



STATUS OF SELECTED WETLANDS IN AHMEDABAD

**Vishwa Kuchara¹, CharanRonak R.², Dr. Archana Mankad³,
Dr. Hitesh Solanki⁴**

Department of Botany, Bioinformatics and Climate Change Impacts Management, School of Science, Gujarat University, Ahmedabad, Gujarat, India.

ABSTRACT

A wetland ecosystem covers about 5-10% of the earth's land. Wetlands play a significant role in the world's economy but they suffer from several threats from various influencing factors. Wetlands are destroyed due to the expansion of human activities and their effect on living and non-living organisms. Studies highlight the reasons for wetland degradation, and also which types of issues need to be addressed. Wetlands are the most important ecosystem on earth, and to control wetland degradation, it is essential to improve special laws and regulations and be aware of people to conserve ecosystems. The present study reveals that the total water bodies are decreasing due to urbanization recorded in the Ahmedabad city of Gujarat state, India.

Keywords: Wetlands, Degradation and loss, Ecosystem, Urbanization, destruction, water bodies, lake

INTRODUCTION

A wetland is an ecosystem that is constant or recurrent shallow inundation at or near the surface of the ground and the presence of physical, chemical and biological features. The most common characteristics of wetland ecosystems are hydric soil and hydrophytic vegetation. Some specific physiochemical, biotic and anthropogenic factors have harmed those wetlands' features for purpose of development. (Council, 1995)

Wetland ecosystem has unique and high levels of biodiversity, not only obligate organisms but also many terrestrial and marine organisms are indirectly connected with wetland productivity, fresh water and nursery habitats. The Wetland ecosystem has boosted nutrient cycling, improved water quality and carbon sequestration and maintained environment composition also provides food, fibre and controlled flooding. (R. T. Kingsford *et al.*, 2016)

Globally more people live in urban areas than in rural areas, about 54% of the world's population lived in urban areas. Erratic and unplanned development of the urban area has damaged the environment. Unplanned structures reduce the green cover and emissions of industries and vehicles have caused many climatic issues. (Gupta *et al.*, 2019)

The present study of Ahmedabad city has been carried out for knowing the current situation of lakes or water bodies in urban areas. Rapid urbanization destruct the water bodies and that directly affects the ecosystem. (Patel *et al.* 2021, n.d.)

• **Reasons for wetland degradation:**

The major factors that affect the wetland and destruct them are two types: Anthropogenic factors- (pollution, excessive utilization of biological resources, peat exploration, reclamation, aquaculture, urbanization); and Natural factors- (climate change and biological resources).

A. Climate change: Climate strongly impacts wetland degradation, mainly change temperature and precipitation. Precipitates increase the water content in soil and enlarge the air of wetlands. (Melly *et al.*, 2017) when the climate will change and the temperature is rise evaporation level is high which results in wetland reduction.

B. Pollution: The main pollution of wetlands is wastewater discharges from industrial agriculture, animal dung and aquaculture. A large amount of industrial wastewater and domestic sewage is discharged into wetlands, rivers, lakes and swamps. Also, pollution from pesticides and fertilizers caused threats to wetlands which results in degradation. (Act, 2016)

C. Excessive utilization of biological resources: Wetland ecosystem can provide food, water and shelter for living beings, but excessive utilization of resources has damaged wetlands, and urbanizations and construction are the main threats that caused biodiversity losses. Long-term overgrazing damage soil structure and that damaged soil structure turns into wetland degradation. (Fu *et al.*, 2006)

D. Urbanization: Many wetlands are changed into artificial aquaculture ponds. Wetlands are occupied by farmlands and infrastructure. Excessive urbanization becomes very common which leads to the reduction of wetlands and habitat loss of wildlife. The improvement of human activities has turned into a serious lack of wetlands land fragmentation, and a lack of ecological resources is affected by a decrease in the capacity of flood storage and also fish spawning, bird habitat and feeding area destruction. (M. Chen *et al.*, 2016)

