

Dal Lake at Risk: A Management-Centered Evaluation of Environmental Laws, Governance Structures, and Stakeholder Strategies for Sustainable Conservation in India

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Abstract

Dal Lake, a world-renowned water body nestled in the heart of Srinagar, Jammu and Kashmir, embodies ecological wealth, cultural heritage, and economic value. Despite its significance, the lake faces severe environmental degradation driven by unplanned urbanization, encroachments, pollution, and governance failures. This qualitative research critically evaluates the legal and institutional mechanisms for the lake's conservation through a management lens. It examines governance structures, policy implementation, inter-agency coordination, and stakeholder engagement, alongside the role of project planning, resource management, and performance monitoring in enforcing environmental laws. Applying management theories—public management, change management, and stakeholder theory—the paper assesses how leadership, accountability, and adaptive strategies can strengthen conservation outcomes. The study underscores the need for integrated, community-participative, and performance-driven governance to ensure the ecological sustainability of Dal Lake.

Keywords:- Dal Lake, Wetland Conservation, Environmental Law, Governance, Management Theories, Stakeholder Engagement

1. Introduction

Set in Srinagar, Dal Lake, an ecological, economic, and cultural identity of Kashmir, extends over 22 square kilometers and provides opportunities for a patchwork of livelihoods—from shikara operators and artisans to vegetable growers in floating gardens ('Rad').¹ Its ecological

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1 S. A. Bhat, S. A. Romshoo and M. Y. Beigh, "Environmental

functions exert a microclimate effect, maintain aquatic biodiversity, and act as a buffer against flooding.

Gradually, the decline has been sped up by urbanization with no checks, with waste flowing in, siltation, and unregulated tourism. In the last 150 years, Dal Lake has shrunk in area by more than 50% and in depth by more than 50%. On account of pollution loads from untreated sewage, eutrophication is aggravated. This ecological descent poses great threats to biodiversity as well as to the socio-economic assembly of communities who depend upon the lake.

Besides the The Environment (Protection) Act, 1986 (Act 29 of 1986); The Water (Prevention and Control of Pollution) Act, 1974 (Act 6 of 1974); The Wetlands (Conservation and Management) Rules, 2017²; and Lake Conservation and Management Authority (LCMA); further attempts have been made to curb the degradation. It is primarily due to judicial activism-generally by the Jammu and Kashmir High Court has played an important role in enforcing conservation directives. Yet, implementation gaps persist due to fragmented governance, inconsistent enforcement, and limited stakeholder integration.

This study builds upon the existing legal analysis and adds a management-oriented perspective, recognizing that conservation effectiveness hinges not only on laws but also on governance structures, planning processes, and leadership strategies.

2. Objectives of the Study

- To analyze the environmental laws applicable to the conservation of Dal Lake.
- To assess governance structures, inter-agency coordination, and stakeholder engagement in conservation.
- To evaluate the role of project planning, resource management, and

Degradation of Dal Lake, Kashmir, India: A Review" 18 *Lakes & Reservoirs: Research and Management* 69 (2013).

2 The Environment (Protection) Act, 1986 (Act 29 of 1986); The Water (Prevention and Control of Pollution) Act, 1974 (Act 6 of 1974); The Wetlands (Conservation and Management) Rules, 2017.

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performance monitoring in enforcing environmental laws.

- To apply public management, change management, and stakeholder theory in assessing conservation strategies.
- To recommend adaptive, leadership-driven approaches for sustainable lake management.

3. Methodology

This research adopts a qualitative, exploratory design aimed at conducting a management-centered evaluation of environmental laws, governance structures, and stakeholder strategies for the sustainable conservation of Dal Lake. The methodological framework integrates documentary analysis, content analysis, and thematic interpretation to draw insights from multiple sources.

3.1 Research Design

The study is qualitative in nature, focusing on understanding how and why environmental laws and governance mechanisms operate in practice rather than merely assessing what laws exist. The design is interpretive, allowing for the integration of legal, ecological, and management perspectives to provide a holistic understanding of conservation challenges and strategies.

3.2 Data Sources

Secondary data formed the backbone of the research. Sources included legal documents and statutory texts, institutional reports, judicial documents, academic literature, policy documents, and civil society contributions. This multi-source approach ensured triangulation, enhancing both the validity and depth of the findings.

