Mansagar Lake, Jaipur	Case study-2 Anasagar Lake, Ajmer	Case study-3 Kankaria Lake, Ahmedabad	Case study-4 Hussain Sagar Lake, Hyderabad	Gadisar Lake, Jaisalmer
Catchment Area	23.5 square kilometres	13 square kilometres	0.64 square kilometres	240 square kilometres	108 square kilometres
History Year	1610	1135 -1150	1451	1563	12th-13th
Type of lake	Artificial lake	Artificial lake	Artificial lake	Artificial lake	Artificial lake
Use of lake	Initially for drinking water and now for tourism	Initially for drinking water and now for tourism	Initially for drinking water and now for tourism	Initially for drinking water, irrigation and now for tourism	Initially for drinking water and now for tourism
Causes of pollution	Sewer with storm water	Sewer with storm water	Solid waste due to tourism	Sewer with storm water	No pollution
Solution	STP	STP	management	STP	-
S (strength)	Rich heritage	Rich heritage	Location	Perennial	Rich heritage
W (weakness)	Development pressure	Water quality	Size	Water quality	Dependency on rain
O (opportunity)	Tourism & Ecology, recreational	Tourism & Ecology, recreational	Tourism & Ecology, recreational	Tourism & Ecology, recreational	Tourism & Ecology, recreational
T (threat)	Urban development	Urban development	Traffic & transport	dumping of waste	Encroachment & Construction waste

Inferences of all the case studies for application in Gadisar lake proposal

- Maintain the water level by other source of water or STP treated water for tourism.
- Plantation in catchment area to reduce soil erosion and sedimentation.
- Create suitable conditions so that Biodiversity is maintained.
- Development of promenade, open public spaces such as Parks, cycle track, Exhibition areas (to promote local culture), musical fountain, kids play area, Amphitheatre (for cultural activity), handicraft bazaar (to promote local craft), restaurant & boating and other recreational activity with supporting services such as parking spaces (to avoid traffic congestion) , public toilets should be provided.

- Improve accessibility and create another access with parking facility.
- Provide musical fountain for beautification & tourism purpose.
- Improve overall development with the financial sustainability.

Daily Footfall on Gadisar Lake, Jaisalmer

Table 9 Footfall of Gadisar Lake (Source: - Primary

Daily Footfall on Gadisar Lake, Jaisalmer					
	Morning	Afternoon	Evening	Night	Total
Local	240	55	480	215	990
Tourist	357	297	899	357	1910
Total	597	352	1379	572	2900

Survey)