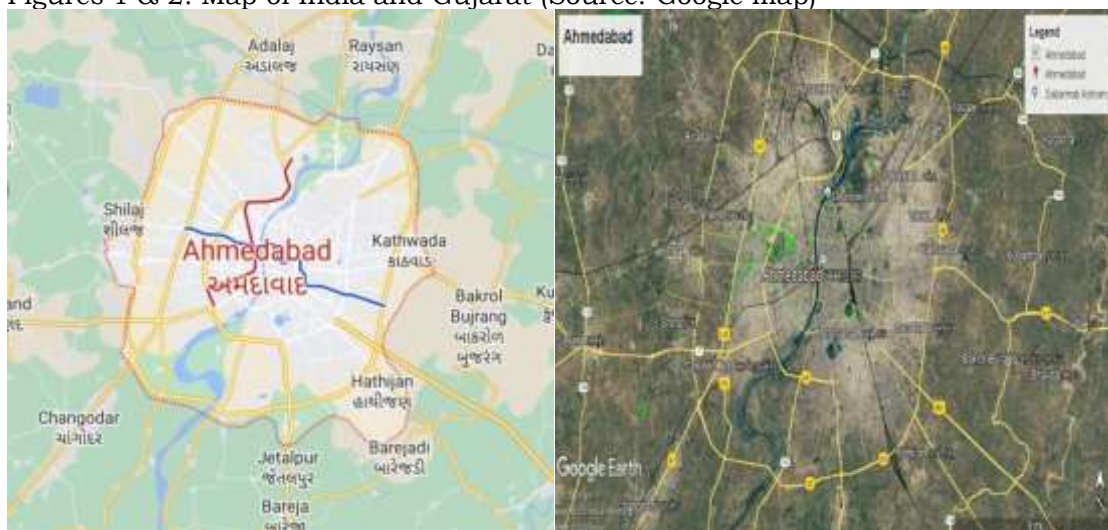
E. Wetland destruction and habitat degradation: Wetland destruction usually turns in the degradation of its ecological functions, and damages the energy flow and nutrient cycling. Human activities caused wetland degradation and wild animals and plants lose their natural habitat. (Yang *et al.*, 2016) (Meng *et al.*, 2017).

Study Area

Ahmedabad city is the megacity of Gujarat, India. Ahmedabad is located near the bank of the Sabarmati River and 25 km far from the capital of Gujarat, Gandhinagar. It is also located in Gujarat state between 23.225 N and 72.3714 E. The city is spread over about 466 sq. km and its total population is about 55,77,94. Ahmedabad has divided into 7 zones- central zone, east zone, north-west zone, south-west zone, north zone, south zone and west zone.



Figures 1 & 2: Map of India and Gujarat (Source: Google map)



Figures 3 & 4: Satellite image of Ahmedabad city (Source: Google earth)

MATERIAL AND METHODS

Wetlands play a major role in maintaining the cultural, economic and ecological health of the ecosystem; they are rapidly disappearing from the landscape. The government protect the wetlands but few of the ecologically sensitive regions whereas several wetlands are becoming easy target for anthropogenic exploitation. (Prasad *et al.* 2002, n.d.)

The use of GIS or Google earth is an effective tool for wetland conservation to check the current status and comparison with past years. The help of these delineates the micro shade boundaries, collection of village cadastral map digitization and mosaic the pictures. Plot-wise land detail is collected from all landscapes under the study from the right of record website. It shows existing land use, geomorphology, slope, water, vegetation, construction, land capability, borders and roads with visual interpretation techniques. (Desai, 2017)

Ahmedabad city has 7 AMC zones; we studied about 6 zones of wetlands. These 6 are the north-west zone, south zone, central zone, south-west zone, east zone and west zone.



Figure 5: zones of the Ahmedabad city (source: Google Earth)

RESULTS AND DISCUSSION

The field survey and FGDs (focus group discussion) are important parts of the research. Field surveys or ground troothing of GIS-based data is conventional to understand the current situation of the wetlands and it is important to get an idea of how much-localized people are aware of wetlands.

During the field survey plant species were documented with help of GL Shah flora (Shah, 1978), and take photographs of the wetlands were, also interacting with residents and collecting more information about the present condition, the collected data is stored in Google forms.

