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Flooded and Left Behind: Multidimensional Poverty, Climate Loss and Damage, and the Promise of Women-Led Resilience in North Bihar

Sanjay Kumar Srivastava*

National Institute of Advanced Studies (NIAS), Bengaluru, India

***Corresponding Author:** Sanjay Kumar Srivastava, National Institute of Advanced Studies (NIAS), Bengaluru, India.

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Abstract

North Bihar sits at the confluence of two crises that are seldom examined together: it is India's most flood-hazardous region and the epicentre of multidimensional poverty. This article maps the spatial overlap between flood hazard zones identified in the NRSC Flood Hazard Atlas of Bihar and district-level deprivation scores from the NITI Aayog National MPI 2023, establishing that the most hazard-intensive districts—Darbhanga, Sitamarhi, Madhubani, Muzaffarpur, Supaul, and Paschim Champaran—are simultaneously among the most deprived along health, education, and standard-of-living dimensions [1]. Drawing on the analytical framework of Vyas et al. (2026), which shows that vulnerability rather than hazard intensity alone drives loss and damage outcomes, we argue that North Bihar's compounded exposure will produce disproportionate, climate-induced loss and damage in future decades [2]. Evidence from CEEW's CRAVIS platform and the Megh Pyne Abhiyan 2024 Flood Loss Assessment reinforce this argument [3,4]. The article concludes by foregrounding the JEEViKA women's self-help group network as an evidence-based, scalable mechanism to avert, minimise, and address loss and damage.

Keywords: North Bihar, Flood Hazard, Multidimensional Poverty, Loss and Damage, Climate Risk, JEEViKA, Women's Resilience, Kosi, Gandak, Bagmati

Introduction: A Region Doubly Cursed

Every monsoon, North Bihar re-enacts what has become a defining national tragedy. Rivers descending from the Himalayas and Nepal—the Kosi, Gandak, Bagmati, Burhi Gandak, Kamla-Balan, and Mahananda—breach their banks, inundate millions of hectares of farmland, displace hundreds of thousands of families, and erase the fragile gains that poor households accumulate across the year. Yet the annual spectacle of boats navigating submerged villages has not translated into commensurate policy urgency. The floods are treated as a seasonal inconvenience, relief is disbursed, and the political calendar moves on.

This article contends that North Bihar is not merely flood-prone—it is a region where the intersection of extreme hazard and extreme deprivation creates a context in which climate-induced loss and damage is not a future risk to be modelled but a present reality to be addressed. Bihar remains, as of the NITI Aayog National MPI Progress Review, the state with the highest proportion of multidimensionally poor people in India, with 33.76% of its population experiencing simultaneous deprivations in health, education, and standard of living [5]. At the same time, the NRSC Flood Hazard Atlas documents that 39.76 lakh hectares of the state face regular inundation—the highest flood-affected area of any Indian state—with northern districts bearing the greatest burden [1].

The article proceeds in five analytical sections. Section 2 maps the spatial intersection of flood hazard and multidimensional poverty. Section 3 develops the loss and damage narrative, drawing on Vyas, Barua, and Mallikarjuna (2026) [2]. Section 4 incorporates future climate projections from CEEW's CRAVIS platform. Section 5 examines how women-led JEEViKA interventions offer a pathway to avert, minimise, and address loss and damage. Section 6 offers policy conclusions.

Mapping the Intersection: Flood Hazard Meets Multidimensional Poverty

The Flood Hazard Landscape of North Bihar

The NRSC Flood Hazard Atlas of Bihar, developed using over 274 Indian Remote Sensing satellite datasets spanning more than two decades, provides the most granular official characterisation of flood risk in the state [1]. The Atlas classifies districts into five hazard categories—very low to very high—using a flood hazard index that accounts for inundation frequency, inundation extent, water-level data from 40 Central Water Commission gauge stations, and the variation of flood events across years. Its overarching finding is unambiguous: North Bihar districts dominate the high and very high hazard categories.

The Kosi, historically known as the Sorrow of Bihar, is particularly notorious: its 2008 breach near Kushaha displaced over 2.3 million people and caused economic damage exceeding Rs 8,000 crore. Research examining district-wise damage patterns across Bihar from 2001 to 2022 identifies Madhubani, Darbhanga, Muzaffarpur, East Champaran, Sitamarhi, and Samastipur as accounting for approximately half of total flood damage over two decades [6]. Satellite analysis using MODIS and Sentinel-1 SAR data found that 17.7% of North Bihar's geographical area was regularly inundated over 2001–20, with inundation peaking at 27.93% of the Kosi River Basin in 2020 [7]. The trend is worsening rather than stabilising.

