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RAMSAR SITES OF GUJARAT, INDIA- A CRITICAL REVIEW

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Abstract: Wetlands represent distinctive ecological systems that perform as intermediary zones between terrestrial and aquatic environments. The Ramsar Convention is recognized as a pivotal achievement in the realm of international environmental conservation. Over the past 50 years, the number of Ramsar-designated sites worldwide has expanded to 2,549. India has demonstrated notable advancements in recent years (2021–2025), underscoring a robust dedication to the conservation and proficient management of wetland resources. This review article examines the contemporary condition of Ramsar sites situated in Gujarat. Comprising nearly 23% of India's overall wetland expanse, Gujarat possesses substantial potential to emerge as a prominent area for a wetland biodiversity hotspot.

Keywords: Ramsar sites, Wetland, Biodiversity, Water, Migration

1. INTRODUCTION

The Earth is known as the "blue planet" because a significant part of its surface, around 75%, is covered by water. Most of this water is in the form of oceans, while the remaining is present as ice fields and groundwater. However, only a small percentage of this water is used by humans (India-WRIS wiki 2015).

Wetlands are among the most prominent aquatic ecosystems on the planet (Ghermandi et al., 2008), and they provide numerous vital services to humans (Ten et al., 2012). They are, nevertheless, ecologically sensitive and adaptive systems (Turner et al., 2000). These wetlands are critical not only for ecological health but also for human wellbeing. Wetlands support rich biodiversity, offer essential resources like water and food, and provide breeding sites for many threatened species. Wetlands undertake a range of critical ecological tasks, including nutrient recycling, water purification, flood regulation, and groundwater replenishment. In addition, they offer valuable resources such as drinking water, fish, fodder, and fuel; provide habitat for wildlife; mitigate urban flood risks; protect shorelines from erosion; and support various recreational activities (Kanaujia and Kumar 2014). Wetlands are the treasury of natural biodiversity. So protection of the nature given and driven ecosystems is our duty, morality and ethics. When wetlands are prioritized as Ramsar sites, it is a green signal for protection, maintenance and restoration of the ambience (Mohanty, 2022).

To encourage national initiatives and international cooperation for the conservation and sustainable use of wetlands and their resources, the Ramsar Convention on Wetlands was established in 1971. The Convention defines wetlands as "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters." In the Indian context, a wide range of man-made wetlands—such as ponds, farm ponds, irrigated fields, sacred groves, salt pans, reservoirs, gravel pits, sewage farms, and canals—along with natural water bodies including rivers,

lakes, coastal lagoons, mangroves, peatlands, and coral reefs collectively constitute the wetland ecosystem, as per the Ramsar Convention's criteria. Furthermore, the Convention notes that "wetlands may include riparian and coastal zones adjacent to the wetlands, as well as islands or bodies of marine water deeper than six meters at low tide lying within the wetlands."

The Ramsar Convention has been fundamental to global wetland conservation, advancing the sustainable use and protection of wetlands across the world. Although the treaty initially focused on safeguarding waterfowl habitats, its scope later expanded to include all wetland ecosystems, acknowledging their ecological and socio-economic significance. Over time, the Convention has shaped policy frameworks at both national and international levels, encouraging collaboration among its contracting parties. With over 169 member countries, the Ramsar Convention continues to support wetland conservation and management through coordinated efforts at local, national, and global scales (Ramsar Convention, 2016). Nevertheless, further research is needed to improve understanding of wetlands' roles in climate change adaptation and their socio-economic benefits, especially in regions where communities depend heavily on wetland resources for their livelihoods.

As of February 2025, there are 2,524 Ramsar sites globally. India contributes 98 of these, covering 13,84,140 hectares, placing the country third worldwide and first in Asia in terms of the number of Ramsar-designated sites. Gujarat, located in western India and known for having the country's longest coastline, covers a geographical area of 1,96,024 km². The state is recognized as one of India's richest wetland regions. Gujarat possesses the largest wetland area among all Indian states, accounting for an impressive 23% of the nation's total wetland area. According to the Space Applications Centre (SAC–ISRO), Gujarat has 34,749.50 km² of wetlands, representing approximately 17.56% of its land area.