Proposal

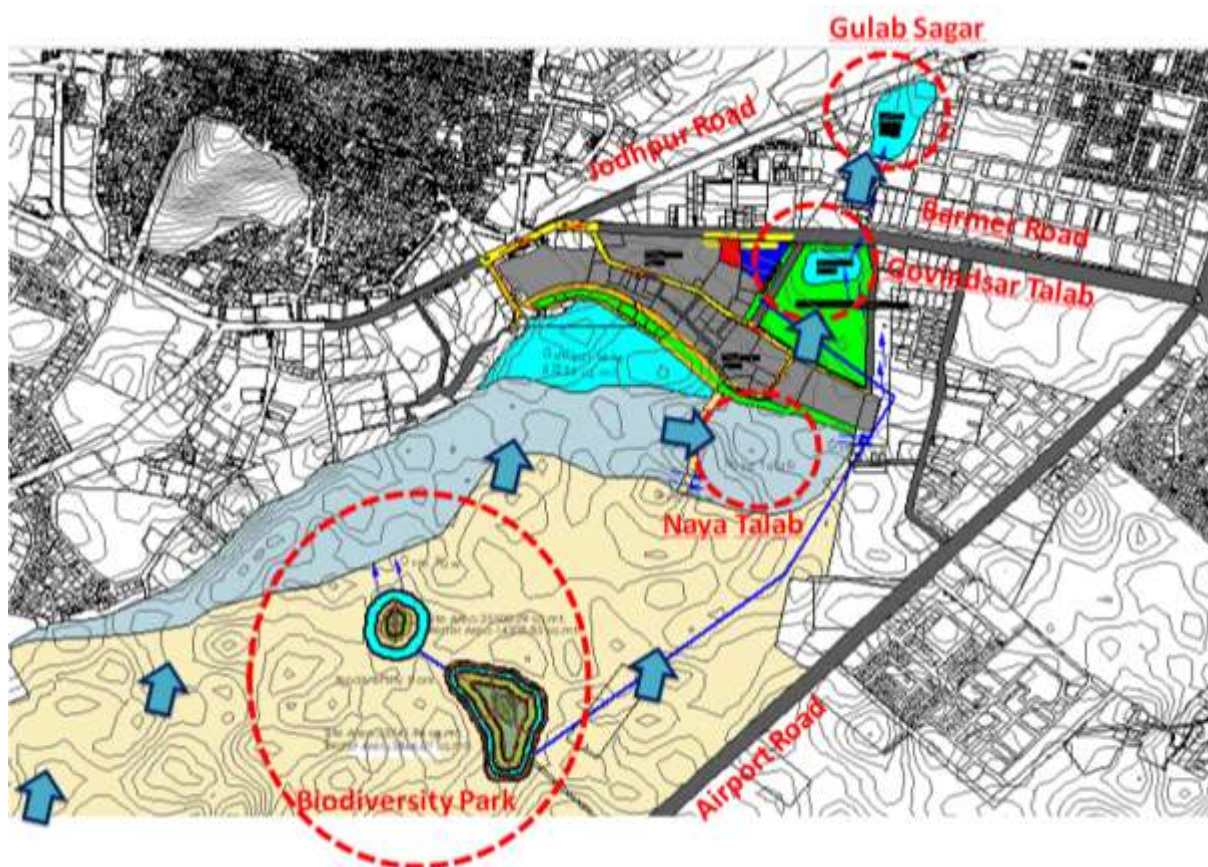


Figure 7 Proposal for Connection Of Water Bodies

- Proposal for improvement of connection of Gadisar Lake and its lake system like Naya Talab, Govindsar Talab & Gulab Sagar Talab.
- In rainy season overflow of Gadisar Lake will go in Naya Talab than Govindsar Talab than finally overflow water will go in Gulab Sagar Talab.
- Dumping of construction waste should strictly ban in all the interconnected lakes

and its catchment area.

- One biodiversity park is proposed in catchment area of Gadisar Lake to improve flora and fauna.
- Improve the accessibility & provide adequate parking.
- To maintain the water level in the lake area and biodiversity park & new artificial water bodies for birds, water line proposed from u.g.water tank at nagar parishad city park (capacity 9 lakh lt.) to biodiversity park.
- As per evaporation data and analysis it is calculated that, to maintain the water level of biodiversity park water bodies of area 14308.85 sq.mt., 5866.07 sq.mt. and Gadisar lake area 87234 sq.mt., water required between 1.0 lakh liter to 4.5 lakh liter (depending on the season between month of September to March) April to June is not considered because these areas not tourist season. In July & August extra water not required because these are rainy season.
- Initially water will be taken from u.g.water tank thereafter upon making the project financially profitable, a dedicated supply line from Indira Gandhi Canal can also be proposed, subject to availability of excess water in the canal.

