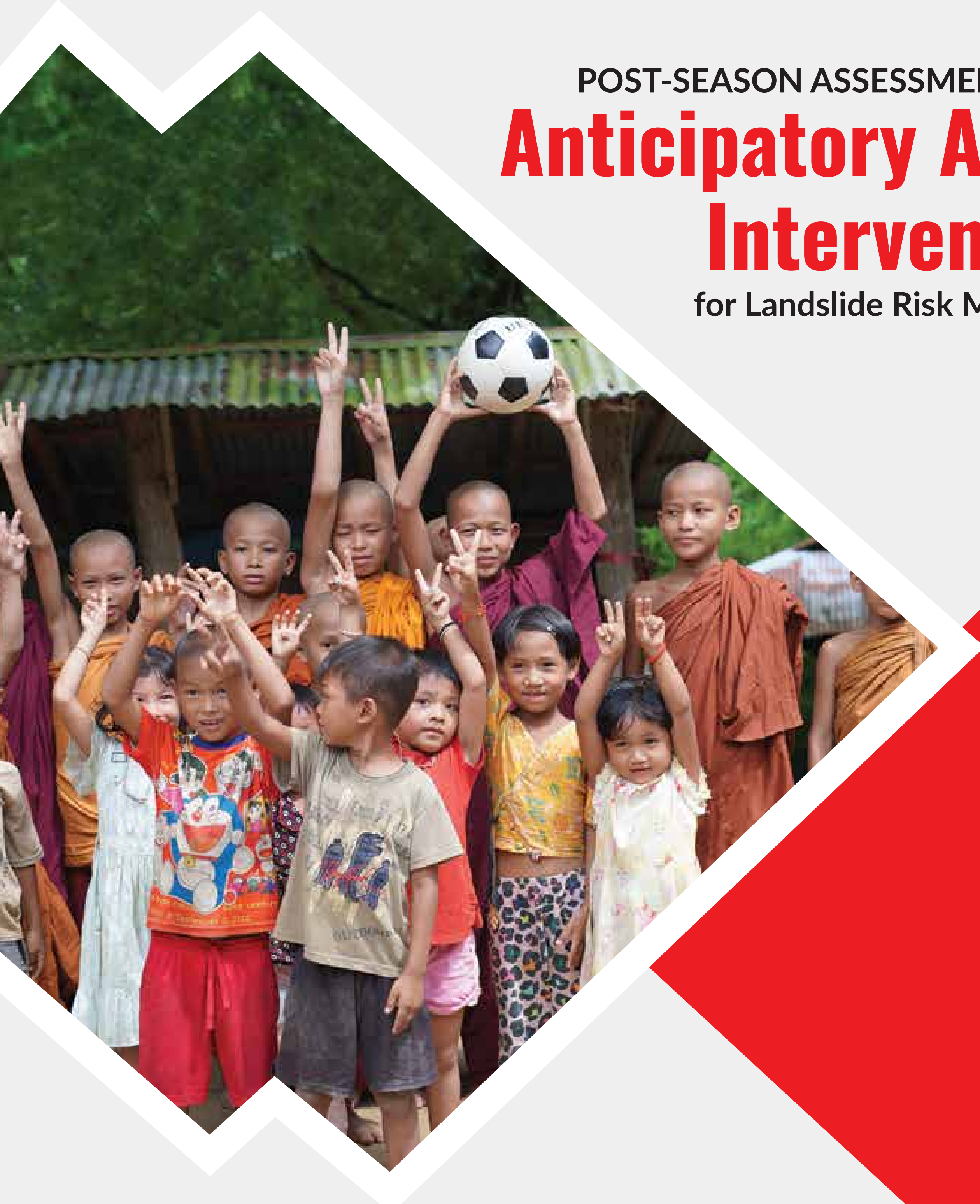
POST-SEASON ASSESSMENT REPORT

Anticipatory Action Interventions

for Landslide Risk Management



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RIMES also extends its appreciation to local government representatives, Union Disaster Management Committee members, community volunteers, and other stakeholders for their cooperation during this assessment. Finally, sincere thanks are extended to the community members who participated in this assessment and shared their post-impact experiences, which form the foundation of the findings.

