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Religious, Environmental And Socio-Cultural Crisis Of The Kadane, Noon And Baya Rivers: A Geographical Study Of The Kudhni And Sakra Regions Of Muzaffarpur District (Bihar)

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Abstract

This paper examines the multi-dimensional crisis afflicting three rivers the Kadane, Noon and Baya in the Kudhni and Sakra regions of Muzaffarpur district (Bihar). The crises are examined through three lenses: religious/ritual practices, environmental/hydrological health, and socio-cultural livelihood impacts. Drawing on field reports, secondary data and local media sources, the study maps the changing flow regimes, pollution and weed infestation, disruption of ritual access, flood-drought paradoxes, and the resulting socio-cultural dislocation. The paper argues that these crises are interconnected, and emerge from a confluence of hydrological mis-management, anthropogenic pressures and neglect of river-culture heritage. The findings highlight the urgent need for integrated policy responses that respect the rivers' religious significance, restore hydrological function, and safeguard socio-cultural livelihoods.

Keywords: Hydrological and Socio-Cultural Interaction, Cultural Ecology, Community-Based River Management, Floodplain Ecology, Sustainable Water Governance

Introduction

Background

The northern Bihar plains are criss-crossed by a dense network of rivers and distributaries, many of which serve as lifelines for agriculture, drinking water, ritual bathing and local culture. In the district of Muzaffarpur, the rivers Kadane, Noon and Baya occupy significant local importance. Historically they were used for ritual practices (such as the offering of arghya during the festival of Chhath Puja) and as sources of irrigation and drainage. However, in recent decades these rivers have been subject to flow stoppages, pollution, encroachments, embankment failures and weed invasion.

Study area

This paper focuses on two adjoining administrative regions (blocks) in Muzaffarpur district: **Kudhni (Kudhani)** and **Sakra**. These areas lie within the flood-plain of the rivers under study and are representative of the interplay of rural livelihoods, religious practice and river-dynamics. A map of the district and the river network is provided below for orientation.

The **Kadane River** is a river in the Muzaffarpur district of Bihar, India, that is known for its ecological problems and flooding. Once called the "**Little Ganga**," it is now polluted and prone to drying up, with recent news detailing significant projects for its restoration and a history of dam breaks causing floods and displacement. he rivers Kadane, Noon, and Baya in the Kudhni and Sakra region of Muzaffarpur district exemplify a layered crisis one that intertwines ecological degradation, ritual heritage loss, and socio-economic

disruption. Over the decades, unregulated discharge of sewage, encroachment on riverbanks, declining flow due to siltation and canal diversion, and negligence in maintenance have collectively reduced these rivers to mere seasonal drains. Their condition today represents not just an environmental tragedy, but a cultural and moral loss for the region that once revered these rivers as sacred life-givers.

However, there are promising signs of revival through integrated planning and modern governance. A major initiative has been undertaken by the Muzaffarpur Municipal Corporation, which has approved the construction of a modern Sewage Treatment Plant (STP) worth ₹84 crore near Fardo Nala the drain that carries untreated wastewater into the Kadane River. This project, supported by the Urban Development and Housing Department under the guidance of the Minister of State for Jal Shakti is expected to purify the wastewater before it reaches the river. Once operational, the treated water will not only improve