Accessibility and Traffic Movement Plan

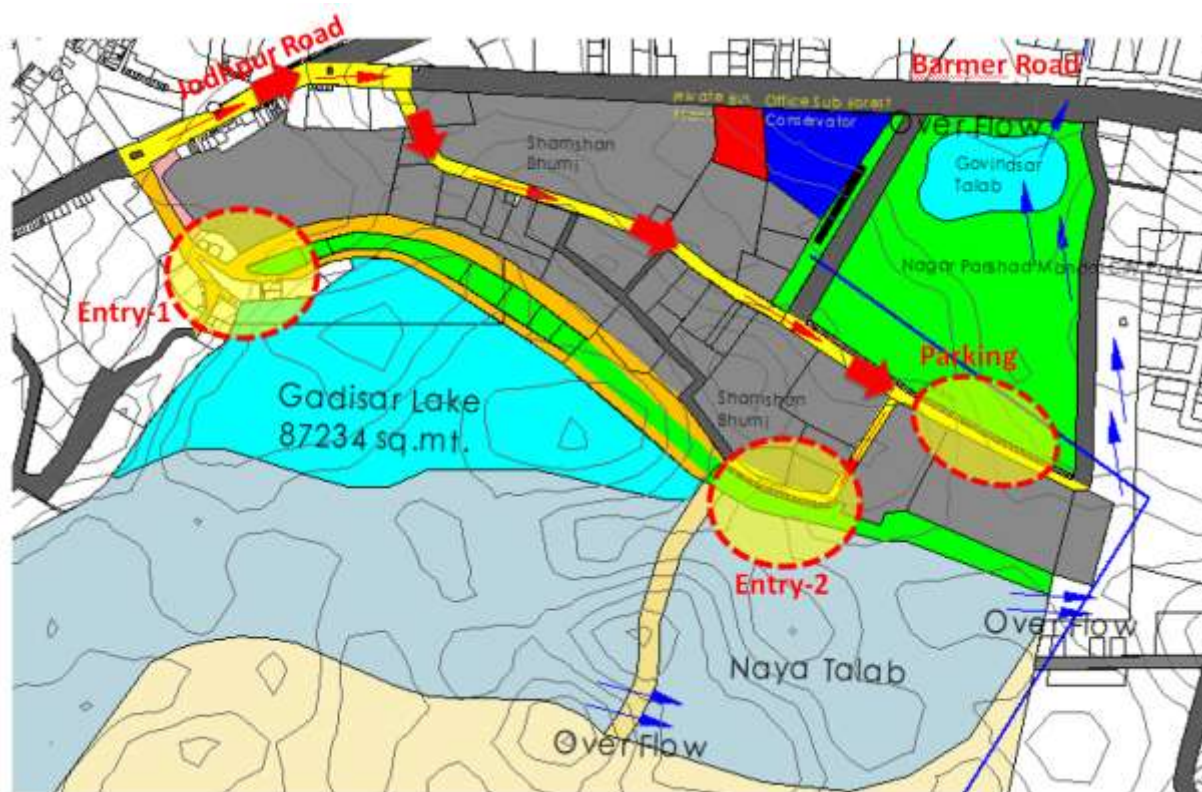


Figure 8 Proposal For Accessibility And Traffic Movement

- Proposal for improvement of accessibility of Gadisar Lake.
- Entry-1 is existing entrance & Entry-2 is proposed second entrance for make Gadisar Lake more accessible in the peak tourist season.
- Entry-2 will also be use as the main entry for the Destination weeding area.
- Adequate Visitor parking (aprox. 1000 ecu) is proposed along the boundary wall of Nagar Parishad city park, near entry-1 and near entry-2.

