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Current Land Use Along Selected Lakefront Stretches of Lake Pichola, Udaipur: A Field-Based Assessment of Environmental Sustainability and Conservation Implications

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Abstarct: Urban lakes are important ecological and socio-cultural assets that support biodiversity, tourism, recreation and local livelihoods. Lake pichola, one of the most prominent lakes of udaipur, has experienced increasing pressure from tourism, commercial development, transportation activities and dense human settlements. The present study examines the current land-use pattern around selected lakefront stretches of lake pichola through field observations and secondary sources such as google earth imagery and published literature. The study identifies major land-use categories including residential areas, tourism and hospitality establishments, commercial activities, transportation infrasturcture, religious and heritage sites, public open spaces, vegetation cover and the water body itself. The findings indicate that tourism related land use is highly dominant along several stretches of the lakefront, while green spaces remain limited and unevenly distributed. Environmental implications such as solid waste generation, pressure on wastewater management, traffic congestion and potential stress on the lake ecosystem were observed. The paper concludes with conservation oriented recommendations emphasizing sustainable tourism, improved waste management, shoreline vegetation protection, and stronger environmental planning for long term sustainability of lake pichola.

Keywords: Conservation; Environmental Sustainability; Lake Pichola; Land use; Udaipur.

Introduction - Urban freshwater lakes are essential components of ecological and urban systems, providing environmental, economic, cultural and recreational benefits. In historic cities such as udaipur, lakes have played a significant role in supporting human settlements, tourism and regonal identity. However, increasing urbanization, tourism expansion, commercial development and changing land use patterns have created growing pressure on the lake ecosystem. Previous studies on udaipur lake system have primarily focused on water quality, eutrophication, pollution, algae growth and other limnological aspects, while comparatively less attention has been given to the relationship between present land use and environmental sustainabilty around individual lakes. (Nair , Saini, & Mahecha, 2016).

Lake pichola, being one of the most prominent heritage lakes of udaipur, is surrounded by residential areas, hotels, commercial establishments, transportation infrastructure, ghats and public spaces, making it highly vulnerable to human-induced environmental stress. According to the (The Times of India, 2024), the highest monthly tourist inflow was recorded in december 2023 with about 2,45 lakh visitors. More recent data indicate that 2,44,558 tourists visited udaipur in january 2026, including approximately 19 thousand foreign tourists, representing the highest january tourist footfall recorded in the city in the past sixteen years (Media India Group, 2026). Understanding the existing landuse pattern around the lake is therefore important for identifying sources of environmental pressure and developing appropriate conservation measures. In this context, the present study attempts to examine the current land use around lake pichola through field based observations and to assess its environmental implications from the perspective of sustainability and conservation.

The objective of this study are:

1. To identify the major land-use categories around lake pichola.
2. To assess the environmental implications associated with the current land use pattern.
3. To suggest conservation measures for improving environmental sustainability around the lake.

Study Area

Map-1: Location of Lake Pichola and selected eastern lakefront field observation points used for the field-based land-use assessment in Udaipur, Rajasthan



Source: (Google Earth Pro, 2026)

Lake pichola is situated in the south western part of udaipur city, rajsathan, india. The lake was originally constructed in 1362CE durig the reign of Rana Lakha by a local Banjara. Initially , it was a small water body but during the 17th century, a large masonry dam called Badi Pal was constructed to increase its water storage capacity and the adjoining Swaroop Sagar was also developed to strengthen the lake system.The lake is located approximately at 24º57'N latitude and 73º67'E longitude. It is one of the important freshwater lakes of udaipur and has historically been used for both drinking water supply and tourism related activities. The lake extends for about 4km in length and 3km in width. According to local geographical records, the lake has an approximate surface area of 6.93km2. the average depth is around 4.32m, while the maximum depth is reported to be approximately 8.5m. The estimated water storage capacity is about 13.08million cubic metres.Lake pichola contains two islands and on those islands well known hotels named the Lake Palace and Jagmandir are situated which are major heritage and tourism attractions. The lake is hydraulically connected with other water bodies of udaipur lake system, including Swaroop Sagar, Doodh Talai, Kumharia Talab and Amarkund. Water from the Sisarma river ultimately enters lake Pichola through the lake an integral component of the udaipur basin (Devda, 2026). Owing to its historical significance, scenic setting and tourism importance, Lake Pichola represents a suitable study area for examining the relationship between urban land use, environmental pressure and sustainable lakefront conversation.

Methodology: The present study adopts a descriptive and field based research approach to examine the current landuse pattern around the lake and to assess its environmental implications from the perspective of sustainability and conservation. The methodology combines primary field observations with secondary spatial and documentary sources to obtain a comprehensive understanding of the lakefront environment.

Research Design: The study is primarily qualitative and observational in nature. Rather than conducting detailed geospatial modelling, the research focuses on identifying dominant land use categories, documenting visible environmental conditions and interpreting their implications for sustainable lake management.

Data Collection: Primary information was collected through systematic field surveys conducted around selected stretches of Lake Pichola, including major lakefront locations such as Gangaur Ghat, Lal Ghat, Ambrai Ghat, Hanuman Ghat, Dudh Talai and adjoining waterfront areas. During the survey, the following observations were recorded- dominant land-use characteristics, tourism and commercial activities, residential settlement patterns, transportation infrastructure, public open spaces and vegetation cover, waste accumulation and sanitation conditions, visible environmnetal pressure on the lakefront.

Secondary information was obtained from published research papers, books related to the geography of udaipur and its lake system, reports of environmental and urban development agencies, google earth imagery for identifying the spatial context of the study area.