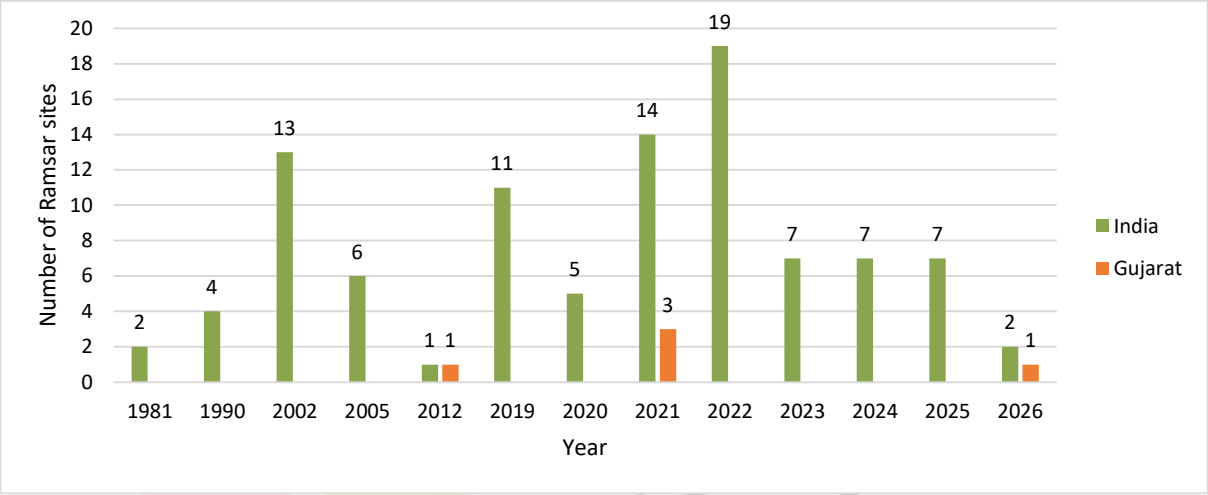

Fig.1 Number of Ramsar sites declared yearly in India & Gujarat

Table 1. State wise Ramsar sites of India (Feb. 2026)

State / UT	No. of Sites	Ramsar Sites
Andhra Pradesh	1	Kolleru Lake
Assam	1	Deepor Beel
Bihar	6	Naktí Lake, Nagi Bird Sanctuary, Kanwar Lake, Gogabil Lake, Gokul Jalashay, Udaipur Jheel
Chhattisgarh	1	Kopra Jalashay
Goa	1	Nanda Lake
Gujarat	5	Thol Lake, Khijadiya Wetland, Wadhvana Wetland, Nalsarovar Bird Sanctuary, Chhari Dhand
Haryana	2	Bhindawas Wildlife Sanctuary, Sultanpur National Park
Himachal Pradesh	3	Pong Dam Lake, Chandra Taal, Renuka Lake
Jharkhand	1	Udhwa Lake Bird Sanctuary

Jammu & Kashmir	5	Wular Lake, Hygam Wetland Conservation, Mansar–Surinsar Wildlife Sanctuary, Hokersar Wetland, Shallbugh Wetland Conservation Reserve
Karnataka	4	Ankasamudra Bird Conservation Reserve, Ranganthittu Bird Sanctuary, Magadi Kere Conservation Reserve, Aghanashini Estuary
Kerala	3	Vembanad–Kol Wetland, Sasthamkotta Lake, Ashtamudi Wetland
Ladakh	2	Tso Kar Wetland, Tso Moriri Lake
Madhya Pradesh	5	Sirpur Lake, Yashwant Sagar, Sakhya Sagar, Bhoj Wetland, Tawa Reservoir
Maharashtra	3	Thane Creek, Lonar Lake, Nandur Madhameshwar
Manipur	1	Loktak Lake
Mizoram	1	Pala Wetland
Odisha	6	Bhitarkanika Mangroves, Ansupa Lake, Chilika Lake, Tampara Lake, Satkosia Gorge, Hirakud Reservoir
Punjab	6	Kanjli Wetland, Beas Conservation Reserve, Harike Wetland, Nangal Wildlife Sanctuary, Keshopur Miani Community Reserve, Ropar Wetland
Rajasthan	5	Sambhar Lake, Keoladeo National Park, Khichan wetland, Menar Wetland Complex, Siliserh lake
Sikkim	1	Khecheopalri Wetland
Tamil Nadu	20	Karikili Bird Sanctuary, Pallikarnai Marsh Reserve Forest, Vaduvur Bird Sanctuary, Udhayamarthandapuram Bird Sanctuary, Koonthankulam Bird Sanctuary, Suchindram Theroor Wetland Complex, Kanjirankulam Bird Sanctuary, Vedanthangal Bird Sanctuary, Karaivetti Bird Sanctuary, Longwood Shola Reserve Forest, Vellode Bird Sanctuary, Vembannur Wetland Complex, Nanjaraayan Bird Sanctuary, Kazhuveli Bird Sanctuary, Point Calimere Wildlife & Bird Sanctuary, Chitrangudi Bird Sanctuary, Pichavaram Mangrove, Gulf of Mannar Marine Biosphere Reserve, Sakkarakottai Bird Sanctuary, Therthangal Bird Sanctuary
Tripura	1	Rudrasagar Lake
Uttar Pradesh	11	Bakhira Wildlife Sanctuary, Sandi Bird Sanctuary, Sur Sarovar Bird Sanctuary, Sarsai Nawar Lake, Samaspur Bird Sanctuary, Nawabganj Bird Sanctuary, Upper Ganga River, Parvati Arga Bird Sanctuary, Saman Bird Sanctuary, Haiderpur Wetland, Patna Bird Sanctuary
Uttarakhand	1	Asan Conservation Reserve
West Bengal	2	East Kolkata Wetlands, Sundarban Wetland