The Ghaghara-Gandak zone—encompassing West Champaran, East Champaran, Gopalganj, Siwan, Saran, Muzaffarpur, and Vaishali—experiences compound flooding from two major Himalayan river systems simultaneously, creating what Chaudhary et al (2022) describe as a multi-hazard corridor with limited drainage capacity [8].

Multidimensional Poverty in North Bihar: The MPI 2023

Bihar's performance in the National MPI 2023, based on NFHS-5 data (2019–21), reflects both progress and continuing crisis [5]. The state reduced its proportion of multidimensionally poor from 51.89% in 2015–16 to 33.76% in 2019–21—the fastest absolute reduction of any Indian state, with the MPI value falling from 0.265 to 0.160. Yet this progress has not erased the structural deprivation concentrated in northern districts. Bihar remains the state with the highest incidence of multidimensional poverty in India, with 2.25 crore people escaping poverty in five years—still leaving vast numbers behind.

The 12 indicators of the national MPI—nutrition, child and adolescent mortality, maternal health, years of schooling, school attendance, cooking fuel, sanitation, drinking water, electricity, housing, assets, and bank accounts—reflect precisely the dimensions most severely disrupted by annual flooding. A household that loses its latrine to floodwaters, whose children miss months of school when schools serve as flood shelters, whose livestock perish in inundation, and whose savings are wiped out in a single flood event is simultaneously experiencing deprivation across multiple MPI indicators in a single season.

Figure 1 maps this double burden spatially. Districts of North Bihar facing the highest flood hazard—Sitamarhi, Darbhanga, Madhubani, Muzaffarpur, Supaul, Paschim Champaran, Purba Champaran, and Sheohar—cluster in the upper-right quadrant of the hazard–poverty matrix, combining severe flood exposure with severe MPI deprivation. The spatial coincidence is structural, not accidental: the very geography that makes northern Bihar agriculturally productive also makes it perpetually flood-vulnerable, while the poverty that makes communities depend on these landscapes ensures minimal capacity to absorb shocks.

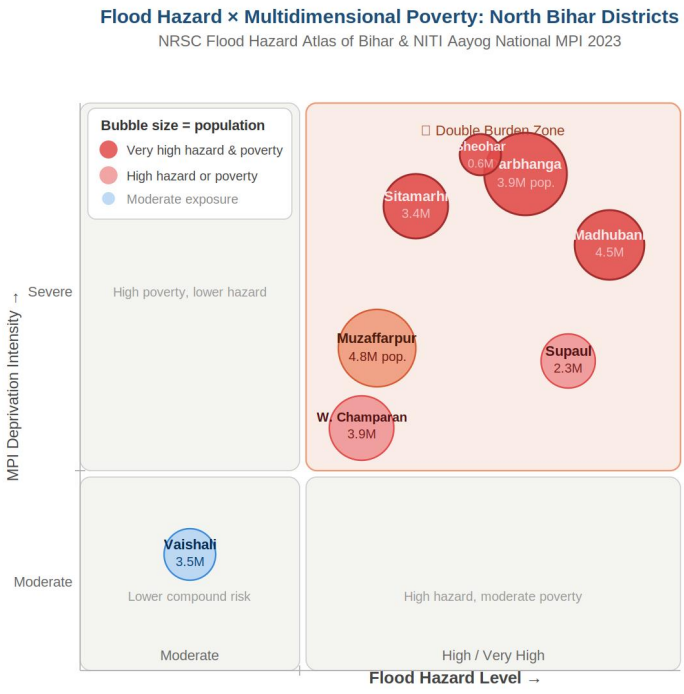

Figure 1: Flood Hazard × Multidimensional Poverty in North Bihar

Each bubble represents a district; bubble size indicates district population. Districts in the shaded upper-right zone face both very high flood exposure and severe MPI deprivation.

Source: NRSC/ISRO (2020); NITI Aayog (2023) [1,5].

