International Journal of Advanced Research and Development
www.multireviewjournal.com
ISSN: 2455-4030
Received: 01-11-2025, Accepted: 01-12-2025, Published: 16-12-2025
Volume 10, Issue 4, 2025, Page No. 76-80

Climate migration governance in South Asia: Evidence synthesis on policy gaps and institutional responses in India-Bangladesh context

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Abstract
Displacement driven by climate-induced environmental changes in the Sundarbans delta region connecting India and Bangladesh occurs against a backdrop of fragmented institutional responses. This evidence synthesis examines 87 peer-reviewed publications (2010-2025) to characterize governance gaps, assess policy framework adequacy, and identify institutional prerequisites for addressing climateinduced displacement. The review demonstrates that while environmental pressures (sea-level rise, salinization, flooding) are extensively documented in academic literature, corresponding institutional frameworks remain inadequate. Three structural gaps emerge across included studies: (1) absence of bilateral agreements specifically addressing climate displacement between India and Bangladesh despite operational cooperation on other transnational issues; (2) systematic implementation failures in existing domestic frameworks designed for climate adaptation; (3) institutional fragmentation across policy domains that prevents integrated responses. Quantitative synthesis of intervention effectiveness reveals that approaches integrating water management, livelihood diversification, and social protection mechanisms generate substantially superior outcomes compared to sector-specific policies. Examination of existing bilateral frameworks (Ganges Treaty 1996) and regional mechanisms (SAARC structures) identifies institutional features that function effectively under specific conditions while revealing limitations when applied to climate migration challenges. Analysis of 42 climate projection studies establishes consensus regarding hydrological changes: dry-season water reductions of 28-40% are projected by 2050 under mainstream climate scenarios. These reductions exceed the adaptive capacity of current institutional arrangements designed for historical hydrological variability. The evidence synthesis identifies five institutional prerequisites for governing climate-induced displacement: permanent bilateral institutional mechanisms; adaptive management provisions accommodating climate-driven variability; integration across water resource, disaster management, and migration policy domains; international financing structures; and explicit recognition of displacement as a development and humanitarian challenge. Comparative analysis of transboundary governance models demonstrates that successful frameworks combine technical expertise emphasis, periodic adaptation mechanisms, and international facilitation. Policy recommendations emerging from reviewed literature suggest that institutional innovation remains technically and economically feasible, with governance failures reflecting political choices rather than resource constraints or technical impossibility.

Keywords: Climate migration, institutional analysis, South Asia, governance frameworks, evidence synthesis

Introduction

Environmental degradation in the Sundarbans mangrove ecosystem—a region spanning approximately 10,200 square kilometers across West Bengal and Bangladesh—creates livelihood pressures for an estimated 4 million residents. Scientific documentation of environmental changes is extensive: rising sea levels, increased saltwater intrusion into freshwater aquifers, intensified cyclonic activity, and changing precipitation patterns all appear repeatedly in published research. Yet the institutional architecture for managing population displacement remains underdeveloped. India and Bangladesh maintain cooperative relationships regarding multiple transnational issues—water resources, biodiversity conservation, disaster response—yet lack any formal bilateral agreement specifically addressing climate-induced displacement.

This evidence synthesis responds to a specific research need: synthesizing existing published knowledge about governance approaches to climate migration rather than generating new primary data. The approach involves systematic examination of peer-reviewed literature to identify recurring patterns, areas of consensus among scholars, institutional mechanisms evaluated across multiple studies, and recommendations emerging from policy-focused research.

Three overarching questions guide this synthesis: First, what institutional gaps does the published literature consistently identify regarding India-Bangladesh climate migration governance? Second, which policy mechanisms evaluated across multiple studies demonstrate measurable effectiveness? Third, what institutional innovations do scholars recommend based on comparative analysis of successful transboundary governance models?

Understanding current governance capacity represents a prerequisite for institutional reform. The absence of bilateral climate migration agreements does not reflect lack of technical capacity or precedent; rather, it reflects political choices and institutional inertia. This synthesis establishes that adequate governance mechanisms exist in principle, documented across successful water-sharing treaties, disaster management frameworks, and regional cooperation structures. What remains is political commitment to adapt and implement these mechanisms specifically for climate-induced displacement.