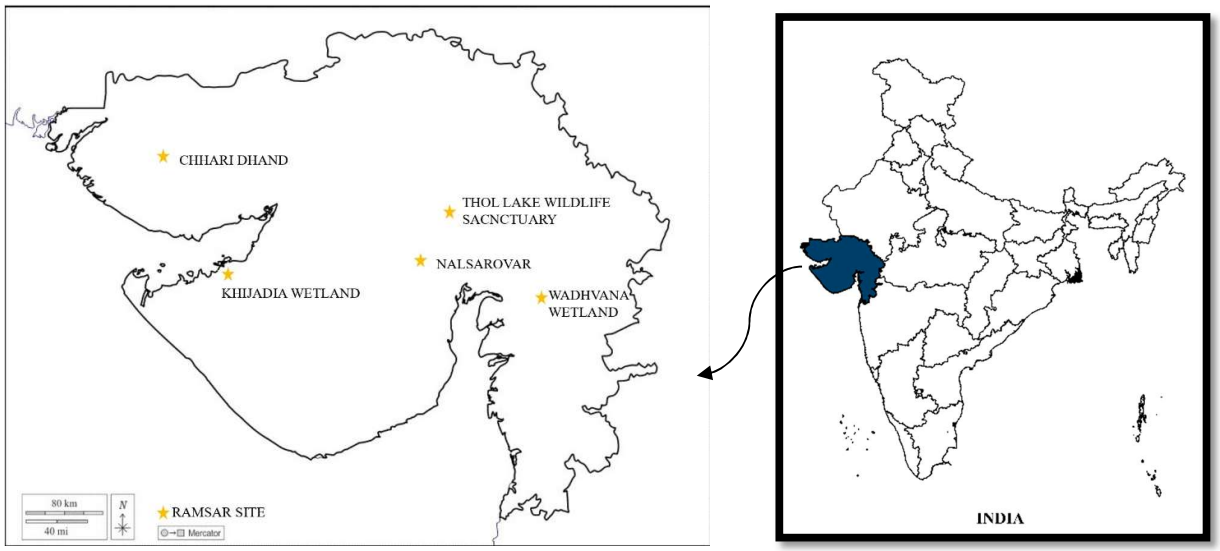

Fig.2 Ramsar sites of Gujarat

2. RAMSAR SITES OF GUJARAT

Gujarat, located along the western coast of India, supports a diverse range of wetland types such as freshwater lakes, reservoirs, dams, rivers, streams, seashores, mudflats, and salt pans. It ranks first in India in terms of total wetland area, contributing nearly 23% of the country's wetlands. According to the National Wetland Atlas–Gujarat prepared by the Space Applications Centre (SAC–ISRO), the state contains 34,749.50 sq. km of wetland area, which constitutes 17.56% of its geographical area (SAC–ISRO, 2010). Coastal wetlands dominate the region, with major categories including intertidal mudflats (22,603.65 sq. km), creeks (1,498.98 sq. km), and salt marshes (1,442.68 sq. km). Among inland wetlands, rivers and streams (2,758.77 sq. km) and reservoirs/barrages (2,489.79 sq. km) form significant components. Additionally, Gujarat contains ecologically unique wetland systems such as coral-associated habitats and mangrove ecosystems. The Government of India has identified eight wetlands in Gujarat as Nationally Important Wetlands—Little Rann of Kachchh, Great Rann of Kachchh, Nalsarovar Lake, Khijadiya Wetland, Thol Irrigation Reservoir, Pariej Irrigation Reservoir, Wadhvana Irrigation Reservoir, and Nani Kakrad. Among these, four wetlands have been designated as Ramsar sites in the last decade.

