



Sacred Waters, Shared Responsibility: A Cultural Studies Analysis of the Ganga and Aquatic Environmental Sustainability

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Abstract

The Ganga (Ganges) river occupies a singular position among the world's waterways: it is simultaneously one of the most heavily used freshwater systems on Earth and one of the most intensely sacralized. This paper undertakes a cultural studies analysis of that duality, asking how the cultural and religious construction of the Ganga as a living goddess shapes, enables, and complicates efforts toward aquatic environmental sustainability. Drawing on theoretical resources from the anthropology of religion, political ecology, and science and technology studies, the paper first traces the textual and ritual construction of Ganga's sacrality across Puranic mythology, pilgrimage practice, and everyday devotional life. It then examines the documented environmental consequences; both regenerative and degrading; of mass ritual practice, drawing on water-quality data from the Central Pollution Control Board, the 2025 Maha Kumbh Mela, and the Namami Gange Programme's decade of implementation. The paper argues against two equally reductive positions: the romantic view that sacrality alone guarantees ecological care, and the secular-technocratic view that culture and religion are obstacles to be managed or bypassed by engineering solutions. Instead, it develops a framework for understanding religious institutions, ritual calendars, and sacred narrative as potential infrastructures of environmental governance, provided that cultural mobilization is integrated with, rather than substituted for, robust wastewater treatment, industrial regulation, and hydrological management. The paper concludes with policy-relevant reflections on how cultural narratives might be responsibly mobilized for sustainable water management in India and, by extension, in other contexts where rivers carry deep cultural and cosmological significance.

Keywords: Ganga, sacred rivers, cultural ecology, Namami Gange, Kumbh Mela, water pollution, religious environmentalism, political ecology, river conservation

1. Introduction

The Paradox of the Sacred River Few natural features anywhere in the world carry the density of cultural, religious, and civilizational meaning borne by the Ganga. Flowing some 2,525 kilometers from the Gangotri glacier in the Himalayas to the Bay of Bengal, the river is at once a hydrological system supporting an estimated 500 million people across its basin, roughly 43 percent of India's population, and a theological personage: Ganga Ma, Mother Ganga, a goddess descended from heaven, worshipped by hundreds of millions as the living embodiment of purification and liberation. This dual identity, as simultaneously *res* and *persona*, infrastructure and deity, is the central analytic problem this paper addresses.

The paradox is not merely poetic. It has concrete, measurable environmental consequences. The same river that is invoked in daily devotional practice as inherently self-purifying and immaculate is also, by the assessment of India's own Central Pollution Control Board (CPCB), among the most heavily contaminated major rivers in the world across long stretches of its course, receiving an estimated three billion litres of largely untreated sewage daily from the fifty major cities along its mainstem, in addition to industrial effluent, agricultural runoff, and solid waste (World Bank 2015; International Finance Corporation [IFC] 2023). The same ritual calendar that draws hundreds of millions of pilgrims into embodied relationship with the river—arguably one of the largest sustained forms of mass ecological engagement anywhere in the world—also generates, at moments of peak congregation, acute and measurable spikes in bacterial and chemical contamination (Central Pollution Control Board [CPCB] 2025, cited in CNN 2025). Cultural sacralization, in other words, has not straightforwardly produced ecological protection, nor has it been irrelevant to it; the relationship is considerably more complicated, mediated by political economy, infrastructure capacity, class and caste stratification, and the specific forms that ritual practice takes (Alley 2002).

This paper is a cultural studies analysis in the specific sense that it treats the Ganga neither as a purely natural object to be described in the language of limnology and hydrology alone, nor as a purely textual or symbolic object to be interpreted in the language of theology and mythology alone, but as what cultural geographers and political ecologists have called a "hybrid" or "socio-natural" object; a river whose physical, chemical, and biological properties are inseparably entangled with the meanings, practices, and power relations that human communities have constructed around it. The methodological premise here follows a now well-established current in cultural and environmental studies: that environmental problems are never purely technical problems awaiting purely technical solutions, but are always also problems of meaning, value, and social organization, and that durable environmental governance therefore requires attention to the cultural logics through which communities relate to their environments, not merely to the engineering of those environments.

This framing draws in particular on political ecology's long-standing insistence that the boundary between

"nature" and "culture" is itself a social and historical construction rather than a given, and on science and technology studies' related concept of the "hybrid" or "quasi-object", an entity, in Bruno Latour's terminology, that resists clean sorting into either the category of pure natural fact or pure social representation (Latour 1993), and whose adequate analysis therefore requires moving fluidly between registers that positivist environmental science and purely textual religious studies have traditionally kept separate. The Ganga is an unusually clear instance of such a hybrid: its chemistry is shaped by ritual practice (organic loading from immersion, heavy metals from idol paint), and its meaning is shaped by chemistry (public disputes over CPCB data are simultaneously disputes over the river's scientific condition and over its theological status). A cultural studies method adequate to this object must therefore hold empirical rigor about measurable water quality and interpretive rigor about religious meaning-making in the same analytical frame, refusing the temptation, common to both technocratic policy discourse and celebratory religious-tourism discourse, to collapse the analysis into only one register.

The paper proceeds in six further sections. Section 2 examines the cultural and mythological construction of the Ganga as sacred, tracing its sources in Puranic narrative and its elaboration in ritual and pilgrimage practice. Section 3 turns to the environmental consequences of that ritual practice, disaggregating positive and negative effects with reference to available data. Section 4 examines the Namami Gange Programme as the principal contemporary state response, assessing its record against the scale of the problem. Section 5 develops a theoretical account of how cultural meanings attached to rivers shape environmental behavior, drawing on theories of the sacred, the commons, and moral ecology. Section 6 asks whether religious institutions and ritual practice can be deliberately mobilized as tools of conservation, examining emergent experiments in "eco-theology" and religious environmentalism. Section 7 offers a set of concluding reflections on the responsible mobilization of cultural narrative for sustainable water management.

