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Invisible Frontlines: Women's Disaster Experiences, Coping Strategies, and Agency among Flood-Affected Rural Households along the Gomti River, Comilla, Bangladesh

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Abstract

Bangladesh ranks among the world's most flood-exposed nations, yet women's roles as primary household managers during disaster events remain systematically invisible in formal relief and policy frameworks. This paper presents findings from an ethnographic study conducted in three villages, Machuabad, Shivnagar, and Puran Bazar in Debidwar Upazila, Comilla, following the catastrophic August 2024 floods along the Gomti River, which reached the highest gauge level recorded in 37 years. Twenty-one women who held primary household-management responsibility during the flood were recruited through purposive and snowball sampling; data sources comprised in-depth semi-structured interviews, ten analytically selected case studies, sustained participant observation, and field notes. Thematic analysis was triangulated with five theoretical frameworks: Pierre Bourdieu's Habitus and Symbolic Violence, Julian Steward's Cultural Ecology, Mary Douglas's social theory of risk, Paul Farmer's Structural Violence, and Political Ecology. Findings reveal that women deployed sophisticated, generation-tested strategies organized into five clusters: seed preservation in sealed earthen vessels, vertical reorganization of domestic space, improvised cooking technology, kinship-network mobilization centered on the baper bari (natal home), and spontaneous community shelter. Despite this indispensable work, women were overwhelmingly excluded from formal relief through three nested barriers, institutional architectures premised onmale household heads, community norms coding public queuing as indecent, and an internalized sense of sharam (shame) producing self-enforced exclusion. The study advances five recommendations operationalizing the Sendai Gender Action Plan at upazila level, treating women as decision-makers and knowledge-holders rather than passive recipients of aid.

Keywords: Women and disasters; Invisible labor; Gomti river; Indigenous flood coping; Bangladesh; Habitus; Structural violence; Disaster risk reduction; Sendai framework; Ethnographic research

Introduction

Recurrent intensifying floods define life along Bangladesh's river margins. The country sits at the confluence of three major transboundary systems as the Ganges, Brahmaputra, and Meghna and receives the bulk of its annual rainfall in a compressed monsoon window between June and September. Approximately 230 rivers traverse its flat deltaic terrain, and long-term hydrological records show that roughly 22 percent of national territory floods in an average year; in centennial events, that figure climbs to 60 percent [1]. Bangladesh has

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recorded 29 major floods in the past five decades, six of which caused catastrophic damage [2], and the country is now widely recognized as the most flood-prone in the world [3]. Climate change is deepening this exposure: the projects [4] further intensification of extreme precipitation across South Asia, with low-lying delta states disproportionately affected. The consequences of these disasters, however, are not shared equally. Evidence accumulated over three decades points consistently to the disproportionate harm borne by women. [5], analyzing data from 141 countries over two decades, found that disasters lower women's life expectancy relative to men's, a gap that narrows in societies. with greater gender equality. In Bangladesh, the pattern is stark: women's death toll in the 1991 cyclone was five times that of men [6], and 91 percent of deaths in that event were female [7]. More recently, the [8] Rapid Gender Analysis of the August 2024 Eastern Bangladesh floods found that 3.05 million of the 5.8 million affected persons were women, with 78,362 pregnant women among the most vulnerable. Research consistently shows that 87 percent of women in disaster-affected areas of Bangladesh face food insecurity [9], and women report compounding difficulties: income loss, disruption of children's schooling, erosion of social support, and heightened psychological burden [10]. Yet the literature also reveals a paradox. Women are simultaneously among the most vulnerable and among the most active responders to flood disasters. They manage households under extreme conditions, preserve seeds and food stores, protect livestock, care for dependents with no external support, and mobilize kinship networks that function as community safety nets. This "invisible labor" does not register in official disaster metrics, receives no compensation, and is largely absent from national disaster risk reduction frameworks. Nahar et al. [11], in a qualitative study of flood-affected women across Bangladesh, found that patriarchal culture systematically blocks women's adaptive capacity not because the capacity is absent, but because social structures deny it recognition and resources. Hossain et al. [12], working in Sirajganj District, reached a comparable conclusion: women's roles in flood resilience constitute critical community assets that remain formally unacknowledged. This study investigates three villages, Machuabad, Shivnagar, and Puran Bazar along the Gomti River in Debidwar Upazila, Comilla, in the wake of the August 2024 flood. On 23 August 2024, the Gomti at Debidwar reached 8.58 metres, 53 centimetres above the declared danger level, the highest gauge in 37 years of Bangladesh Water Development Board records [13]. Triggered by heavy upstream rainfall in India's Tripura state, the flood inundated 73 upazilas across 11 districts within hours, leaving residents with no warning time [14,15]. The suddenness of this event, and its concentration of impact on women managing households alone, makes these communities an analytically important case.

The paper pursues four objectives: (i) to document women's lived experiences during and after the 2024 event; (ii) to analyze the household management strategies and indigenous knowledge they applied; (iii) to examine the structural and normative barriers that blocked their access to formal relief; and (iv) to evaluate how informal kinship and community ties functioned as a substitute safety net where institutional provision failed. The findings contribute to a growing anthropological literature on gendered disaster experience and speak directly to current debates about the Sendai Gender Action Plan [16].

Research questions

In response to these gaps, the present study addresses four research questions (RQs):

- RQ1. What lived experiences did women in Debidwar Upazila have during and after the August 2024 Gomti flood?
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- RQ3. What structural and normative barriers blocked their access to formal relief?
- RQ4. How did informal kinship and community ties function as a substitute safety net where institutional provision failed?