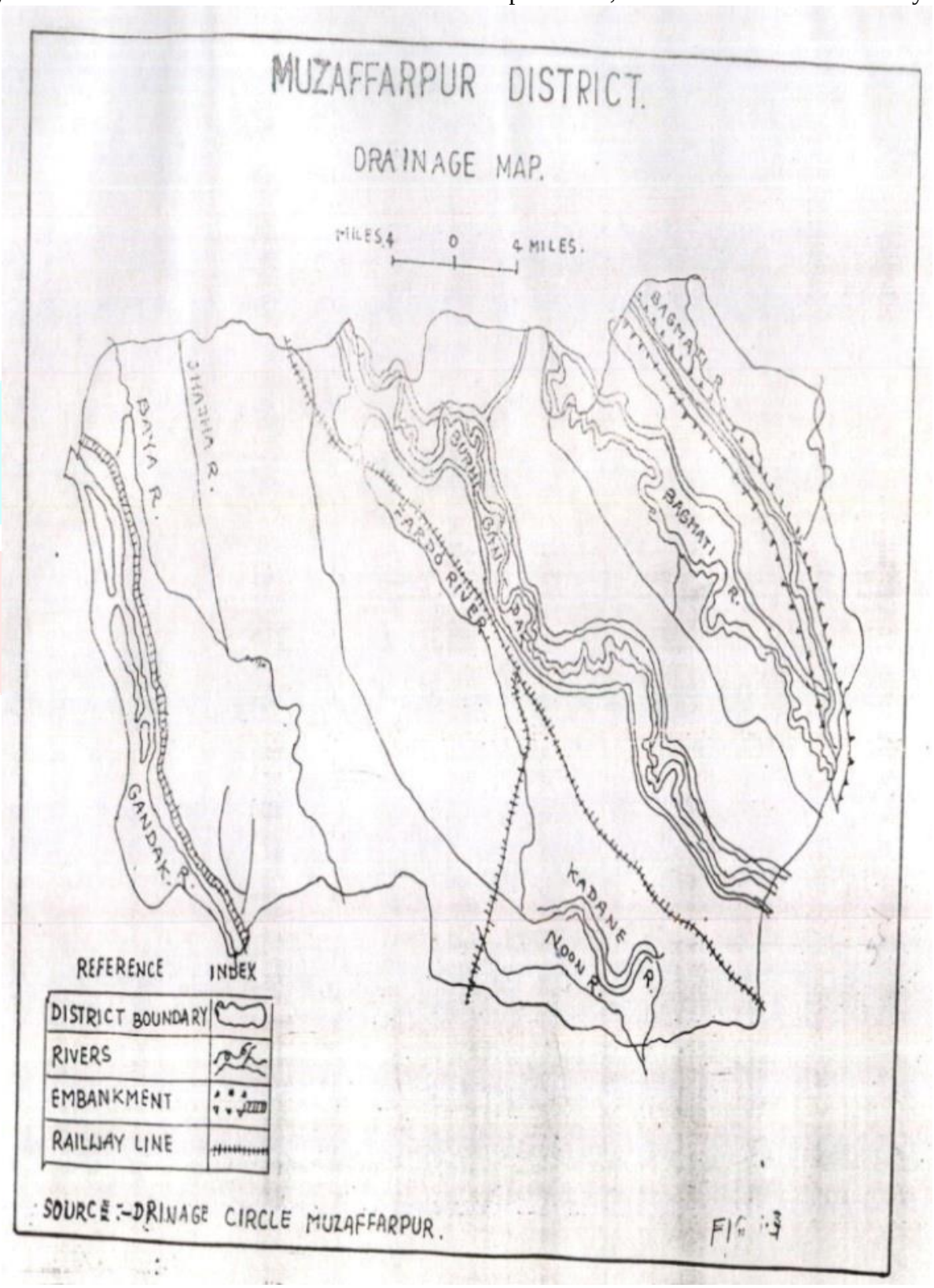

Figure-1: Muzaffarpur district River Map

the river's quality but also be supplied to nearby industries such as NTPC Kanti, generating revenue for the corporation. This dual focus on pollution control and economic sustainability represents a pioneering model for urban river management in Bihar.

The geographical sensitivity of the Muzaffarpur plains marked by low relief, dense settlement, and intersecting canal networks implies that even small interventions can bring large-scale environmental change. By combining GIS and Remote Sensing tools, the spatial mapping of river flow, pollution intensity, and land-use patterns can guide sustainable interventions. The integration of scientific monitoring with community awareness, cultural respect, and policy coordination is essential for lasting impact.