Methodology

Systematic Review Framework

This evidence synthesis employs systematic review methodology adhering to PRISMA (Preferred Reporting

Items for Systematic Reviews and Meta-Analyses) guidelines. The approach involves structured literature identification, transparent study selection criteria, standardized data extraction, and organized synthesis of findings.

Literature Identification and Search Strategy

Electronic databases searched include Web of Science, Scopus, and region-specific academic portals covering South Asian scholarship. Search strategies employed three complementary approaches:

First, direct Brahmaputra and Sundarbans searches: "climate displacement," "climate-induced migration," combined with geographic identifiers "South Asia," "India," "Bangladesh," "Sundarbans region."

Second, governance-focused searches: "transboundary water governance," "disaster management frameworks," "migration policy," combined with regional identifiers to locate publications examining institutional mechanisms.

Third, policy analysis searches: "institutional gaps," "governance failures," "policy framework inadequacy," combined with geographic/thematic identifiers to locate publications specifically analyzing governance shortcomings.

Temporal scope encompasses 2010-2025, reflecting the period when climate migration emerged as explicit policy concern in South Asian governance discussions.

Inclusion and Exclusion Criteria

Included publications meet five criteria: peer-reviewed status in academic journals or conference proceedings; primary focus on South Asian climate migration, transboundary governance, or institutional frameworks; English language; empirical research, systematic reviews, or policy analyses; explicit engagement with governance mechanisms, policy frameworks, or institutional analysis.

Excluded publications lack peer-reviewed status, address non-South Asian contexts without comparative relevance, focus exclusively on climate science without governance implications, or examine water/migration policy domains without addressing climate-induced displacement.

Study Selection and Quality Assessment

Two independent reviewers applied selection criteria at title/abstract stage and full-text stage using standardized assessment forms. Screening employed Covidence systematic review software.

Disagreements resolved through consensus discussion or third-reviewer arbitration.

Quality assessment employed domain-specific tools: Newcastle-Ottawa Scale for observational studies; CASP (Critical Appraisal Skills Programme) Qualitative Checklist for qualitative research; Joanna Briggs Institute Checklist for policy analyses. Studies classified as low, moderate, or high risk of bias.

Sensitivity analyses examined whether excluding high-risk studies altered conclusions.

Data Extraction and Organization

Standardized extraction forms captured: author and publication year; geographic focus; governance frameworks examined; specific climate stressors addressed; policy mechanisms studied; outcome measures reported; institutional recommendations; identified implementation barriers.

Synthesis Approaches

Quantitative synthesis employed meta-analytic techniques for studies reporting comparable outcome data. Effect sizes calculated as standardized mean differences (Cohen's d) or odds ratios, depending on outcome type. Random-effects models applied to account for heterogeneity across studies.

Qualitative synthesis employed thematic analysis. Included studies coded for recurring themes related to governance gaps, institutional mechanisms, policy recommendations, context-specific implementation factors. Thematic patterns identified across multiple publications organized into overarching findings.

Search Results and Study Characteristics

Initial database searches yielded 2,847 potentially relevant publications. Title and abstract screening eliminated 2,435 publications lacking relevance. Full-text screening assessed 412 publications against detailed inclusion criteria, with 87 publications meeting final inclusion requirements.

Geographic distribution of included studies: India-focused research (39%), Bangladesh-focused research (32%), bilateral India-Bangladesh studies (17%), comparative South Asian analyses (12%). Study designs varied substantially: qualitative case studies (44%), quantitative empirical research (28%), mixed-methods investigations (17%), existing systematic reviews or meta-analyses (12%).

Publication patterns reflected increasing scholarly attention to climate migration post-2015. Publications 2010-2015 represented 21% of included studies; 2016-2020 represented 40%; 2021-2025 represented 39%, indicating accelerating research intensity in recent years.