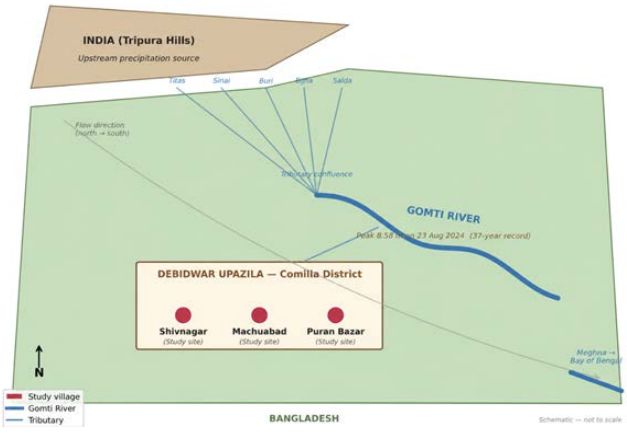

Figure 1: Schematic map of the study area showing the Gomti River, the three study villages in Debidwar Upazila, and the upstream flood trigger pathway from Tripura, India. The August 2024 flood peak of 8.58 m was the highest in 37 years of Bangladesh Water Development Board records.

These questions are pursued through an ethnographic design grounded in five interlocking theoretical frameworks. The paper proceeds as follows: Section 2 situates the study in the gender and disaster literature and develops the theoretical framework. Section 3 describes the methodology. Section 4 presents findings organized around the four research questions and discusses them in light of the theoretical frameworks.

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Section 5 concludes with five evidence-grounded policy recommendations operationalizing the Sendai Gender Action Plan [16] at upazila level.

Situating the Study: Key Debates in Gender and Disaster Research

Gendered Vulnerability as a Social Product

Vulnerability to natural hazard is not an inherent property of physical environments but is produced through unequal social arrangements that determine who faces risk and who commands resources to manage it [17-19]. Gender is among the most pervasive axes along which this vulnerability is distributed. In Bangladesh, where patriarchal household structures and rural poverty intersect with chronic flood exposure, the consequences for women are well documented. Sultana et al. [20], whose foundational research on gendered waterscapes in Bangladesh introduced the concept of "hydro social" disaster experience, showed that women's vulnerability is constituted not only by physical flood exposure but by the social relations that restrict their mobility, control their assets, and define their public presence.

Rezwana et al. [21], in a rigorous case study of cyclone affected coastal Bangladesh, extended this analysis by mapping the relationship between disasters and gender-based violence, a relationship that operates before, during, and after events through what they term "layered disasters". Their work is particularly relevant here because it demonstrates that women's post-disaster experiences cannot be understood in isolation from pre-existing patriarchal power relations, a point this study confirms at the household level in Debidwar. Islam et al. [6] provide further regional evidence, documenting compounded vulnerabilities with inadequate shelter, restricted WASH access, social harassment, and GBV risk faced by women in flood and cyclone events across coastal Bangladesh.

Invisible Labor, Indigenous Knowledge, and Women's Agency

Women in disaster-affected communities are routinely rendered invisible by frameworks that cast them as victims requiring assistance rather than agents possessing knowledge and strategies. Enarson et al. [22], first theorized this dynamic as the "gendered terrain of disaster." In Fordham [23] showed that making women's contributions visible requires deliberate methodological and political work, since dominant disaster management systems are designed around assumptions of male household headship.

Recent Bangladesh-focused research confirms that this invisibility persists. Hossain et al. [12], working in flood-prone Sirajganj District, used Focus Group Discussions to document women's contributions across human, social, and financial capital dimensions during flooding. Male FGD participants explicitly acknowledged women's superior flood-management knowledge: women's "daily experience and knowledge of the recurrent flood are very effective in managing different stages of the disaster." Yet this acknowledged capacity does not translate into formal recognition or policy inclusion. Nahar et al. [11], similarly, found that women's flood adaptation capacity in Bangladesh is thwarted not by absence of skill but by patriarchal social structures that deny access to the knowledge, resources, and social standing needed to act on those skills. Sulaiman et al. [24], in a parallel qualitative study, reached identical conclusions about women's excluded adaptive capacity in flood-prone Bangladesh communities.

The concept of indigenous ecological knowledge defined by Fikret Berkes's [25] as cumulative, practice-based, and environment-specific bodies of understanding provides a productive theoretical anchor for interpreting women's flood-response strategies. Paul et al. [26] documented such knowledge in their study of two flood-vulnerable Bangladesh villages, including food preservation and structural adaptation strategies closely paralleling those recorded in the present fieldwork.

Social Capital and the Informal Safety Net

Robert Putnam's [27] concept of social capital networks, norms, and trust enabling collective action has been extensively applied to disaster resilience. In rural Bangladesh, bonding capital (within-community ties) consistently outperforms bridging capital (cross-community or state linkages) as an immediate resource during floods [26-28]. The cultural institution of the baper bari(natal/paternal home) functions as a critical node in these networks: returning to one's birth family's home with dependents and portable assets is a long-established coping strategy whose logic follows the distributed risk management principles identified by Camargo, et al. [29] in their study of kinship and flood recovery in Bangladesh.

International Policy Context

The Sendai Framework for Disaster Risk Reduction 2015-2030 provides the global governance architecture for DRR, yet scholars have noted persistent gaps in its gender responsiveness. In Sorensen et al. [30] found that five years into implementation, the Framework remained weak on addressing structural drivers of women's vulnerability. In direct response, UNDRR and UN Women launched the Sendai Gender Action Plan (Sendai GAP) in March 2024 following consultation with 65 countries and more than 500 stakeholders with nine key objectives and 33 recommended actions to advance gender-responsive DRR [16]. The present study is situated explicitly within this international framework, and its findings and recommendations contribute documented ethnographic content to the GAP's implementation knowledgebase.