2. The Cultural Construction of the Ganga as Sacred

2.1 Mythological Foundations

The sacrality of the Ganga is not a diffuse or vague cultural sentiment; it is elaborated with considerable narrative and theological specificity across a body of Sanskrit textual sources spanning more than two millennia. The river's descent to earth is narrated at length in the Puranic corpus—most famously in the story of King Bhagiratha, who is said to have performed severe austerities to bring the celestial river Ganga down from heaven in order to purify the ashes of his ancestors, the sixty thousand sons of King Sagara, who had been reduced to ash by the wrath of the sage Kapila and could attain liberation only through contact with Ganga's waters (Eck 1982; Drew 2017). Because the force of the river's descent threatened to devastate the earth, the god Shiva is said to have caught the falling waters in his matted locks, releasing them gradually onto the Himalayan plains; an image that remains ubiquitous in Ganga iconography and that encodes, in mythological form, an early cultural recognition of the need to moderate and channel the river's power.

This narrative complex accomplishes several things simultaneously that are significant for the present analysis. First, it establishes the Ganga as thiogenic; not merely blessed or dedicated to the divine, but constitutively divine in her own right, typically depicted as a goddess (frequently iconographically rendered riding a makara, a crocodile-like aquatic creature) rather than merely a river dedicated to a god. Second, it establishes contact with the river's waters as directly efficacious for liberation (moksha) and the purification of even the most severe accumulated transgression, a soteriological function that later ritual practice; particularly the practice of immersing cremated remains; directly operationalizes. Third, it encodes an early and enduring cultural motif in which the river's power is understood as simultaneously beneficent and potentially destructive, requiring mediation, channeling, and right relationship rather than unregulated approach; a motif with clear, if underexploited, resonances for a contemporary ecological ethic of stewardship.

2.2 Ganga in Ritual Cosmology and Everyday Practice

Beyond these founding narratives, Ganga occupies an extraordinarily dense position in everyday Hindu ritual life. Ganga water (Gangajal) is used in domestic worship (pooja) across the subcontinent, transported and stored in households far removed from the river's physical course, used to consecrate temples, mark rites of passage, and seal oaths; it is popularly held, and has been the subject of scientific curiosity since the colonial period, to resist bacterial putrefaction over long storage, a property some contemporary researchers have associated with dissolved oxygen levels, bacteriophage activity, and mineral content in the river's upper Himalayan reaches, though this property is understood by practitioners in explicitly theological rather than biochemical terms (Alley 2002; Gupta 1994). The river is one of the seven sacred rivers (sapta-sindhu) of classical Hindu geography, and bathing at particular *tirthas* (river crossings understood as thresholds between the mundane and the sacred) is held to confer purification unavailable through ordinary ablution (Eck 1981; Alter 2001).

This ritual density is spatially concentrated at a set of riverside cities; Haridwar, Prayagraj (Allahabad), Varanasi, and, for the Ganga's tributary system, Ujjain and Nashik on the Kshipra and Godavari; that function as major pilgrimage centers organized around elaborate ghat architecture: stepped embankments, often architecturally and historically significant in their own right, that mediate the interface between urban settlement and river (Eck 2012). Varanasi in particular occupies a distinctive place in this geography as a maha-shmashana, a great cremation ground, where death itself is ritually integrated with the river through the practice of cremation on the ghats and the immersion of ashes, predicated on the belief that dying in Varanasi and being cremated on Ganga's banks confers direct liberation from the cycle of rebirth (samsara) (Eck 2012; Alley 2002).

2.3 Pilgrimage as Mass Cultural Practice: The Kumbh Mela

The most concentrated expression of this ritual cosmology is the Kumbh Mela, a pilgrimage festival rotating among four riverside cities (Haridwar, Prayagraj, Ujjain, and Nashik) according to an astrological cycle, held in its full form every twelve years at each location (with an intermediate Ardh, or half, Kumbh at the six-year midpoint), and its rare Maha or great iteration occurring after twelve full cycles; 144 years. The 2025 Maha Kumbh Mela at Prayagraj, held at the sangam, the confluence of the Ganga, Yamuna, and the mythical subterranean Saraswati, was by any measure among the largest gatherings of human beings for a single purpose in recorded history: government and media estimates placed total attendance over the roughly six-week festival at approximately 600 million pilgrim-visits, a figure equivalent to more than a third of India's total population and larger than the population of any country on Earth except India and China, drawn to what participants and organizers described as a once-in-a-lifetime, civilizationally significant event (CNN 2025).

The scale of this congregation is worth dwelling on analytically, because it is precisely this scale; the transformation of a riverside pilgrimage site into what commentators have called "the world's largest temporary city," accommodating on peak bathing days upward of several million people in a matter of hours (CNN 2025; Down to Earth 2025); that produces the sharp environmental tensions examined in the following section. The Kumbh Mela is not merely a large religious festival; it is a recurring, predictable, ritually mandated act of mass congregation at the water's edge, organized around the specific practice of full-body immersion (snan) on astrologically auspicious dates, and it therefore constitutes a uniquely intense natural experiment in the relationship between sacred practice and river ecology.

3. Environmental Impacts of Religious Ritual and Pilgrimage: A Balanced Assessment

3.1 The Case for Positive Environmental Effects

It would be a significant analytical error to treat the cultural sacralization of the Ganga as environmentally inert or purely destructive. Several distinct mechanisms plausibly link Ganga's sacred status to positive environmental outcomes, and these deserve serious treatment rather than dismissal.

