A Planning Proposal for Lake Re-Development: A Case Study of Dabholi Lake, North Zone, Surat

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***Abstract*- Lakes naturally occur as a component of the environment. Lakes have historically fulfilled the role of providing water to the inhabitants for drinking, washing dishes, farming, fishing, as well as for religious and cultural purposes. Lakes are known to recharge ground water, channelize water flow to prevent water logging and flooding, in addition to these uses for the Lake's body. The main goal of the study is to protect the lake and turn buffers into open-air recreation spaces with useful riparian vegetation strips. By protecting the lake, it is guaranteed that the local population will be preserved and protected. By converting lake buffer zones into open-air recreational areas, it is certain that no structures will be built there in the future. Additionally, inviting the public into the area would enable enhanced public participation in the lakes campaign and better management of the lake's functioning components. A recreation area would increase the value of the area and be seen as a destination. This study will be carried out to see whether it would be feasible to follow a lake development plan while also maintaining the lake.**

***Keywords*: Lake Re-development, Waterfront, Recreational Space.**

I. INTRODUCTION

Lakes are areas of water located in a basin, surrounded by land, and distinct from any outlet. They are not part of the ocean, but are part of the Earth water cycle. Many lakes are artificial and constructed for industrial or agricultural use, hydroelectric power generation, domestic water supply, aesthetic or recreational purposes, or other activities. Water shortages are a major issue in Indian towns due to the lack of fresh water. Lakes serve a variety of ecological, social, and economic purposes, but have deteriorated due to rapid development and human pressures. Lakes contribute to the Earth's water cycle, unlike lagoons, which are ocean shore areas.

Lakes are often deeper and bigger than ponds, and rivers and streams can be compared to them. Man-made lakes are created for commercial or agricultural use, production of hydroelectric power, supply of domestic water, aesthetic or recreational purposes, or other purposes. However, wastes are dumped in the lakes, reducing ground water recharge and causing an unpleasant odor, mosquito breeding, and poor water quality. Loss of lakes in urban areas causes problems such as less groundwater recharge, more frequent flooding, and water logging. Lakes are bodies of water that are located on land and contribute to the Earth's water cycle. Lagoons are ocean shore areas, while lakes are deeper and bigger than ponds. Rivers and streams can be compared to lakes, and man-made lakes are created for commercial or agricultural use, hydroelectric power production, domestic water supply, aesthetic or recreational purposes, or other purposes.

Because of the numerous wastes that wind up being dumped in the lakes, the ground water recharge is diminished. Additionally, this causes an unpleasant odor, mosquito breeding, and poor water quality. The loss of lakes in urban areas causes problems such as less groundwater recharge, more frequent flooding, water logging, etc.

Although there is no formal or scientific definition, lakes are often deeper and bigger than ponds, which are also on land. Rivers and streams, which often run in a channel on land, can be compared with lakes. Most rivers and streams feed and drain lakes. Numerous lakes are man-made and are created for commercial or agricultural use, for the production of hydroelectric power or the supply of domestic water, for aesthetic or recreational purposes, or for other purposes.

II. LITERATURE REVIEW

Urbanization has a number of effects on lakes, including eutrophication, siltation, and flooding. Eutrophication occurs when industrial waste, runoff from agricultural fields, trash and sewage, and household waste are dumped into lakes, where they decompose and release nutrients. Siltation occurs when rainwater is carried into a lake by deforestation, and flooding occurs when tanks are built to store water and maintain it throughout the year.

All of these effects have an effect on climate change. The seven principles of managing lakes in a sustainable way include coexistence between people and the environment, a lake drainage basin, sound science and the most current information, resolving disputes between competing users of lake resources, and encouraging residents and other stakeholders to actively contribute to detecting and fixing serious lake issues.

2.1 Managing Lakes in a Sustainable Way: The Seven Principles

1. The sustainable use of lakes depends on coexistence between people and environment.
2. A lake drainage basin is the obvious place to begin when organizing and managing lake use.
3. Preventing the causes of lake deterioration requires a long-term, proactive strategy.
4. Sound science and the most current information should serve as the foundation for developing lake management policies and making decisions.