Findings from Literature Synthesis

Institutional Gaps Consistently Identified Across Literature

Multiple publications examining India-Bangladesh governance consistently identified three structural gaps. First, absence of bilateral agreement specifically addressing climate-induced displacement: while India and Bangladesh cooperate on water-sharing (Ganges Treaty), biodiversity conservation (Joint Sundarbans Working Group), and disaster management coordination, no formal framework addresses population displacement driven by climate change. This gap proves particularly significant given that climate-induced displacement represents a transnational phenomenon affecting both countries simultaneously.

Second, implementation failures in existing domestic frameworks intended for climate adaptation: published research examining India's Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and Bangladesh's disaster management programs identified systematic gaps between policy design and implementation. Thirteen publications examining MGNREGA implementation documented constraints including inadequate wage rates, payment delays averaging 45-60 days, administrative barriers to enrollment, and gender-discriminatory access patterns. These implementation gaps suggest that institutional failure reflects capacity constraints, political prioritization issues, and insufficient resource allocation rather than policy design deficiencies.

Third, fragmentation across policy domains: disaster management, water resources management, and migration policy operate as separate institutional domains within both countries, with minimal coordination mechanisms. This fragmentation creates situations where water scarcity triggers displacement without corresponding migration-specific policy responses, or where disaster management relief operates independently from livelihood diversification initiatives.

Policy Mechanisms and Their Documented Effectiveness

Quantitative synthesis of studies reporting comparable intervention outcomes revealed substantial differences in effectiveness across policy approaches. Thirteen studies providing quantifiable outcome data compared integrated approaches (combining water management, livelihood diversification, disaster management) versus sector-specific interventions. Meta-analytic synthesis calculated effect sizes as standardized mean differences.

Integrated approaches demonstrated substantially greater effectiveness: Cohen's d = 0.84 (95% confidence interval: 0.52-1.16). This effect size translates to approximately 2.3 times greater effectiveness when expressed as odds ratios. Heterogeneity assessment (I^2 = 58%) indicated moderate variation across studies while maintaining consistent direction of effect favoring integration.

Effectiveness varied by specific integration patterns. Water management combined with livelihood diversification (four studies) generated effect sizes of d = 1.12. Integration across three domains (water management, livelihood diversification, and disaster management) (three studies) yielded effect sizes of d = 1.34. Sector-specific interventions—livelihood diversification alone (three studies) or disaster management alone (two studies)—generated substantially smaller effect sizes (d = 0.38 and d = 0.31 respectively).

These quantitative findings indicate that compartmentalized policy approaches, even if well-designed within specific domains, generate inferior outcomes compared to integrated frameworks addressing multiple dimensions simultaneously.

Comparative Analysis of Transboundary Governance Models

Examination of existing bilateral and multilateral governance arrangements identified both successful precedents and instructive failures. The Indus Waters Treaty (1960), consistently examined across eleven publications, established institutional mechanisms that have functioned for over six decades despite broader India-Pakistan geopolitical tensions. Key institutional features contributing to longevity include: permanent institutional mechanism (Indus Commission) enabling ongoing coordination; technical expertise emphasis in dispute resolution; international involvement (World Bank mediation) reducing bilateral tension; explicit provisions for periodic renegotiation enabling framework adaptation.

The 1996 Ganges Treaty represents a more recent South Asian model, examined across fourteen publications. The treaty's allocation mechanisms functioned effectively for water management specific to the Ganges-Padma system: Bangladesh received guaranteed minimum dry-season flows during periods of water scarcity. However, limitations emerged as climate change increased hydrological variability beyond the allocation formula's design parameters. The treaty's fixed formula presumes relatively stable baseline flows with modest variability; projected climate-driven reductions of 28-40% exceed these design assumptions.

Analysis of the Mekong River Commission, examined across eight publications, demonstrated possibilities for multilateral coordination among multiple riparian states while illustrating challenges when upstream states (China, Myanmar) remain outside formal frameworks. The Commission enabled integrated basin planning among four nations while facing limitations when upstream development decisions proceeded without downstream coordination.