First, sacred status has historically functioned as a form of de facto protected-area designation. Stretches of river, particular ghats, and riparian groves associated with temples have often been afforded a degree of customary protection from certain forms of development or extraction precisely because of their religious significance, a pattern well documented in the broader literature on "sacred natural sites" across South Asian religious traditions (sacred groves, protected temple tanks, and similar institutions), which comparative conservation biology has increasingly recognized as informal but ecologically consequential complements to formally designated protected areas (Bhagwat and Rutte 2006). The prohibition, however unevenly enforced, on constructing certain kinds of industrial infrastructure in the immediate vicinity of major ghats reflects this logic.

Second, the sheer scale of devotional attention to the river has generated significant social capital for conservation mobilization. Organizations such as the Sankat Mochan Foundation in Varanasi, founded by a lineage of temple priests, have for decades combined religious authority with environmental science advocacy, using the credibility of religious leadership to press for wastewater treatment and monitoring in ways that a purely secular environmental NGO might have struggled to achieve in the same social context (Alley 2002). The activist G. D. Agrawal, a former engineering professor who became a Hindu monk and undertook repeated hunger strikes—ultimately fatal, in 2018; demanding that the government honor its commitments to an unimpeded (aviral) and clean (nirmal) Ganga, exemplifies the distinctive moral and political force that specifically religious framings of river advocacy have been able to mobilize, drawing national and international attention to hydrological issues (particularly the impact of dams and barrages on flow) that might otherwise have remained the province of specialist hydrologists (Drew 2017).

Third, and more speculatively, the belief in the river's purity has been invoked—including in recent government-adjacent scientific discourse around the 2025 Kumbh; as a spur to continuous public monitoring and official accountability, insofar as officials are compelled to respond publicly to any suggestion that the river's condition falls short of its represented sanctity, generating a distinctive form of what might be called reputational governance, however imperfect and contested its actual enforcement (CNN 2025). Fourth, at the level of individual behavior, ethnographic and survey research on riverside communities has documented that professed reverence for the river correlates, for at least some practitioners, with self-reported restraint in certain forms of waste disposal and with participation in voluntary cleanup activities (shramdaan), particularly around major festival dates, suggesting that sacred framing can, under the right conditions, translate into pro-environmental behavior at the individual and community level (Alley 2002; Drew 2017).

3.2 The Case for Negative Environmental Effects

Against these positive mechanisms must be set a substantial body of documented negative environmental consequences directly attributable to ritual practice, which cultural studies analysis cannot responsibly minimize.

Mass bathing and acute bacterial contamination:

The clearest evidence comes from water-quality monitoring during the 2025 Maha Kumbh Mela itself. A Central Pollution Control Board report submitted in early February 2025 found faecal coliform levels; an indicator of untreated human and animal sewage; far in excess of the CPCB's own safe bathing standard of 2,500 units per 100 millilitres; at several sampling points along the Ganga and Yamuna near the sangam, levels exceeded the safe limit by more than a thousand-fold, with some reports citing coliform concentrations roughly 1,400 times the

permissible threshold in the Ganga and 660 times the threshold in the Yamuna (CPCB 2025, cited in CNN 2025 and Down to Earth 2025). This contamination reflects the combined pressure of an unprecedented concentration of human bodies (bathing, but also generating sewage from the temporary settlements housing millions of pilgrims and support workers), the ritual practice of immersion itself, and despite an "exhaustive survey" of drainage points and official claims that all major drains were sealed prior to the festival, residual leakage from the vast informal sanitation infrastructure required to service a temporary population in the millions (CNN 2025). It should be noted that this finding was publicly disputed by state officials, including the Chief Minister of Uttar Pradesh, and that a parallel body of officially cited scientific opinion argued that low water temperatures and bacteriophage activity rendered the river safe despite the coliform readings—an evidentiary and political controversy that itself illustrates the contested terrain on which claims about the river's sacred purity and its measured chemical condition come into direct public conflict (CNN 2025).

Cremation, immersion, and organic loading:

The practice of cremation on the ghats of Varanasi and other pilgrimage centers, followed by immersion of ashes (and, historically and in exceptional cases still today, of incompletely cremated remains, particularly of those—infants, ascetics, certain categories of the dead—for whom cremation is not customarily prescribed and full-body immersion is instead performed) introduces organic and, in some cases, pathogenic loading directly into the river. Alongside human remains, the ritual immersion of religious idols (visarjan, most prominently associated with the Durga Puja and Ganesh Chaturthi festivals across the wider Gangetic cultural region, though relevant to Ganga tributaries and associated water bodies as well) introduces plaster of Paris, synthetic paints containing heavy metals, and non-biodegradable decorative material into riverine and lake ecosystems, a well-documented seasonal pollution pulse studied extensively in Indian environmental science literature.

Floral and ritual offering waste:

The practice of offering flowers, food, and other materials (prasad, phool) to the river, while organic and in principle biodegradable, occurs at a volume, compounded by the plastic and synthetic packaging in which such offerings are increasingly wrapped in contemporary urban ritual practice—that overwhelms natural decomposition capacity at high-traffic ghats, contributing to floating debris load, drainage blockage, and (as offerings decompose in situ) localized eutrophication and oxygen depletion.

Solid waste from mass congregation:

Beyond specifically ritual waste, the logistics of hosting mass pilgrimage generates immense solid waste streams—food packaging, plastic water bottles and containers (notwithstanding a single-use plastics ban formally instituted for the 2025 Kumbh as part of a "Green Kumbh" sustainability initiative), and general urban solid waste associated with any temporary settlement of comparable scale—much of which, absent robust waste collection infrastructure, finds its way into the river or its floodplain.