Land-use classification: Based on field observations and supporting literature, the land use around Lake Pichola was classified into categories like water body, residential land use , commercial land use, tourism and hospitality land use, transportation infrastructure, religious and heritage land use, public and recreational open spaces, vegetation and green cover. This classificaion was designed to reflect the major human and enviornmental interactions occuring along the lakefront.

Data Analysis: The collected information was analysed using descriptive analytical techniques. Field observations were compared with secondary literature to identify recurring patterns and environmental concerns associated with different land use categories. The analysis emphasized the relationship between existing land use and environmental sustainability, particularly in terms of waste generation, tourism pressure, green spaces availability and shoreline conservation .

Results and Discussions: Field observation conducted around Lake Pichola revealed a complex and highly dynamic land use pattern consisting of residential settlements, tourism and hospitality establishments, commercial activities, transportation infrastructure, religious and heritage sites, vegetation cover. The spatial arrangement of these land uses reflects the dual role od Lake Pichola as both a heritage landscape and a contemporary urban-economic resources.

The most prominent land use category observed during the survey was tourism and hospitality. Hotels, guest houses, rooftop restaurants, cafes, boating facilities and tourist oriented commercial establishments were particularly

concentrated around Gangaur Ghat, Ambrai Ghat, Lal Ghat. These areas experience intense visitor activity throughout the day and form core tourism zone of Pichola waterfront. The observed pattern corresponds with the findings of (Samant, 2010),who demonstrated that tourism oriented urban regeneration has significantly transformed the land-water interface of Pichola, leading to the increasing commercialization of historic waterfront. From an environment perspective, the concentration of tourism facilities may contribute to increased freshwater consumption, greater wastewater generation, higher solid waste production, disturbance to the lakeside environment during peak tourist seasons.

Residential land use was observed mainly in the old city areas adjoining the lakefront, where dense housing is closly interwoven with small shops, restaurants, souvenir stores and other commercial activities. This mixed land use pattern creates a hugh intensity of human activity within a relatively limites urban space. Such conditions are important from a sustainable perspective because dense residential and commercial zones can increase domestic sewage discharge, litter accumulation and drainage related problems. Similar views were put forward by (Shama, Sharma, & Jain, 2008), who reported in their work that rapid urbanization and inadequate environmental management have contributed to the deterioration of urban lake environments.

Vegetation and public green spaces were found to be limited and unevenly distributed around the immediate lakefront. Although some tree-lined stretches, landscaped gardens and small recreational areas exist but continous ecological buffer zone are largely absent in many sections of the shoreline. The fragmented vegetation pattern observed in this study is consistent with the broader trend identified in the (School of Planning and Architecture, Bhopal, 2018). which reported that increasing builtup land and changing land use pattern have reduced ecosystem services and ecological buffering functions within the lake catchment. Green spaces are important for urban lake sustainability because they reduce surface runoff, controls soil erosion, improve the local microclimate, support urban biodiversity, enhances the asthetic quality of the waterfront.

Transportation infrastructure, including roads, bridges, parking areas and boating access points forms another significant component of the lakefront land use pattern. The survey recorded substantial movement of tourist vehicles, local traffic, pedestrians and boating operations especially near major ghats and commercial nodes. In addition to trasportation activites, several other human activities were observed like religious activities that contributes to disposal of flowers and other ritual materials. Commercial vending also stresses the environment as it causes litter accumulation near public spaces. These observation indicate that the environmental condition of Lake Pichola is influenced not only by static land use categories but also by intensity of daily human activities accurring along the waterfront. The ecological significance of such anthropogenic pressure has been scientifically documented by (Sharma, Sharma, & Watanabe, 2007), who said tourism, domestic discharge and urban runoff are important contributors to nutrient enrichment and eutrophication in Lake Pichola.

The environmental issues identified during the field survey demonstrate that current land use practices aroud Lake Pichola have direct implications for water quality, shoreline stability, waste management and ecological sustainability. Tourism oriented activities and dense urban development generate significant pressure on sanitation infrastructure and increase the risk of pollutant inflow into the lake. National urban lake conservation guidelines emphasize that effective management of urban lakes requires integrated sewage treatment, catchment protection, solid waste management, shoreline restoration and community participation (Central Pollution Control Board, 2021); (Ministry of Environment,Forest and Climate Change , 2019). Furthurmore, sustainable waterfront planning should incorporate green buffers, public open spaces and environmentally sensitive transportation management to improve urban resilience and reduce ecological stress (UN-Habitat, 2020). The adoption of ecosystem based conservation approaches, including regulation of boating activities and protection of aquatic habitats, is also consistent with internationally recognized wetland management principles (Ramsar Convention Secretariat, 2016). Therefore, the long term sustainability of lake pichola depends on balancing tourism development and urban growth with scientifically imformed conservation and participatory environmental management.

Conclusion: The study assessed the current land use pattern around Lake Pichola, Udaipur, through field observations and supporting secondary sources. The findings show that tourism and hospitality activities dominate the lakefront, while residential settlements, commercial establishments, transportation infrastructure and limited green spaces also form important components of the surrounding landscape. The observed land use pattern has significant environmental implications, including increased wastewater generation, solid waste accumulation, traffic pressure and ecological stress on the lakefront environment. The limited distribution of vegetation furthur highlights the need for better ecological planning and shoreline management. The study concludes that the long term sustainability of Lake Pichola depends on integrated conservation measures, including effective sewage treatment, improved waste management, protection of lakeside green spaces and sustainable tourism practices. Although based on a descriptive field based approach, the research provides a useful understanding of the relaionship

between urban land use and environmental sustainability around lake pichola and can support future detailed investigations using GIS and water quality analysis.

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