Table 2. Ramsar sites in Gujarat

Ramsar Site No.	Site name	Designation date	Area (ha)
2078	Nalsarovar	24/09/2012	12,000
2454	Wadhvana Wetland	05/04/2021	630
2458	Thol Lake Wildlife Sanctuary	05/04/2021	699
2464	Khijadia Wildlife Sanctuary	13/04/2021	511.745
2588	Chhari dhand	03/02/2026	22,700

2.1. Nalsarovar

Nalsarovar is an inland freshwater wetland and a designated bird sanctuary since 1969. It became the first Ramsar site of Gujarat in 2012. Located between 22°78′–22°96′ N latitude and 71°92′–72°64′ E longitude, the wetland spans 147 sq. km, while the sanctuary covers 120.82 sq. km. More than 300 islets, mostly situated along the western boundary, contribute to the site's structural complexity. Nalsarovar represents a unique freshwater ecosystem with seasonally fluctuating salinity, primarily influenced by rainfall (GEMI, 2024).

The wetland supports exceptional avifaunal diversity, with 222 recorded bird species, including 122 waterbirds and 60 migratory species. As a significant component of the Central Asian Flyway, it acts as an important stopover for species such as the Greater Flamingo and Dalmatian Pelican. Several globally threatened species are also recorded here, including the Critically Endangered Sociable Lapwing (*Vanellus gregarius*), Red-headed Vulture, White-rumped Vulture, as well as the Vulnerable Marbled Teal (*Marmaronetta angustirostris*), Eastern Imperial Eagle, and Sarus Crane (*Grus antigone*). The area also hosts 74 flowering plant species, one pteridophyte, and 48 recorded algal taxa. During arid periods, the endangered Indian Wild Ass (*Equus hemionus khur*) frequently uses the wetland as a refuge. Odonate diversity has also been well documented. Rathod and Parasharya (2018) recorded 46 species, a substantial increase from the 7 species previously reported by Prasad (2004), indicating improved documentation and possibly increased habitat heterogeneity.

Despite its ecological significance, Nalsarovar is under pressure from various anthropogenic activities, including increasing human population, livestock grazing, fuelwood extraction, fishing, recreational boating, horse riding during winter, and poaching of aquatic birds (Nirmal & Kumar, 2007). Recent assessments have reported a decline in dried wetland patches, surrounding vegetation cover, and agricultural land. Meanwhile, biodiversity assessments have added 27 benthic fauna species and 24 phytoplankton species to the site's known biological inventory (GEMI, 2024).

In addition to human pressures, climatic variability plays a major role in shaping the ecological condition of Nalsarovar, particularly because local communities depend heavily on the wetland for livelihoods, making the ecosystem highly sensitive to multiple interacting factors (Biswas & Pandey, 2019).

2.2. Wadhvana Wetland

Wadhvana Wetland, designated as a Ramsar site in 2021, is located in Dabhoi Taluka of Gujarat at 22.1615° N latitude and 73.4757° E longitude. The wetland receives its primary inflow from the Mahi and Narmada canals, which function as feeder channels for the lake. It is used extensively for fishing, irrigation, and drinking water supply to nearby villages (Dabgar, 2012). Wadhvana is internationally important for its birdlife, serving as a wintering ground for migratory waterbirds along the Central Asian Flyway. More than 80 migratory species visit the wetland, including several globally threatened species. These include the Endangered Pallas's Fish-Eagle (Haliaeetus leucoryphus), the Vulnerable Common Pochard (Aythya ferina), and Near Threatened species such as the Dalmatian Pelican (Pelecanus crispus), Grey-headed Fish-Eagle (Icthyophaga ichthyaetus), and Ferruginous Duck (Aythya nyroca).
Earlier studies reported 82 floral species belonging to 73 genera and 43 angiospermic families at Wadhvana Wetland (Dabgar, 2012). Gandhi et al. (2018) documented 42 butterfly species belonging to 31 genera and four families. The aquatic ecology of the Wadhwana irrigation reservoir exhibits good productivity potential and supports a diverse biological community (Vankar et al., 2019).