The structural point:

The critical analytical point is that these negative impacts are not incidental to ritual practice but are in significant part *products of scale and infrastructure mismatch* rather than of ritual practice as such. A modest, geographically dispersed pattern of individual devotional bathing plausibly imposes negligible burden on river assimilative capacity; the concentration of that same practice, multiplied across hundreds of millions of participants within a compressed festival window and a geographically constrained sangam, in a context where sanitation infrastructure, however substantially improved relative to earlier decades, remains inadequate to service a population surge of this magnitude, transforms an ecologically modest practice into an acute pollution event. This point has direct policy implications developed further in Sections 4 and 7: the environmental problem is not best framed as ritual practice versus conservation, but as a problem of infrastructure capacity failing to keep pace with the scale of a cultural practice that shows no sign of diminishing and that, if anything, has grown in scale across successive Kumbh cycles.

3.3 The Broader Baseline: Structural Pollution Beyond Ritual

It is essential, for analytical proportion, to situate ritual-associated pollution within the much larger baseline of the Ganga's structural pollution burden, the great majority of which is unrelated to religious practice. Domestic sewage from the roughly 50 major cities and hundreds of smaller towns along the Ganga's mainstem accounts for an estimated 70 to 80 percent of the river's pollution load, with industrial effluent (from tanneries, textile mills, distilleries, and chemical plants concentrated in cities such as Kanpur) contributing a further 15 to 20 percent, and agricultural runoff, containing fertilizer and pesticide residues, contributing an additional and less precisely quantified burden (World Bank 2015; IFC 2023).

Estimates place total sewage generation across the wider Ganga basin at over 1,200 million litres per day, with roughly 3,000 million litres per day entering the river's mainstem; a 2022 review found that only approximately 37 percent of the sewage generated in the basin was being treated before discharge, meaning that a substantial majority of the river's pollution burden originates in the daily infrastructural deficits of ordinary urban and industrial life rather than in periodic ritual events (Public Accounts Committee 2024). This baseline context is analytically indispensable: it prevents both an overstatement of ritual practice's environmental culpability (a framing sometimes deployed, not always in good faith, to shift attention away from structural governance and infrastructure failures) and an understatement of the genuine, if episodic, additional pressure that mass ritual congregation places on a river system already operating at or beyond its assimilative capacity for much of the year.

4. Government Response: The Namami Gange Programme

4.1 Institutional History and Design

State efforts to address Ganga pollution predate the current program by decades. The Ganga Action Plan (GAP), launched by Prime Minister Rajiv Gandhi in June 1985, was independent India's first major river-cleaning initiative, covering 25 Class I towns across Uttar Pradesh, Bihar, and West Bengal at a cost of approximately ₹862.59 crore, and focused principally on intercepting and treating domestic sewage before it reached the river (Public Accounts Committee 2024). GAP is now widely regarded, including in government's own retrospective assessments, as having achieved only limited and non-durable results, hampered by inadequate treatment capacity, poor plant maintenance, weak inter-agency coordination, and insufficient attention to the river's overall ecological flow (Public Accounts Committee 2024).

The Namami Gange Programme, launched by the Government of India in June 2014 under the Ministry of Jal Shakti's Department of Water Resources, River Development and Ganga Rejuvenation, and implemented through the National Mission for Clean Ganga (NMCG), represents a considerably more ambitious and structurally different intervention. Rather than a narrow focus on sewage interception, Namami Gange was designed as an integrated conservation mission spanning multiple "pillars": sewerage treatment infrastructure, river-surface cleaning, afforestation, biodiversity conservation, industrial effluent monitoring, riverfront (ghat and crematoria) development, and public awareness and participation, organized under a three-tier national–state–district governance structure and covering eight basin states (Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Haryana, Rajasthan, and Delhi) along with more than 97 towns and 4,400 villages (National Mission for Clean Ganga [NMCG] 2025).

4.2 Financial Scale and Institutional Innovation

The programme's financial scale has grown substantially since inception. Originally approved with a budgetary outlay of ₹20,000 crore through 2020, it was subsequently extended as "Namami Gange Mission-II" through March 2026 with an enhanced outlay of ₹22,500 crore, and cumulative budgetary allocation since inception has reached approximately ₹26,800–29,200 crore across various government accountings as of the 2025–26 fiscal year (Press Information Bureau [PIB] 2026). Of the funds allocated between 2014–15 and 2023–24, the NMCG had disbursed approximately 82 percent, reflecting improved fund utilization relative to the Ganga Action Plan era, when the Comptroller and Auditor General's 2018 report had found only about a quarter of eligible funds spent between 2014 and 2017 and had specifically criticized implementation performance (Comptroller and Auditor General of India [CAG] 2018; PIB 2026).

A significant institutional innovation has been the adoption of the Hybrid Annuity Model (HAM) for sewage treatment plant construction and operation, developed jointly by the NMCG, the World Bank, and the International Finance Corporation, under which private operators receive 40 percent of capital costs upon construction milestones and the remaining 60 percent disbursed over a 15-year period contingent on verified treatment performance; a design intended to solve the chronic problem, endemic to earlier Indian sewage infrastructure programs, of treatment plants being constructed but subsequently falling into disrepair or non-operation for want of maintenance funding (2030 Water Resources Group 2024). This model has helped mobilize more than \$1.5 billion in total investment, including approximately \$650 million in private capital, and is now cited internationally as a template for performance-linked water infrastructure financing (2030 Water Resources Group 2024; IFC 2023).

4.3 Documented Outcomes

The programme's measurable outcomes as of 2025–26, drawing on government and CPCB reporting, present a genuinely mixed but not inconsequential picture, which a rigorous cultural-studies-informed analysis should neither dismiss as propaganda nor accept uncritically at face value.