Biodiversity Park

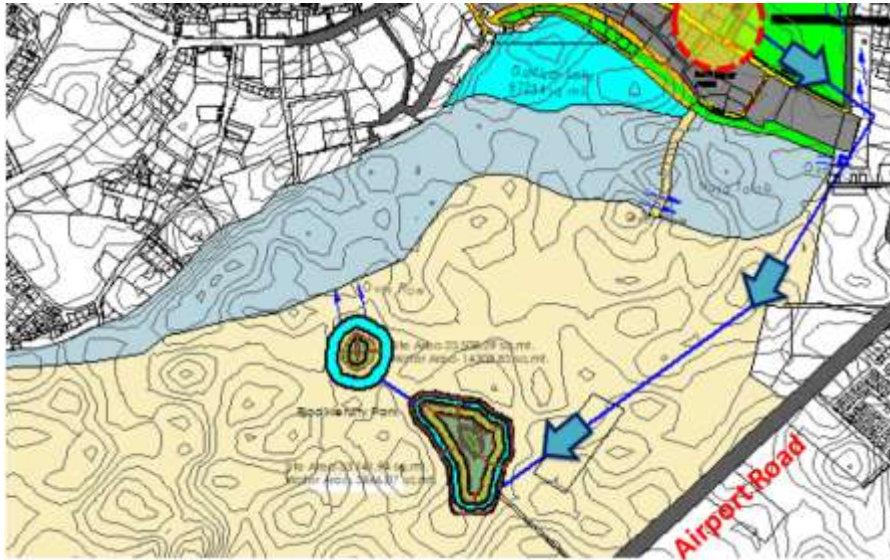


Figure 9 Location of Proposed Biodiversity Park

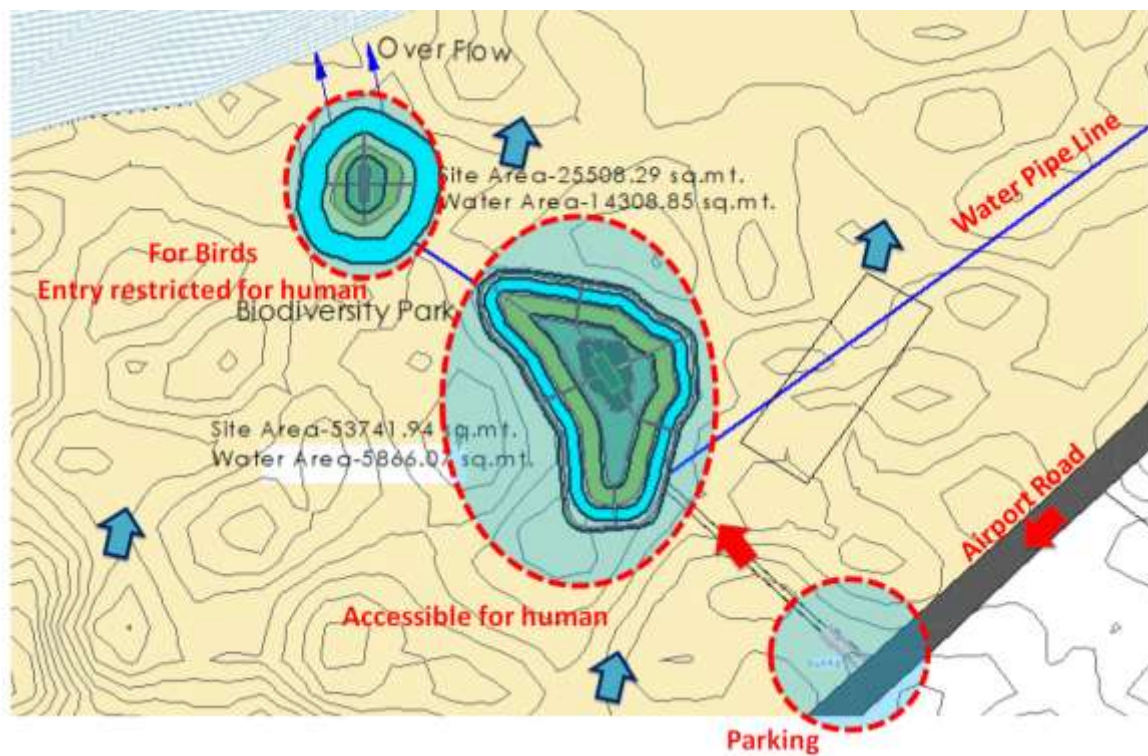


Figure 10 Proposal for Biodiversity Park

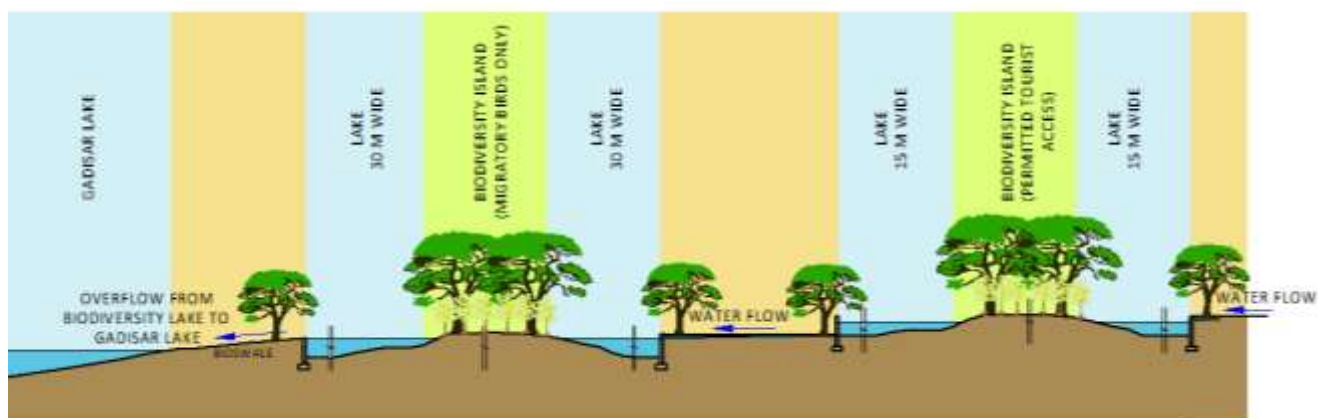


Figure 11 Biodiversity Park Section

- Biodiversity parks are accessible from airport road.
- Adequate Visitor parking (approx. 150 ecu) is proposed along the road.
- After contours analysis it is found that there are two natural mounds in the Gadisar lake catchment area which can be used for biodiversity park without disturbing the natural slope of rain water.
- After the analysis of natural slope, drain & contours etc. two areas for biodiversity park are proposed in the Gadisar lake catchment area.
- First one Biodiversity Park is proposed for birds only which is surrounded by 30 mt wide and 1.5 mt. depth water body. Area of this biodiversity park is 25508.29 sq.mt. Human entry is restricted in this biodiversity park.
- Second Biodiversity Park proposed at 100 mt. distance from first biodiversity park.
- Second Biodiversity Park is surrounded by 15 mt. wide and 0.8 mt depth water body. Area of this biodiversity park is 53741.94 sq.mt. Pathways, street furniture's, public toilets, viewing deck, ticketing counter, fast food kiosk, is proposed in this area so that tourists can come to Biodiversity Park and enjoy watching birds and take photographs.
- Planting of native tree and shrubs species is proposed inside and outside in periphery of these areas to create aneco-sensitive environment which is supported by the environment.
- Second biodiversity park water body will be filled by u.g.water tank near nagar parishad city park through pipe line, then overflow water of second biodiversity park will fill the first biodiversity park water body, then finally the overflow water of first biodiversity park water body will go to Gadisar lake to maintain the water level.