3.3 Analytical Approach

The primary analytical method was content analysis, following three stages: coding framework development, categorization, and interpretation. Themes were analyzed in light of Public Management Theory, Change Management, and Stakeholder Theory.

3.4 Theoretical Framework Application

- Public Management Theory informed the evaluation of governance structures, accountability mechanisms, and performance-based funding models.

- Change Management (Kotter, 1996) guided the assessment of leadership strategies, urgency creation, coalition-building, and institutionalization of reforms.

- Stakeholder Theory (Freeman, 1984) shaped the analysis of community participation, conflict management, and collaborative decision-making processes.

3.5 Scope and Limitations

Scope: The study focuses on Dal Lake as a case study to illustrate broader environmental governance challenges in India.

Limitations: The research relies on secondary data, which may reflect the biases or omissions of source authors. Lack of primary fieldwork limits the ability to capture real-time stakeholder perceptions; however, the use of diverse and reputable sources mitigates this limitation.

3.6 Ethical Considerations

All data used in the study was sourced from publicly available legal, institutional, and academic records. Proper citations and attributions have been maintained to uphold academic integrity.

4. Literature Review

With conservation of Dal Lake as a theme, there are a number of ecological, legal, and governance studies. Bhat et al. (2013) has studied and pointed out the decline³ in surface area and depth of the lake due to siltation and encroachment. Both Sofi (2020)⁴ and Ahmad & Hussain

3 S. A. Bhat, S. A. Romshoo and M. Y. Beigh, "Environmental Degradation of Dal Lake, Kashmir, India: A Review" 18 *Lakes & Reservoirs: Research and Management* 69 (2013).

4 M. A. Sofi, "Institutional Inefficiencies in Lake Conservation: The Case of Dal Lake" 30 *Environmental Policy and Governance* 165 (2020).

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(2018)⁵ have taken institutional fragmentation as the main governance problem, highlighting inefficiencies caused by overlapping jurisdictions. Rather (2016)⁶ highlights the socio-economic dependence of the local communities on lake resources and the conservation issues raised by exclusionary practices.

In the broader realm of environmental governance, the study of lakes like Chilika in Odisha and Vembanad in Kerala⁷ show how ILBM frameworks, community co-management, and performance-based funding can produce real ecological, due for reference in the Dal Lake conservation.

Judiciary interventions especially by Jammu and Kashmir High Court and National Green Tribunal have forced administrative action to take place. That said, the judicial interventions have brought to the fore and dominated over gaps in proactive governance and enforcement. Management theory perspectives, particularly Public Management Theory, Change Management, and Stakeholder Theory, have been underutilized in Indian lake governance literature. Their application could bridge the gap between policy formulation and implementation, fostering leadership, accountability, and inclusive decision-making.

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- 5 S. Ahmad and A. Hussain, "Governance Challenges in Dal Lake Conservation: An Institutional Analysis" 210 *Journal of Environmental Management* 278 (2018).
 - 6 T. A. Rather, "Community Perspectives on Wetland Conservation: The Case of Dal Lake" 42 *International Journal of Ecology and Environmental Sciences* 231 (2016).
 - 7 Chilika Development Authority, *Integrated Management Plan for Chilika Lake (2020-2030)* (CDA Publications, Bhubaneswar, 2020); Vembanad Lake Conservation Council, *Community-Driven Wetland Restoration in Kerala* (VLCC Publications, Kochi, 2019).

5. Analysis and Findings

The analysis of Dal Lake's conservation reveals systemic issues spanning governance, enforcement, and stakeholder engagement.

5.1 Governance Structures and Institutional Performance

Dal Lake's governance suffers from overlapping mandates among LCMA, municipal bodies, and pollution control agencies. Public management theory suggests centralizing these functions⁸ into a single empowered authority with statutory backing, a unified budget, and clear accountability lines.

5.2 Policy Implementation and Enforcement Gaps

Despite strong laws, absence of time-bound performance targets, and reactive rather than proactive approaches weaken enforcement. Change management frameworks reveal missing urgency creation⁹ and lack of "quick wins" to build momentum.