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Research Gap and Theoretical Framework

Three gaps emerge from the literature reviewed above. First, although Bangladesh-focused work has documented women's adaptive capacity in general terms [11,12,24], few studies provide micro-level ethnographic content that names specific strategies, identifies their material and cultural pre-conditions, and traces how they articulate with formal relief systems in real time. Second, the August 2024 Eastern Bangladesh floods, the largest such event in nearly four decades have been documented primarily through rapid assessments [8,31,32] that, by design, prioritise reach over depth. Sustained qualitative inquiry into household-level women's experience of that specific event remains scarce. Third, the recent launch of the Sendai Gender Action Plan [16] creates an immediate need for empirically grounded content that can anchor its objectives in named local practices and identifiable barriers.

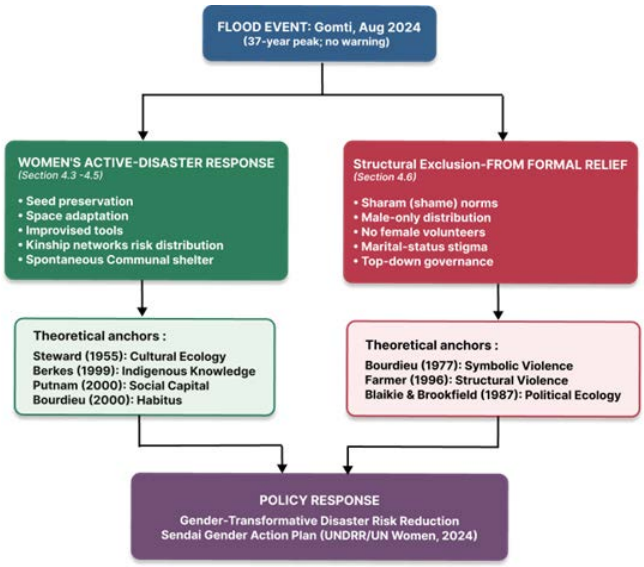

Figure 2: Conceptual framework illustrating the dual dimensions of women's flood experience with active household response and structural exclusion from relief with associated theoretical anchors and the policy implications derived from the findings.

To address these gaps, the present study integrates five theoretical frameworks into a single analytical lens (Figure 2). On the response side, Pierre Bourdieu's concept of [33,34] explains why women's sophisticated crisis management is misrecognized by themselves and by observers as ordinary domestic routine. Julian et al. [35] Cultural Ecology and [25] framing of Traditional Ecological Knowledge provide the interpretive language for treating women's improvised practices as a coherent body of environmentally adapted knowledge. Robert Putnam [27] social Capital explains the role of informal networks. On the exclusion side, Mary Douglas's [36] social theory of risk clarifies why women's perceptions of threat are mediated by moral and relational considerations that quantitative vulnerability assessments miss. In this paper, Paul Farmer's [37] structural Violence names the institutional architectures that deny women access to relief, while [33] Symbolic Violence names the community-level normative enforcement of that exclusion. Finally, Political Ecology [18-38] frames the wider technical-administrative decisions that worsen disaster outcomes for those without political voice.

Methodology

Research Design and Epistemological Grounding

This study adopts a qualitative ethnographic design, rooted in the anthropological tradition of prolonged, participatory engagement with a community. The interpretive framework draws on [39] concept of thick description, which holds that social behavior cannot be adequately understood through surface observation alone but requires immersion in the contextual webs of meaning that give actions their significance. This commitment to depth over breadth is particularly apt for studying women's flood responses, since the strategies of interest are tacit, embodied, and embedded in daily domestic. routines that resist quantification. The study reports its design in line with the Consolidated Criteria for Reporting Qualitative Research [40], addressing the three COREQ domains of research-team reflexivity, study design, and analysis findings.

The number of papers based on different curricula

Three villages, Machuabad, Shivnagar, and Puran Bazar located in Debidwar Upazila, Comilla District, on the western bank of the Gomti River were selected as the fieldwork sites. These communities were among the most severely affected in the August 2024 flood, which submerged all three within a single night. The selection was also shaped by the researcher's personal connection to the area: direct observation of the flood's sudden onset motivated the decision to document women's responses in detail. The villages represent a cross-section of riverside household economies, encompassing subsistence agriculture, small-scale trading, and daily-wage labor.

Sampling

A two-stage, non-probability sampling procedure was adopted. In the first stage, purposive sampling [41] identified women who had held primary household management responsibility during the flood. Selection criteria were: (i) direct personal experience of the 2024 event; (ii) residence in one of the three study villages; (iii) primary responsibility for household and dependent care during the flood period. The 2024 flood context itself was an additional criterion, since participants needed direct experience of that particular event. In the second stage, snowball sampling [42] extended the sample through peer referrals. This was especially productive in a social environment where women are reluctant to speak

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Table 1: Socio-demographic overview and theoretical relevance of key case study participants. All names are pseudonyms to protect confidentiality. MIL = mother-in-law.