Proposal for Zoning Plan of Shoreline Development

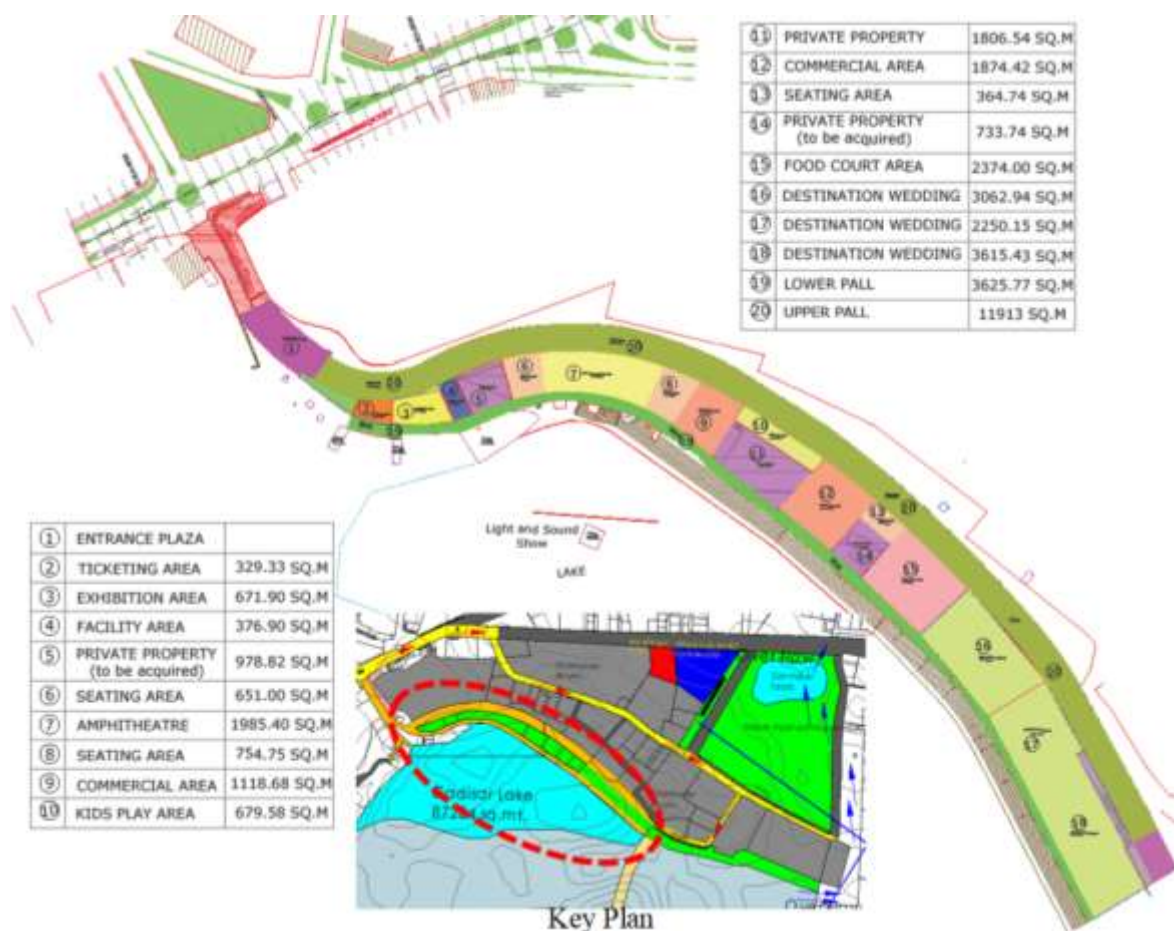


Figure 12 Proposal For Zoning Plan of Shoreline Development

Salient Features of Proposal

- Develop a biodiversity park in catchment area for flora and fauna.
- Develop connection of water bodies.
- Restoration of the lake, restoration of the monument and tourism activities.
- Improve accessibility and create another access with parking facility.
- Water front pedestrian walk away with restaurants & food court.
- There will be a handicrafts bazaar with souvenir shops.
- An Amphitheatre for daily cultural activities,
- Exhibition area for promotion of art & craft.
- Public facilities.
- Light & sound show (musical fountain).
- Kids play area.
- Boat jetties for visitor's entertainment.
- Viewing deck.

- Parking facility to avoid traffic congestion.
- Develop a certain zone on lake front for destination wedding.
- Provide fountain for Aeration and Oxidation and also for beautification.