2.3. Thol Lake Wildlife Sanctuary

Thol Lake Wildlife Sanctuary is located in Mehsana district of Gujarat between 23°15′–23°30′ N and 72°30′–72°45′ E. It is a man-made shallow water reservoir with a maximum depth of 3 m and a total area of 6.99 square kilometers. Situated about 25 km northwest of Ahmedabad, Thol is one of the most popular birding sites in the region. The sanctuary was declared in 1988 and supports 327 bird species (Ganpule, 2016). Thol lies on the Central Asian Flyway, supporting more than 320 bird species, which accounts for approximately 57 percent of Gujarat's avifauna. More than 110 waterbird species have been recorded, representing about 43 percent of India's waterbird diversity, with nearly 30 percent being migratory. Rathod et al. (2022) reported 35 species of odonates at Thol, representing 59 percent of odonate records from protected areas in Gujarat. The sanctuary is also an important habitat for blackbuck (Antilope cervicapra) and other mammals, especially during the dry season.
Despite being situated in a semi-arid zone dominated by dry deciduous vegetation, Thol Lake maintains green vegetation for most of the year. It contributes to drinking water supply, irrigation, groundwater recharge, and also supports tourism and recreation. According to GEMI (2024), the sanctuary has experienced a 25.14 percent decrease in vegetation cover and an 8.73 percent decline in agricultural land. The study also reported 17 benthic fauna species and 18 phytoplankton species. Makwana and Prajapati (2025) documented nine zooplankton species from Thol Lake Wildlife Sanctuary.

2.4. Khijadia Wildlife Sanctuary

Khijadia Wildlife Sanctuary is located about 10 kilometers from Jamnagar district, Gujarat, at 22.5094° N latitude and 70.1560° E longitude. The sanctuary is characterized by a unique ecological setting where freshwater habitats occur on one side, while salt pans and saline wetlands occur on the other. A tidal creek from the Gulf of Kutch flows along the northern boundary, supporting mangroves and marine biodiversity (Jambu, 2017).
The wetland system originated after the erstwhile ruler of Jamnagar State constructed an earthen bund in 1920 to protect agricultural land from salinity ingress. Over time, freshwater accumulated on one side of the bund, creating a distinctive saltwater–freshwater ecosystem. Khijadia supports 312 bird species, including several categorized under the IUCN Red List. Khijadia holds significant waterbird assemblages. Vala and Trivedi (2024) documented 146 bird species representing 106 genera, 50 families, and 20 orders. These included 92 resident species, 45 winter migrants, five species that function as both resident and winter migrants, and one monsoon-breeding migrant. Additional categories such as vagrants and passage migrants were also observed. Recent studies recorded 29 species of odonates from this wetland (Rathod et al., 2022).

2.5. Chhari Dhand

Chhari Dhandh is a freshwater-cum-brackishty water natural shallow lake with associated marshy emergent vegetation. It is located in the western Kutch region of Gujarat, known locally as "Nani Banni" near southern part of Great Rann of Kutch. Under the perpetual water conditions in rainy season, the area of this wetland swells up to 80 sq. km. The maximum water-depth of 2m is recorded in the central

portion and in water channels during good rainfall year. Like several other wetlands in Kachchh, Chhari Dhandh is located on the migration route of wintering migratory birds that use Central Asian Flyway. Due to this reason, very rich birdlife occurs here in winter Earlier studies by Joshi et al. 2018, observed large number of water bird congregation at Chhari dhand during winter season. The monitoring guidelines suggested for management of open water and shoreland area during winter season due to large record of migratory bird like Dalmatia pelican, Great white pelican, Eurasian Curlew, Lesser Flamingo etc.

Table 1. Major faunal groups of Ramsar sites in Gujarat

Ramsar Sites	Protozoa	Invertebrates	Fishes	Amphibia	Reptilia	Birds	Mammals	Total
Nalsarovar	6	221	35	7	21	283	26	599
Wadhvana Wetland	-	42	5	-	1	101	-	149
Thol Lake Wildlife Sanctuary	3	17	4	1	5	267	15	312
Khijadia Wildlife Sanctuary	-	28	13	4	12	312	16	385
Chhari Dhand	-	17	-	-	-	145	4	166