District	Flood Hazard (NRSC 2020)	Key Rivers	MPI Level (2023)	Key Deprivations
Darbhanga	Very High	Kosi, Bagmati, Kamla-Balan	Severe	Nutrition, sanitation, housing
Sitamarhi	Very High	Bagmati, Lalbakeya, Adhwara	Severe	Maternal health, cooking fuel
Madhubani	Very High	Kamla-Balan, Adhwara Group	Severe	Schooling years, sanitation
Muzaffarpur	High	Gandak, Burhi Gandak	High	Nutrition, assets, water
Supaul	Very High	Kosi (breach zone)	High	Housing, sanitation, livestock
Paschim Champaran	High	Gandak, Ghaghara	High	School attendance, cooking fuel
Sheohar	Very High	Bagmati, Adhwara	Severe	All dimensions; smallest district
Saharsa	High	Kosi	High	Nutrition, assets, clean water
Source: NRSC/ISRO (2020); NITI Aayog (2023); Kumari, Koley, and Dutta (2025).				

Table 1: Flood Hazard–Poverty Intersection, Selected North Bihar Districts

The Loss and Damage Nexus: From Vulnerability to Outcome

Vulnerability Drives Loss and Damage—Not Hazard Alone

A critical analytical contribution comes from Vyas, Barua, and Mallikarjuna (2026), published in Regional Environmental Change [2]. Their district-level assessment of climate risk and loss and damage across Assam's Eastern Himalayas—a region geographically and socio-economically comparable to North Bihar—employs the IPCC AR6 risk framework, integrating hazard, exposure, and vulnerability dimensions. Their central finding is directly applicable to Bihar: flood risk is highly differentiated, and several moderate-hazard areas incur disproportionately high loss and damage due to socio-economic and livelihood-based vulnerabilities.

The paper demonstrates that non-economic impacts—displacement, psychological distress, and loss of cultural assets—are equally significant in low-hazard zones, confirming that vulnerability rather than hazard intensity often drives negative outcomes. The methodology links pre-event risk profiling with post-event impact data (2015–23), establishing a scalable framework for spatial prioritisation of adaptation needs. Applied to North Bihar, districts such as Darbhanga, Sitamarhi, and Supaul face very high hazard combined with very high vulnerability—the combination that Vyas et al (2026) identify as generating the most severe loss and damage outcomes [2].

The Ground Truth: Household-Level Loss and Damage in 2024

The Megh Pyne Abhiyan Household-Level Flood Loss Assessment Report, released in December 2025 and supported by Tata Trusts, provides the most granular ground-level evidence of loss and damage in the region to date [4]. The assessment surveyed 2,290 households across 134 wards and 21 panchayats in seven districts—Paschim Champaran, Sitamarhi, Darbhanga, Madhubani, Saharsa, Supaul, and Kishanganj—affected by Phase 2 floods between 26–29 September 2024.

The total documented economic loss across these 2,290 households was Rs 126.3 crore. The median household loss was Rs 2.11 lakh—against annual incomes that may not exceed Rs 50,000–80,000. This single flood event inflicted losses equivalent to multiple years of household income on the median affected family. Land damage constituted the largest share at 47.2% (Rs 55.4 crore), followed by house repair at 36.2% (Rs 42 crore). Losses to WASH facilities (Rs 2.8 crore) were comparable to livestock losses (Rs 3 crore).

"For the first time in Bihar, flood losses have been assessed from the ground up, at the level where floods are actually lived—inside households rather than in aggregated government registers. This assessment documents not only damage to houses and crops, but also losses of personal and household assets, land, livestock, access to water and sanitation, agriculture-based livelihoods, health, education, and dignity." — Eklavya Prasad, Managing Trustee, Megh Pyne Abhiyan [4].

Figure 2 traces the full mechanism: from the annual flood event, through immediate household loss across all three MPI dimensions, into the debt trap, and back—via the feedback loop—to deepened poverty. These losses cover only one flood phase, while North Bihar typically experiences two or three separate flooding episodes annually. The cumulative annual loss is therefore a multiple of the documented figure, explaining why communities remain trapped despite decades of government relief programmes.