- Improve overall development with the financial sustainability.

Proposal for Gadisar Lake Development Section

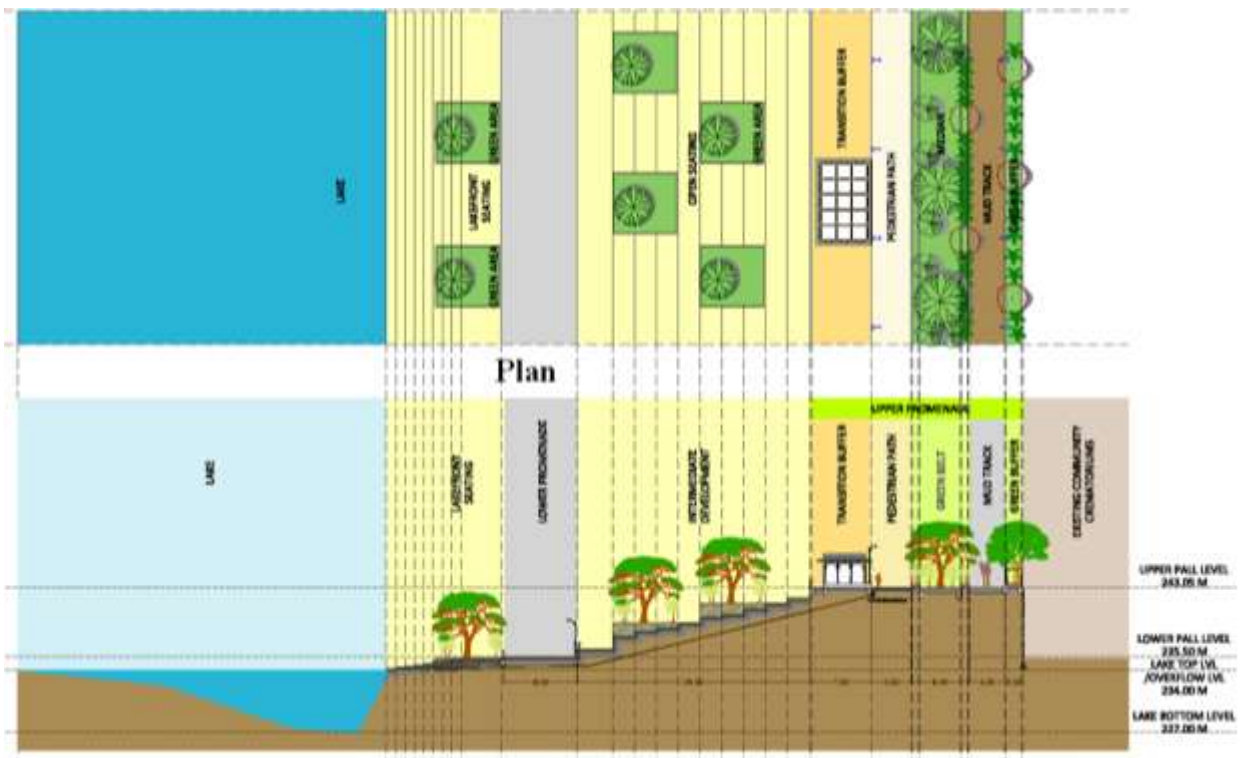


Figure 13 Proposal For Gadisar Lake Development Section

- Proposed section of Gadisar lake and Gadisar pal which is designed to maintain the heritage, cultural value with intermediate green areas.
- It is primarily designed as a point of attraction and recreation for not just tourists but also for the local population. The area is currently being frequented by local residents for regular walks, this development would enhance the usability of the lake.
- Intermediate development includes activities like amphitheater, seating area, musical fountain show, commercial area, food court, exhibition area, facility area, kids play area, destination wedding area etc.
- Green buffer of 2 mt wide with dense plantation which will create a green screen between lake development and cremation ground.
- Transition buffer will provide a buffer between upper pal and Intermediate

development.