Ultimately, the rejuvenation of Kadane, Noon, and Baya must rest on a holistic approach one that brings together technical expertise, religious sensitivity, and participatory governance. Mobilizing both technical and cultural voices, restoring river health while preserving ritual access, and empowering local communities are crucial for reviving their vitality. The new STP initiative is not merely an infrastructural project; it is a symbol of hope, demonstrating how modern urban planning and traditional ecological wisdom can together reclaim the life and purity of Bihar's sacred rivers.

The **Noon River** in Muzaffarpur is a right-bank tributary of the Burhi Gandak River, which flows through the fertile, flood-prone Indo-Gangetic plains of northern Bihar. The Noon is not a major river but is an important local stream, part of a larger, complex drainage system. The Noon River originates near Kamtaul, a town in the Muzaffarpur district. It flows for about 15 kilometers before joining the Kedane River near Sukki. The Jamuari River, which originates near Dholi, joins the Noon near Musapur. The combined Noon-Balan stream later meets the Burhi Gandak via a sluice near the village of Dihapur. The entire Noon-Balan river system has a drainage area of about 2,283 square kilometers. As a tributary of the Burhi Gandak, the Noon's waters eventually flow into the Ganga River near Khagaria.

Geographical context and significance

Low-lying topography: Muzaffarpur is a low-lying, "saucer-shaped" city situated on the Indo-Gangetic plains, with an average elevation of just 47 meters. The flat terrain and gentle gradient contribute to the region's susceptibility to flooding. **Flood impacts:** Because the Burhi Gandak and its tributaries, including the Noon, flow through a wide, flat alluvial plain, the river basin is highly prone to seasonal flooding during the monsoon months. These floods can cause extensive damage and inundation in Muzaffarpur and neighboring districts. **Pollution:** Like other local waterways, the Noon River has faced environmental challenges. Local news reports indicate that pollution from untreated city sewage flowing into nearby streams, like the Furdoo and Kadane, has also impacted the water quality of the Noon, especially near populated areas. **Local importance:** Despite its relatively small size, the Noon holds local religious significance and was historically used by devotees for rituals, as recounted by local residents.

The **Baya River** is a tributary of the Ganga that flows through North Bihar, including the Muzaffarpur district, in the plains region. Known as the Upper Baya or Raghua River in its headwaters, it passes through Muzaffarpur and other districts before joining the Ganga. The Baya River begins as the Raghua River, which originates from the Sarotar *chaur* (marshy wetland) in the East Champaran district. After entering the Muzaffarpur district from East Champaran, it is known as the Upper Baya River and flows in a southeast direction. It is joined by the Jhajha River on its left bank near Fatehabad, Muzaffarpur. It flows past the Sahebganj community development block, located on its banks northwest of Muzaffarpur town. The Baya continues in a southeast direction, entering Vaishali and then Samastipur district. In Samastipur, it is joined by the Ghaghra River on its right bank before turning south. It finally joins the Ganga River near Semariaghat, after entering Begusarai district. The river's total catchment area is approximately 2,776 square kilometers. The Baya flows between the Burhi Gandak basin to the north and the Ganga basin to the south. The region has a monsoon-influenced humid subtropical climate, receiving an average annual rainfall of about 1,100 mm. About 91% of this precipitation occurs during the monsoon season, from June to October. The river's water level is highly seasonal. Like other rivers in the area, the Baya is unpredictable during the rainy season and contributes to flooding in the Muzaffarpur district. In the pre-monsoon period, water levels drop significantly. The river can become shallow, with water accumulating in localized depressions known as "*zengs*".

The Baya flows through the flat Indo-Gangetic plains of Bihar. The river's high sedimentation rate during the monsoon season contributes to the area's fertile alluvial soil. The floods are a recurring feature of the Muzaffarpur district, with the Baya and other regional rivers causing annual inundation.

Ecology and human impact.

