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EXPLORING GENDERED DIMENSIONS OF CLIMATE DISASTER VULNERABILITY: A STUDY OF THE CHITTAGONG HILL TRACTS, BANGLADESH

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ABSTRACT

This study explores the gendered dimensions of climate disaster vulnerability in the Chittagong Hill Tracts (CHT), with a particular focus on Bandarban District – one of Bangladesh's most ecologically fragile and disaster-prone regions. Drawing on mixed-methods research, including structured surveys and key informant interviews, the study identifies both environmental and socio-structural factors contributing to the region's exposure to floods and landslides. While intense monsoonal rainfall and land degradation are direct causes, findings reveal that women and children disproportionately bear the burden of disasters due to caregiving roles, limited mobility, insecure shelter conditions, and exclusion from early warning systems. Survey data shows that 58% of respondents were unable to evacuate on time, 40% of women lacked access to sanitary facilities, and 53% of households reported emotional trauma. Poorly planned infrastructure, such as railway construction and unregulated hill cutting, further exacerbates landslide risks. The study employs vulnerability theory, feminist disaster studies, and intersectionality to analyze how gender, geography, and ethnicity intersect to shape disaster experiences. The findings underscore the need for gender-responsive, community-based disaster risk reduction strategies that prioritize the voices and needs of the most affected. Addressing these social vulnerabilities is essential to building long-term resilience in the CHT.

KEYWORDS: *Disaster vulnerability, Gender, Floods, Landslides, Chittagong Hill Tracts (CHT)*

INTRODUCTION

The Chittagong Hill Tracts (CHT) in southeastern Bangladesh, with its steep terrain and fragile geology, is increasingly prone to climate-induced disasters such as sudden floods and landslides. Intensified monsoonal rainfall, erratic weather patterns, and human-induced land degradation have heightened the frequency and severity of these hazards (Mi, 2021). Women and children are particularly vulnerable, as their exposure to disasters is shaped not only by environmental conditions but also by socio-economic and cultural factors (Mitu, Jones, & Vintges, 2022). Extreme rainfall events in the CHT can trigger deadly landslides within minutes, often with little or no warning (Masum, 2019). Indigenous communities, historically marginalized and living under inadequate infrastructure, face compounded risks due to limited access to essential services (Haque et al., 2021).

Gendered divisions of labor, socio-cultural restrictions, and socio-political marginalization further exacerbate the vulnerability of women and children. Women frequently assume caregiving responsibilities during disasters, while children experience disruptions in education, food insecurity, and psychological trauma (Tanjeela, 2024). Early warning systems are often male-centric or linguistically inaccessible to indigenous women, limiting their preparedness and response capacity (Sharmin & Islam, 2013). Post-disaster losses, including land and livelihood depletion, disproportionately affect female-headed households, deepening poverty cycles ((Alam et al., 2019) Existing adaptation mechanisms remain largely top-down, often neglecting gendered needs and indigenous coping strategies (Garai & Ku, 2024). This study aims to fill this gap by identifying the main climatic factors contributing to sudden floods and landslides and exploring the social vulnerabilities of women and children in the CHT. By combining climate data with community-level experiences, the research seeks to provide actionable insights for inclusive disaster risk reduction policies and interventions, prioritizing the most at-risk groups.

Theoretical Consideration

This study is grounded in the frameworks of vulnerability theory and feminist disaster scholarship, both of which argue that disasters are not solely natural phenomena but are shaped by social, political, and economic inequalities. Vulnerability theory posits that exposure to risk is unequally distributed due to systemic factors such as poverty, gender, ethnicity, and geography *(Painter et al., 2023)*. In the context of the Chittagong Hill Tracts, structural marginalization coupled with environmental degradation intensifies susceptibility to climate-induced hazards. Building on this, feminist disaster studies highlight how gendered power relations influence preparedness, response, and recovery. Women often face increased burdens of care, limited mobility, and exclusion from decision-making, making them more vulnerable before, during, and after disasters (Slick & Hertz, 2024).