Pseudonym	Age	Household role	Key action during flood	Theoretical frame
Amena	63	Elder household head	Improvised stove from cut tin; elevated household goods	Cultural Ecology; Habitus
Khadija	35	Primary caregiver, 3 children	Vertical space reorganisation; seed preservation	Cultural Ecology; Indigenous Knowledge
Johura Begum	27	Caregiver (ill MIL + 3 children)	Continued cooking on gas stove atop bed during flood	Douglas's Risk Theory; Symbolic Violence
Lutfunnahar	52	Extended household manager	Sent daughter-in-law with poultry to natal home pre-flood	Social Capital; Kinship Network
Nira	25	Partial homeowner	Opened unfinished 3-storey building as community shelter	Social Capital; Political Ecology
Nurjahan	50	Elder, single woman	Refused relief queue despite acute need (sharam)	Symbolic Violence; Structural Violence
Rubina	N/A	Mother of infant	Transported child in cooking vessel; banana-trunk raft	Cultural Ecology; Indigenous Knowledge
Sadia	N/A	Divorced, single head	Excluded from relief: marital stigma and logistical trap	Structural Violence; Gender Exclusion
Sharmin	N/A	Young wife	"If it floods again, we go back to the embankment", fatalism	Structural Violence; [37]
Zohra Begum	N/A	Experienced flood veteran	Rescued livestock with wicker baskets (khari) and rafts	Cultural Ecology; Social Capital

with outsiders about hardship and survival, and where trust must be built incrementally through community-intermediated introductions. A total of 21 participants were recruited across the three villages. Recruitment was halted when sustained iterative coding indicated thematic saturation that is, when new interviews ceased to generate codes or to refine existing codes [43].

Of these 21 participants, ten case studies (Table 1) were developed from narratives that most clearly illustrated the study's key themes; cases were selected during fieldwork on the basis of analytical relevance, not prior planning [44].

Data Collection

Four methods were combined, consistent with the methodological pluralism recommended by [45] for ethnographic inquiry into complex social phenomena.

- **Participant observation [46]:** Extended observation of daily routines, household spaces, and community interactions in all three villages provided the con-textual foundation for interpreting interview data. Field visits took place in the weeks following the flood, when physical evidence of damage and recovery was still visible and vivid.
- **In-depth semi-structured interviews:** Twenty-one interviews of 45–90 minutes were conducted individually in Bengali. Interviews were audio-recorded with informed consent, subsequently transcribed, and analysed thematically. Questions focused on flood preparation, household management during the event, access to relief, and community support.
- **Case studies:** Ten case studies (Table 1) were developed from narratives that most clearly illustrated the study's key themes. Cases were selected during fieldwork on the basis of analytical relevance, not prior planning [44].
- **Field notes:** Detailed ethnographic notes were maintained throughout fieldwork, following [47] method of progressive elaboration from summary jottings in the field to detailed reconstructive accounts at the end of each day. Notes documented emotional expressions, spatial arrangements, material objects, and social interactions that were not captured in interview recordings.

Analytical Approach

Thematic analysis [48] was applied to interview transcripts and case study data. Codes were developed inductively from the data and then organized into themes that were refined through comparison with the theoretical frameworks outlined in Section 2. This process was iterative: initial codes derived from the data were tested against theoretical categories, revised, and reapplied. The analysis maintained fidelity to participants' own terms and conceptual categories, particularly around key local concepts such as sharam (shame), baper bari (natal home), Khowar (attic space), and khari (wicker basket). Triangulation was achieved across three data sources (interviews, observation, field notes) and against secondary materials, the [8] Rapid

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Gender Analysis of the same event and the [8] assessment to test whether patterns identified in the present sample echoed those documented at the regional scale [45].

Positionality and Ethics

Fieldwork was conducted with an awareness of the power differentials between researcher and participant in a rural, post-disaster context. All participants provided informed verbal consent following a clear explanation of the study's aims, their right to withdraw, and the measures taken to protect confidentiality. No identifying information appears in this paper; all participant names are pseudonyms. The researcher's proximity to the affected community, and the fact that the flood itself motivated this research, is acknowledged as both an asset enabling trust and depth and a potential source of bias, managed through reflexive note-taking and theoretical triangulation.

Methodological Limitations

Several limitations bear acknowledgement. First, the study is geographically confined to three villages within a single upazila, which means findings should not be generalized uncritically to other flood-prone regions of Bangladesh. Second, twenty-one participants constitute an appropriate sample for qualitative inquiry but do not support statistical inference. Third, data collection occurred within an academic time constraint that precluded the longitudinal engagement best suited to studying disaster recovery. Fourth, most data are retrospective and memory-based, introducing potential recall bias; the absence of contemporaneous written records from the field sites compounded verification challenges. These constraints are consistent with those noted by comparable qualitative studies in similar settings [11,12] and do not undermine the analytical depth that ethnographic methods afford.

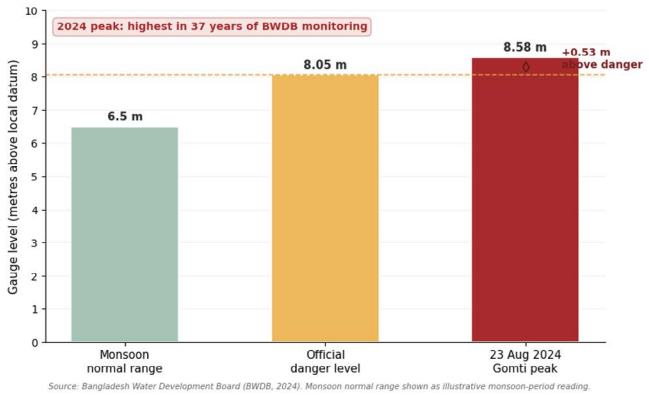

Figure 3: Gomti Riversnip gauge reading at Debidwar on 23 August 2024 (8.58 m) shown against the declared Danger level (8.05 m) and a typical monsoon range. The 2024 peak was the highest in 37 years of BWDB monitoring [13].