On the positive side of the ledger: of 524 sanctioned projects, 355 (approximately 68 percent) had been completed as of February 2026; sewage treatment capacity has expanded substantially, with reported combined new capacity in the range of 3,200–3,446 MLD added over roughly the past five years, against a target of reaching 7,000 MLD of cumulative treatment capacity by December 2026 (PIB 2026). Water quality monitoring by the CPCB has recorded genuine stretch-level improvements: the Kannauj-to-Varanasi stretch in Uttar Pradesh moved from Priority River Stretch (PRS) category III in 2015 to category V by the mid-2020s (a lower category number indicating higher pollution, such that this represents improvement); the Buxar-to-Bhagalpur stretch in Bihar moved from PRS II to PRS IV over a comparable period; and biological oxygen demand levels in some Uttar Pradesh stretches fell from a 2015 range of roughly 10–20 mg/l to approximately 3–6 mg/l by 2022 (DD News 2026; PIB 2026). Perhaps the most striking biodiversity indicator is the recovery of the Gangetic river dolphin (*Platanista gangetica*), an endangered species and recognized bioindicator of overall river health: nationwide survey data cited by the NMCG shows an increase from an estimated 2,500–3,000 individuals in 2009 to approximately 3,500 in 2015 and to roughly 6,300 individuals in the most recent (2021–2023) comprehensive nationwide assessment; more than a twofold increase since 2009; with dolphins newly recorded in tributaries where they had not previously been documented, including the Rupnarayan, Girwa, Bagmati, Ken, and Betwa rivers (PIB 2026; NMCG 2025). The programme has also received international recognition, being named in December 2022 as one of the UN Environment Programme's ten inaugural "World Restoration Flagships" under the UN Decade on Ecosystem Restoration (DD News 2026).

On the negative side of the ledger, and this must be stated with equal clarity: government and independent water-

quality assessments have continued, into the mid-2020s, to find the river generally unfit for bathing and drinking across much of its length according to fecal coliform standards, notwithstanding the stretch-level improvements noted above. Faecal coliform readings at key monitoring points remain, even on the programme's own reporting, substantially elevated relative to bathing-water standards: for example, median faecal coliform values at Assi Ghat in Varanasi, while reduced from 2,500 MPN/1 00mL in 2014 to 790 MPN/1 00mL in 2025, and at Patna's Gandhi Ghat, reduced from 5,400 to 2,200 MPN/1 00mL over the same period, still exceed or approach the CPCB's bathing-water threshold, and the acute contamination recorded during the 2025 Kumbh Mela (discussed in Section 3.2) demonstrates that baseline improvements can be sharply and temporarily overwhelmed by peak ritual congregation (PIB 2026). More structurally, independent reviews have found that even where treatment capacity exists, a substantial proportion of plants have historically operated below design efficiency or intermittently, and a 2022 assessment found only around 37 percent of basin-wide sewage generation was being treated; suggesting that, notwithstanding a decade of substantial investment and genuine stretch-level gains, the fundamental infrastructure gap between sewage generation and treatment capacity across the wider basin has not yet been closed (Public Accounts Committee 2024).

4.4 Interim Assessment

The balanced reading suggested by this evidence is that Namami Gange represents a genuine, well-resourced, and institutionally more sophisticated intervention than its predecessors, with credible and independently corroborated gains in specific domains—dolphin population recovery, stretch-level BOD reduction, treatment capacity expansion, and international recognition—while falling considerably short of its own foundational goal, articulated at the programme's 2014 launch, of a Ganga that is both aviral (unimpeded in flow) and nirmal (pollution-free) across its length. The gap between the sacred ideal of an inherently pure river and the persistent, measured reality of significant contamination remains, as of 2026, a live and publicly contested feature of Indian environmental politics, not a problem that a decade of programmatic intervention, however well-funded, has resolved.

5. How Cultural Meanings Attached to Rivers Shape Environmental Behavior

5.1 Theorizing the Sacred as an Environmental Category

To move from description to theory, it is useful to draw on the broader comparative literature on sacred natural sites and religious environmental behavior. Anthropologists and religious studies scholars working across traditions have long observed that the designation of a natural feature as sacred does not translate in any simple or automatic way into ecological protection; the relationship is mediated by at least three variables that the Ganga case illustrates with unusual clarity (Bhagwat and Rutte 2006).

The first variable is the specific content of the sacred narrative i.e. what, precisely, the tradition holds the river to be and to do. The Ganga's theological construction emphasizes the river's capacity to *purify*, to absorb and dissolve impurity and transgression, rather than emphasizing (as some other sacred-nature traditions do) the river's fragility or vulnerability to human harm (Gupta 1994). This is analytically significant: a tradition that constructs a natural feature as inherently self-purifying, an eternal absorber of impurity by theological definition, generates a very different behavioral logic than a tradition that constructs a natural feature as fragile, finite, or susceptible to human-caused degradation. Ethnographic and survey work on Ganga-adjacent communities has repeatedly found that a significant number of devotees hold, sincerely and without cognitive dissonance, both the belief that the Ganga is empirically polluted in specific, visible ways and the theological belief that Ganga as goddess remains inherently and permanently pure; a distinction between the physical river (subject to worldly contamination) and the theological Ganga (categorically unsusceptible to spiritual impurity) that allows practitioners to acknowledge pollution as an empirical, correctable problem without it destabilizing the underlying sacred status of the river itself (Alley 2002). This dual framing can be read charitably, as a sophisticated and psychologically stable basis for supporting cleanup efforts (since acknowledging pollution does not threaten faith), or less charitably, as a theological structure that reduces the felt urgency of ecological harm precisely because the sacred referent is understood to be immune to it (Alley 1998).