EXECUTIVE SUMMARY

This Post-Impact Assessment was conducted under the ECHO-funded Anticipatory Action for Landslide Risk initiative to examine how early warning, preparedness measures, capacity-building activities, and anticipatory cash support influenced community outcomes during the 2025 monsoon season in landslide-prone areas of Chattogram and Bandarban districts. The study covered selected wards and unions in the Chattogram City Corporation and Banshkhali, Lama, and Naikhongchhari Upazilas.

The assessment applied a mixed-methods approach, combining 400 household surveys with Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs). Data were collected after the monsoon season to capture post-impact experiences related to landslides and associated flash flood events.

Findings confirm that landslides remain the most critical and recurrent hazard in the study areas, frequently occurring alongside flash floods and intensified by structural factors such as hill cutting, deforestation, unplanned settlements, and repeated displacement. Landslide incidents were reported again during the 2025 monsoon, with impacts ranging from house damage and livelihood loss to fatalities. FGDs further indicated that some landslide events are not formally reported, suggesting that official records may underestimate the scale of impacts.

During the 2025 monsoon season, a total of 11 landslide special bulletins were issued to support institutional coordination and standardized interpretation of warning levels in both Bangla and English. These were complemented by large-scale community dissemination of landslides and other hazard early warnings through voice messaging, with more than 27,500 messages delivered across Bandarban and Chattogram, reaching even remote and hard-to-access communities.

The findings demonstrate that Landslide Early Warning interventions significantly influenced community preparedness and early action. The majority of respondents who received early warning information acted proactively, primarily by evacuating to safer locations and implementing household preparedness measures. Voice messages were widely perceived as accurate, understandable, and trustworthy, and information was frequently shared with family members and neighbors, extending the reach of warnings beyond direct recipients. Most households reported receiving one to three days of lead time, which was generally sufficient to support early action.

Capacity-building interventions, including Interpreter Pool and Resource Pool training, contributed to improved understanding of forecasts and strengthened confidence in responding to early warnings. Anticipatory cash support, although received by a limited proportion of households, enabled recipients to take early protective actions and reduce losses. Return on Investment analysis demonstrates that anticipatory actions generated substantial avoided losses, thereby confirming the economic efficiency of early warning–enabled preparedness.

Key challenges identified include gaps in the dissemination of last-mile early warnings due to poor mobile network coverage, evacuation constraints linked to inadequate shelter and transport facilities, and limited access to anticipatory resources in remote areas. Overall, the analysis indicates that anticipatory action for landslides is effective and cost-efficient but requires further strengthening and institutionalization to ensure equitable coverage and sustained impact.

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF INFOGRAPHICS

LIST OF FIGURES

LIST OF ACRONYMS

AA	Anticipatory Action
BMD	Bangladesh Meteorological Department
ECHO	European Civil Protection and Humanitarian Aid Operations
FFWC	Flood Forecasting and Warning Centre
FGD	Focused Group Discussion
INSTANT	Integrated Forecast Dissemination Portal
KII	Key Informant Interview
RIMES	Regional Integrated Multi-Hazard Early Warning System
ROI	Return on Investment
UDMC	Union Disaster Management Committee
UzDMC	Upazila Disaster Management Committee
YPSA	Young Power in Social Action

1. INTRODUCTION

1.1 Background

Bangladesh is facing increasing vulnerability to natural disasters as the impacts of climate change intensify. Although notable progress has been achieved in reducing flood and cyclone risks through Disaster Preparedness and Anticipatory Action approaches, cascading hazards, particularly landslides and flash floods, continue to pose significant and under-addressed threats. While Early Action Protocols exist for floods and cyclones, a comprehensive and operational anticipatory action mechanism for cascading hazards such as rainfall-induced landslides remains largely absent.