It is observed in the study that the wetlands are in a highly degraded condition, and the encroachment causes major damage to the wetlands. (Modi *et al.*, 2014) Ahmedabad city have 630 lakes from total water bodies in the civic limits in 1999, which is now decreased to 122 big and small lakes. Since many water bodies were shallow they get excluded from the official list of a lake, and once these water bodies were not considered lakes they were available for development and construction. The study pointed out that the water bodies in Ahmedabad are shrinking at a high rate of 1.57 sq. km because of the expansion of infrastructure as well as pollution and dumping of wastes.

We studied around the year 2000 to 2022, almost 20 years of data with the help of Google earth. Comparison of the situation of lakes between the year 2000 to the current year and get an estimate of the condition of water bodies.

Table 1: wetlands of Ahmedabad city

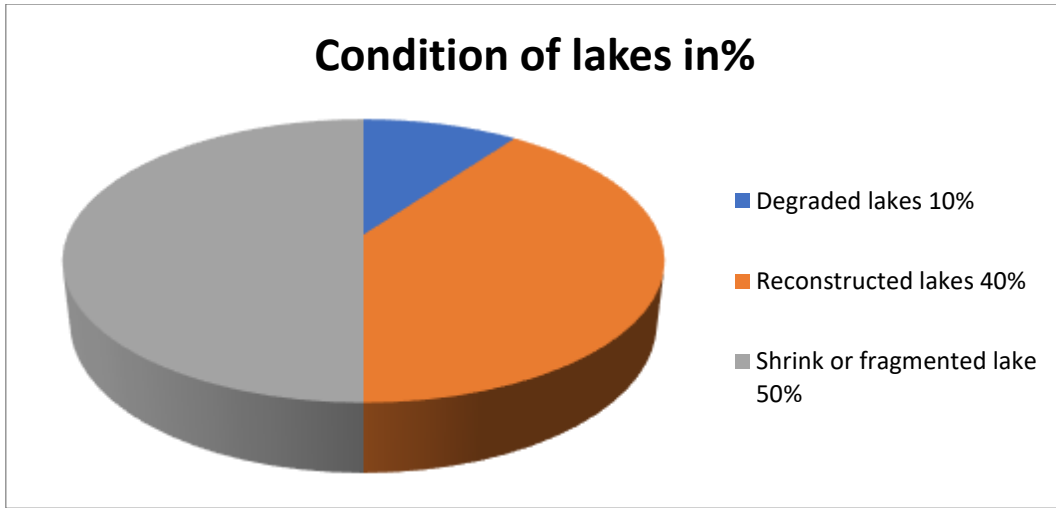
Wetlands	Zone	Condition
Vastrapur lake	Northwest zone	Shrink, reconstructed and polluted
Chandola lake	South zone	Available but not properly conserved and polluted
Sola lake	Northwest zone	Fragmented, reconstructed and polluted
Makarba lake, near police headquarter	Southwest zone	Dried and degraded
Sofi lake, Ramol	East zone	Wetland lost due to concrete infrastructure
Khadiyapur lake, Vejalpur	Southwest zone	Dried and shrink
Danilimda lake	South zone	Degraded, shrink and polluted
Gafurbasti lake, Ramol	East zone	Shrink and polluted
Bibitalavdargah, Vatva	South zone	Shrink, degraded and polluted
Chandkheda lake	West zone	Degraded, shrink and polluted