The Baya River is home to diverse fish species, though studies indicate a seasonal decline in fish diversity during the pre-monsoon season due to lower water levels. Anthropogenic, non-industrial pollution, including agricultural runoff and domestic waste, is a concern, particularly in areas near Muzaffarpur. While Muzaffarpur does not have a comprehensive sewerage system, some open drains discharge sewage into rivers like the Burhi Gandak, though the Baya is affected by more localized pollution. The river provides water for irrigation in the surrounding fertile agricultural lands.

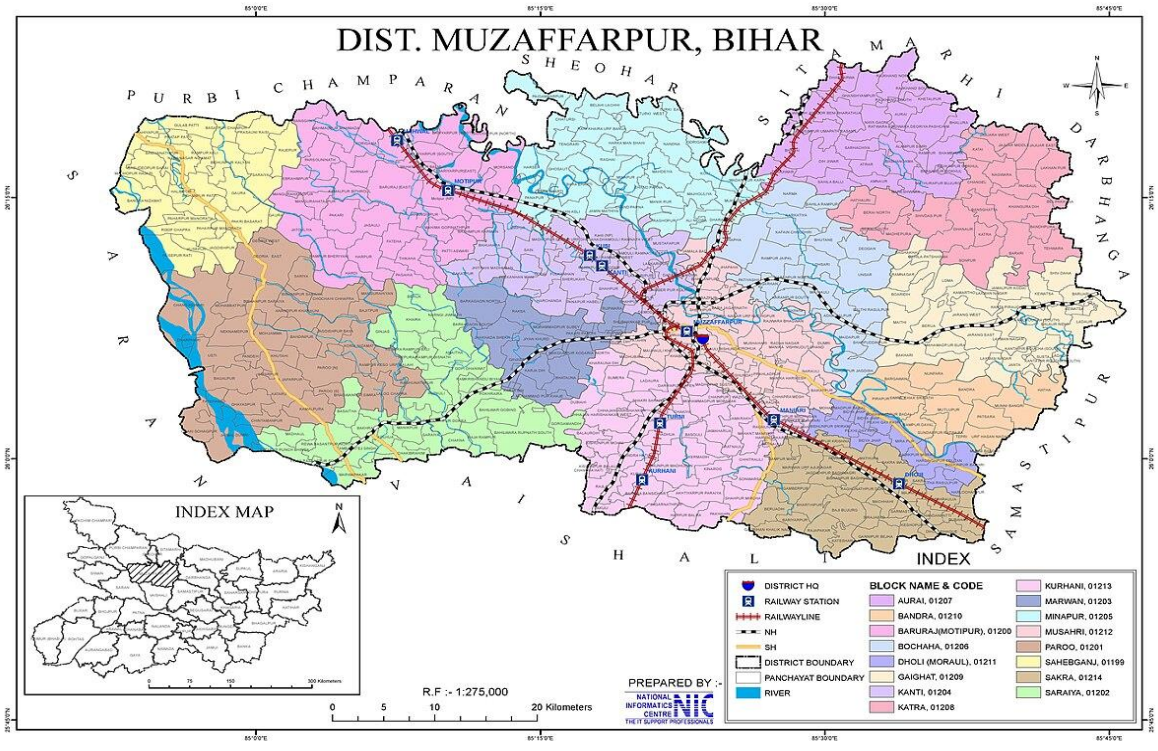

Figure-2: Muzaffarpur District Index Maps Showing Blocks

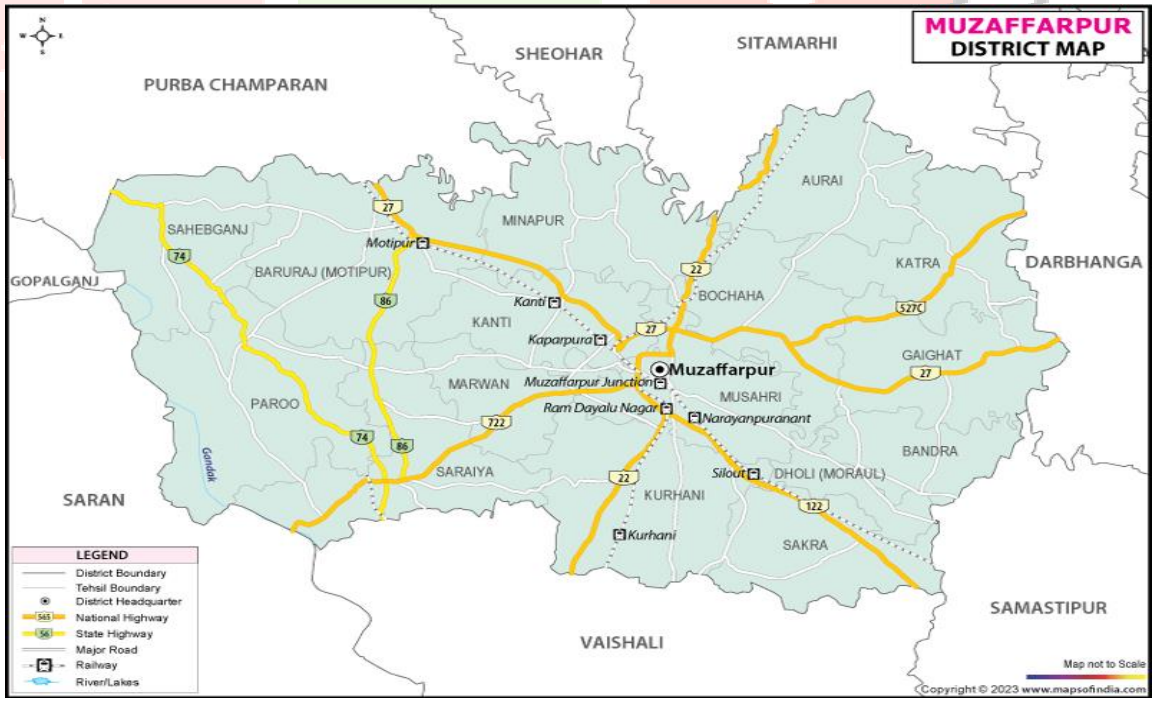

Figure-3: Muzaffarpur District Map with block Kurhani and Sakra

Aim and objectives

Aim: To explore the religious, environmental and socio-cultural crises associated with the Kadane, Noon and Baya Rivers in the Kudhni and Sakra regions and to understand how geographical processes underlie these crises.

Objectives:

1. Document the historical and ritual significance of the rivers in the study area.
2. Analyse the environmental/hydrological changes (flow regime, pollution, embankment/breach events, weed infestation).
3. Assess socio-cultural impacts on livelihoods, religious practice, community identity, and equity of access.