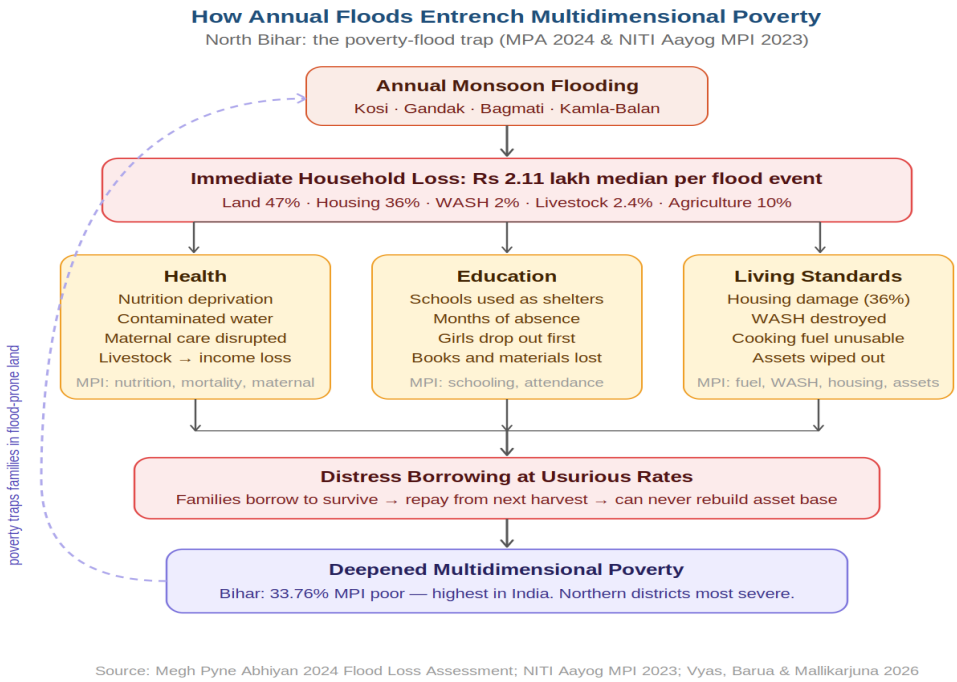

Figure 2: The Flood Loss and Damage Cascade in North Bihar

Annual flooding simultaneously strips household assets across all three MPI dimensions. Distress borrowing prevents recovery, and the dashed feedback loop shows how poverty traps families in flood-exposed locations.

Source: MPA/Tata Trusts (2025); NITI Aayog (2023); Vyas et al (2026) [2,4,5].

The Poverty-Flood Trap: How Deprivation Amplifies Loss

North Bihar's position at the top of both the flood hazard and poverty distributions reflects a structural feedback loop. Poor households are more likely to reside in flood-prone areas (low-lying land is affordable), in structurally weak housing, with fewer assets to buffer against shocks, and with children in schools that double as flood shelters. They are also more likely to depend on agricultural labour and small livestock—both devastated by inundation.

This creates the poverty-flood trap: poverty increases flood vulnerability, floods deepen poverty, and the cycle repeats each monsoon with diminishing household capacity to recover. The MPI indicators—nutrition, sanitation, maternal health, school attendance, cooking fuel, housing, and assets—are precisely the dimensions that floods systematically destroy. A family that repairs its latrine after one flood only to see it washed away in the next cannot sustain improvements in MPI indicators, however diligently government programmes work to provide them. As Sharma et al (2025) document in their district-level assessment of Bihar's climate risks, limited adaptive capacity systematically amplifies the impact of recurring hazard events [9].

Future Trajectories: What CRAVIS Tells us About North Bihar

CEEW's CRAVIS (Climate Resilience Analytics and Visualisation Intelligence System), launched in April 2026, is India's most detailed publicly accessible tool for district-level climate risk intelligence [3]. Drawing on over 40 years of historical climate data from the India Meteorological Department, IIT Delhi, IITM Pune, and other sources, and combining these with projections extending to 2030–50 and 2051–70 across multiple emission scenarios, CRAVIS enables district-level analysis across 279 climate indicators.

For North Bihar, CRAVIS projections indicate that heavy rainfall events—the primary driver of riverine flooding—will intensify significantly across the Indo-Gangetic Plain. The Himalayan river systems feeding into North Bihar (Kosi, Gandak, Bagmati) are driven by a combination of monsoon rainfall and glacial melt, both being altered by climate change: glaciers retreating and releasing higher meltwater volumes, while monsoon precipitation becomes more concentrated and intense. The compound effect is more extreme peak discharge events, more frequent embankment breaches, and longer inundation durations [9].

Research projecting Bihar's district-level climate risks under IPCC RCP 4.5 scenarios finds that most districts face maximum temperature rises exceeding 2°C by 2070, with significant monsoon precipitation variability [9]. The Himalayan Tarai districts—including North Bihar—face particularly high to very high overall climate risk when hazard, exposure, and vulnerability are integrated.