Findings and Discussion

This section presents findings organized around the four research questions stated in Section 1.1 and discusses each in light of the theoretical framework. Section 4.1 contextualizes the August 2024 flood event. Section 4.2 to Section 4.5 address how women experienced and responded to the flood (RQ1 and RQ2). Section 4.6 addresses the barriers blocking access to formal relief (RQ3). Section 4.7 examines the political-ecological dynamics of technical decision-making during the flood. Section 4.8 synthesises the findings into a thematic analysis matrix and locates the case study sample across the analytical frame (RQ4).

Contextualizing the August 2024 event

The August 2024 flood in Debidwar Upazila was unusual both in its severity and in its suddenness. When waters from Tripura's hills fed into the Titas, Sinai, Buri, Bijna, and Salda tributary rivers simultaneously, the Gomti rose faster than local memory could reference. BWDB records show no precedent for 8.58 metres at the Debidwar gauge in 37 years of monitoring [13]. In Feni and Noakhali districts alone part of the same flood system, 81,675 hectares of cropland were lost [31]. Nationally, the event left 5.8 million people affected, 59 killed, and 3.05 million women in direct need [31]. Al-Mamun et al. [32], studying women's health and hygiene needs across the same five most-affected districts, documented the scale of disruption to basic services and the disproportionate burden borne by women and adolescent girls. In Machuabad, Shivnagar, and Puran Bazar, the flood arrived in the night, offering residents no meaningful preparation window and no opportunity for organised evacuation.

Habitus and the Invisibility of Female Agency

Among the study's most consistent findings was the systematic self-minimization by participants of their own flood-response activities. Amena (age 63) and Khadija (age 35), whose households sustained some of the most prolonged inundation, described interventions that were, by any measure, skilled and consequential: they relocated heavy domestic appliances, fashioned cooking stoves from corrugated tin, preserved seed stocks, managed livestock, and maintained food provision for their dependents under continuously worsening conditions. Both women, without prompting, categorized these activities as "ordinary", the kind of work that any woman would naturally do.

This self-description is not incidental. It reflects what [33-34] theorized as Habitus: the structured set of durable dispositions through which social actors perceive and evaluate their own actions without recognizing those perceptions as socially constructed. For these women, protecting the household is so thoroughly naturalized as a feminine obligation that even extraordinary exercise of that capacity under crisis conditions carries no mark of achievement. Hossain et al. [12] identified precisely this

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dynamic in Sirajganj, noting that patriarchal norms render women's vital flood roles invisible not only to policymakers but to the women themselves. The present study deepens this observation through individual case narratives that illustrate the mechanism of anticivilization from the inside.

The policy consequences of this "misrecognition" [33] are material. If women do not frame their crisis management as leadership, and if administrators and relief planners share that framing, the strategic knowledge embodied in these women's practices is systematically excluded from disaster preparedness planning. The Sendai GAP [16] explicitly identifies this as a priority gap, the failure to recognize and remunerate women's informal leadership, knowledge and the present study provides ethnographic content that can anchor that policy aspiration in documented local practice.

Risk Perception and Culturally Embedded Adaptive Management

The case of Johura Begum (age 27) illuminates how women's risk perception during disasters integrates physical, social, and moral considerations in ways that simple vulnerability assessments miss. In the hours before the flood peaked, Johura's husband dismissed her warnings as excessive. Her anxiety, however, was grounded in precise logistical reasoning: she was responsible for a bedridden mother-in-law and three young children, had no male adult in the household, and could see that the water table was rising faster than local custom suggested it should. When water entered the ground floor, she placed the gas stove on top of the bed and continued cooking.

Mary Douglas [36] framework in Purity and Danger is instructive here. Douglas argues that risk is not a property of physical events, but a social and cultural construct shaped by the values and relationships of those experiencing it. For Johura, the "real risk" was not primarily the floodwater but the prospect of failing her dependents: failing to feed them, failing to maintain the household's functioning, failing in the duties that constituted her social identity. This recentering of risk from physical hazard to social obligation is also legible through [33] concept of symbolic violence: the social expectation that women ensure domestic continuity regardless of environmental conditions is so thoroughly internalized that Johura experiences it as personal imperative rather than social imposition. In Julian Steward's [35] Cultural Ecology provides the adaptive lens: her cooking arrangements gas stove on bed, elevated above the waterline represent a culturally specific, environmentally calibrated adaptive behavior transmitted through gendered domestic socialization.

Indigenous Knowledge: A Household Science of Flood Survival Agency

Women in the study communities possessed a detailed, practice-tested body of knowledge for managing life in a flood-risk environment. This knowledge, accumulated across generations of living with the Gomti's seasonal rhythms, was deployed with striking consistency across the three villages.

Table 2: Catalogue of indigenous flood-response strategies documented in the study communities. Strategies are not exhaustive but represent the categories most consistently observed across the three villages.

Strategy cluster	Documented technique	Material requirements	Household function	Temporal horizon
Seed preservation	Earthen pots sealed with a mixture of mud and dried cow dung; placed on elevated surfaces or upper-floor rooms.	Earthen pots; mud; dried cow dung; elevated storage.	Livelihood continuity through replanting after flood recession.	Months ahead (post-flood season).
Vertical space reorganization	Cooking, sleeping, and food storage moved to elevated surfaces; refrigerators lifted onto tables placed on beds; activities shifted to the khowar mezzanine.	Pre-existing elevated structures; tin-roofed houses with Khowar.	Functional continuity of the home as flood line rises.	Hours to days (during peak).
Improvised cooking technology	Sections of corrugated tin roofing cut into hearth supports; fire-based cooking maintained above water line.	Corrugated tin; firewood; cutting implements; flood-environment experience.	Daily food provision under crisis conditions.	During flood.
Kinship-network risk distribution	Dependents and portable assets (e.g., poultry) sent to the baper bari (natal home) before flood peak.	Functional natal-home ties; pre-flood mobility window; transport options.	Distributed insurance — peak burden reduced, asset survival probabilities raised.	Pre-flood through recovery.
Spontaneous communal shelter	Unfinished or elevated structures opened to neighbors, their children, and livestock during the flood.	Owner's elevated structure; neighborhood trust networks.	Collective survival capacity beyond the individual household.	During flood.