To address this critical gap, RIMES and Save the Children are promoting anticipatory landslide risk management across both rural and urban contexts. A core focus of this effort is the institutionalization of a landslide Early Action Protocol through systematic testing, refinement, and adoption, alongside the integration of proven best practices within local and national disaster management institutions. Building on current and previous DG ECHO funded disaster preparedness investments, the initiative aims to strengthen existing systems and establish a sustainable and embedded anticipatory action framework with a clear exit strategy. Effective implementation relies on close coordination with key stakeholders including the national Forecast based Financing and Anticipatory Action Task Force, GFFO funded initiatives, the SUFAL and STEP consortium, START Ready, and the IOM Displacement Cluster.

The Chattogram Hill Tracts, particularly the Bandarban district and selected areas of Chattogram district, are among the most landslide-prone regions in Bangladesh. Increasingly erratic and intense rainfall, deforestation, hill cutting, and unplanned urban and rural expansion have significantly heightened landslide risks. These hazards result in loss of lives and assets, disrupt livelihoods, and frequently lead to the displacement of vulnerable communities. Despite these impacts, landslide risks and displacement dynamics remain inadequately reflected in formal land use planning, hill management policies, and development frameworks.

Under the ECHO Humanitarian Implementation Plan funded Anticipatory Action for Landslide Risk project, Save the Children, in collaboration with YPSA, ASHIKA, and RIMES as the technical partner, is working to strengthen Landslide Early Warning systems and enhance community level preparedness and early action. This engagement aims to support evidence-based policy dialogue and foster coordinated action to reduce landslide related risks and impacts in the Chattogram Hill Tracts and beyond.

1.2 Objective

This study was conducted to assess the effectiveness of ECHO-supported anticipatory action interventions for landslide risk management at the community level. The assessment focused on community awareness, accessibility, and use of landslide forecasts and early warning advisories, as well as the community response to early actions implemented prior to landslide events. The main objectives of the assessment were to:

- Assess the effectiveness of interventions under the project in improving community awareness of landslide risk, forecasts, and early warning advisories.
- Examine community responses and perceived benefits of Landslide Early Warning information and advisory services.
- Review the impacts of early actions implemented for landslide risk management and preparedness.
- Identify key gaps, limitations, and areas for improvement in existing anticipatory action mechanisms.
- Generate evidence to support the strengthening and scaling of anticipatory actions for landslide hazards at local and national levels.

1.3 Study Area

The study was conducted in selected landslide-prone locations of project areas in Chattogram and Bandarban districts in southeastern Bangladesh. These areas experience recurrent landslides and associated impacts during the monsoon season. These wards, unions, and upazilas were selected based on their high historical landslide risk and their classification as high-risk landslide-prone areas within the districts. In Chattogram District, the assessment covered Ward 7, Ward 8, and Ward 9 under the Chattogram City Corporation, as well as Shandhanpur and Kalipur unions of Banshkhali Upazila. In Bandarban District, the assessment encompassed all unions of Lama and Naikhongchhari upazilas, ensuring full geographic coverage of these highly landslide-susceptible areas. The selected study locations represent a mix of urban, peri-urban, and remote hill communities with varying levels of exposure, accessibility, and preparedness capacity, thereby providing a comprehensive basis to assess the effectiveness of ECHO-supported anticipatory actions and Landslide Early Warning interventions at the community level.