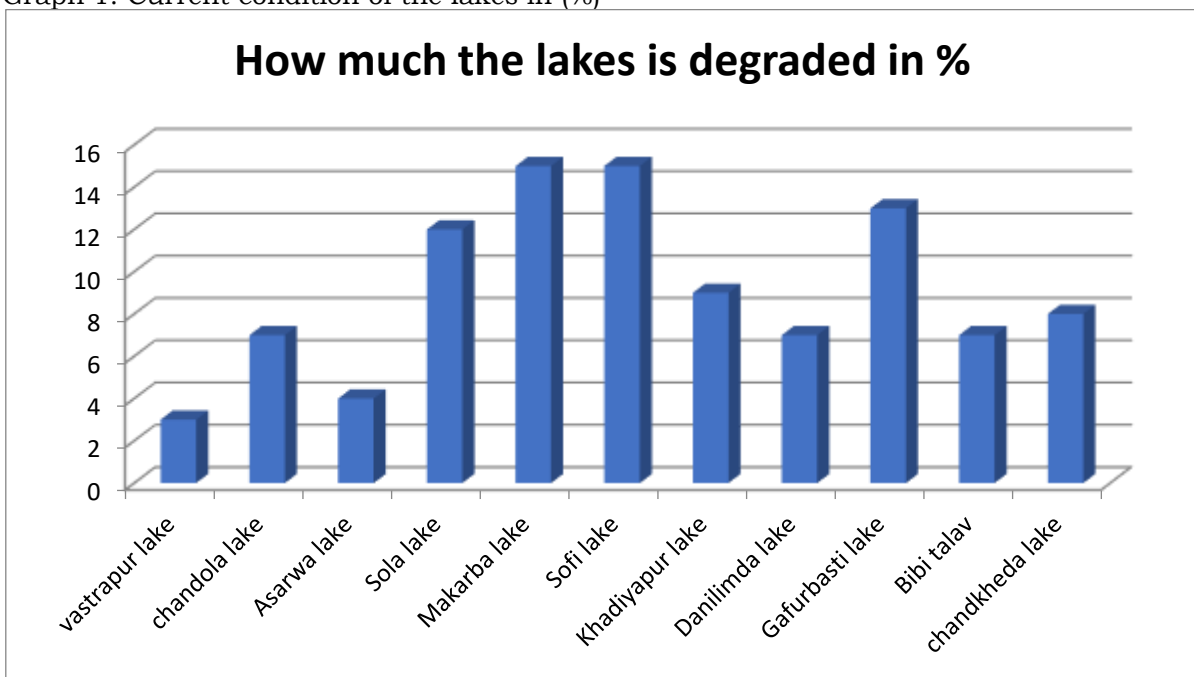
Figures 6 & 7: Comparative study of Sola lake (2000-2022)(Source: Google earth)



Figures 8 & 9: Comparative study of Gafurbasti lake (2000-2022) (Source: Google earth)



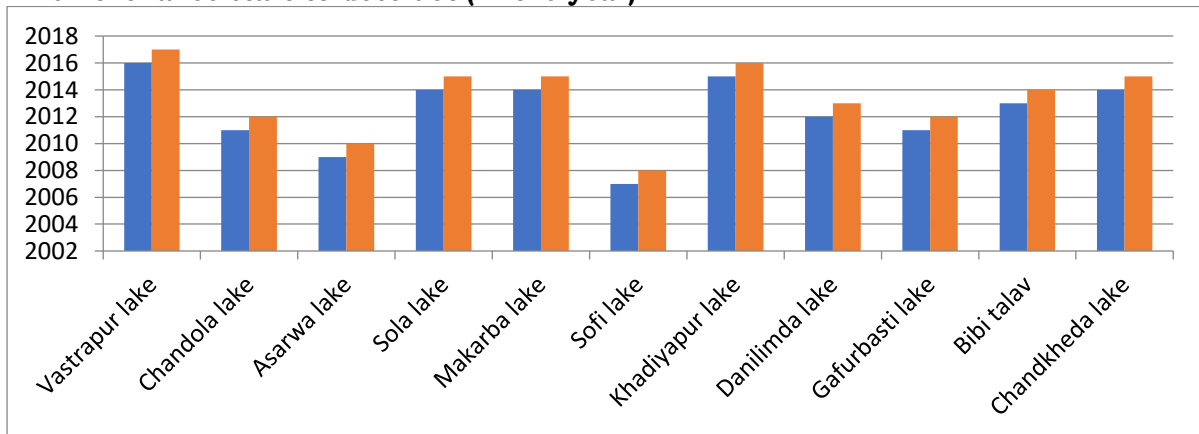
Graph 1: Current condition of the lakes in (%)



Graph 2: Graphical representation of how much lakes are degraded in (%)

Graph 1 shows that what is the current condition of the lakes and graph 2 represents how much the lake is degraded in the percentage of Ahmedabad city.