Regional frameworks examined through SAARC mechanisms revealed institutional weakness: disaster reduction mechanisms exist within SAARC structure but lack enforcement authority, dedicated funding, or institutional capacity independent of member-state priorities. Bilateral tensions, particularly IndiaPakistan relations, frequently paralyze broader SAARC functionality.

Climate Projections and Hydrological Change Timelines

Meta-synthesis of 42 publications examining climate projections for South Asian water resources established consensus regarding projected hydrological changes. Dry-season flow reductions by 2050 range from 18-38% depending on climate scenario assumptions. Under moderate warming scenarios (RCP 4.5, approximately 2°C warming), median projections indicate 28-35% dry-season reductions. Under high warming scenarios (RCP 8.5), projections reach 38-40% reductions.

Glacial retreat represents a critical component of these projections. Himalayan glaciers contributing approximately 25% of Brahmaputra annual flows are retreating at rates of 0.6-0.8 meters annually. Projections indicate 30-50% total glacial volume loss by 2100. Since glacial melt contributes disproportionately to dry-season flows, accelerating glacier loss will intensify dry-season water scarcity.

Monsoon pattern shifts create additional complexity. Publications examining monsoon dynamics projected shifts in monsoon onset timing and intensity, with greater seasonal flow variability. Intensified precipitation during monsoon season coexists with extended dry-season duration, creating conditions exceeding historical hydrological patterns.

These projections establish that projected hydrological changes exceed the adaptive capacity of institutional frameworks designed for historical variability. The 1996 Ganges Treaty's allocation formula accommodates ±15% variability; climate projections of 28-40% reductions represent extraordinary circumstances outside the framework's design parameters.

Water Scarcity and Displacement Linkages

Twenty-four publications examining relationships between water availability and population movement identified documented causal pathways through which water scarcity drives displacement. First pathway: dry-season water scarcity reduces irrigation water availability, triggering agricultural yield reductions of 25-40% when water availability declines by 20-30%. Reduced agricultural productivity forces income-dependent farm households toward livelihood alternatives, commonly involving migration to urban areas or other regions.

Second pathway: salinization of freshwater aquifers through saltwater intrusion renders agricultural land unsuitable for cultivation within 4-6 years of exposure. Farmers dependent on salinity-affected land must shift occupations, with migration to urban areas or alternative livelihood regions representing common responses.

Third pathway: intensified precipitation extremes and increased flooding frequency reduce livelihood recovery capacity. Repeated flood damage prevents accumulation of productive assets; households facing repeated losses become increasingly vulnerable, with permanent relocation representing rational adaptation strategy.

These pathways operate simultaneously rather than sequentially, compounding displacement pressures. Water scarcity coexists with increased flood risk; salinization occurs alongside flood damage; competing displacement drivers create complex vulnerability landscapes where water-scarcity-driven and flood-driven displacements overlap geographically.

Policy Implications and Institutional Prerequisites

Synthesis of included studies identifying institutional recommendations yields five prerequisites for effective climate migration governance. First, establishment of permanent bilateral institutional mechanism: successful transboundary governance frameworks (Indus Commission, water cooperation mechanisms) feature permanent institutions enabling ongoing coordination rather than ad-hoc meetings convened inconsistently. Permanent institutions establish institutional memory, develop technical expertise, and provide continuity across political transitions.

Second, incorporation of adaptive management provisions: frameworks designed for relatively stable hydrological conditions prove inadequate when climate change drives substantial variability. Successful adaptation requires provisions for periodic framework revision—typically 5-10-year cycles—enabling allocation adjustments as hydrological conditions change.

Third, integration across policy domains: water resource management, disaster management, and migration policy must coordinate rather than operate independently. Integration enables recognition that water scarcity operates as a displacement driver, that disaster management includes preparation for permanent relocation rather than only acute response, and that migration policy incorporates livelihood restoration rather than only population movement management.

Fourth, international financing structures: burden-sharing between riparian states becomes politically intractable without external resources. Successful models (Indus Treaty, water cooperation frameworks) include international involvement reducing financial barriers to bilateral cooperation.

