

Legal Framework For Aquatic Ecosystem Protection In India: Challenges And Policy Reforms

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Abstract

With an astonishingly disproportionate portion of the national biodiversity, drinking water sources and rural livelihoods, the rivers, lakes, wetlands and coastal waters of India are faces to a constant onslaught of industrial effluents, agricultural run-offs, urban sewage, sand mining and unplanned infrastructure projects. Coastal Regulation Zone Notification, 2019, the Water (Prevention and Control of Pollution) Act, 1974, the Environment (Protection) Act, 1986, the Wetlands (Conservation and Management) Rules, 2017, the Biological Diversity Act, 2002, and the current legal and institutional framework governing the preservation of aquatic ecosystems in India are all examined in this paper. The research applies a doctrinal and policy-analytical approach by reviewing statutory provisions, judicial statements of the Supreme Court and National Green Tribunal and secondary scholarly sources to pinpoint invariably unfulfilled gaps between the textual provisions of laws and the ecological consequences. The review concludes that the main inhibitors to successful protection include fragmented jurisdiction between central and state governments, lack of effective enforcement capacity by pollution control boards, lack of baseline ecological information and the subordination of environmental clearance to development priorities. The paper proposes the following areas of reform: integrated river-basin governance, the enhancement of the enforcement authority of the National Green Tribunal, compulsory ecological flow standards, and the increased involvement of the community in the management of wetlands and coastal zones. It finds that reforming the law is not enough without investing in parallel in the monitoring infrastructure and institutional accountability.

Keywords: aquatic ecosystems, environmental law, water pollution, wetland conservation, coastal regulation, India.

1. Introduction

There is a unique position of water bodies in Indian communal life. Between fishing communities and real estate developers the rivers are worshipped, the wetlands are neglected, and the coastlines is disputed, all in the same policy cycle. Such a paradox is more than a cultural phenomenon; it is enshrined in the legal system of the country that considers the aquatic ecosystems as sacred commons, economic resource, and administrative afterthoughts. India has nearly one-fifth of the global population but approximately one-fourth of the freshwater supply, which has only worsened over the years as groundwater tables have dropped and river systems have become more seasonal (Central Water Commission, 2021). When a large proportion of the Gangetic plain and coastal deltas in the past were wetlands, currently, four decades ago, they have reduced drastically as a result of drainage, encroachment, and agricultural, or urban development.

There has not been, nor is there coherence, in the legal response to this decline. A series of laws have been passed by the Parliament since the 1970s to regulate water pollution, preserve the wildlife habitats, and regulate the development of the coast. Each of these laws, at its own time, was a real stride. One of the earliest pollution-control laws to be enacted anywhere in the developing world was the Water Act of 1974. The first law that was enacted following the Bhopal gas tragedy in 1986 was the Environment (Protection) Act and the central government was granted the ability to establish standards and give instructions. However, some 40 years later, much of the major rivers, such as the Yamuna, the Godavari, and the Sabarmati continue to be declared as heavily polluted by the Central Pollution Control Board (Central Pollution Control Board, 2022). The continuation of such disparity between ambition within the statute and actual eco-reality is the main puzzle that this paper will answer.

There are three questions that are posed in this paper. To start, what is the current system of laws and institutions in place to safeguard India's rivers, lakes, wetlands, and coastal waters? Second, what are the challenges in structure, administration, and enforcement that may hinder this framework to meet its proclaimed goals? Third, what changes, based on both local judicial justification and comparative practice, would reduce the difference

between law and outcome? This paper will review current literature on the topic of environmental federalism and water governance in India, and then conduct a doctrinal analysis of the key statutes and a sample of landmark judgments. Then it looks at four types of challenge; fragmentation of jurisdiction, lack of enforcement capacity, lack of data and monitoring, and the contradiction between development pressures and ecological restraints. A series of policy suggestions that are structured based on institutional integration, technological monitoring, and participatory governance form the conclusion of the paper.

The paper is also limited to freshwater and coastal water ecosystems in the territorial and administrative waters of India; the paper does not deal with the management of marine fisheries in the exclusive economic zone or multilateral river sharing agreements, unless it relates directly with the domestic ecosystem protection.