5. Resolving disputes between competing users of lake resources while taking into account the requirements of both current and future generations as well as the demands of nature is necessary for the management of lakes for their sustainable use.
6. It is important to urge residents and other stakeholders to actively contribute to detecting and fixing serious lake issues.
7. Fairness, openness, and empowerment of all stakeholders are the cornerstones of good governance, which is necessary for the sustainable use of lakes.

2.2 Suggested Step from Standard Used for the lake Redevelopment

1. The Water Bodies should be notified in the municipal land use records as the municipal asset.
2. Urban Water Bodies should also include other forms of water sources like storm water drains, step wells (baoris), trenches around old forts, wells as well as man-made Water Bodies like ponds within temples, gurudwaras, mosques and other such public places which are together, commonly called as the "green architecture" of a city.
3. The shore-line of the Water Bodies should be properly fenced to protect it from encroachment. A well-planned awareness campaign should be conducted in the localities to highlight benefits to be gained from them. If any encroachment exists on the bank, it needs to be re-settled/relocated in consultation with affected peoples.
4. The inlet and outlet of the Water Body should be identified and need to be monitored at a frequent interval. Any obstruction in the inlet and outlet should be recorded and be removed.
5. Any outfall of domestic/ industrial sewage into the Water Body should be prevented and only treated effluent, as per effluent standard of the State Pollution Control Board, may be allowed to dispose into the Water Bodies.
6. Catchment area treatment like afforestation, storm water drainage management, silt traps, etc., may be undertaken.

2.3 A Case Study of Kankariya Lakefront Development, Ahmedabad

Sultan Muizz-ud-din Muhammad Shah II initiated the lake's development in the fifteenth century. The lake's inscription states that it was finished in 1451, under the reign of Sultan Qutb-ud-din Ahmad Shah II. This inscription states that it was given the name "hauj-e-qutb" (pond of qutb) in his honour. Since Ahmedabad was founded in 1451, the Kankaria Lake has played an integral role in shaping the city's character. In 1884 AD, the Kankaria Tank was added to the city limits. The Kankaria Preservation Act was designated as an Ancient Monument in 1928.

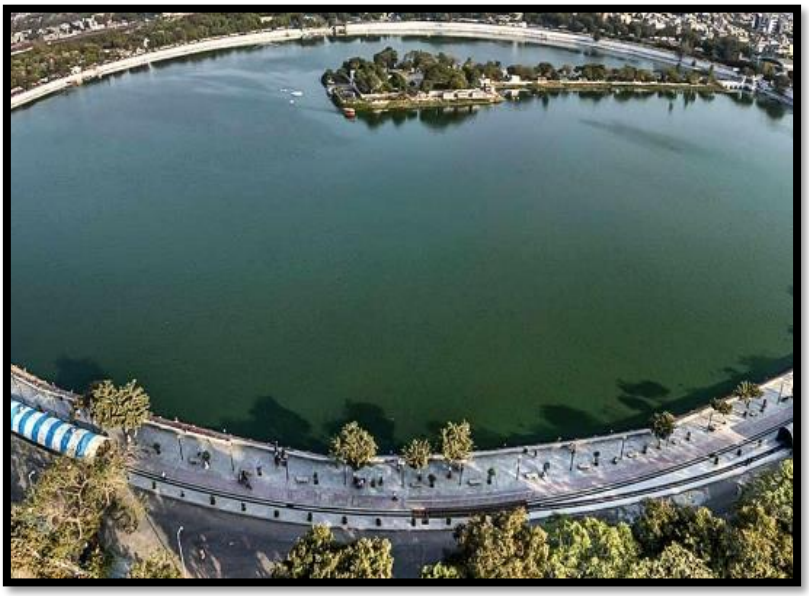

Figure 1: Kankariya Lake Ahmedabad

i.Purpose of Development: -However, the insufficient access to the lakefront, the heavy traffic on the lakeside road, the chaotic informal activities, the haphazard use of the right of way, and the heavy usage of the right of way impeded the full use of all its potentials. This project was started by the Ahmedabad Municipal Corporation and is a complete lakefront precinct located in the centre of Ahmedabad. It was designed as an iconic recreational urban park. Its main goal is to provide a reliable infrastructure that can sustain present activities while also encouraging brand-new ones.