The second variable is institutional mediation i.e. whether there exist organized religious institutions capable of translating diffuse devotional sentiment into coordinated behavioral or political action. Where such institutions exist and choose to prioritize environmental advocacy (as with the Sankat Mochan Foundation's decades-long combination of temple authority and water-science advocacy in Varanasi), sacred sentiment can be channeled into sustained, credible, and locally legitimate conservation pressure (Alley 2002; Drew 2017). Where such institutional mediation is absent, weak, or oriented toward other priorities (ritual continuity, pilgrimage revenue, temple architecture and adornment), diffuse reverence for the river may coexist indefinitely with high tolerance for measured pollution, since no institutional actor is positioned to translate belief into coordinated environmental practice.

The third variable is the structure of individual incentive and collective action surrounding ritual practice, understood through the classic economic and sociological literature on commons governance. Elinor Ostrom's influential analysis of common-pool resource governance emphasizes that sustainable stewardship of shared resources typically requires clearly defined boundaries, mechanisms for monitoring individual behavior, graduated sanctions for violation, and low-cost conflict-resolution mechanisms (Ostrom 1990); conditions that are extremely difficult to satisfy for a resource used simultaneously by hundreds of millions of geographically dispersed individuals, each of whose individual contribution to river condition (a single ritual offering, a single

act of bathing) is negligible in isolation but whose aggregate effect, precisely because no individual bears a perceptible share of the collective consequence, produces a textbook tragedy-of-the-commons dynamic that shared religious reverence, absent institutional coordination mechanisms of the kind Ostrom identifies, does not by itself resolve (Ostrom 1990).

5.2 Comparative Reflection: Varanasi and Haridwar as Contrasting Ritual Ecologies

Comparing two of the Ganga's principal pilgrimage cities usefully illustrates how the three variables identified above; narrative content, institutional mediation, and collective-action structure; interact differently even within a single religious tradition and river system. Varanasi's ritual economy is organized substantially around death and cremation; its moral ecology therefore centers on questions of appropriate disposal of human remains, the maintenance of the cremation ghats (Manikarnika and Harishchandra being the principal sites), and a highly specialized occupational community (the Doms, traditionally responsible for cremation labor and the maintenance of the sacred fire) whose social position has historically been marked by caste-based marginalization even as their ritual function is understood as indispensable (Eck 2012; Alley 2002). Environmental interventions in Varanasi must therefore contend with a distinctive set of practices; partial cremation of certain categories of the dead, ash immersion, funeral pyre wood sourcing; that have no close analogue at Haridwar.

Haridwar's ritual economy, by contrast, is organized substantially around the river's mythologized point of first entry onto the plains (the site, according to tradition, where Vishnu's footprint, or Har-ki-Pauri, marks the ghat) and around bathing, rather than cremation, as the central ritual act (Eck 2012; Alter 2001); its Kumbh Mela iterations and its year-round stream of pilgrim bathing generate a pollution profile dominated by human waste from mass bathing and temporary settlement rather than by the specific organic and heavy-metal loading associated with cremation practice. Government reporting cited in Section 4.3 records comparatively favorable faecal coliform readings at Haridwar (135–140 MPN/100mL in 2025) relative to downstream cities such as Varanasi and Patna (PIB 2026), a difference plausibly attributable both to Haridwar's position closer to the river's Himalayan headwaters, where dilution and self-purification capacity remain higher, and to its comparatively smaller permanent urban population relative to its ritual significance.

This comparison suggests an important refinement to the paper's broader argument: cultural and religious mobilization strategies for river conservation cannot be designed generically at the level of "the Ganga" or "Hinduism" in the abstract, but must be tailored to the specific ritual economy, occupational structure, and pollution profile of each pilgrimage locale—a granularity that reinforces Principle 2 (translation rather than imposition) developed in Section 7.1 below, since effective translation between devotional and ecological registers is necessarily local and practice-specific rather than achievable through a single national messaging campaign.

5.3 The River as Moral Community and the Limits of Individual Virtue

A further theoretical resource is the concept, developed across environmental ethics and the anthropology of religion, of moral ecology; the proposition that communities develop locally specific ethical frameworks governing appropriate human relationship to particular landscapes and resources, frameworks that may be more granular, more behaviorally specific, and more locally legitimate than the abstract, universalist categories of formal environmental law or international conservation science (Dwivedi 2006). The Ganga's moral ecology, as reconstructed from ethnographic literature, includes specific prohibitions and prescriptions—regarding, for instance, the treatment of cremated remains, the appropriate conduct of bathing, and the handling of ritual waste—that constitute a genuine, locally elaborated environmental ethic, even though this ethic does not map neatly onto the categories (biological oxygen demand, coliform count, dissolved oxygen) through which contemporary environmental science measures river health (Alley 2002). The central theoretical claim this paper advances is that such moral-ecological frameworks are not obstacles to be overcome by scientific environmental management but potential resources to be engaged, translated, and, where necessary, updated in dialogue with contemporary ecological science—a claim developed further in Section 6.

At the same time, this paper resists a romantic overstatement of moral ecology's sufficiency. Individual virtue and reverence, however sincerely held, cannot substitute for the collective-action and infrastructure-provision functions that only coordinated state capacity, adequately resourced, can perform at the scale the Ganga's basin population requires. The persistence of severe pollution despite near-universal professed reverence for the river across its basin population is itself powerful empirical evidence against any theory that treats cultural sacralization as a sufficient condition for environmental protection; it demonstrates, instead, that sacred meaning operates as one input among several into a behavioral and political system whose outcomes are also, and perhaps primarily, determined by infrastructure investment, regulatory enforcement, urban planning, and industrial governance.