- Pedestrian path is a main part of upper pal, width of pedestrian path is proposed 4.5 mt wide. Tourist will move on pedestrian path and enjoy the beauty of Gadisar lake. Local public will come for the morning walk, cycling, skating etc.
- Proposed 6.5 mt. green belt (trees, shrubs, flowerbed) will give good appearance to the upper pal.
- Mud track of 4 mt. wide will be used for camel ride and horse riding for tourist, this will be a main attraction point for tourist.

Recharge Well in Gadisar Lake (In Over Flow Catchment Area)

- Open ground water recharge wells have been traditionally used in Jaisalmer area for ground water improvement and for local population's usage. Such wells can still be seen in Amar sagar lake, situated at around 5 Kms from Jaisalmer.
- Such recharge wells are proposed in the Gadisar Lake's overflow area (Naya Talab, Govindsar Talab), these wells would improve ground water levels around the lake area, thereby reducing the future water requirements (from water tanks) and also boosting the flora and fauna around the lake.

Recommendations for the conservation of Gadisar:

- Stabilization of catchment by planting native tree and shrubs species. This would reduce erosion and cut down the flow of silt into the lake.
- Development of biodiversity park for enhancing flora & fauna around the lake.
- Shore line development with green belt for utilization of tourism and economic potential of the lake.
- Efforts to enhance the availability of water should be made through measures such plantation that reduces the rate of evaporation to reduce the stress on biological life.
- Protection of the wildlife by Government and non-government organizations needs to be initiated.
- Vast uninhabited area around the lake which provides food and shelter to the wild animals should be conserved.
- Trees around the lake provide roosting site for the local and migratory birds. These should be protected.

- Artificial feeding of the animals/birds needs to be stopped immediately.
- Wastewater flowing into the lake from buildings on the bank should be diverted to the drainage system.
- Recharge of ground water level from excess water in rainy season by providing recharge pit for sustainable development.
- Secondary treated water from STP to be used for the green areas of shoreline development.
- Maintenance of minimum water level throughout the tourist season.
 - o Existing u.g.water tank near city park.

Financial Model

Shoreline Development Cost Detail

Table 10 Shoreline Development Cost

Shoreline Development Cost Detail					
S.no.	Name	Area (SQM)	Rate Per SQM	Cost of Development Rs.	
1	Entrance Plaza	1286.55	7000	9005850	
2	Ticketing Area	329.33	22000	7245260	
3	Exhibition Area	671.9	22000	14781800	
4	Facility Area	376.9	20000	7538000	
5	Private Property 1	978.82	5000	4894100	
6	Seating Area 1	651	18000	11718000	
7	Amphitheatre	1985.4	20000	39708000	
8	Seating Area 2	754.75	18000	13585500	
9	Commercial Area 1	1118.68	23000	25729640	
10	Kids Play Area	679.58	18000	12232440	
11	Private Property 2	1806.54	5000	9032700	
12	Commercial Area 2	1874.42	23000	43111660	
13	Seating Area 3	364.74	18000	6565320	
14	Private Property 3	733.74	5000	3668700	
15	Food Court	2374	23000	54602000	
16	Destination Wedding Area 1	3062.94	25000	76573500	
17	Destination Wedding Area 2	2250.15	25000	56253750	
18	Destination Wedding Area 3	3615.43	25000	90385750	
19	Lower Pall	3625.77	10000	36257700	
20	Upper Pall	11913	10000	119130000	
	Total	39167.09		642019670	
		Total Cost of Development Rs (in Cr.)			64.20

Detail

Capital Costs of Project

Table 11 Capital Costs of Project

Capital Costs of Project		
S.no.	Particulars	In Rs Lakhs
1	Catchment Area Treatment	1070.00
2	Biodiversity Park	525.00
3	Hydraulic Works	70.00
4	Solid Waste Management (construction waste)	33.00
5	Shore Line Development	6420.20
6	Public Awareness and Public Participation	58.40
7	Administrative charges	17.00
	Total	8193.60
8	Unforeseen and Miscellaneous cost @ 3%	245.81
	Grand Total	8439.40
	Say Total (in Cr.Rs.)	84.39
	Funding by Center Govt. (under NLCP) @45% in Cr. Rs.	37.98
	Funding by State Govt. @ 55% in Cr. Rs.	46.42