The study also draws on intersectionality, recognizing that indigenous identity, economic status, and rurality compound the vulnerabilities experienced by women and children in Bandarban.

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Theory	Focus	Why It Matters
Vulnerability Theory	Social causes of disaster risk	Shows how poverty, location, and systems increase risk
Feminist Theory	Gender roles in disaster impact	Explains why women face more burden and less support
Intersectionality	Overlapping identities	Helps understand how gender + ethnicity = more risk

Thus, the disaster impacts observed are not simply outcomes of environmental shocks but of deeply rooted social vulnerabilities. A theoretical lens that integrates these perspectives allows for a more holistic understanding of disaster risk and emphasizes the need for gender-responsive, locally informed disaster governance.

Methodology

This study employs a mixed-methods approach to examine the climatic factors causing sudden floods and landslides and assess the social vulnerabilities of women and children in the Chittagong Hill Tracts (CHT). Quantitative data will be collected through structured surveys with 60 participants from communities historically affected by floods and landslides. The survey will capture information on exposure, preparedness, and impacts on women and children, while GIS mapping will identify and visualize hazard-prone areas. Qualitative data will be gathered through 5 KII (Key Informant Interview) with women, children, and community leaders to explore lived experiences, coping mechanisms, and barriers to disaster response. Purposive sampling will ensure that participants represent households most affected by past disasters. Quantitative data will be analyzed using SPSS to generate descriptive statistics, cross-tabulations, and correlations, while qualitative data will be thematically analyzed. Integrating these findings will provide a comprehensive understanding of environmental and socio-cultural vulnerabilities and guide inclusive disaster risk reduction policies.

RESULTS AND DISCUSSION

Socio-Demographic Profile of Respondents

The socio-demographic profile of 60 respondents from disaster-prone areas of Naikhongchori and Lama in Bandarban district is presented in Table 1. The age distribution shows that most respondents (38.3%) were between 31–40 years, followed by 18–30 years (25%), 41–50 years (20%), and 51–60 years (16.6%). This indicates a predominantly middle-aged population actively involved in household and community decision-making (Haque et al., 2021). Gender representation was balanced, with 50% male and 50% female respondents, ensuring equal perspectives on disaster experiences. Religion distribution revealed 57% Buddhists, 20% Muslims, 14% Christians, and 9% Hindus, reflecting the multicultural composition of the Chittagong Hill Tracts (Parbatta News, 2022).

Table-1: Socio-Demographic Characteristics of Respondents

Variable	Category	Percentage	Variable	Category	Percentage
Age (years)	18–30	25	**Profession**	Job	30
	31–40	38.3		Business	33.3
	41–50	20		Agriculture	25
	51–60	16.6		Student	11.6
Gender	Male	44	**Household Size**	1–20	63.3
	Female	56		21–40	83.3
Religion	Buddhist	57		41–60	75
	Muslim	20	**Permanency of Residence**	6 months – 1 year	20
	Christian	14		1–5 years	33.3
	Hindu	9		5–10 years	50

Source: Field work, March-June,2025

Occupationally, 33.3% were engaged in business, 30% in jobs, 25% in agriculture, and 11.6% were students, highlighting the economic diversity and reliance on local resources. Household size varied, with 63.3% having 1–20 members, 83.3% 21–40 members, and 75% 41–60 members, suggesting extended family structures common in the region (Ahmed, 2021). Regarding permanency of residence, 50% had lived in the area for 5–10 years, 33.3% for 1–5 years, and 20% for 6 months–1 year. This demonstrates that most respondents are long-term residents with in-depth knowledge of local hazards and environmental changes. Overall, these socio-demographic characteristics indicate a population with sufficient experience and awareness to provide reliable insights into disaster vulnerability and coping strategies. Balanced gender, diverse occupational backgrounds, and long-term residence contribute to understanding both social and environmental factors influencing disaster preparedness (Mitu et al., 2022).