6. Can Religious Institutions and Ritual Become Tools for Aquatic Conservation?

6.1 Existing Experiments in Religious Environmentalism

The question of whether religious institutions can be deliberately mobilized for conservation purposes is not speculative; a body of concrete experiments already exists and offers instructive evidence. The "Green Kumbh" framing officially adopted for the 2025 Maha Kumbh Mela—encompassing a single-use plastics ban, provision of eco-friendly and biodegradable materials for ritual offerings, electric vehicle deployment for pilgrim transport, expanded solid-waste collection infrastructure, and public awareness campaigns explicitly linking devotional practice to environmental responsibility—represents a state-led attempt to fuse ritual mega-event management

with sustainability messaging (CNN 2025; Down to Earth 2025). Independent assessments of this initiative's actual effectiveness remain limited and, given the acute contamination findings documented in Section 3.2, clearly indicate that messaging and symbolic commitments were not matched by adequate underlying sanitation infrastructure at the scale the event required; the initiative should be read as an important precedent and partial success in certain domains (solid waste, plastics) rather than as a demonstrated solution to the more intractable problem of sewage treatment capacity under conditions of extreme demographic surge.

More organically rooted examples include temple-led river-cleaning and afforestation drives, the promotion of biodegradable and "eco-friendly" alternatives to plaster-of-Paris idols for festival immersion (an initiative with growing traction, though still a minority practice, across several Indian states, promoted through a combination of municipal regulation, environmental NGO advocacy, and, increasingly, endorsement by religious leaders and organizations), and the long-standing advocacy tradition exemplified by figures such as G. D. Agrawal and institutions such as the Sankat Mochan Foundation, discussed above, which have used religious authority and personal sacrifice (in Agrawal's case, fatal hunger strikes) to sustain public and political attention to river governance across multiple government administrations (Drew 201 7; Alley 2002).

6.2 A Framework for Religious Institutions as Conservation Infrastructure

Drawing on this evidence, this paper proposes that religious institutions and ritual calendars possess at least four distinctive capacities relevant to conservation that purely secular environmental governance often lacks, while also facing distinctive limitations that must be honestly acknowledged.

Capacity 1 - Legitimacy and reach: Religious institutions command forms of trust and behavioral authority among riverine populations that state agencies and secular NGOs frequently do not, particularly in rural and economically marginalized communities where distrust of government institutions may be high. A message about waste disposal or ritual practice delivered by a respected local priest or religious authority may achieve behavioral compliance that an equivalent municipal ordinance, unaccompanied by enforcement capacity, cannot.

Capacity 2 - Calendrical predictability: Because major ritual events (Kumbh Mela, Durga Puja, Ganesh Chaturthi, and the routine cycle of auspicious bathing dates) occur on fixed, well-known calendrical schedules, they present a rare opportunity for anticipatory environmental management—pre-positioning of sanitation infrastructure, temporary treatment capacity, and waste collection systems—of a kind that is far harder to achieve for unpredictable pollution events. The 2025 Kumbh's advance survey of all 81 relevant drainage points, however imperfectly executed in outcome, illustrates the kind of anticipatory planning that calendrical predictability makes possible in principle (CNN 2025).

Capacity 3 - Symbolic capital for behavior change: Because ritual practice is already understood by participants as a domain requiring correct conduct (appropriate preparation, appropriate materials, appropriate comportment), the introduction of environmentally motivated modifications to ritual practice—biodegradable idol materials, designated immersion zones with post-immersion recovery infrastructure, restrictions on non-biodegradable offering wrapping—can potentially be framed as an elaboration of correct ritual conduct rather than as an externally imposed secular constraint upon it, a framing likely to achieve greater voluntary compliance than a purely regulatory approach.

Capacity 4 - Sustained moral pressure on state accountability: As the Agrawal case illustrates, religiously framed advocacy can sustain public attention to slow-moving infrastructure and governance failures across multiple political administrations and news cycles in a way that technocratic environmental reporting alone often struggles to achieve, functioning as a distinctive and durable form of civil-society pressure.

Limitation 1 - Institutional fragmentation: Hindu religious authority, unlike some more centralized religious hierarchies, is highly distributed across a vast number of largely autonomous temples, akharas (monastic orders), and individual religious figures, with no single institution capable of issuing binding directives across the tradition as a whole (Drew 201 7); this makes coordinated, tradition-wide environmental mobilization considerably harder to achieve than in more centralized religious contexts, and any conservation strategy premised on religious mobilization must therefore work through a plurality of institutional actors rather than a single authoritative channel.

Limitation 2 - The scale mismatch: No plausible combination of ritual modification and religiously mobilized behavior change can substitute for the underlying infrastructure deficit documented in Section 3.3 i.e the gap between approximately 1 2,000 MLD of basin-wide sewage generation and the treatment capacity currently available (World Bank 201 5; IFC 2023). Even a fully successful religious- environmentalist mobilization addressing ritual-specific waste streams (idol immersion, floral offerings, cremation practice) would leave untouched the much larger structural burden of daily urban and industrial sewage, which no amount of cultural mobilization can treat; only sustained public infrastructure investment can.

Limitation 3 - The risk of instrumentalization and majoritarian politics: Any strategy of mobilizing religious institutions for state environmental purposes carries risk of entanglement with majoritarian religious politics, potentially marginalizing the perspectives of India's religious minorities and secular citizens with respect to what is, constitutionally, a shared national resource and public good, and potentially subordinating rigorous environmental science to politically convenient religious messaging (as arguably occurred in aspects of the public dispute over CPCB findings during the 2025 Kumbh, discussed in Section 3.2; see also the parallel critique of the 201 7 Uttarakhand High Court ruling as blending "constitutional law with religious sentiment" in Policy Circle 2025). A responsible conservation strategy must therefore engage religious institutions as one partner among

several in a pluralistic governance framework, not as a substitute for independent scientific monitoring or as a vehicle for excluding non-religious framings of environmental responsibility.