Under higher emission scenarios (SSP5-8.5), Bihar's combination of flood susceptibility—affecting over 65% of its districts and 72% of its land—with limited adaptive capacity creates a compound climate-poverty risk: future loss and

damage will not scale linearly with increased hazard but will be amplified by the inability of impoverished households to invest in adaptation, rebuild after losses, or diversify livelihoods. The districts where CRAVIS projects the greatest increase in heavy rainfall events are, without exception, the same districts carrying the highest historical flood damage burden: Darbhanga, Sitamarhi, Madhubani, Muzaffarpur, and Supaul.

The JEEViKA Pathway: Women-Led Resilience as Loss and Damage Response

JEEViKA: Scale, Structure, and Reach

JEEViKA—the Bihar Rural Livelihoods Project—was initiated in 2007 with World Bank support and now operates as the state's nodal platform under the National Rural Livelihoods Mission (NRLM) [10]. JEEViKA has mobilised over 12 million rural women into approximately 1.03 million self-help groups (SHGs), organised into village organisations and cluster-level federations. It touches every second household in rural Bihar—the largest state-level women's livelihood programme in India.

JEEViKA's community architecture provides exactly the institutional scaffolding that flood resilience requires: dense local networks, trusted female leadership, community savings, mutual accountability, and peer-to-peer information flow. JEEViKA demonstrated its crisis mobilisation capacity during COVID-19: SHGs under NRLM produced over 168 million face masks, ran 122,600 community kitchens, and facilitated delivery of USD 2.3 billion in financial assistance to over 206 million women [10].

What JEEViKA has Achieved in Flood-Prone Districts

WEF (2025) documented how JEEViKA has catalysed flood-resilient livelihood adoption among SHG members in flood-prone districts [11]. Women members have shifted toward livelihoods specifically designed to withstand flooding: goat rearing (animals that can be moved before floods arrive), poultry (faster recovery post-flood than crop-based livelihoods), and vegetable cultivation on raised beds (which remain productive even as surrounding fields inundate). In Darbhanga and Madhubani, JEEViKA SHGs have promoted Madhubani painting enterprises—income entirely unaffected by floods. Didi ki Rasoi community kitchens have served as nutrition safety nets during flood periods, while Bank Sakhis have maintained financial access for displaced families when physical bank branches are inaccessible.

A 2025 study examining JEEViKA's health outcomes demonstrates that SHG platforms effectively improve maternal and child health indicators in Bihar, including significant improvements in antenatal care attendance, institutional delivery, and infant and young child feeding practices—the precise MPI health dimensions most at risk of reversal during flood events.1

Figure 3 maps JEEViKA's existing interventions against the three loss and damage response categories—avert, minimise, and address—as recognised under the IPCC AR6 framework and operationalised at COP27. The programme already operates across all three pillars, though without yet being formally constituted as a loss and damage response mechanism.