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Causes of Climate-Related Disasters in Bandarban District

The findings from the field survey indicate that while only 20% of respondents had directly witnessed major disasters such as floods and landslides, a notable portion of the population perceives their areas as vulnerable to these hazards. This highlights the importance of community perception in disaster risk assessment and emphasizes the need for effective risk communication strategies (Ahmed, 2021). One elderly farmer described:

"Before the railway project, water used to flow down naturally through the small canals and slopes. Now, the tracks block the streams, and water builds up like a dam before bursting through the hills during heavy rain."

Respondents identified several human-induced factors contributing to the occurrence of flash floods and landslides. The construction of the Dhaka-Cox's Bazar railway line was cited by 30% of respondents as a primary cause, while unregulated hill cutting (20%) and deforestation (23.3%) were also significant contributors. These findings are consistent with prior research showing that anthropogenic activities, such as unplanned infrastructure development and land-use changes, increase landslide risk in the region (Haque at el., 2021).

Specifically, railway construction has altered natural drainage paths and caused improper hillside cutting, exacerbating flood and landslide events (Bonik Barta, 2023). Deforestation and unrestricted hill cutting reduce slope stability and increase soil erosion, making the region highly vulnerable to sudden-onset disasters during intense rainfall events (Chakma, 2022). Several respondents expressed frustration at the lack of enforcement of environmental protection laws. One female teacher shared:

"We see trucks cutting away the hills every week. No one stops them. When the trees go and the earth is exposed, it slides with just one heavy rain. We fear sleeping at night during the monsoon."

Overall, these results underline the need for integrated disaster risk management strategies that address both natural and human-induced factors. Incorporating local community insights and perceptions is crucial to develop targeted interventions for reducing flood and landslide risks in Bandarban District (Mitu at. el, 2022).

Table-2: Experience of Disasters and Perceived Causes of Floods and Landslides in Bandarban District

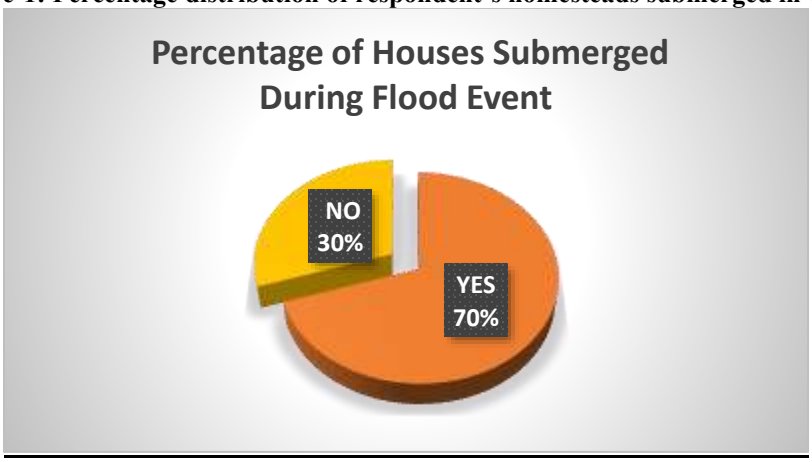
Variable	Category / Cause	Percentage
Witnessed Major Disasters	Yes	20
	No	80
Possible Causes of Floods and Landslides	Dhaka-Cox's Bazar railway construction	30
	Unrestricted hill cutting	20
	Deforestation	23.3
	Illegal stone extraction	16.6
	Don't know	10
Total Respondents		100

Source: Field work, March-June,2025

Information about the Impact and Damage from Disaster

The devastating floods and landslides that struck the Chittagong Hill Tracts (CHT), particularly the Bandarban district in August 2023, revealed the region's acute vulnerability to climate-induced hazards. Field survey data from September–October 2023 shows that 70% of respondents' homes were submerged, while 30% remained dry. In many instances, entire structures were either washed away or severely damaged, particularly in flood-prone settlements near rivers like the Sangu and Matamuhuri.