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Five strategy clusters were documented consistently

- **Seed preservation:** Seeds for pumpkin, rice, bitter gourd, and seasonal vegetables were packed into earthen pots and sealed with a mixture of mud and dried cow dung to create airtight containers. These pots were placed on elevated surfaces or taken to upper-floor rooms. This practice protects the household's capacity to replant after waters recede a strategy of livelihood continuity that extends the household's disaster management horizon well beyond the flood event itself.
- **Vertical reorganization of domestic space:** When ground floors became impassable, women transferred cooking, sleeping, and food storage to elevated surfaces. Refrigerators were lifted onto tables placed on top of beds. Cooking operations shifted to the khowar the internal mezzanine space common in tin-roofed houses in the region. This vertical reorganization essentially re-draws the functional boundaries of the home in response to the flood line.
- **Improvised cooking technology:** When conventional stoves became inaccessible, Amena and Khadija cut sections of corrugated tin roofing into improvised hearth supports, enabling fire-based cooking at elevated levels. This is a zero-cost, locally available solution requiring both skill and prior experience of flood conditions.
- **Emergency human transport:** Rubina, unable to carry her infant through chest-high, fast-moving water, placed the child in a large aluminum cooking vessel (deg) and pushed it ahead of her while wading. She also fashioned a rough raft from a cut banana-tree trunk, a buoyant and locally abundant material to navigate the current. These techniques require knowledge of local materials, physical strength, and confident judgement under acute stress.
- **Livestock rescue:** Zohra Begum recalled managing the rescue of her household's livestock using wicker baskets (khari) and improvised wooden rafts to move animals to higher ground. Livestock represent a critical long-term livelihood asset; their rescue signals an understanding of disaster impact that extends beyond immediate survival to post-flood economic recovery.

These strategies collectively constitute what [26] called "everyday resilience", capacities embedded in the routines and material culture of daily life rather than acquired through formal training. Fikret Barkers [25] would characterize them as components of a local ecological knowledge system: cumulative, experiential, and deeply contextualized. That these practices pass informally through women's socialization networks, without documentation or institutional recognition, renders them structurally fragile at risk of disruption as household compositions and social arrangements change under migration pressure and urbanization.

A Social Capital as the First Responder

Across all cases, the study found that informal kinship and neighborhood networks provided more immediate, contextually appropriate, and dignity-preserving support than any formal relief mechanism. Two distinct forms of social capital were particularly prominent.

The first was kin-based risk distribution, centered on the baper bari (natal/paternal home). Lutfunnahar (age 52), recognizing in advance that the flood would stress her household's resources, arranged for her daughter-in-law to return to her own natal home, taking the household's poultry with her. This is an economically rational strategy: it distributes both dependents and assets across two households, reducing the peak burden on any one unit and increasing the probability that at least some livestock will survive. Camargo et al. [29] documented this pattern in their study of flood recovery and kinship in Bangladesh, noting that the baper bari institution functions as a form of distributed insurance for rural households without access to formal financial protection.

The second form was spontaneous communal resource conversion. Nira (age 25), whose family's unfinished three-story concrete building happened to stand above the anticipated flood level, opened it to neighbors, their children, and their animals for the duration of the event. No formal agreement governed this arrangement; it was mediated entirely by neighbourly trust and the urgency of the situation. This case exemplifies what Robert Putnam's described as high-trust bonding social capital, the dense, reciprocal relationships within a community that enable rapid collective action in crises. The [31], assessing the same flood event, found comparable informal sharing of cooking stoves and shelter across affected households in Feni and Noakhali, suggesting that this pattern operates across the region.

Structural Exclusion from Relief: Shame, Stigma, and the Architecture of Aid

The structural failure to reach women most in need of formal relief was among the study's most consequential findings. This failure operated at three nested levels simultaneously, analyzed against women's actual needs in Table 3.

At the institutional level, relief distribution in Shivnagar and Puran Bazar was organized entirely by male community leaders and male student volunteers. No women were involved in either organizing or distributing aid. There were no home-based distribution arrangements, no women-only queuing spaces, and no provision for women who could not leave their homes. The architecture of the relief system was premised on a male household representative collecting and returning resources to the family an assumption that structurally excluded female-headed households, divorced

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Table 3: Gap analysis comparing women's documented relief needs (Column 1) with features of the August 2024 formal relief operation in Debidwar (Column 2). The resulting gaps (Column 3) are addressed by the recommendations in Section 5.