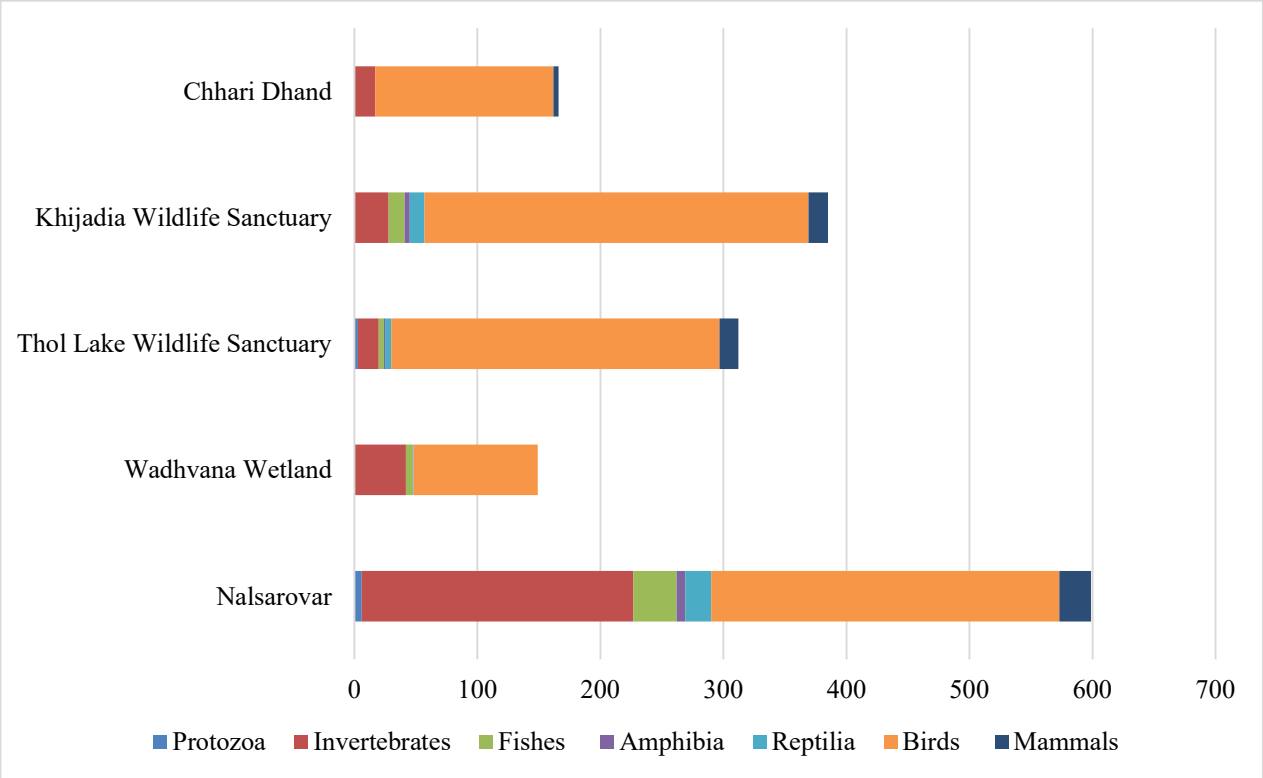

Fig.3 Faunal composition of Ramsar sites of Gujarat

3. THREATS TO RAMSAR SITES

Wetlands, a globally endangered ecosystem, are facing increasing human-induced pressures in India and elsewhere. Certain environmental factors including, habitat degradation, hydrological changes, climatic changes and salinity intrusion plays significant role in disturbances to wetland ecology. Ramsar sites in Gujarat face threats like habitat loss from encroachment, water scarcity caused by changes in hydrology, and contamination from agriculture (Vankar et al., 2018). Increased tourism, disturbances to wildlife, and invasive species further harm wetland ecosystems. Climate changes, poaching of wildlife (Nirmal and Kumar 2007), salinity intrusion, and overuse of resources put additional pressure on these important wetlands. Strategic efforts are mandatory to protect their biodiversity and ecological balance.

4. CONCLUSION

Gujarat state represents diverse and unique biogeography with rich wildlife. A uniform strategy cannot effectively manage all; however, a core conservation framework can be applied and then modified based on the unique ecological requirements of each wetland. Wetland ecosystems hold significant biological and economic value, making their conservation essential. The Ramsar Sites of Gujarat- Nalsarovar, Thol, Wadhvana, and Khijadiya—are irreplaceable ecological assets, providing critical habitat along the Central Asian Flyway and supporting substantial biodiversity, including numerous globally threatened species. However, their future is threatened by pollution, hydrological stress due to excessive water abstraction, and climate variability. Sustainable conservation requires bridging the gap between detailed ecological data (such as biomonitoring of contaminants) and robust, localized governance frameworks, utilizing integrated and long-term research strategies. An effective strategy can include promoting regular research and monitoring on varied floral as well as faunal diversity, inclusive management plan, extension of buffer zone and sensitization of stakeholders.

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