Figure-1: Percentage distribution of respondent's homesteads submerged in water



Source: Field work, March-June,2025

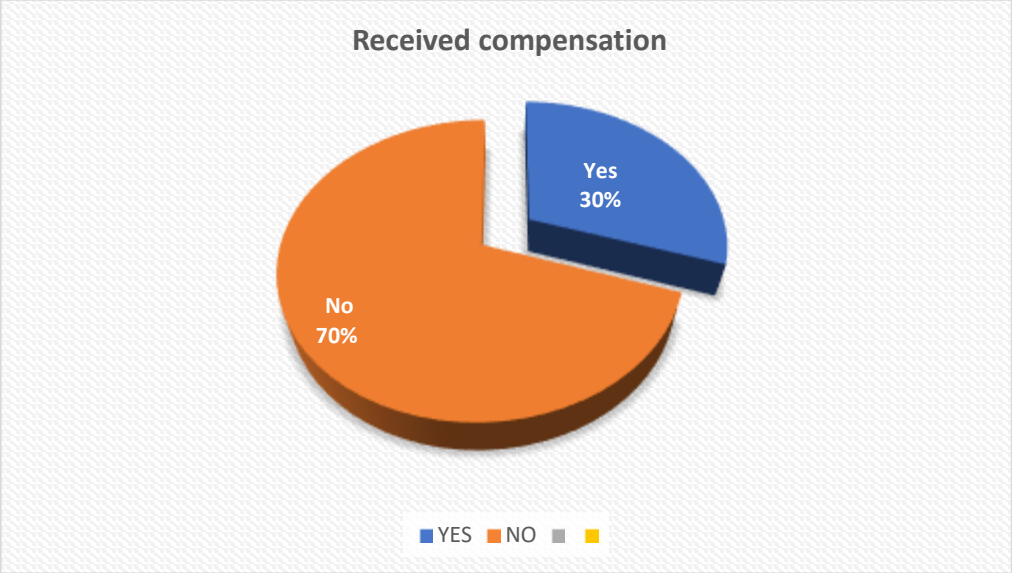
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This environmental catastrophe was driven by 668 mm of rainfall over seven days, the highest in two decades, which caused both major rivers to overflow and inundate urban and rural settlements. According to local administrative data, 15,600 houses were affected and around 62,000 people from nearly 16,000 families were displaced (Roads and Highways Division, 2021) The rainfall also triggered widespread landslides due to loosened soil, with more than 50% of respondents surveyed reporting landslide impacts. The flooding of previously unaffected areas indicates a shift in hydroclimatic patterns, possibly linked to broader trends in climate variability (Masum, 2019; Ahmed, 2021).

In terms of economic damage, the loss was staggering. Survey data indicates that 80% of respondents lost their homes, 45% suffered crops and land damage, and 60% lost other household assets, including livestock. Local government reports estimate the total loss to infrastructure, agriculture, education, tourism, and fisheries sectors at over 700 crores, with 8,243 hectares of cropland and 10,975 livestock animals affected (New Age, 2023). These statistics align with research showing that CHT is one of the most ecologically fragile and disaster-prone zones in Bangladesh. Landslides and floods are becoming more frequent due to unregulated development, deforestation, and soil erosion, compounding existing vulnerabilities (Alam, 2020).

The human impact is particularly severe for women and children, who are often left behind during evacuation or forced into unsafe shelters. Studies have shown that these groups experience greater food insecurity, gender-based violence, and long-term trauma during disasters (Tanjeela, 2024; Mitu et al., 2022).