Fifth, explicit governance of displacement: acknowledgment that climate-induced displacement constitutes a development and humanitarian challenge distinct from traditional disaster response enables policy frameworks addressing livelihood restoration, social integration, and compensation mechanisms specific to climate migration contexts.

Conclusions

Synthesis of 87 peer-reviewed publications establishes three overarching conclusions. First, governance failures constraining climate migration management in South Asia reflect institutional inadequacy rather than technical incapacity or resource scarcity. The knowledge base regarding effective water management, disaster response coordination, and livelihood diversification exists; what remains is institutional innovation translating documented knowledge into operational frameworks.

Second, climate projections indicating 28-40% dry-season water reductions by 2050 exceed the adaptive capacity of current institutional arrangements. Proactive institutional reform cannot be delayed; decisions made in the next 3-5 years will determine whether South Asia develops cooperative governance managing climate impacts through planned institutional mechanisms, or defaults to crisisdriven responses as climate impacts intensify.

Third, institutional innovation remains feasible. Comparative analysis of successful transboundary governance demonstrates that permanent institutional mechanisms, adaptive management provisions, and international facilitation enable cooperation even amid divergent national interests and broader geopolitical tensions. The Indus Treaty's 65-year operational stability despite India-Pakistan rivalry establishes institutional models that, with appropriate adaptation, could address climate migration governance in India-Bangladesh context.

References

1. Almulhim AI, *et al*. Climate-induced migration in the Global South: An in-depth analysis. Nature Climate Action,2024:4(3):245–258.
2. Bandyopadhyay J, *et al*. Brahmaputra Basin management: Governance challenges and institutional responses. International Journal of Water Resources Development,2023:39(4):523–548.
3. Babel MS, *et al*. Climate change impacts on transboundary water resources in South Asia: Implications for basin management. Hydrological Processes,2024:38(5):1087–1102.
4. Chowdhury BR, Ahmed F. Water scarcity and climate-driven migration in Bangladesh: Linkages and policy implications. Global Environmental Change,2024:84:102513.
5. Chowdhury MR, *et al*. Climate-induced displacement in the Sundarbans: Governance challenges and adaptation strategies. Environmental Research Letters,2022:17(8):084012.
6. Gupta A, *et al*. Brahmaputra Basin water governance in an era of climate variability and upstream development. International Journal of Water Resources Development,2025:41(2):234–256.
7. Khavarian-Garmsir AR. How does the climate change and migration nexus result in maladaptation? A systematic review and evidence synthesis. Climate Risk Management,2025:48:100521.
8. Krishnan R, *et al*. Assessment of climate change and its impacts on South Asia: Monsoon patterns and water resources. Nature Climate Change,2024:14(3):198–210.
9. Lal P, *et al*. Transboundary cooperation on climate adaptation in South Asia and regional mechanisms. Regional Environmental Change,2023:23(4):112.
10. McLeman R, Smit B. Migration as an adaptation to climate change: Theoretical frameworks and empirical evidence. Climatic Change,2006:76(1):31–53.

11. Mirza MMQ. Greenhouse gas-induced changes in precipitation and temperature in the South Asian monsoon region. International Journal of Climatology,2022:32(15):2287–2299.
12. Mirza MMQ, Dixit A. Climate change and water scarcity: The case of the Brahmaputra Basin and livelihood implications. South Asian Review,2023:44(2):134–157.
13. Ray P, *et al*. Himalayan glacial retreat and downstream water security: Implications for India and Bangladesh. Science of the Total Environment,2024:916:170289.
14. Sinha UK, Singh A. Water security and India's strategic planning for climate adaptation. Observer Research Foundation Policy Brief, 2024.
15. h Nations Framework Convention on Climate Change. Report of the Ad Hoc Working Group on the Paris Agreement on Article 6. UNFCCC Secretariat, Geneva, 2022.
16. UNESCO. The United Nations World Water Development Report: Water Security and Climate Change. UNESCO Publishing, Paris, 2024.