When the lakes start to destruct (In the year)



Graph 3: In which year do lakes start the destruction.



List of Plant Species of Lakes

Table 2: List of Plant Species available at Lakes

No	Botanical name	Family	Habitat
1	<i>Ipomoea aquatic</i> Forssk.	Convolvulaceae	Climber
2	<i>Prosopisjuliflora</i> (Sw.) DC.	Mimosaceae	Shrub
3	<i>Calotropisprocera</i> (Aiton) W.T.Aiton	Asclepiadaceae	Shrub
4	<i>Acacia nilotica</i> (L.) Delile	Mimosaceae	Tree
5	<i>Azadirachtaindica</i> A. juss	Mimosaceae	Tree
6	<i>Capparissepia</i> L.	Capparaceae	Shrub
7	<i>Commelinadiffusa</i> Burm.f.	Commelinaceae	Herb
8	<i>Cynodondactylon</i> (L.) Pers.	Poaceae	Herb
9	<i>Cyperus</i> sp.	Cyperaceae	Herb
10	<i>Cyperusrotundus</i> L.	Cyperaceae	Herb
11	<i>Eriochloa</i> sp.	Poaceae	Herb
12	<i>Euphorbia</i> sp.	Euphorbiaceae	Herb
13	Grass	Poaceae	Herb
14	<i>Amaranthusviridis</i>	Amaranthaceae	Herb
15	<i>Achyranthusaspera</i>	Amaranthaceae	Herb
16	<i>Solanumxanthocarpum</i> Schrad&Wendl.	Solanaceae	Herb
17	<i>Pontederiacrassipes</i>	Pontederiaceae	Hydrophyte

Due to the expansion of urbanization land of water bodies is used for constructing roads, buildings and housing areas. Early in Ahmedabad area of the lake is huge and vegetation is available but the current condition of the lake is worst.

Some of them like Chandolalake and Vastrapur lake are reconstructed for decorative purposes, and damage the natural vegetation after that use the ornamental plant for vegetation. Chandkheda, Gafurbasti, and Danilimda are polluted lakes due to chemical waste, plastic waste and sewage water. For that chemical, the water surface of lakes is covered with algal bloom and other invasive species like *Pontederiacrassipes*. Most of the water bodies are fragmented and shrunk in past decades, and it results in increased temperature. From the year 2012 to 2022 major loss of water bodies is noticed. During the field survey, we observe that people don't aware of lakes, so it is important to spread awareness to people about the conservation of lakes.

CONCLUSION

Wetlands are the most reproductive ecosystem in the world, but their numbers of wetlands are highly shrink and declining day by day. The major wetland degradation in Ahmedabad city destroys catchment areas, and create problem in discharging of sewage, domestic and industrial wastewater, urban exploitation and pollution. The study of wetlands can display the current condition of wetlands, and it helps to improve the effective management of wetlands. It is important to take some strict steps for wetland conservation and management, aware people of the situation, and make special rules and regulations regarding wetland loss.

REFERENCE

- 1) Foote, A. L., Pandey, S., &Krogman, N. T. (1996). Processes of wetland loss in India. *Environmental conservation*, 23(1), 45-54.
- 2) Modi, N. R., Mulia, N. R., &Dudani, S. N. (2013). Ecological investigations of Shahwadi Wetland. *Int. J. of Pharm. & Life Sci.(IJPLS)*, 4(12), 3193-3199.
- 3) Garg, J. K. (2015). Wetland assessment, monitoring and management in India using geospatial techniques. *Journal of environmental management*, 148, 112-123.
- 4) Patel, H. G. (2017). Community structure and population dynamics of wetland avifauna of Sola lake, Ahmedabad, Gujarat. *Lifesciences Leaflets*, 84, 1-7.
- 5) Patel, J. G., Murthy, T. V. R., Singh, T. S., Panigrahy, S., Panigrahy, S., Shankar Ray, S., &Parihar, J. S. (2009, December). Analysis of the distribution pattern of wetlands in India in relation to climate change. In *Proceedings of the workshop on impact of climate change on agriculture. Ahmedabad, India* (pp. 17-18).