2. Literature Review

The literature on governance of aquatic ecosystems in India adopts three traditions that are overlapping which are the environmental law doctrine, political ecology, and the public administration. In what is still referred to as one of the most referenced treatments of Indian environmental law, Divan and Rosencranz (2001) follow the manner in which the constitutional basis to environmental protection was constructed more of through judicial interpretation and not a guarantee of the text. Article 21, 48A and 51A(g) of the Constitution combine to form what the Supreme Court has termed an enforceable right to a clean environment, though the authors point out that this right has been fulfilled unevenly, with less continued judicial scrutiny given to water pollution predicaments compared to air quality or forest protection cases.

Leelakrishnan (2016) provides a more institution-oriented explanation, thinking that the dual-board system of the Water Act, a Central Pollution Control Board backed by State Pollution Control Boards was based on the needs of an age of point-source industrial pollution and has had difficulty with the diffuse, non-point pollution sources, which now contribute most of the river pollution load, agricultural runoff and untreated municipal sewage. The subsequent empirical research supports this structural criticism. The Comptroller and Auditor General of India has repeatedly found in its performance audits of river-cleaning programs like the Namami Gange Programme and the Ganga Action Plan that the capacity to treat sewage has not kept pace with population growth or the amount of funds allocated for its construction (Comptroller and Auditor General of India, 2017).

The second line of literature places legal reform in the context of more general discussions on environmental federalism. Rajamani (2007) discusses the role of the shared legislative competence between the Union and the States in water constituting a State subject in the Seventh Schedule of the Constitution, the so-called environmental protection, as being shared in parts in the Concurrent List, has led to overlapping and occasionally conflicting regulatory jurisdiction. This subdivision is directly relevant to aquatic ecosystems: a river crossing multiple states can have varying enforcement priorities and possibilities of monitoring along its flow, which frustrates the basin-wide approach that hydrologists and ecologists believe should be taken to manage these systems.

A third stream of literature deals with the role of judiciary as alternative to legislative and administrative action. Research into the National Green Tribunal, a special purpose environmental dispute forum formed in 2010, typically attributes the tribunal with the effects of increasing access to environmental justice and greater application of the precautionary and the polluter pays principles than regular courts (Gill, 2017). Meanwhile, critics observe that the procedures of the Tribunal on wetland and river-front issues often experience long delays at the state level, because the Tribunal itself lacks a significant enforcement apparatus, and requests that its directives be carried out by the local governments and state pollution control bodies.

The development of wetland-specific scholarship has significantly increased since the stating of the Wetlands (Conservation and Management) Rules in 2010 and its revision in 2017. Scholars who have engaged in satellite-based national wetland inventories have recorded massive loss of wetlands in the peri-urban areas especially around growing metropolitan areas and have suggested that the 2017 Rules, by failing to provide a central regulatory body and instead devolving wetland classification into state-based bodies may have undermined protection in practice instead of enhancing it (Bassi et al., 2014).

The literature on coastal governance focuses on the successive notifications of the Coastal Regulation Zone of 1991, 2011 and 2019. Academics agree that development limitations have been gradually loosened with each revision in an effort to find a middle ground between protecting coastal residents' livelihoods and ensuring a steady stream of tourists and investments in infrastructure, a pattern which fisherfolk organisations and certain environmental groups also claim has yielded the balance to commercial interests (Menon et al., 2016).

This body of literature reflects in common on a single diagnosis; that the laws that govern the aquatic ecosystems in India are not drafted poorly, or even not enforced at all, but operate in an institutional context where fragmented power, resource-starved regulatory institutions, and a policy culture that views environmental clearance as a procedural hurdle to be overcome, rather than a substantive ecological protection. In this paper, I develop the diagnosis further, revising it with recent statutory and judicial developments and going further toward the actual suggestions of reform.

3. Legal and Institutional Framework

3.1 Constitutional Foundations

Aquatic ecosystems or water pollution are not explicitly described in the Constitution of India, yet three clauses have been the basis of judicial activism. The Supreme Court has interpreted Article 21 as guaranteeing the right to life, which includes the right to a safe and healthy environment and access to clean water, since the 1980s. The State is obligated to preserve and improve the environment, safeguard forests, and protect animals, as stated in Article 48A of the Directive Principles. Article 51A(g) is also one of the Fundamental Duties that has an equivalent liability on the citizens. Since neither Directive Principles nor Fundamental Duties can be applied independently, courts have always interpreted them into Article 21 to formulate justiciable environmental rights, which was most evident in the series of public interest litigation cases against industries that were discharging effluents into the Ganga in the late 1980s.