7. Mobilizing Cultural Narratives for Sustainable Water Management: Toward a Synthesis

7.1 Principles for Responsible Cultural Mobilization

Drawing together the preceding analysis, this paper proposes five principles for the responsible mobilization of cultural and religious narrative in service of sustainable water management, applicable to the Ganga and, with appropriate contextual modification, to other culturally significant water bodies internationally: the Nile, the Jordan, and notably the Whanganui River in New Zealand, where Indigenous Māori conceptions of the river as an ancestor and living entity were formally incorporated into New Zealand law through the Te Awa Tupua (Whanganui River Claims Settlement) Act 2017, granting the river legal personhood; a model increasingly discussed as a potential template, with adaptation, for Ganga governance. India briefly attempted an analogous move of its own: just five days after the Te Awa Tupua Act took effect, the Uttarakhand High Court applied the same logic to the Ganga and Yamuna in a March 2017 ruling (Mohd. Salim v. State of Uttarakhand 2017), which was stayed by the Supreme Court of India that July on the grounds that conferring legal personhood on a natural entity required legislative rather than judicial authorization (Policy Circle 2025).

Principle 1 - Complementarity, not substitution: Cultural and religious mobilization should be pursued as a complement to, never a substitute for, adequately resourced sewage treatment infrastructure, industrial effluent regulation, and hydrological flow management. The evidence reviewed in this paper does not support any framing in which enhanced devotional messaging or ritual reform could plausibly close the basin's structural infrastructure gap; it can, at most, address the specific and real, but comparatively smaller, pollution burden directly attributable to ritual practice, while contributing valuable social capital and political pressure in support of the larger infrastructure project.

Principle 2 - Translation rather than imposition: Effective engagement with religious communities on environmental practice appears, on the evidence of cases such as the Sankat Mochan Foundation, to work best when framed as an internal elaboration of existing devotional logic (correct conduct, appropriate offerings, respect for the goddess's living body) rather than as an externally imposed secular environmental regulation that implicitly positions religious practice as the problem to be corrected. This requires environmental scientists, policymakers, and religious authorities to work collaboratively on translation, in both directions, between the register of ecological science and the register of devotional practice.

Principle 3 - Calendrical anticipation: Given the predictable, calendrical structure of major ritual congregation events, environmental governance should prioritize pre-positioned, surge-capacity sanitation and waste-management infrastructure specifically designed around the ritual calendar, rather than relying on standing infrastructure designed for average daily loads, which will always be overwhelmed by peak ritual demand of the kind documented during the 2025 Kumbh.

Principle 4 - Independent monitoring and transparent data: The public dispute over CPCB water-quality findings during the 2025 Kumbh illustrates the corrosive effect that the politicization of environmental data can have on public trust and on the capacity of cultural narrative to support, rather than obstruct, genuine environmental accountability. Sustainable water management requires that water-quality monitoring remain scientifically independent and its findings publicly transparent, regardless of the political or religious sensitivities its results may implicate; sacred narrative and empirical monitoring should be understood as operating in different registers that need not, and should not, be forced into artificial agreement.

Principle 5 - Attention to distributional and caste dimensions: Cultural studies analysis of the Ganga must also attend to the uneven distribution of both ritual authority and pollution burden across caste and class lines within riverine communities; including the historically marginalized status of communities engaged in occupations directly involving river-adjacent waste and sanitation labor (Alley 2002); a dimension beyond this paper's primary scope but essential to any genuinely equitable conservation strategy, since strategies that romanticize "traditional" river relationships without attending to the internal social stratification of those traditions risk reproducing existing inequities under a conservationist banner.

7.2 Toward a Hybrid Governance Model

The overall argument of this paper points toward what might be called a hybrid governance model for culturally significant water bodies: one in which state investment in hard infrastructure (sewage treatment, industrial regulation, hydrological flow management) remains the indispensable foundation of environmental improvement, but in which this infrastructural core is deliberately and thoughtfully integrated with, rather than isolated from, the cultural, religious, and narrative resources through which affected populations already understand their relationship to the river. Such a model treats religious institutions neither as an obstacle to be circumvented by purely technocratic environmental management nor as a self-sufficient solution capable of substituting for state capacity, but as one significant category of stakeholder and partner among several—alongside scientific agencies, municipal governments, industrial regulators, and affected communities across the caste and class spectrum—within a genuinely plural and accountable water governance system.

8. Conclusion

The Ganga's cultural construction as a living, purifying goddess and its measured hydrological and biochemical condition constitute two registers of description that are neither reducible to one another nor entirely independent

of one another. This paper has argued that the relationship between sacred meaning and environmental behavior along the Ganga is characterized by genuine complexity: cultural sacralization has generated real and documented conservation resources—social capital, institutional advocacy, reputational pressure on the state, and a distinctive moral-ecological framework governing appropriate conduct toward the river; while simultaneously sustaining ritual practices whose sheer contemporary scale, as vividly demonstrated by the 2025 Maha Kumbh Mela's documented contamination spikes, generates acute environmental pressures that a decade of substantial state investment through the Namami Gange Programme, notwithstanding genuine and measurable gains in dolphin population recovery, stretch-level water quality, and treatment infrastructure, has not yet been able to fully resolve. The path toward genuinely sustainable management of the Ganga, this paper has argued, lies neither in a romantic faith that reverence alone will produce ecological care, nor in a technocratic dismissal of cultural and religious meaning as irrelevant or obstructive to environmental science, but in the deliberate, careful, and politically honest integration of both registers: continued and expanded investment in the hard infrastructure of sewage treatment and industrial regulation, pursued in genuine partnership with the religious institutions, ritual calendars, and moral-ecological frameworks through which hundreds of millions of people already understand their relationship to what they know not merely as a river, but as Ganga Ma—at once the most measured and the most sacred water on Earth.

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