5.3 Inter-Agency Coordination

Coordination remains informal; without an institutionalized joint task force, interventions such as STP upgrades and encroachment removals face delays.

5.4 Stakeholder Engagement

Communities are often sidelined, leading to mistrust. Stakeholder theory advocates participatory planning committees, livelihood compensation, and shared monitoring responsibilities.¹⁰

8 J. P. Kotter, *Leading Change* (Harvard Business School Press, Boston, MA, 1996).

9 J. P. Kotter, *Leading Change* (Harvard Business School Press, Boston, MA, 1996).

10 R. E. Freeman, *Strategic Management: A Stakeholder Approach* (Pitman, Boston, MA, 1984).

5.5 Project Planning, Resource Management, and Performance Monitoring

Currently, conservation efforts are implemented through fragmented projects without a comprehensive basin-wide plan. A management-oriented project planning process should integrate needs assessment, ILBM principles¹¹, and phased implementation. Resource management is hampered by inconsistent funding flows and inadequate O&M budgets. Sustainable models, such as blended finance and eco-tourism levies, can ensure continuity. Performance monitoring is sporadic, with limited transparency. KPI-driven frameworks, technology-enabled dashboards, and independent audits can enhance accountability. Successful examples from Chilika Lake (Odisha), Vembanad Lake (Kerala), and Lake Biwa (Japan)¹² illustrate these principles in action.

6. Key Challenges

1. Institutional Fragmentation and Overlapping Jurisdictions

Dal Lake is managed by multiple agencies — the Lake Conservation and Management Authority (LCMA), Srinagar Municipal Corporation, Pollution Control Board, Tourism Department, and various state-level environmental bodies. These entities operate under different mandates, often without formal coordination mechanisms. This results in duplication of work, gaps in coverage, and conflicting priorities. For example, while LCMA may prioritize shoreline restoration, municipal authorities may sanction construction permits nearby, undermining conservation efforts.

11 United Nations Educational, Scientific and Cultural Organization, *Integrated Lake Basin Management Guidelines* (2021), available at: <https://unesdoc.unesco.org>

12 Chilika Development Authority, **Integrated Management Plan for Chilika Lake (2020-2030)** (CDA Publications, Bhubaneswar, 2020); Japan International Cooperation Agency, *Lake Biwa Environmental Conservation Strategy* (JICA Press, Tokyo, 2015).

2. Weak Legal Enforcement without Performance-Linked Monitoring

Although environmental laws applicable to Dal Lake¹³ — such as the Water Act (1974) and Environment Protection Act (1986) — are robust on paper, but enforcement is inconsistent. There are no strict performance-linked indicators for agencies, meaning that projects can remain incomplete without consequences. Even High Court directives often face delayed compliance due to administrative inertia.

3. Funding Volatility and Absence of Ring-Fenced Budgets

Conservation projects often rely on annual budgetary allocations, which fluctuate based on political priorities. There is no **dedicated, ring-fenced conservation fund** to ensure continuity. As a result, long-term initiatives like dredging or shoreline stabilization are interrupted when funding lapses. For instance, a major STP upgrade project in 2019 was delayed for two years due to mid-year budget cuts.

4. Resistance from Communities due to Livelihood Impacts

Many residents depend on the lake for their livelihoods — such as fishing, floating garden farming, and shikara tourism. Conservation measures that restrict these activities without offering viable alternatives face resistance. Encroachment removal drives have at times sparked protests because affected families were neither adequately consulted nor compensated.

5. Tourism Pressure Exceeding Ecological Carrying Capacity

Dal Lake is a prime tourist attraction, with thousands of daily visitors during peak season. Overcrowding increases waste generation, fuel spills from motorboats, and noise pollution. Without carrying capacity studies, tourism continues to grow unchecked, accelerating ecological stress. Similar patterns were observed in other fragile ecosystems like Pangong Lake in Ladakh, where uncontrolled tourism led to rapid waste accumulation.

13 The Environment (Protection) Act, 1986 (Act 29 of 1986); The Water (Prevention and Control of Pollution) Act, 1974 (Act 6 of 1974).