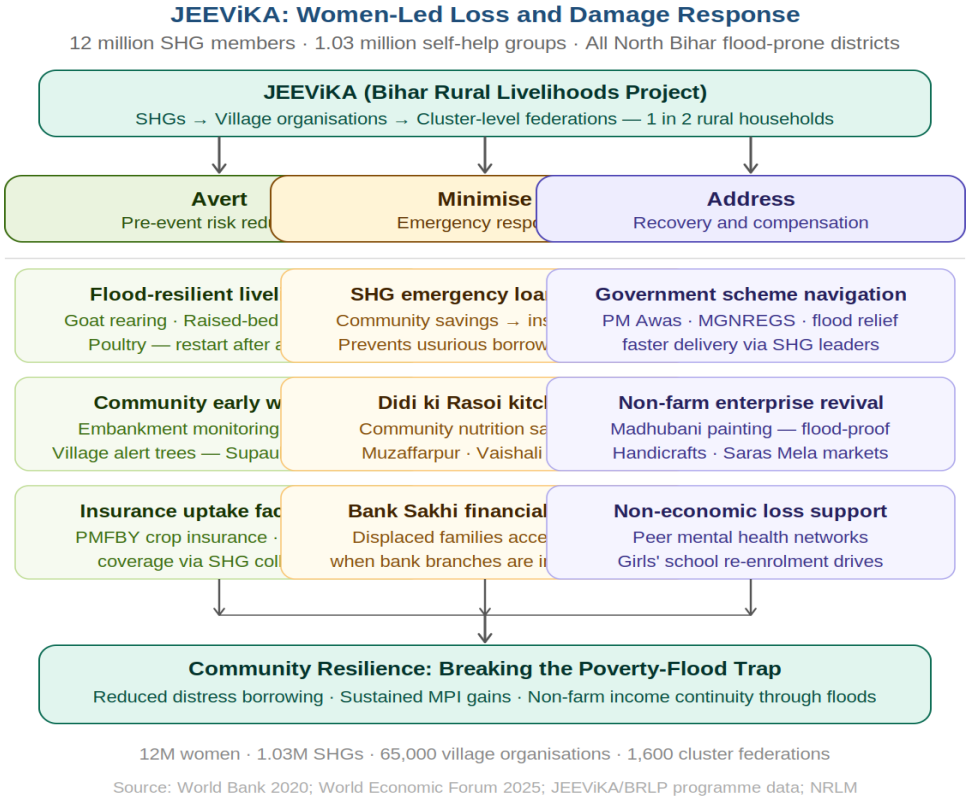

Figure 3: JEEViKA Women-Led Interventions Mapped to Loss and Damage Response Categories

The three columns correspond to the IPCC AR6 / COP27 L&D framework: avert (pre-event), minimise (during event), and address (post-event recovery).

Source: World Bank (2020); WEF (2025); BRLP/JEEViKA programme data [10,11].

Scaling JEEViKA as Loss and Damage Infrastructure

The IPCC AR6 framework distinguishes three categories of loss and damage response: averting (pre-event risk reduction), minimising (emergency response), and addressing (post-event recovery and compensation). JEEViKA's architecture and demonstrated capacity position it as a vehicle for action across all three.

To avert loss and damage, JEEViKA SHGs can undertake community-level flood preparedness: mapping flood-vulnerable households, pre-positioning emergency supplies, maintaining early warning communication trees, facilitating livestock insurance uptake, and promoting flood-resilient livelihood diversification. In embankment-breach districts such as Supaul and Darbhanga, SHGs can monitor embankment conditions and channel community reporting to flood management authorities. To minimise loss and damage, SHG emergency funds built from regular community savings can provide immediate, no-collateral liquidity in the critical days after a flood—the window when families are otherwise forced into distress borrowing at usurious rates. To address loss and damage, JEEViKA's connectivity to government programmes—MGNREGS, PM Awas Yojana, PMFBY crop insurance—can accelerate post-flood recovery benefit delivery [10,12].

L&D Response	JEEViKA Mechanism	Target Districts	Outcome
Avert	Flood-resilient livelihoods: goat, poultry, raised-bed vegetables	Sitamarhi, Darbhanga, Madhubani	Income continuity through floods
Avert	SHG embankment monitoring; community early-warning trees	Supaul, Darbhanga	Earlier warning reduces asset loss
Avert	Facilitation of PMFBY crop and livestock insurance uptake	All flood-prone districts	Financial buffer for next event
Minimise	SHG emergency loan funds — no collateral, immediate	All 7 MPA districts	Prevents resort to moneylenders
Minimise	Didi ki Rasoi kitchens during displacement	Muzaffarpur, Vaishali, Saran	Food security when markets fail
Minimise	Bank Sakhi financial access for displaced families	All flood-prone districts	Asset preservation; money transfer
Address	Navigation of PM Awas, MGNREGS, flood relief entitlements	Paschim Champaran, Sitamarhi	Relief reaches families faster
Address	Madhubani painting; non-farm enterprise revival	Madhubani, Darbhanga	Income recovery and dignity
Source: WEF (2025); World Bank (2020); MPA/Tata Trusts (2025).			

Table 2: JEEViKA Interventions Mapped to Loss and Damage Response

Non-Economic Loss and Damage: What Women-Led Institutions Uniquely Address

Vyas et al (2026) emphasise that non-economic impacts—displacement, psychological distress, and cultural loss—are often invisible in hazard-focused assessments [2]. This is especially pertinent in North Bihar, where floods disrupt social calendars, religious practices, and children's educational trajectories in ways that asset-damage surveys cannot capture. Women in North Bihar bear a disproportionate burden: disruption of WASH facilities forces women and girls into dangerous open defecation arrangements, school displacement hits girls' attendance hardest, and domestic violence spikes in displaced communities [4]. JEEViKA's peer networks—led by and for women—are uniquely positioned to identify, document, and address these non-economic losses, providing intelligence that remains invisible to conventional government systems.