Figure-2: Percentage distribution of received compensation for recent disasters



Source: Field work, March-June,2025

Regarding compensation, Figure:1 reveals that 30% of respondents received partial aid, while 30% received none. This inconsistency reflects known gaps in Bangladesh's disaster governance systems, which are often reactive rather than proactive (Sharmin & Islam, 2013). Many of the worst-affected areas, including Ujani Para and Rowangchhari, remain underserved due to their remoteness and administrative neglect.

In conclusion, the Bandarban floods exemplify how climate events magnify structural inequalities. The combination of ecological fragility, inadequate infrastructure, and limited social safety nets turns natural hazards into complex humanitarian disasters. Addressing these issues will require localized early warning systems, resilient infrastructure, and gender-responsive disaster planning, particularly in high-risk zones like the CHT (Garai & Ku, 2024, Rahman at. el, 2022).

Disaster Vulnerability and Shelter Response among Women and children

The survey data highlights the disproportionate impact of flood-related disasters on specific demographic groups in Bandarban, particularly women and children, who emerge as the most vulnerable. Among the respondents, 36.6% identified women and 25% children as the most affected groups requiring urgent relocation to shelter centers. This is consistent with findings from disaster studies in Bangladesh, where women and children face higher risks due to limited mobility, cultural restrictions, and dependency roles (Sharmin & Islam, 2013).

Furthermore, the data shows that 60% of respondents needed to relocate to a shelter center, yet accessibility remains a concern. Approximately 45% had to travel over 3 kilometers, with 20% traveling 5–7 km, and 10% over 7 km. These distances can become insurmountable for elderly people, pregnant women, and children, especially during torrential rain or landslides. Prior research supports that long distances to shelters significantly

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reduce evacuation compliance during emergencies, particularly for marginalized groups (Ahmed, 2021). The conditions of women and children in shelters remain alarming: 80% were described as helpless and vulnerable, while only 20% were reportedly in a safe and secure condition. Problems faced by this group included lack of adequate shelter (23.3%), sanitary issues (50%), and mobility challenges (38.3%). Women's restricted mobility in traditional communities, combined with infrastructural inadequacies, creates severe protection risks. Moreover, financial constraints (20%) and physical and mental fatigue (31.6%) further hinder recovery. These findings mirror those in studies that highlight how post-disaster trauma and gender-based inequalities intersect to produce long-term social suffering (Mitu et al., 2022). The healthcare and safety arrangements were rated as good by 64%, but 25% still deemed them inadequate, while 11% described them as average. These mixed responses suggest inconsistencies in emergency response quality across shelters, echoing criticisms from civil society and media outlets following the August 2023 floods (New Age, 2023).

In terms of shelter center conditions, 50% rated them as satisfactory, yet 32% called them unhealthy, and only 16% deemed them "very good". This indicates that while some progress has been made, substantial improvements in shelter hygiene and safety standards are still needed. Remote areas such as Ujani Para and Rowangchhari reported significant exclusion from government aid, consistent with critiques of reactive and centralized disaster governance (Sharmin & Islam, 2013). One woman explained:

"The government officials came once with dry food. That was it. We didn't get the housing materials or cash that others got. Maybe it's because our village is too far."

Table-3: Disaster Vulnerability, Shelter Accessibility, and Post-Evacuation Conditions for Women and Children

Variable / Indicator	Category / Description	Percentage	Variable / Indicator	Category / Description	Percentage
Most Vulnerable Groups			**Need to Go to Shelter Center**		
	Women	36.6		Yes	60
	Children	25		No	40
	Aging People	18.3	**Distance to Shelter Center**		
	Men	11.6		1–3 km	10
	Others	8.3		3–5 km	15
Conditions of Women & Children				5–7 km	20
	Helpless & Vulnerable	80		7–9 km	10
	Danger Free	20	**Shelter Center Condition**		
Problems Faced by Women & Children				Very Good	16
	Lack of Safe Shelter Centers	23.3		Good	16
	Sanitary Issues	50		Unhealthy	32
	Not Being Able to Move Easily	38.3		Satisfactory	50
	Financial Problems	20	**Food & Provision Facilities**		
	Physical & Mental Weakness	31.6		Enough	60
Healthcare & Safety Arrangements				Not Enough	40
	Good	64			
	Not Good	25			
	Average	11			