6. Inadequate Real-Time Monitoring and Data Gaps

Water quality monitoring is often manual and infrequent, with reports generated months after samples are collected. This delay prevents timely intervention. Installing real-time water quality sensors linked to a public dashboard could help address this, as successfully demonstrated at Lake Biwa in Japan.¹⁴

7. Political Interference in Enforcement

Political considerations sometimes delay enforcement actions, especially when encroachment or illegal construction involves influential individuals. In some cases, orders to remove unauthorized structures have been stalled due to fear of political backlash.

8. Reactive Rather than Proactive Management

Most conservation actions are reactive, triggered by judicial orders, public protests, or media coverage rather than proactive planning. This leads to crisis-driven management, where interventions are rushed and often lack long-term vision.

7. Recommendations

7.1 Governance Restructuring

Recommendation: Establish a **Single Empowered Dal Lake Authority** with legal powers, unified budget control, and integrated staffing from existing agencies. Include a **multi-stakeholder advisory board** to ensure representation from local communities, NGOs, academia, and the tourism sector.

Rationale: Institutional fragmentation is one of the biggest roadblocks to effective conservation. A central authority with statutory powers can eliminate overlapping jurisdictions, speed up decision-making, and align conservation projects under one strategy.

14 Lake Biwa Environmental Research Institute, *Annual Water Quality Monitoring Report* (Shiga Prefecture, Japan, 2017).

Example: *Singapore's Public Utilities Board* consolidated all water management functions into one entity, leading to streamlined planning, stronger enforcement, and public trust.

7.2 Strategic Project Planning

Recommendation: Develop a **10-year Integrated Lake Basin Management (ILBM) Master Plan** with clearly defined short-term, medium-term, and long-term milestones. Adopt **rolling five-year implementation cycles** with annual reviews for adaptive planning.

Rationale: Without a coherent, long-term vision, conservation projects remain piecemeal and inconsistent. A master plan ensures that infrastructure upgrades, dredging, pollution control, and habitat restoration are integrated and phased logically.

Example: The *Chilika Lake Restoration Project* in Odisha¹⁵ implemented a phased master plan integrating hydrological restoration, fishery regulation, and ecotourism management, leading to a revival of fish populations and an increase in tourist numbers without damaging the ecosystem.

7.3 Sustainable Resource Mobilization

Recommendation: Create a **Dal Lake Conservation Fund** financed through:

- Eco-tourism fees (e.g., per-night stay in houseboats, motorboat permits)
- Corporate Social Responsibility (CSR) contributions from hospitality and transport sectors
- International environmental grants (e.g., GEF, UNDP)

Rationale: Long-term conservation requires predictable funding streams rather than fluctuating annual allocations. A dedicated fund ensures continuity, especially for maintenance-heavy projects like sewage treatment and dredging.

Example: The *Vembanad Lake Conservation Fund* in Kerala¹⁶ channels eco-tourism revenues into sanitation and waste

15 Chilika Development Authority, **Integrated Management Plan for Chilika Lake (2020-2030)** (CDA Publications, Bhubaneswar, 2020).

16 Vembanad Lake Conservation Council, *Community-Driven Wetland*

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management projects, reducing dependence on unpredictable state funding.

7.4 Performance-Based Funding and Monitoring

Recommendation: Tie funding disbursements to the achievement of **Key Performance Indicators (KPIs)** such as:

- Percentage reduction in untreated sewage inflows
- Reduction in Biological Oxygen Demand (BOD) levels
- Number of encroachments removed
- Increase in native aquatic vegetation coverage

Use **public dashboards** to display progress and commission **quarterly third-party audits**.

Rationale: Performance-based funding incentivizes agencies to deliver measurable results and increases transparency for citizens and donors.

Example: *Japan's Lake Biwa Management Plan*¹⁷ uses KPI-linked budgets and public dashboards to track water quality, increasing community participation and compliance.

7.5 Stakeholder-Centred Approaches

Recommendation: Form **Community Conservation Committees** with legally defined decision-making authority in areas such as waste management, eco-tourism regulations, and surveillance against illegal activities. Develop **livelihood transition programs** for those affected by conservation measures (e.g., training in eco-tourism services, handicrafts, organic farming).

Rationale: Engaging communities in governance builds ownership and reduces resistance to conservation measures that might affect livelihoods.