4. Map spatially the key areas of concern (e.g., flow stoppage zones, flood-prone panchayats, ritual access points).
5. Propose policy/intervention recommendations linking religious, environmental and social domains.

Literature Review

There is limited published academic research on these particular rivers (Kadane, Noon and Baya) in Muzaffarpur district. Much of the data comes from government reports, local media, water department documentation and activist accounts. The river Noon is the most important right bank tributary of the Burhi Gandak, which originates at 26°0′ N and 85°15′ E near Kamtaul in the district of Muzaffarpur. Total drainage area of the entire river Noon-Balan is about 2,283 sq km." (Scribd et. al 2025) Moreover, activist commentary has flagged that over 100 rivers in Bihar including Noon, Balan, Kadane, etc. are "virtually on the brink of death" due to flow stoppages and neglect. (Down To Earth et. al 2022) Published media reports highlight specific events. A scape regulator opened after two years, restoring flow in the Noon river, following drought-like conditions. (Bhaskar et. al 2025) Eight panchayats between the Tirhut embankment and the Baya river were submerged, affecting 1,000 families. (Bhaskar et. al.2025) Protests in Kudhni area over cleaning of the Kadane river due to obstructed drainage. (Live Hindustanet.al 2025) This study builds on such sources and situates them in a geographic framework to draw integrative insights.