Women's documented need	Feature of the August 2024 relief response	Gap
Means to receive aid without violating public-mobility norms.	Aid distributed exclusively at male-controlled public points; no home-based, mobile, or women-only distribution.	No distribution channel was compatible with restricted female public mobility.
Recognition of single, widowed, divorced, or de facto female-headed households as eligible recipients in their own right.	Aid architecture assumed a male household representative collecting on behalf of dependents.	Female-headed households fell outside the recognized unit of distribution.
Female agency in relief organization, distribution, or community accountability.	No women involved in either organizing or distributing aid; volunteer pool was male students and male community leaders only.	Zero female agency in any layer of the formal relief operation.
Dignity-preserving channels for accessing assistance.	Public queuing in shared spaces, coded as "indecent" for women under prevailing community norms.	Public queuing imposed a social cost incompatible with female honor codes.
Timely, proactive outreach to identified vulnerable households.	Reactive distribution dependent on physical presence at distribution points.	Women with the highest need (e.g., immobile, single, ashamed to attend) were systematically missed.

women, and women whose husbands had migrated for wage labor.

At the community level, standing in a relief queue in a public space was widely perceived as a form of social transgression for women. To be seen waiting publicly for charity was understood, in local normative terms, as evidence of poverty, of inadequate male provision, and of a failure of household honor. Bourdieu [33] concept of symbolic violence captures this dynamic precisely: the social norms that prevent women from accessing relief are not experienced as external impositions but as self-evident moral truths, reproduced through the everyday practices of the community. Rezwana et al. [21] noted a structurally comparable dynamic in their study of cyclone-affected Bangladesh, where fear of social shame systematically suppressed women's reports of gender-based violence and restricted their post-disaster movements.

Nurjahan (age 50) presents the clearest case of internalized exclusion. Despite being without food and without male household support, she refused to approach the relief queue, citing sharam. Her refusal was not coerced; no one told her not to go. The inhibition was internal, the product of decades of socialization in norms that tie female honor to domestic containment and invisibility. This is precisely what [33] meant by calling symbolic violence the "most profound violence" it is effective because its victims enforce it upon themselves.

Sadia's case added a further dimension. As a divorced woman, she faced the intersection of two stigmatized identities: a woman without male protection, and a woman whose marital failure marked her as a social liability. She faced an impossible practical choice: leave her home unguarded to seek food, or guard her home and go hungry. She went hungry. Robina's case illustrated how arbitrary and undignified the alternatives were: after three days without food in rain-soaked conditions, she received help only because a group of passing male students noticed her. Her relief was an accident of visibility, not a product of any system.

Pauls Farmer [37] framework of structural violence the systematic erosion of vulnerable people's capacity for survival through unequal access to resources, security, and institutional protection provides the analytical language for understanding these cases as systemic rather than individual. The women who went without food did not fail to seek help because of personal failing. They were caught in a structure that punished women for needing public assistance, organized relief around assumptions that excluded them, and offered no alternative pathway.

Political Ecology and the Cost of Ignoring Local Knowledge

A third dimension of the study's findings concerns the dynamics of technical decision-making during the active flood event, specifically the confrontation between military engineering solutions and the economic imperatives of farming households.

As flood levels rose, military personnel determined that cutting a road at a specific point near the "Don" area in Shivnagar would create a drainage channel to divert water and reduce inundation. Local farmers refused. Their reasoning was direct, the crops standing in the surrounding fields represented their entire income for the season. Road-cutting would guarantee crop loss; the proposed drainage benefit was uncertain. The resulting standoff prevented the drainage operation. The flood subsequently sought an alternative path, breaching an embankment at Burichang and dramatically worsening the inundation footprint across a wider area.

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Nira (age 25), who reported this sequence of events, framed it in explicitly economic terms: "The army tried to cut the road, but the farmers wouldn't let them because their crops were there. Then the water broke through elsewhere and made everything worse." This case is analytically legible through Political Ecology, as theorized by [18], which examines how environmental management decisions are shaped by competing economic interests and relations of power rather than by purely technical or environmental rationality. The farmers were not wrong to protect their crops; the administration was not wrong to want to divert water. The catastrophe arose from the absence of any negotiated process compensation, community consultation, trust-building that might have found a workable solution. Scott et al. [38], in his landmark analysis of state-driven development failures, identified exactly this dynamic: technical solutions imposed without local knowledge or community consent routinely produce outcomes worse than the problems they were designed to solve.

Synthesis: Thematic Analysis Matrix and Case Coverage

Table 4 presents the thematic analysis matrix that aggregates the case-by-case findings reported in Section 4.2 to Section 4.7. The matrix shows how four core themes naturalized invisibility of female labour, indigenous flood knowledge, kinship as primary safety net, and multi-level exclusion from relief are anchored in identifiable codes from the data, illustrated by case-study exemplars, and mapped to the theoretical frameworks introduced in Section 2.

The matrix confirms the dual analytical structure introduced in Figure 2: themes cluster into two opposed but interdependent zones, with women's active response on one side (Themes 1-5) and the institutional and normative architectures that exclude that response from formal recognition on the other (Themes 6-9). The ten case studies provide coverage across both zones, reflect this distribution: Cultural Ecology appears most frequently because it anchors several of the active-response themes, while structural and symbolic violence dominate the exclusion zone. The matrix thus operationalizes the conceptual framework rather than illustrating it post hoc.

Conclusion and Policy Recommendations

The women of Machuabad, Shivnagar, and Puran Bazar who participated in this research were not passive victims of the 2024 Gomti River flood. They were household managers who kept families fed and alive under conditions of acute environmental stress, using knowledge accumulated across generations, informal networks built across years of shared community life, and a degree of physical resourcefulness that formal disaster planning systems entirely failed to anticipate, support, or recognize.

This paper has documented the specific content of those capacities as seed preservation, vertical space adaptation, improvised cooking technology, kinship-network risk distribution, spontaneous communal shelter provision and has shown, through ten case studies analyzed across five theoretical frameworks, that their invisibility in formal disaster

Table 4: Thematic analysis matrix linking codes derived from interview and observation data to case-study exemplars and the theoretical frameworks introduced in Section 2.