Example: *The Lake Victoria Fisheries Organization* involves local fishing communities in co-management, leading to improved compliance with fishing regulations and better ecological outcomes.

Restoration in Kerala (VLCC Publications, Kochi, 2019).

17 Japan International Cooperation Agency, *Lake Biwa Environmental Conservation Strategy* (JICA Press, Tokyo, 2015).

7.6 Regulating Tourism Pressure

Recommendation: Conduct **carrying capacity studies** to determine the maximum sustainable number of tourists and boats on the lake. Mandate **eco-certification** for all tourism operators, with license renewals tied to compliance.

Rationale: Over-tourism is a key driver of ecological decline. Eco-certification and visitor caps help maintain ecological balance while supporting sustainable livelihoods.

Example: *Bhutan's high-value, low-impact tourism policy* limits tourist numbers through pricing and certification, preserving the environment while boosting per-visitor revenue.

7.7 Judicial and Administrative Synergy

Recommendation: Establish a **Judicial Monitoring Cell** linked to the Jammu and Kashmir High Court to track compliance with court orders in real time. Align administrative plans under s.30 of the Environmental Act with judicial directives to avoid duplication or conflict.

Rationale: Judicial activism has been a driving force in Dal Lake's conservation, but implementation often lags. A monitoring cell would create an institutional bridge between the judiciary and executive arms of governance.

Example: The *Yamuna River Monitoring Committee* established by the National Green Tribunal (NGT)¹⁸ ensures that court orders on pollution control are executed through coordinated administrative action.

8. Conclusion

From the management angle, the socio-ecological decline of Dal Lake does not merely stem from natural causes. Rather, it illustrates fine governance issues, fragmented institutional mandates, and an insufficient integration of community interests into the decision-making process. The deterioration of the lake, despite decades of legal protection and judicial oversight, brings to light the fact that conservation issues are more of a management challenge than a legal problem or an ecological one.

18 National Green Tribunal, *Yamuna River Monitoring Committee Report* (NGT Secretariat, New Delhi, 2019).

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The study shows that although India's environmental laws, such as the Environment (Protection) Act, 1986, and the Wetlands (Conservation and Management) Rules, 2017¹⁹, lay a strong legal framework, the enforcement of these laws is inconsistent, agency responsibilities overlap, and project planning remains reactive instead of proactive. From this angle, it is revealed that with strategic governance restructuring, sustainable financing, and result-oriented monitoring, the current system might present better performances.

Applying Public Management Theory²⁰ would provide a solution for rationalizing the assignment of institutions, establishing accountability, and focusing on increasingly measurable outcomes.

According to change management principles, urgency has to be created, coalitions built, and adaptive reforms need to be institutionalized. The stakeholder theory, on the other hand, emphasizes the idea of local communities being empowered to work as partners instead of being mere beneficiaries.

The way forward for Dal Lake has to be an integrated, long-term management framework anchored in transparency, community ownership, and evidence-based decision-making, thus putting an end to all further fragmented project-based interventions. Ecological revival is made possible when governance is reformed to mobilize resources in a sustainable manner and in a transparent way for tracking performance, as evidenced by successful examples from Chilika Lake, Vembanad Lake, and Lake Biwa.²¹

At the end of the day, the saving of Dal Lake is not merely a matter of saving a water body but more so about protecting a cultural heritage site, conserving biodiversity, sustaining livelihoods, and ensuring

19 The Environment (Protection) Act, 1986 (Act 29 of 1986); The Wetlands (Conservation and Management) Rules, 2017.

20 J. P. Kotter, *Leading Change* (Harvard Business School Press, Boston, MA, 1996); R. E. Freeman, *Strategic Management: A Stakeholder Approach* (Pitman, Boston, MA, 1984).

21 Chilika Development Authority, *Integrated Management Plan for Chilika Lake (2020-2030)* (CDA Publications, Bhubaneswar, 2020); Japan International Cooperation Agency, *Lake Biwa Environmental Conservation Strategy* (JICA Press, Tokyo, 2015).

intergenerational equity. Adopting a management-centred, law-backed, and community-driven approach is not just a policy option; rather, it is a necessity, if the jewel of Kashmir is to be saved from irreversible decline.