ii.Activities: -Boating, Museum, Aquarium, Water walk, Butterfly Park, Exhibition, safari, Balloon safari, Food courts, Kids play zone, Zoo park, Toy train Desert. Zoo Park, balvatika, amusement park, kids' city, toy train, balloon safari, Nagina wadi, stone mural park, aquarium.

III. Study Area Profile

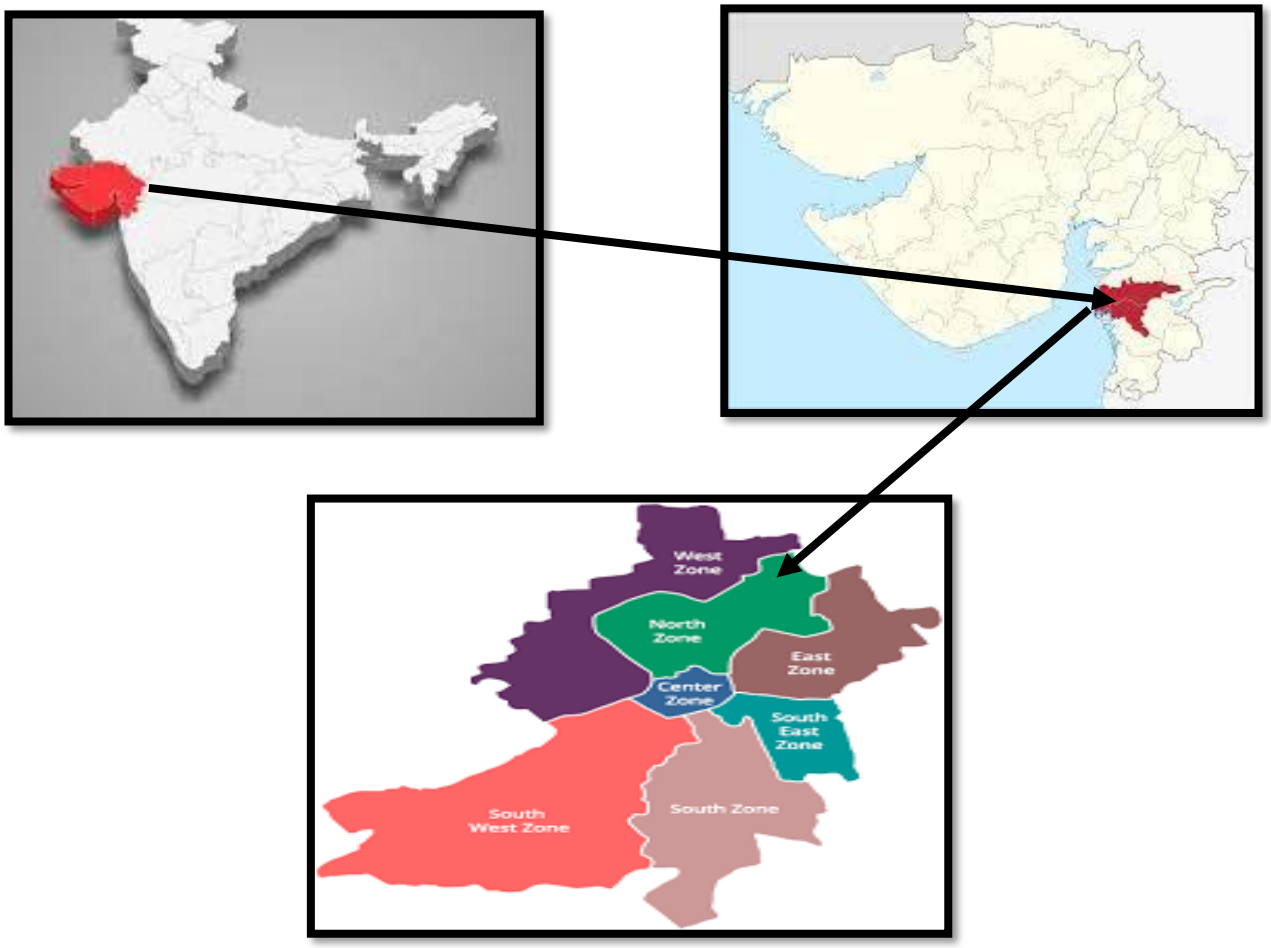

Figure 2: Location of North Zone

3.1 North Zone of Surat City

About 36.363km or 11.13 percent of the city's total size is in the North Zone. There are 11 administrative wards and 7,03,494 people living in NZ, with a population density of 193.46 PPHA. If municipal services are adequately maintained and urban planning is enhanced, cities will continue to have a beneficial impact on the area. Cities play an increasingly more prominent role in the globalization scenario. Typically, a city's appeal as a location for investment depends on the level of social infrastructure, social safety, and connectedness. The foundations for the city's growth depend on an improved quality of life. The difficulties in granting urban poor people access to service land for homes as well as in supplying them with the necessities.(Patel and Bhatt 2016)

Table 1. Zones Wise Area and Population

Zone name	Area (Sq.km)	Percentage	No. of Persons	Percentage
North Zone	36.36	11.13	705163	15.79
West Zone	51.279	15.71	424986	9.51
East Zone	37.525	11.49	1137138	25.46
South East Zone	19.492	5.97	748304	16.75
South West Zone	111.912	34.27	347447	7.78
Central Zone	8.18	2.51	408760	9.15
South Zone	61.764	18.92	695028	15.56
Total	326.51	100	4466826	100

3.2 Problem Definition of Dabholi Lake

Studies carried out in the present investigation revealed that one of the most important causes of water pollution in Dabholi lake is algae and dumping of waste. Also, pollution, soil erosion, lack of social activities, lack of population attraction and unused area around the lake are the key issues.