Methodology

This research on the Kadane, Noon, and Baya rivers in the Kudhani Sakra region of Muzaffarpur district is based on both primary and secondary data to ensure a balanced scientific and socio-cultural understanding. Primary data were collected through extensive field surveys, personal observation, interviews, questionnaires, sampling. Direct observations were made on river flow, pollution points, bank erosion, encroachment, and land use changes. Local residents, farmers, priests, and municipal officials were interviewed to understand religious practices, irrigation dependence, and the social impacts of river degradation. Water samples were tested for pH, BOD, COD, turbidity, and dissolved oxygen, while soil samples were analyzed for nutrient content and contamination. Secondary data were obtained from government reports and records of the Central Water Commission, Bihar State Pollution Control Board, and Muzaffarpur Municipal Corporation, including details of the ₹84 crore Sewage Treatment Plant project. Additional data were drawn from Census of India reports, scholarly publications, historical gazetteers, and topographic maps. Qualitative data from interviews were thematically interpreted to reveal patterns of environmental degradation and socio-religious transformation. Spatial integration of both datasets helped identify the intersection of pollution, ritual sites, and community dependence. Verbal consent was taken from participants, and cultural sensitivity was maintained during fieldwork and documentation at religious locations. By combining scientific observation with community perspectives, the methodology provides a comprehensive framework to understand the environmental, religious, and socio-cultural dimensions of the river crisis and to support sustainable management of the Kadane, Noon, and Baya rivers in the Muzaffarpur region.

Limitations: Access to detailed hydrological time-series (flow volumes, sedimentation rates) is limited; some reliance on media reports means data may be partial; baseline historical data for ritual-practice changes is limited.

Findings

1. Religious/Ritual Crisis

Historical significance

Locally, the Kadane, Noon and Baya rivers were considered **teerth** (holy places) in the local tradition. Devotees from the region used to bathe and perform offering rituals (arghya) in the rivers during festivals like Chhath Puja. A priest in the Sakra region recalled that about 40 years ago pilgrims returning from Nepal/upper Bihar used to sequence bathing in the Noon, Kadane and Baya. (Down To Earth et al. 2025)

Current disruptions

Devotees in Kudhni & Sakra now report inability to access the river-banks of the Kadane and Noon rivers for arghya due to thick mats of water-weed and blocked access. The stoppage of flow in the Noon river for nearly two years caused ritual and livelihood anxiety. (Bhaskar et.al.2025) Thus, ritual access has been compromised by environmental degradation (weed, low flow, pollution) and infrastructural neglect (lack of cleaned ghats, blocked drainage).

Figure 4:-Devotees performing Chhath Puja on the banks of the Kadane River at Husepur village on 2 november 2019

Implications- Degradation of ritual spaces erodes intangible cultural heritage and community identity. Alternate sites (temporary ghats, bore-well rituals) may emerge, but they often lack the locality and sanctity of the original river-banks. Faith-leaders and local institutions face challenge sustaining their traditional roles, possibly leading to ritual adaptation or attrition over time.

2. Environmental/Hydrological Crisis

Flow regime changes & stoppage

The Noon river suffered a stoppage of flow lasting roughly two years due to a regulator (scape regulator) being closed; this caused drought-like conditions: agriculture suffered and groundwater levels declined. (Bhaskar et al. 2025) The Kadane river is reported to have blocked drainage due to weed and waste, and the local road-traffic was impeded when water could not flow during rains. (Live Hindustan et al.2025)

Flood and embankment problems

The Baya river, between the Tirhut embankment and its channel, caused flooding in eight panchayats; 1,000 families were affected. The Noon river's water-level rise created fears of flood in adjacent wards of Morwa due to rainfall and poor drainage. (Bhaskaret al.2025)

Pollution, weed invasion & drainage malfunction

The Kadane river has been the subject of road-block protests demanding its cleaning; locals claim the flow is obstructed, and during monsoons the area around the river, especially in "Gorihari", experiences months long waterlogging. (Live Hindustan et al.2025)

- Figure-5: Flood caused by the Kadane River in Paigamberpur Panchayat(Muzaffarpur district) during the monsoon season of 2023

- Figure-6: Weed invasion & drainage malfunction of kadane river at Husepur-Paigambarpur Village date 22 October 2025

Activist commentary says that many of Bihar's smaller rivers (including Kadane, Noon) are "virtually on the brink of death" due to mis-management, flow stoppages and pollution.