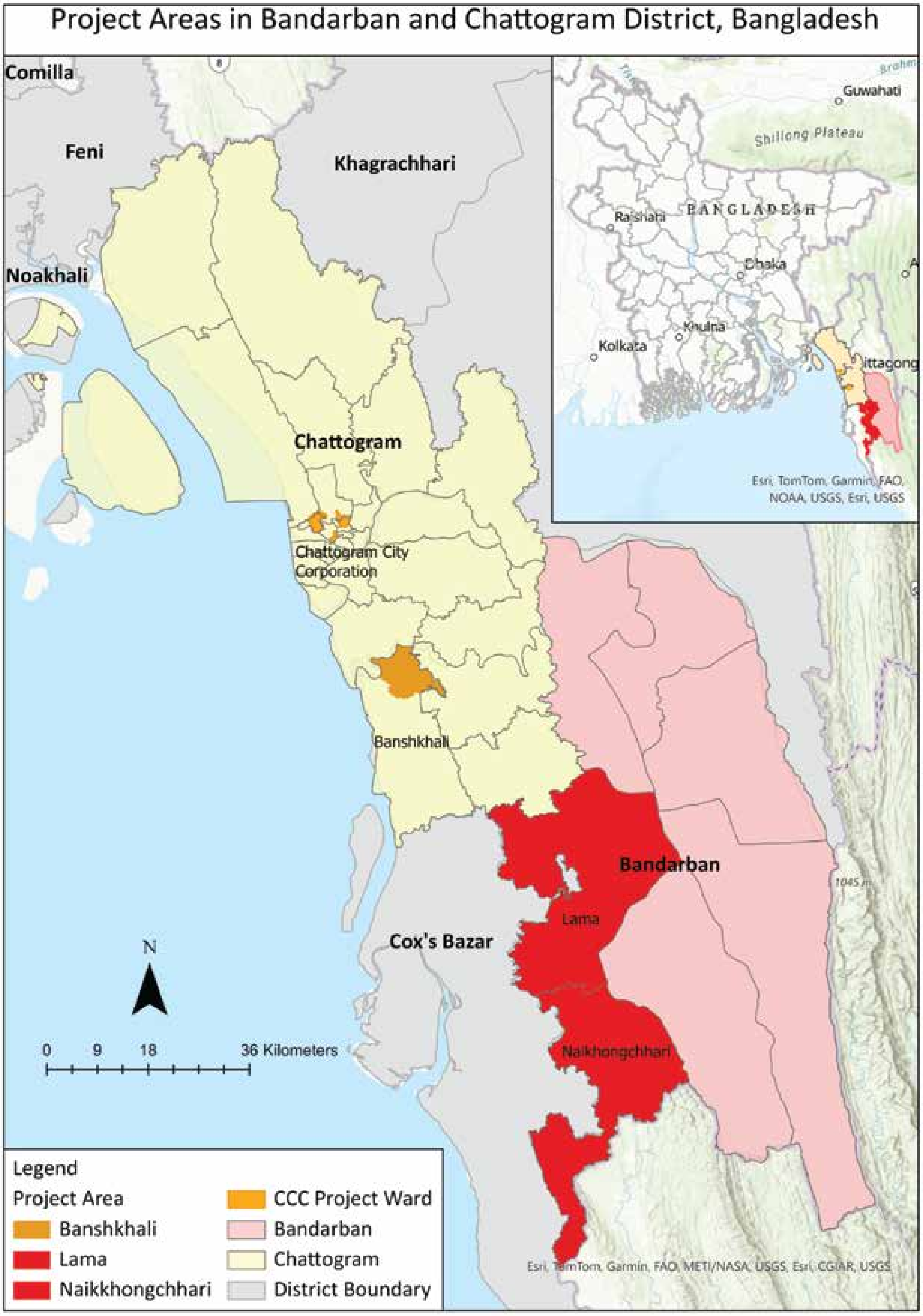


Figure 1 Study area of the project

1.4 Observed Hydro-Meteorological Condition 2025

1.4.1 Overview of River Condition 2025

The hydrograph of the Bakkhali River at Ramu station shows daily variations in water level (WL) in meters Mean Sea Level (mMSL), represented by the blue line, against the danger level (DL) marked by a red dashed line at 5.79 mMSL. Over the June–October period, the WL remained below the DL throughout, indicating that no episodes of flooding were observed at this station. However, the hydrograph shows several sharp rises followed by rapid recessions, reflecting a highly responsive system in which short-duration rainfall events and upstream inflow pulses can generate rapid increases in river stage.