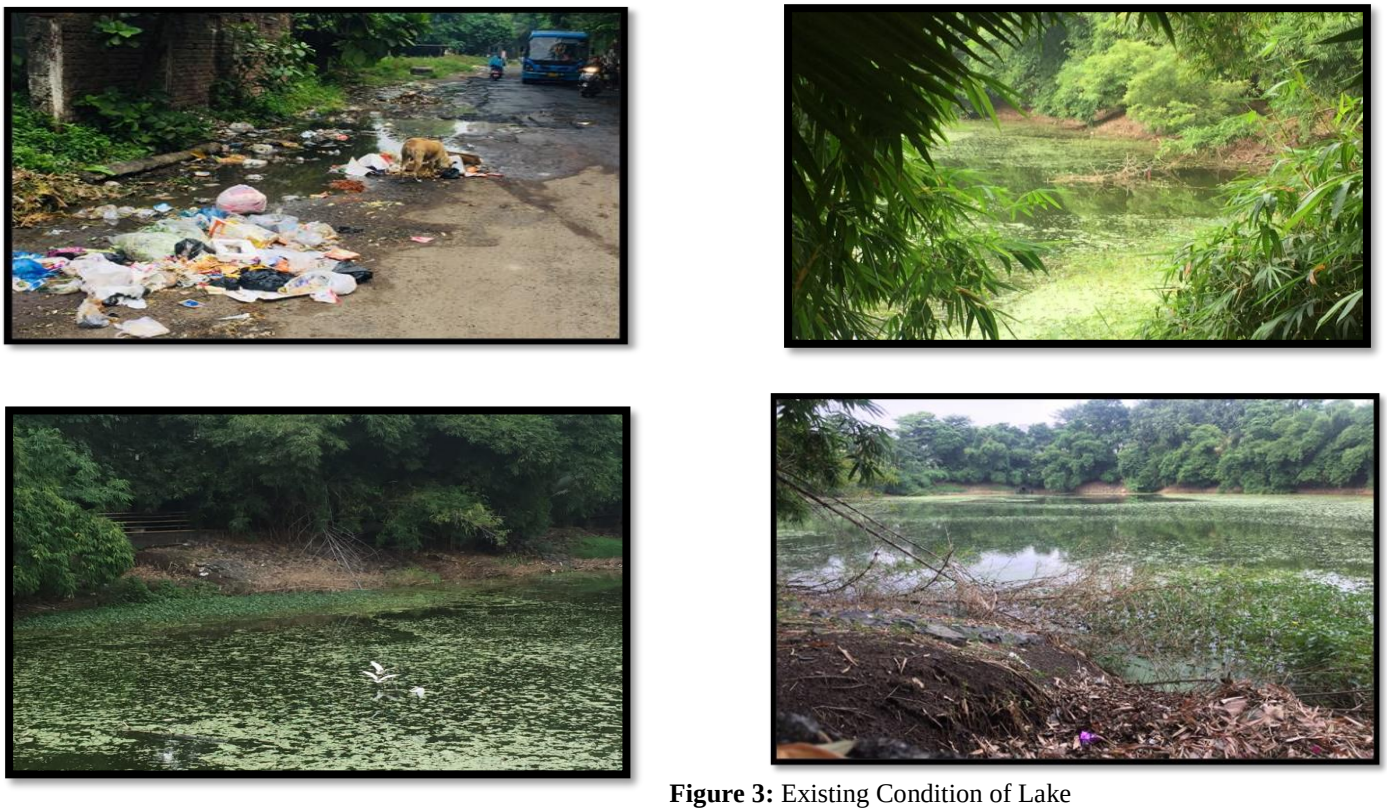

Figure 3: Existing Condition of Lake

IV. Data Collection & Analysis

4.1 Park and Open Space

Currently, the city's 285.03 hectares worth of parks, gardens, lawns, and other open areas are used for leisure and recreation. The estimates also take into account current parks and open areas along the shoreline. The following table displays the total area of parks in SMC and SUDA borders, broken down by administrative zones.

Out of the 326 sq. km. that make up the SMC, 2.63 sq. km. are now designated as parks, gardens, and open spaces. This merely makes up 0.81% of the whole SMC area. These comprise all types of parks and open areas, including those at the neighbourhood, city, and community levels. It is evident that there are not enough parks and open spaces in either SMC or the rest of the SUDA area. In order to provide inhabitants with a green and healthy atmosphere, efforts should be made to expand the space underneath them.The lungs of the city are green, manicured places called parks. Parks offer places for a variety of social activities that are pollutant-free and pedestrian-friendly. Leisure time, relaxation, official and informal meetings, such as a senior citizens' laughing club, and some physical recreation, like running and other hobbies, can all be included in the activities. Depending on their size and location, parks can host a variety of recreational and leisure activities.

Table 2. Parks and Garden details of SUDA Region

Sr. No.	Zone	Gardens	Shantikunj/ Shantivan	Area (ha)
1	Central	12	1	4.11
2	West	24	6	31.43
3	Southwest	18	2	18.34
4	South	10	5	14.04
5	Southeast	4	6	0.54
6	East	8	6	11.33
7	North	14	3	10.55
Sub Total		90	29	
SMC Total		**119**	**90.36**	
SUDA		**40**	**21.24**	
Total		**159**	**111.60**	