Geographical/hydrological factors

The Kudhni & Sakra region lies in the flood-plain/trough of these rivers, meaning slight changes in flow, siltation or embankment breaches quickly translate into large spatial impacts. The presence of embankments, drainage regulators and canals influences flow regimes both positively (irrigation) and negatively (stoppage, altered channel flow). Weed proliferation indicates stagnation, low flow velocity, nutrient enrichment and drainage backlog a sign of ecological decline.

3. Socio-Cultural & Livelihood Crisis

Agricultural/livelihood impacts

Due to the stoppage of flow in the Noon river, irrigation water could not reach fields; wells and groundwater also declined, exacerbating agricultural stress. Flooding caused by Baya river affected village roads, disrupted traffic, damaged houses and agricultural lands, placing socio-economic burden on local communities.

Cultural/communal impacts

With ritual access impeded (see earlier section), local communal practices around the rivers have been disrupted festivals, bathing rituals, community gatherings. Local protests (such as blocking roads for cleaning of the Kadane river) reflect growing frustration and community mobilization; however, delayed action means these crises persist.

Equity & governance issues

The dual problem of drought-like condition (flow stoppage) and flood-risk indicates poor governance of water infrastructure (sluice-gates, regulators, embankments). Marginalised groups (small farmers, river-bank dwellers, ritual participants) bear disproportionate costs: when flow stops they lose irrigation; when floods come they lose homes and fields. The rivers' degradation reflects a gap between technical river-management (aimed at flood control/irrigation) and the religious-cultural function of the rivers, leading to neglect of the latter.

Spatial Analysis & Mapping

Study area and river network

The following map sheets illustrate: (a) Muzaffarpur district with major rivers, (b) river network of the study area (Kadane, Noon, Baya) and (c) flood/embankment/regulator zones.

Mapping crises

Flow-stoppage zones: E.g., the location of the "scape regulator" at Malikpur branch canal (44 RD) which opens into the Noon river in Kudhni block. **Flood-affected panchayats**: Eight panchayats between the Tirhut embankment and Baya river – we can overlay these on the map to identify the flood-susceptible belt. **Ritual access spots**: Traditional bathing/offerings ghats on Kadane and Noon rivers in Kudhni & Sakra; current accessibility obstructed by weed or blocked drainage. **Drainage/weed-infestation hotspots**: Areas around Gorihari in Kudhni where waterlogging occurs due to blocked Kadane river.

Geographical interpretation

The rivers run through alluvial plains with gentle slopes, making them prone to meandering, siltation and stagnation when flow reduces. Embankments and regulators alter natural drainage; while built to prevent floods or serve irrigation, they often create unintended consequences (e.g., "trapped" flood waters, stagnated channels). Human-induced changes (encroachment of river beds, weed proliferation due to high nutrient inputs, urban/industrial sewage entering rivers) accelerate the crisis. The spatial overlay shows that the zones where ritual access is lost, agricultural stress high and flood risk strong largely overlap indicating that geography (location in flood/flow-affected zone) is a key mediator of the crises.

Discussion

Inter-linkages of crisis domains

The religious, environmental and socio-cultural crises are not isolated: each domain influences the others. A ~flow-stoppage in the Noon river (environmental) leads to loss of irrigation (livelihood) and inability to perform arghya (ritual). Flooding from the Baya river (environmental) destroys fields and homes (livelihood) and disrupts communal gatherings (socio-cultural). Weed invasion in the Kadane river (environmental) makes river-bank access impossible (ritual) and demands community protest (socio-cultural).