Theme	Representative code	Case-study exemplar	Theoretical frame
Naturalized invisibility of female labor	Self-categorization of crisis labor as "ordinary"	Amena and Khadija describe stove-improvisation, asset relocation, seed preservation as routine domestic work.	Habitus & Misrecognition [33], [34]
Indigenous flood knowledge	Pre-monsoon preservation; vertical reorganization; improvised cooking; livestock rescue.	Khadija, Amena, Rubina, Zohra Begum.	Cultural Ecology [35]; Indigenous Knowledge [25]
Risk perception as moral obligation	Risk framed in terms of duty to dependents rather than physical hazard.	Johura Begum continued cooking on stove placed on bed despite advancing water.	Risk Theory [36]; Symbolic Violence [33]
Kinship as primary safety net	Pre-flood mobilization of natal-home ties; asset redistribution.	Lutfunnahar sent daughter-in-law with poultry to baper bari.	Social Capital [27]; [29]
Spontaneous communal shelter	Conversion of private elevated space to public shelter.	Nira opened unfinished three-story building to neighbors.	Bonding Social Capital [27]
Institutional exclusion from relief	Male-only distribution; no female agency in aid delivery.	Distribution in Shivnagar and Puran Bazar (collective observation).	Structural Violence [37]
Community-level normative exclusion	Public queuing coded as "indecent" or "men's work".	Local relief practice observed across the three villages.	Symbolic Violence [33]
Internalized exclusion (sharam)	Self-enforced withdrawal from public relief despite acute need.	Nurjahan refused relief queue; Sadia excluded by marital stigma; Sharmin fatalism.	Habitus [34]; Structural Violence [37]
Political-ecological mis-coordination	Top-down technical intervention rejected by farmers; consequent worse outcome.	Shivnagar road-cutting standoff reported by Nira.	Political Ecology [18], [38]

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management is not accidental but structurally produced. The Habitus through which women naturalize their own labor, the Symbolic Violence that prevents them from accessing public relief, the Structural Violence that deprives them of institutional support, and the Political Ecology that dismisses local economic knowledge in favor of top-down technical intervention, all work together to ensure that women's most sophisticated capacities remain outside the frame of official disaster response. These findings align with a converging body of recent evidence: the [8] Rapid Gender Analysis of the same flood event; the [31] September 2024 North and South-Eastern Floods assessment; [12] women's adaptive capacity in Sirajganj; [11] and [24] qualitative studies of women's blocked adaptation in flood-prone Bangladesh communities; and the global DRR policy trajectory represented by the Sendai Gender Action Plan [16]. Taken together, this body of work makes a cumulative case for structural change in how disaster management systems are designed, funded, and evaluated.

Theoretical contribution

The paper makes three theoretical contributions. First, it operationalizes the integration of five frameworks as habitus, cultural ecology, indigenous knowledge, structural violence, and political ecology into a single coherent analytical lens for gender-disaster research, demonstrating that no single framework is adequate to the dual structure (active response / structural exclusion) of women's flood experience. Second, it extends the Bangladesh-focused literature on women's adaptive capacity [11,12,24] by providing micro-ethnographic content that names specific strategies, identifies their material and cultural pre-conditions, and traces how they articulate with formal relief systems in real time. Third, it generates empirically grounded ethnographic content that can anchor the recently launched Sendai Gender Action Plan in identifiable local practice addressing [30] call for better evidence linking global DRR policy to local realities.

Policy recommendations

The study supports five evidence-grounded recommendations operationalizing the Sendai Gender Action Plan at upazila level:

- **Redesign relief distribution architectures:** Formal relief must reach women who cannot access public queues. This requires home-based distribution tiers, women-only distribution points, female volunteer networks, and specific provisions for single women, divorcees, and female-headed households, none of which were present in the August 2024 response in Debidwar. Implementation should be benchmarked against the Sendai GAP recommendations on equitable access [16].
- **Systematically document and integrate indigenous knowledge:** Women's flood-response practices such as seed preservation, space adaptation, improvised tools, kinship coordination should be formally recorded by upazila-level disaster management committees and incorporated into community preparedness plans. This directly addresses Sendai GAP Objective 2.
- **Include women as decision-makers, not only as recipients:** Women must participate in disaster management committee membership, early warning system design, shelter planning, and relief distribution governance. The [31] makes this recommendation explicitly; it has not been implemented in the study communities.
- **Build participatory processes into infrastructure decisions:** Technical flood control interventions must include genuine community consultation and economic compensation mechanisms for losses incurred during implementation. The Shivnagar road-cutting failure illustrates the cost of proceeding without this.
- **Address underlying structural vulnerability:** Long-term resilience for women in flood-prone areas requires sustained investment in livelihood diversification, gender-equitable social protection, disaster preparedness training, and WASH infrastructure all identified as priorities in [6-32].

Directions for further research

The paper makes three theoretical contributions. First, it operationalizes the integration of five frameworks as habitus, cultural ecology, indigenous knowledge, structural violence, and political ecology into a single coherent analytical lens for gender-disaster research, demonstrating that no single framework is adequate to the dual structure (active response / structural exclusion) of women's flood experience. Second, it extends the Bangladesh-focused literature on women's adaptive capacity [11,12, 24] by providing micro-ethnographic content that names specific strategies, identifies their material and cultural pre-conditions, and traces how they articulate with formal relief systems in real time. Third, it generates empirically grounded ethnographic content that can anchor the recently launched Sendai Gender Action Plan in identifiable local practice addressing [30] call for better evidence linking global DRR policy to local realities.

Transparency

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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