Source: Field work, March-June,2025

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Finally, regarding food and provision, 60% reported receiving adequate support, but 40% lacked sufficient supplies. Food insecurity during disasters disproportionately impacts women and children, who often eat last and least in resource-scarce situations (Haque et al., 2021).

Gendered Vulnerabilities during Disasters

The survey data collected from disaster-prone regions of Bandarban reveals significant gendered disparities in disaster preparedness, evacuation, and post-disaster experiences. Notably, 58% of respondents reported being unable to evacuate on time during flood or landslide events, with 30% attributing this delay to caregiving responsibilities, primarily affecting women. One woman explained:

"I couldn't leave the house because I had to take care of my mother-in-law and children. The water rose too fast"

These findings reflect longstanding gender norms where women are socially expected to prioritize dependents over personal safety, a phenomenon widely documented in South Asian disaster literature (Tanjeela, 2024). Further compounding evacuation challenges, 25% of respondents cited lack of transportation, and 20% noted elderly support as key barriers, reinforcing how infrastructural limitations intersect with household vulnerabilities in the hilly terrain of the CHT (Ahmed, 2021). A mother shared: *"After the flood, my daughter had to stop going to school to help with chores at home."*

Table-4: Gendered Impacts and Household Experiences During and After Disaster

Survey Question	Response Option	Percentage (%)
Were you able to evacuate on time during the flood/landslide?	Yes	42.0
	No	58.0
	Caregiving	30.0
What challenges did you face in evacuation?	Elderly support	20.0
	Lack of transport	25.0
Did any female family member face difficulty accessing sanitary facilities?	Yes	40.0
	No	60.0
Did any girl child drop out of school post-disaster?	Yes	20.0
	No	50.0
	Not Applicable	30.0
Did your household experience loss of income/livelihood?	Yes	25.0
	No	55.0
	Partial	20.0
Did you or a family member experience emotional trauma?	Yes - Mild	20.0
	Yes - Severe	33.3
	No	46.7
Were early warnings accessible and understandable?	Yes - Fully	25.0
	Yes - Partially	36.6
	No	38.4
How did domestic workload change post-disaster?	Increased a lot	46.6
	Increased slightly	33.3
	No change	20.1
Were there any incidents of insecurity/harassment in shelters?	Yes	15.0
	No	70.0
	Prefer not to say	15.0

Source: Field work, March-June,2025

Sanitation access in emergency shelters emerged as a critical issue, with 40% reporting that female family members lacked access to proper sanitary facilities. one woman noted the gendered insecurity this posed:

"There were no separate toilets for women. I didn't feel safe using the public facility at night." This corroborates findings by Alam, (2019) which highlighted how many shelters in the region were not equipped with gender-segregated toilets, posing serious threats to women's privacy, safety, and health. Educational disruption among girls was also prominent, with 20% of respondents confirming school dropouts, often driven by the need for girls to assume domestic responsibilities after disaster displacement. These disruptions align with *Mitu, Jones, and Vintges* (2022), who showed that adolescent girls in climate-affected zones face interrupted schooling and reduced life opportunities.

Livelihood loss further intensified gendered vulnerability, with 25% of households reporting complete loss of income, and 20% experiencing partial damage. Female-headed households were

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particularly impacted, consistent with prior research highlighting their limited access to land rights and post-disaster aid (Haque et al., 2021).