Project Phasing

Table 12 Project

Phasing

Project Phasing							
Phase Year wise	Name	Cost of Development Rs.	Cost of Development Rs. (in cr.)	Total Amount Rs. (in cr.)	Total incl misc charges, public participation etc.	Funding by state Gov. @55%	Funding by Center Gov. @45%
1	Entrance Plaza	9005850	0.90	24.05	25.03	13.77	11.26
	Ticketing Area	7245260	0.72				
	Commercial Area	68841300	6.88				
	Upper Pall	119130000	11.91				
	Lower Pall	36257700	3.63				
2	Food Court	54602000	5.46	27.78	28.87	15.88	12.99
	Destination Wedding Area	223213000	22.32				
3	Exhibition Area	14781800	1.48	29.35	30.49	16.77	13.72
	Amphitheatre	39708000	3.97				
	Seating Area	31868820	3.19				
	Facility Area	7538000	0.75				
	Kids Play Area	12232440	1.22				
	Private Property	17595500	1.76				
	Biodiversity Park	52500000	5.25				
	Hydraulic Works	7000000	0.70				
	Catchment Area Treatment	107000000	10.70				
	Solid Waste Management	3300000	0.33				

Return can generate form

- Commercial Shops
- Food Shops
- Destination Wedding Area
- Ticketing Gadisar Lake
- Ticketing Biodiversity Park
- Ticketing Musical Fountain

Return on Investment

Year-1

- Return on Investment Per Annum (Year-1) = 7.37 Cr.
- Operational Cost (Year-1) = 5.09 Cr.

Year-2

- Return on Investment Per Annum (Year-2) = 11.50 Cr.
- Operational Cost (Year-2) = 7.93 Cr.

Year-3

- Return on Investment Per Annum (Year-3 and onwards) = 12.04 Cr.
- Operational Cost (Year-2) = 8.31 Cr.

(Operational Cost is include salaries 5%, maintenance cost 4%, administrative expenses 10%, utilities 5%, other expenses 5% of total revenue)

NPV (Net Present Value) & IRR Calculation*Table 13 NPV (Net Present Value) & IRR Calculation*

Year	0	1	2	3	4	5
Cash Flow (After Operations cost) with year to year increment of 10% (second year onward)	0	50872320	87262879	100497627	110547390	121602129
Phase wise investment	-137655786	-158806001	-167705467			
Rs. in cr.	-13.77	-10.79	-8.04	10.05	11.05	12.16
Present Value (5% risk free interest rate)	-137655786	-102793982	-72963798	86813629	90947611	95278450
Rs. in cr.	-13.77	-10.28	-7.30	8.68	9.09	9.53
NPV At the end of the year	-137655786	-240449767	-313413565	-226599936	-135652325	-40373875
Rs. in cr.	-13.77	-24.04	-31.34	-22.66	-13.57	-4.04

6	7	8	9	10	Internal Rate of Return (IRR) @ 10 Years
133762342	147138576	161852434	178037677	195841445	
13.38	14.71	16.19	17.80	19.58	
99815519	104568639	109548098	114764674	120229659	19%
9.98	10.46	10.95	11.48	12.02	
59441644	164010283	273558381	388323055	508552713	
5.94	16.40	27.36	38.83	50.86	

Recommendations for the conservation of Gadisar:

- Stabilization of catchment by planting native tree and shrubs species. This would reduce erosion and cut down the flow of silt into the lake.
- Development of biodiversity park for enhancing flora & fauna around the lake.
- Shore line development with green belt for utilization of tourism and economic potential of the lake.
- Efforts to enhance the availability of water should be made through measures such plantation that reduces the rate of evaporation to reduce the stress on biological life.
- Protection of the wildlife by Government and non-government organizations needs to be initiated.
- Vast uninhabited area around the lake which provides food and shelter to the wild animals should be conserved.
- Trees around the lake provide roosting site for the local and migratory birds. These

should be protected.

- Artificial feeding of the animals/birds needs to be stopped immediately.
- Wastewater flowing into the lake from buildings on the bank should be diverted to the drainage system.
- Recharge of ground water level from excess water in rainy season by providing recharge pit for sustainable development.
- Secondary treated water from STP to be used for the green areas of shoreline development.
- Maintain minimum water level throughout the tourist season.
 - Existing u.g.water tank near city park.

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