Water, which is the subject of the State List in the Seventh Schedule, under the head of Entry 17, is in the first place an object of state, and includes the water supply, irrigation, and drainage. The Concurrent List, however, in its entry 20, is economic and social planning, which the Union has relied on to support central legislation on environmental issues, such as water pollution, on the theory that environmental degradation has impacts which cannot solely be seen in the borders of a particular state. This bi-competence is the constitutional source of the jurisdictional overlap that will be addressed later in this paper.

3.2 The Water (Prevention and Control of Pollution) Act, 1974

For the purpose of controlling discharge into rivers, lakes, and groundwater, the Water Act remains the primary instrument in India. This act was the first of its kind to concentrate on pollution control. It authorized the establishment of the Central Pollution Control Board and granted authority to the State Pollution Control Boards to approve new and existing industrial and municipal outlets, set effluent standards, and bring criminal charges against those who violate them. The Act enforcement mechanism depends on the so-called consent to operate process where industries apply to the periodical clearance to prove that they meet required standards of discharges. Nominally, consent renewal has in most cases been more a formal administrative exercise than an actual ecological checkpoint, especially among small and medium industrial establishments that contribute a disproportionate portion of untreated discharge (Central Pollution Control Board, 2022).

3.3 The Environment (Protection) Act, 1986

Passed as a general act in the wake of the Bhopal catastrophe, the Environment (Protection) Act provides extensive rule-making capability to the central government, such as the ability to establish standards of quality of the environment, establish areas where industries may be situated and give directions to any individual or authority, as well as, the ability to close, prohibit or regulate an industry. Some of the more specific tools below, such as the Coastal Regulation Zone Notification and the Wetlands Rules, were adopted under the generic rule-making authority of this Act, but without any primary legislation, a trend that has enabled relatively easy adaptation of protective measures against amendment, but also exposed them to amendment by executive prerogative.

3.4 The Wildlife (Protection) Act, 1972 and the Biological Diversity Act, 2002

The Wildlife Protection Act allows the announcement of sanctuaries and national parks, including those that shield wetland habitats, an important source of life to migrating birds and fish breeding, like the Keoladeo National Park, Bharatpur, and the Chilika Lake sanctuary. Recording and preserving biological resources, including aquatic flora and fauna, and controlling access to genetic resources are the responsibilities of the National Biodiversity Authority, which was established by the Biological Diversity Act of 2002. A three-tier system culminating in the State Biodiversity Boards and local Biodiversity Management Committees further ensures this responsibility. It has

produced a smaller practical effect on the protection of aquatic ecosystems than its institutional architecture may imply, in part due to financial, technical, and/or explicit enforcement capacity of Biodiversity Management Committees in local level.

3.5 Wetlands (Conservation and Management) Rules, 2017

The 2017 Rules superseded a previous 2010 framework and transferred the primary regulatory role to State Wetland Authorities, eliminating the need to centrally approve activities in notified wetlands that previously existed under the previous rules. The Rules also prohibit some actions, such as conversion to non-wetland uses, dumping solid waste, and construction within the boundaries of wetlands but leave much discretion to state authorities to determine the boundaries of wetlands and what may be done on them, what critics term a devolution that has undermined rather than enhanced protection given uneven state capacity (Bassi et al., 2014).

3.6 Coastal Regulation Zone Notification, 2019

The 2011 notice was superseded by the 2019 one under the Environment (Protection) Act, which divides coastal regions into four zones with different levels of development restrictions. The 2019 notice reduced the number of types of no-build zones along coastlines and mandated that states create coastal zone management plans. The relaxed standards, which are partly aimed at helping tourism, fisheries infrastructure, and urban development along the coast, have come under criticism by fishing communities and some coastal states, which recognize that this is making them more susceptible to storm surges and erosion, especially with the current and increasing rate of sea-level rise occurring along the coast in India.

3.7 The National Green Tribunal Act, 2010

The National Green Tribunal Act established a special court which had the authority to hear cases involving a serious question touching on the environmental issue such as cases under the water act, environment protection act and similar laws. Important orders on river rejuvenation, especially in the Yamuna floodplain and building development on riverbanks in Delhi, have been made by the Tribunal, which uses the polluter-pays and precautionary principle in Indian environmental law. One of the framework's long-standing shortcomings is the lack of monitoring of compliance with the Tribunal's instructions, which need execution by state pollution control boards and municipal governments.