A widowed respondent described:
"My small grocery shop was washed away. We now live on borrowed money".
Emotional and psychological trauma was widespread, as over 53% experienced either mild or severe stress, with women disproportionately affected due to the compounded burden of caregiving, financial strain, and insecure living conditions (Islam, 2013).
The functionality and inclusivity of early warning systems also remain questionable. Only 25% of respondents found early warnings fully accessible, while 38.4% reported them as entirely inaccessible, suggesting a gap in both dissemination and gender-sensitive communication, especially among indigenous or linguistically marginalized women (Garai & Ku, 2024). Post-disaster, nearly 47% of respondents reported a significant increase in domestic workload, particularly among women, while 15% reported experiencing or witnessing harassment in shelters, pointing to urgent protection concerns. These layered vulnerabilities clearly demonstrate that climate-induced disasters in the CHT are not only environmental events but also social crises that deepen existing gender inequalities.

Psychosocial Impacts and Trauma
Psychosocial trauma and mental health issues often remain under-addressed in disaster risk reduction strategies, particularly in rural and indigenous communities such as those in the Chittagong Hill Tracts (CHT). Field survey data reveal that over 53% of respondents experienced some form of emotional trauma, with 33.3% reporting severe distress following flood and landslide events. The burden was disproportionately borne by women and children, who face greater post-disaster isolation, uncertainty, and vulnerability. Children showed signs of anxiety, sleep disturbance, and educational disengagement, consistent with post-traumatic stress disorder (PTSD) symptoms reported in similar contexts.

These findings align with recent research by Ahmed and Raja (2024), who document high rates of trauma and behavioral regression in disaster-affected children in hilly regions of Bangladesh. They found that displaced children exhibited increased aggression, nightmares, and an inability to concentrate in school, all of which mirror our own survey results, where 20% of respondents confirmed that girl children had dropped out of school after disaster events. The compounded stress of displacement, loss of familiar environments, and poor conditions in shelters including overcrowding and lack of psychosocial support further exacerbate mental health challenges (Tanjeela, 2024; Sharmin & Islam, 2013).

Moreover, women especially those who are widowed, pregnant, or heads of households reported persistent anxiety, insomnia, and helplessness, particularly when shelter conditions were unsanitary or when they faced gender-based violence. This confirms that disasters amplify pre-existing psychological burdens linked to structural gender inequalities (Mitu, Jones, & Vintges, 2022). The absence of trained mental health workers, culturally sensitive counseling, and child-safe spaces in most emergency shelters limits long-term recovery and contributes to chronic psychosocial distress in post-disaster periods.

To address these layered vulnerabilities, it is crucial for disaster response frameworks to integrate community-based psychosocial interventions, including indigenous healing practices, safe schooling initiatives, and mental health counseling tailored for displaced women and children. Without such measures, the emotional scars left by floods and landslides may persist far beyond the immediate material damage.

CONCLUSION
This study highlights the complex and deeply gendered nature of climate-related disasters in the Chittagong Hill Tracts, with a specific focus on floods and landslides in Bandarban District. Findings from field surveys and community narratives reveal that while environmental factors such as intense rainfall and land degradation are key triggers, it is the underlying social structures especially gender inequality, poverty, and remoteness—that shape how disasters are experienced.

Women and children emerge as the most vulnerable groups, facing barriers in evacuation, access to sanitation, education, and security in shelters. The burden of caregiving, compounded by socio-cultural restrictions and limited representation in disaster governance, severely limits their ability to respond and recover. Emotional trauma, livelihood losses, and inadequate compensation further exacerbate their vulnerability. Additionally, the analysis reveals critical weaknesses in early warning dissemination, shelter conditions, and healthcare provisioning—particularly for marginalized and indigenous populations. These challenges are not merely logistical but reflect systemic neglect of gender and equity in disaster planning. To build resilience in high-risk regions like the CHT, disaster risk reduction must move beyond infrastructure to address social vulnerability. Gender-responsive policies, community-based early warning systems, and inclusive recovery strategies are essential for ensuring no one is left behind in the face of escalating climate hazards.

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