Policy Imperatives: Building the Architecture of Resilience

Towards an Integrated Policy Recognition

The evidence assembled in this article points to a fundamental policy gap: India approaches flood management in North Bihar as events to be responded to rather than as structural drivers of multidimensional poverty to be addressed. What is absent is recognition that the repeated, cumulative loss and damage experienced by North Bihar's poorest households constitutes a climate justice issue—one demanding both domestic policy innovation and engagement with the international Loss and Damage framework established at COP27 [2].

Two immediate recognitions are essential. Bihar's State Action Plan on Climate Change must explicitly incorporate the flood-poverty nexus and identify district-level convergence points between flood management infrastructure and poverty reduction programmes—using CRAVIS to operationalise this convergence [3]. The state's disaster management framework must also move from a reactive relief model to a proactive resilience investment model, recognising that every rupee invested in pre-event resilience yields disproportionate returns in reduced loss and damage.

Structural Recommendations

Six structural interventions emerge as most urgent. First, a Loss and Damage Assessment Protocol for North Bihar should be institutionalised, building on the MPA methodology but made an annual, state-mandated process disaggregated by gender, caste, and landholding status [4]. Second, JEEViKA should be formally designated as a Disaster Risk Reduction platform, enabling it to access NDRF and SDRF funds and integrating SHG early warning functions into official flood monitoring infrastructure. Third, flood-resilient livelihood promotion should become mandatory in JEEViKA district plans for all high and very high hazard districts. Fourth, CRAVIS-based climate risk intelligence should be integrated into district development planning for all North Bihar districts [3]. Fifth, Bihar requires an annual, district-level rapid assessment of MPI indicators in flood-affected areas to track how floods reverse poverty reduction progress. Sixth, international Loss and Damage finance must be actively sought for North Bihar through India's engagement with the COP27 Loss and Damage Fund.

Conclusion: The Arithmetic of Injustice

North Bihar's flood crisis is not a natural disaster. It is a produced vulnerability—shaped by decades of inadequate investment in embankment maintenance, by development patterns that leave the poorest communities in the most hazard-exposed locations, by relief architectures that address symptoms rather than causes, and increasingly by climate change that intensifies the hazard without any proportionate increase in adaptive capacity for those most at risk.

The arithmetic of this injustice is now documented with precision. A household in Supaul loses Rs 2.11 lakh in a single flood phase [4]. It faces multiple flooding events each year. Its annual income is a fraction of this loss. It is already multidimensionally poor by every measure the NITI Aayog uses [5]. And CRAVIS tells us that heavy rainfall events will become more frequent and intense as the century progresses [3]. The conclusion is inescapable: without structural intervention, North Bihar's poorest households are locked into a deepening spiral of climate-induced loss and damage from which they cannot escape through individual effort alone.

The JEEViKA model offers a different arithmetic. Twelve million women organised into a million SHGs, embedded in every village in rural Bihar, linked to government programmes, trained in health and livelihoods, and increasingly experienced in flood response—this is not merely a livelihoods programme. It is the foundation of a community resilience architecture that, properly resourced and integrated into Bihar's climate governance, can genuinely avert, minimise, and address loss and damage at the scale the crisis demands [10,11].

The question is not whether Bihar can afford to invest in this architecture. At Rs 126.3 crore in documented losses from a single flood phase in seven districts, the cost of inaction dwarfs any conceivable investment in resilience. What is required is the political will to treat North Bihar's compounded climate-poverty crisis as the emergency it is, and to build the institutional response it deserves.

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Footnote

[1] A 2025 study assessing JEEViKA's health layering programme (published on PubMed, PMID: 40826211 proxy) found significant improvements in antenatal care attendance, institutional delivery rates, and infant and young child feeding practices among SHG member households in Bihar relative to non-member households. These are precisely the MPI maternal health and child nutrition indicators most at risk of reversal during flood displacement. See Sharma et al (2025) for the broader district-level climate context for these health outcomes [9].

Note on Figures

Figures 1–3 were produced using primary data from NRSC/ISRO (2020), NITI Aayog (2023), and MPA/Tata Trusts (2025) [1,5]. Future climate risk intelligence draws on CEEW's CRAVIS platform (https://cravis.ai), launched April 2026, which provides district-level projections across 279 indicators under multiple IPCC emission scenarios. Readers may access CRAVIS district dashboards for North Bihar directly at the above URL.