Source: Parks and Garden Department, SMC & Land Use Field Survey Data 2014 SUDA

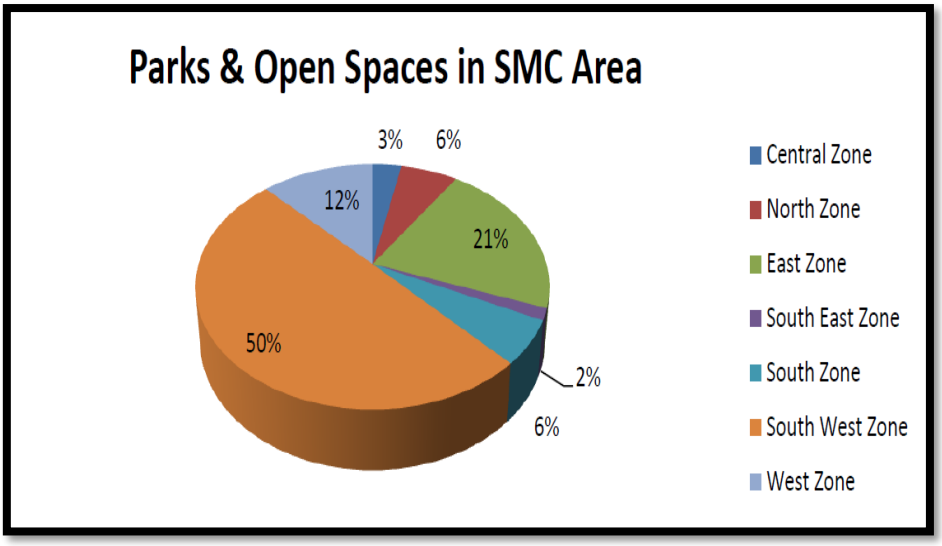

Figure 4: Zone wise Park & Open Space

4.2 National Lake Water Quality Criteria and Standards

Table 3. Parks and Garden details of SUDA Region

NO	CATEGORIES	DESCRIPTION
1.	CATEGORY A	Lakes used for recreational purposes - primary body contact such as swimming, diving and kayaking.
2.	CATEGORY B	Lakes used for recreational purposes - secondary body contact such as boating and cruising. Swimming is not allowed.
3.	CATEGORY C	Lakes meant for the preservation of freshwater aquatic life and biodiversity
4	CATEGORY D	Lakes managed for the minimum preservation of good aquatic life. It applies good management practices.

4.2.1 NLWQS Parameters and Water Quality of Dabholi Lake

Table 4. Comparison Between NLWQS Parameters and Water Quality of Dabholi Lake

PARAMETER	UNIT	CATEGORY				Water Quality of Dabholi Lake
		A	B	C	D	
Temperature	°C	28±3	28±3	28±3	28±3	25
pH	-	6.5-8.5	6.5-8.5	6.0-9.0	5.5-9.0	7.82
Dissolved oxygen (DO)	mg/L	6.3-7.8	5.5-8.7	4.5-10.3	3.3-10.3	6.39
Conductivity	µS/cm	1000	1000	2000	5000	350
Turbidity	NTU	40	40-170	70	250	79.1
Total Suspended Solid	mg/L	<100	100-200	200	>200	145

- Lake Water Quality is Satisfied with National LAKE Water Quality Criteria & Standards.
- Match With **Category B**: -Lake Used for Recreational Purpose.(National Hydraulic Research Institute of Malaysia (NAHRIM) 2015)

V. Conclusion:

- The study outcome is about Surat city having 132 Lakes and few lake are drying due to lack of maintenance. Also, Some of the lakes are use as dumping ground. Many waterbodies and water quality are degrading due to lack of maintenance. That generate negative impact around lake like unhygienic condition, raised health issues and also effect on lake ecology and surrounding environment due to contamination of lake.

- This research covers the provision of several elements surrounding Dabholi Lake, such as a boardwalk and a jogging track, for enhancing public health. Additionally, a garden is created as a crucial component of the project to enhance the lake's surroundings and somewhat reduce pollution levels.
- The planned renovation might improve the food court, draw more people there, and provide areas for relaxation like a garden, a play area for kids, and an open gym. Also, make parking accessible and secure. Parking lots, boating, Aqua Cycle, and Flora Park all contribute to revenue generation.

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