- 6) Patel, J., Gajjar, J., Maitreya, B., & Solanki, H. A. (2022). A COMPARATIVE ACCOUNT OF HYDROPHYTES DIVERSITY IN TWO INLAND WETLANDS (HERANJ AND KANEWAL) OF CENTRAL GUJARAT.
- 7) Jaivin Patel, D., & Maitreya, B. (2021). Diversity of aquatic Angiosperms and Associated Species of Heranj Wetland, Kheda-Gujarat for Sustainability.
- 8) Suthar, A. M., Tatu, K., Gujar, R., & Kamboj, R. D. (2019). A Comparative Account of Diversity of Hydrophytes in Some Inland Wetlands (Pariej, Kanewal and Wadhwana) of Central Gujarat. *Research & Reviews. Journal of Life Science*, 9(2), 39-43.
- 9) URBAN, B. C. T., & AHMEDABAD, C. I. CONSERVATION SCIENCE.
- 10) Kingsford, R. T., Basset, A., & Jackson, L. (2016). Wetlands: conservation's poor cousins. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 26(5), 892-916.
- 11) Gupta, N., Mathew, A., & Khandelwal, S. (2019). Analysis of cooling effect of water bodies on land surface temperature in nearby region: A case study of Ahmedabad and Chandigarh cities in India. *The Egyptian Journal of Remote Sensing and Space Science*, 22(1), 81-93.
- 12) National Research Council. (1995). *Wetlands: Characteristics and boundaries*. National Academies Press.
- 13) Prasad, S. N., Ramachandra, T. V., Ahalya, N., Sengupta, T., Kumar, A., Tiwari, A. K., ...& Vijayan, L. (2002). Conservation of wetlands of India-a review. *Tropical Ecology*, 43(1), 173-186.
- 14) Shah, G. L. (1978). Flora of Gujarat state.
- 15) Desai, M. (2017). WATER QUALITY ASSESSMENT OF VASTRAPUR & SOLA LAKE OF AHMEDABAD CITY, GUJARAT, INDIA. *Editors*, 605.
- 16) Modi, N. R., Mulia, N. R., & Dudani, S. N. (2013). Ecological investigations of Shahwadi Wetland. *Int. J. of Pharm. & Life Sci. (IJPLS)*, 4(12), 3193-3199.
- 17) Melly, B. L., Schael, D. M., & Gama, P. T. (2017). Perched wetlands: an explanation to wetland formation in semi-arid areas. *Journal of Arid Environments*, 141, 34-39.
- 18) Kongmuang, U., Sritanaudomchai, H., & Morioka, I. (2016). Potential use of sludge cake from paper mill wastewater treatment as degradable flower pot. *Environmental health and preventive medicine*, 21(4), 258-264.
- 19) Fu, C., Hua, X., Li, J., Chang, Z., Pu, Z., & Chen, J. (2006). Elevational patterns of frog species richness and endemic richness in the Hengduan Mountains, China: geometric constraints, area and climate effects. *Ecography*, 29(6), 919-927.
- 20) Chen, M., & Jaffé, R. (2016). Quantitative assessment of photo- and bio-reactivity of chromophoric and fluorescent dissolved organic matter from biomass and soil leachates and from surface waters in a subtropical wetland. *Biogeochemistry*, 129, 273-289.
- 21) Yang, W., Liu, Y., Ou, C., & Gabor, S. (2016). Examining water quality effects of riparian wetland loss and restoration scenarios in a southern Ontario watershed. *Journal of environmental management*, 174, 26-34.
- 22) Meng, W., He, M., Hu, B., Mo, X., Li, H., Liu, B., & Wang, Z. (2017). Status of wetlands in China: A review of extent, degradation, issues and recommendations for improvement. *Ocean & Coastal Management*, 146, 50-59.