3.8 Judicial Contributions

Along with the National Green Tribunal, the Supreme Court has made a number of landmark rulings that have affected the legislation pertaining to aquatic environments. The Supreme Court established an early precedent for enforcing pollution-control standards in a series of decisions in the late 80s and 90s known as *M.C. Mehta v. Union of India*. The cases mandated that tanneries operating on the Ganga River either construct effluent treatment facilities or cease operations. The case of *Vellore Citizens Welfare Forum v. Union of India* (1996) codified the polluter-pays concept and the precautionary principle into Indian environmental law, and it determined that tanneries in Tamil Nadu were liable for damages caused by groundwater pollution. These verdicts demonstrate a recurring trend to Indian environmental policy: judicial intervention where administrative inaction creates a gap which judicial intervention is then filling, a trend that has led to an impressive tradition of doctrinal evolution at the cost of individual litigant and judiciary initiative.

4. Challenges

4.1 Jurisdictional Fragmentation

State and federal governments, as well as different federal ministries and agencies, have always had competing interests in protecting aquatic habitats. The Ministry of Jal Shakti, the State Pollution Control Board, the appropriate urban local authorities in charge of sewage facilities, the Ministry of Environment, Forest and Climate Change, and, if required, the port or irrigation authorities might all have jurisdiction over a single river length. Hydrologists think that river-basin organisations are the right scale at which to govern interconnected water systems, but there are only a few and patchy examples of river-basin organisations in India, although shaping water systems at the basin scale is long-standing in policy documents. The national ganga council that was established in 2016 to establish a

single oversight of the Ganga basin is indicative of both the potential and limitations of this policy: on the one hand, it has consolidated authority on paper, and on the other, there is a lack of consistency in both coordination with the eleven states the Ganga and its tributaries flows through.

4.2 Enforcement Capacity and Institutional Resourcing

State Pollution Control Boards are never adequately staffed compared to the size of the monitoring and enforcement they are required to carry out. Audits by the Comptroller and Auditor General and reports by parliamentary standing committees have reported on numerous occasions that vacancy rates in a number of state boards were more than a third of approved technical positions, as well as outdated laboratory equipment and lack of ability to conduct constant rather than intermittent effluent monitoring (Comptroller and Auditor General of India, 2017). In cases where violations are detected by boards, the penalties that exist, including historically the possibility of criminal prosecution under the Water Act, have been found to be slow and hard to enforce via the normal criminal justice system, so a change in policy to decriminalise most environmental offences has been adopted instead of penalties, a move that is supposed to accelerate enforcement but whose environmental performance remains to be proven given its recent implementation.

4.3 Data and Monitoring Deficits

Good stewardship of ecosystems should consider quality baseline data and longitudinal records of water quality, flow and biodiversity, and the monitoring network in India is unevenly distributed. Oftentimes, the Central Pollution Control Board's national water quality monitoring program is restricted to a few thousand sites, although the frequency of sampling at many of the stations is too low to measure seasonal pollution peaks of agricultural runoff or monsoon sewage overflow. The wetland inventories, which have been significantly enhanced by satellite based mapping activities, are still lacking ground based ecological survey, especially the fish populations and aquatic vegetation survey required to measure the health of the ecosystems beyond the mere area. Such lack of data derails regulatory decision-making, as well as the capacity of civil society or judiciary to hold authorities to account, as litigation and public pressure both require evidence of harm to demonstrate.

4.4 Development Pressure and the Subordination of Environmental Clearance

The environment clearance procedures established by the Environment (Protection) Act and relevant notifications are theoretically meant to pre-screen environmental impact projects before granting approval. Practically, revisions in the environmental impact assessment process have broadened the list of exempted projects which do not require consultation with the populace or only go through a curtailed process, a move that has been grounded on the basis of minimizing regulatory procrastination in the case of infrastructural and industrial projects. The development of river fronts, sand mining activities and port expansion projects have often continued with environmental clearances that have been described by critics as poorly examined, especially in terms of cumulative effects where several projects in the same water body or floodplain are developed over time. The dilemma between the economic development needs and environmental boundaries is not peculiar to India, but it is sharpened by the rapid urbanisation of the country, and the fact, that the big rural population depends on the aquatic ecosystems, to irrigate their land, fish, and drink.