Geographical under-pinnings

The flood-plain setting of Kudhni & Sakra means the rivers are dynamic systems; simple interventions (such as embankments or regulators) without integrated planning often worsen rather than relieve the situations. The rivers' multiple functions (drainage, irrigation, ritual bathing, ecology) require integrated management; however, the current focus is often singular (flood control or irrigation) leading to neglect of the ritual/cultural dimension. Spatial inequities emerge: villages located downstream of closed regulators or between embankment and main channel are more exposed to crisis; communities with less voice (small farmers, marginalised castes) are more affected.

Governance and cultural-ecological dilemmas

Technical solutions exist (clearing weed, repairing regulators, restoring flow) but the challenge is how to integrate them with cultural restoration (ghats, access for rituals). The lack of awareness that rivers like Kadane/Noon are not just hydrological entities but part of the cultural-religious landscape means policy tends to ignore their ritual dimension ("common men too are not raising the issue" as one activist stated) (Down To Earth et al. 2024) The dual nature of crisis (flood vs drought) exemplifies that traditional river-management (focused on flood defence) does not always align with the local needs (irrigation, ritual, ecology).

Implications for local communities

The disruption of irrigation and drinking-water sources threatens agricultural productivity, increasing rural distress and possibly migration. Loss of ritual access may weaken community bonds and cultural heritage, especially in smaller villages where the river-bank has been a site of communal gathering. Flood events damage housing, schools, roads increasing vulnerability of already marginalised groups. The repeated postponement or failure of river-cleaning drives (as seen in protests) erodes trust in local governance.

Recommendations

Based on the analysis, the following recommendations are proposed:

1. **Integrated River Management Plan**: Develop for Kadane, Noon and Baya rivers a comprehensive plan that addresses hydrology (flow, regulators, embankments), ecology (weed clearing, sedimentation management), ritual access (ghats, pathways) and community livelihoods (irrigation, drainage).

2. **Ritual Access Restoration**: Identify and restore key bathing/offering ghats on these rivers in Kudhni & Sakra; remove weed/floating vegetation; ensure safe bank access, lighting and sanitation for festivals like Chhath.

3. **Flow Regulation & Monitoring**: Re-open and maintain regulators (e.g., the scape regulator at Malikpur on the Noon) to ensure minimal perennial flow rather than episodic release; install flow-gauges and citizen-reporting of stoppages.

4. **Flood & Drainage Infrastructure Improvement**: Strengthen embankments (especially between Tirhut and Baya), ensure proper drainage channels from villages (especially Kudhni market/Gorihari area) so that rainwater and diverted flow do not cause water-logging.

5. **Ecological Clean-Up & Weed Management**: Regular cleaning of river beds, removal of water hyacinth (जल कुंभी), control of sewage/industrial discharge entering the rivers; community-based river monitoring groups can help.

6. **Community & Ritual-Heritage Engagement**: Engage local religious and community groups in river health campaigns; document folk-heritage of the rivers (local legends, pilgrimage routes) and incorporate these into the restoration narrative.

7. **Equity-Focussed Interventions**: Prioritise marginalised villages located at high risk (flow stoppage, flood-prone) for infrastructure support; ensure local participation in decision-making.

8. **Data Collection & Research**: Establish baseline hydrological, water-quality and socio-cultural surveys of these rivers; enable academic collaborations (GIS mapping, drone imagery, community participatory mapping) for monitoring change over time.

Conclusion

The rivers **Kadane, Noon** and **Baya** in the **Kudhni-Sakra** region of **Muzaffarpur district** exemplify a layered crisis one that spans ritual heritage, ecological function and social livelihoods. The geography of the region flat flood-plain, embankments, irrigation canals, dense settlement means that small changes in flow or maintenance can lead to large repercussions. The inter-linking of religious access (arghya and bathing), environmental health (flow, pollution, weed) and socio-cultural livelihoods (irrigation, community gatherings) underscores the need for **holistic river-governance**. Mobilising both technical and cultural voices, restoring river health while preserving ritual access, and empowering local communities will be crucial if these rivers are to recover their vitality and role in the region's life.

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