4.5 Climate Change and Cumulative Ecological Stress

The increasing temperatures, shift in the monsoon cycles, and melting of glaciers in the Himalayan headwaters are altering the flow regimes of the key rivers in India in a manner which is ill-suited in existing legal regimes that do not rely on managing the flow of rivers but rather on controlling pollution. Due to excess extraction of groundwater mainly due to unregulated agricultural practices that do not require the attention of most surface water centered laws, depletion of groundwater exacerbates pressure in wetlands and stream base flows during dry periods. Rising sea-level, intensified cyclones, and intrusion of saline water into freshwater aquifers are all compounding pressures on coastal ecosystems which the framework of the Coastal Regulation Zone, which is centered around construction setbacks, can only indirectly respond to.

5. Policy Reforms and Recommendations

5.1 Integrated River-Basin Governance

The legal system in India could also be improved by having statutory river-basin bodies that would have binding powers in coordination across all states, following in part the international experience of river-basin authorities like the Murray-Darling Basin Authority in Australia, but adjusted to the federal system in India. Instead of completely supplanting state powers over water, they may be given the capacity to establish ecological flow targets on the basin-wide level, coordinate inter-state data on pollution monitoring, and arbitrate controversial water distribution and quality matters before they devolve into protracted legal proceedings.

5.2 Strengthening the National Green Tribunal's Enforcement Reach

The substantive jurisprudence of the Tribunal has also had its effect, although its practical effect could be enhanced by specific compliance monitoring cells, with powers to check on the enforcement of its orders not just of the government authorities, but also of the individual polluters.

5.3 Mandatory Ecological Flow Standards

Minimum ecological flow requirements, which require a minimum water flow to support river ecosystems, fish migration, and downstream water quality, should be extended to all large dams and barrages not only the small number of Himalayan hydropower projects which already have a legal minimum ecological flow requirement. Environmental clearance should include environmental flow assessment as a technical requirement on all water infrastructural projects, rather than an optional requirement.

5.4 Restoring Central Oversight for High-Value Wetlands

Whereas small or otherwise ecologically insignificant wetlands may warrant devolution to state authorities, high-value wetlands, especially those of Ramsar designation and those of migratory bird populations deserve restored central regulatory control, or at least minimum protection standards that cannot be watered down by state authorities.

5.5 Investment in Monitoring Infrastructure and Open Data

The further extension of continuous and automated water quality monitoring coupled with publicly available data platforms would enhance regulation and civil society control. Ecological, rather than only chemical, investment in such monitoring as fish population surveys and aquatic vegetation would offer a more comprehensive view of ecosystem health than would be provided by only pollutant concentration data.

5.6 Community and Livelihood-Centred Governance

Fishing communities, farmers in floodplains, and other communities whose livelihoods rely on the aquatic ecosystems have fine-grained local ecological information that is not available in formal monitoring systems. Better compliance and validity of conservation among communities that otherwise may feel that restrictions are imposed on them may be achieved through statutory recognition of community-based wetland and coastal management committees with full decision-making authority instead of exclusively advisory roles.

6. Conclusion

The Indian laws covering the protection of aquatic ecosystems on paper is comprehensive: it encompasses both constitutional law, pollution laws, wildlife and biodiversity law, wetlands and coastal laws, and a dynamic body of judicial case law. However, that rivers, wetlands, and beaches remain polluted after 40 years since the adoption of the Water Act means that the main barrier must be not a lack of law but a lack of implementation, coordination, and monitoring capabilities. The paper has suggested that much of this gap is due to jurisdiction fracturing between central and state governments, chronic under-funding of pollution control agencies, lack of ecological information and the fact that environmental clearance is structurally subordinate to development interests. To deal with it, the reforms will need to move beyond redrafting of statutory text: integrated basin management, enhanced enforcement of text by tribunal, mandatory standards of ecological flow, re-established oversight of high-value wetlands, access to increased infrastructure of monitoring, and authentic community engagement all provide a more realistic direction on bridging the gap between legal aspiration and ecological achievement. Such a future study could benefit by empirically analyzing state level differences in enforcement outcomes in a more empirical fashion, an area to which the data limitations described in this paper themselves are a major impediment.

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