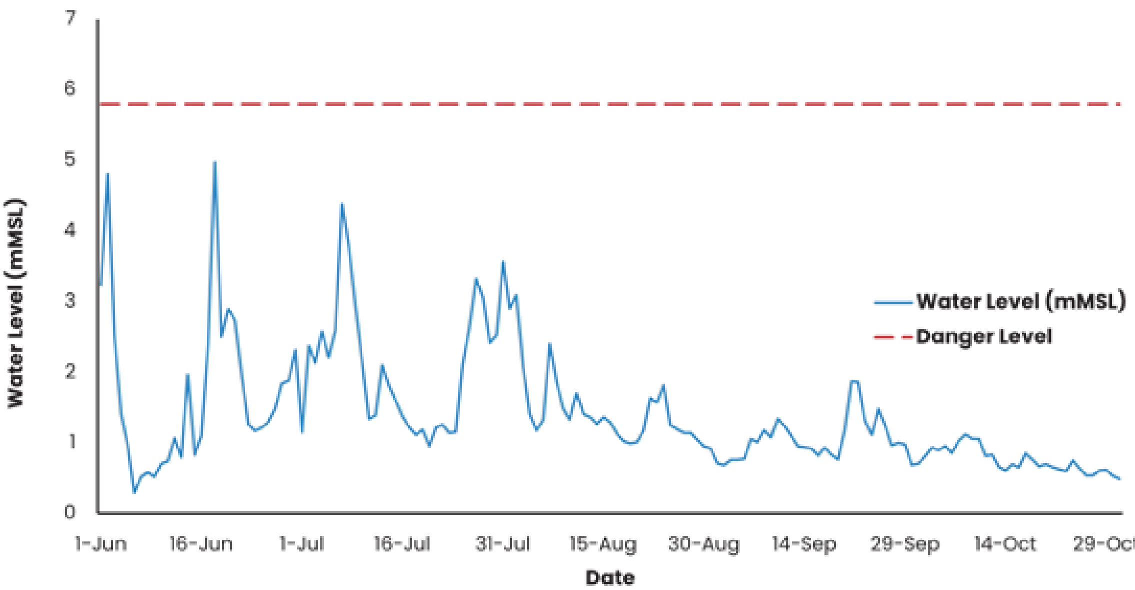


Figure 2 Monsoon Hydrograph of Bakkhali River at Ramu point (Source: FFWC)

Early June was marked by pronounced volatility. The WL began at 3.23 mMSL on 1 June and rose sharply to 4.80 mMSL on 2 June, bringing the river to its closest point to the DL (approximately 0.99 m below). This spike was followed by a steep decline, dropping to 0.30 mMSL on 6 June, which indicates a rapid runoff-driven pulse rather than sustained high flow. A second major rise occurred in mid-June, when the WL climbed from 2.39 mMSL on 17 June to the seasonal maximum of 4.97 mMSL on 18 June, remaining 0.82 m below the DL. Levels then fell quickly to 2.50 mMSL on 19 June, after which the river fluctuated at moderate levels through the remainder of the month.

During July, monsoon variability continued with another notable crest in the first week. The WL reached 4.38 mMSL on 7 July, representing the second-highest peak of the season, before receding through mid-July. Later in the month, a further rise was observed, reaching 3.32 mMSL on 27 July and 3.57 mMSL on 31 July, consistent with multiple monsoon pulses rather than a single prolonged flood wave. In August, the river generally receded relative to the June–July peaks, although moderate fluctuations persisted; the WL reached 3.09 mMSL on 2 August, then trended downward and remained largely within the lower ranges for the rest of the month.

In September, relatively low baseline levels early in the month (around 0.7–1.3 mMSL) were noted, followed by a short late-month increase to 1.87 mMSL on 21 September. By October, the hydrograph reflects a post-monsoon recession, with minor short-term oscillations and an overall decline toward the end of the month. The WL reached its lowest recorded level on 31 October (0.49 mMSL). Overall, the Bakkhali River at Ramu remained below the danger level throughout the monitoring period and did not result in flooding in the surrounding area. However, the repeated sharp rises highlight the need for continued monitoring and timely warning dissemination, particularly during early monsoon windows when rapid stage increases were most evident.

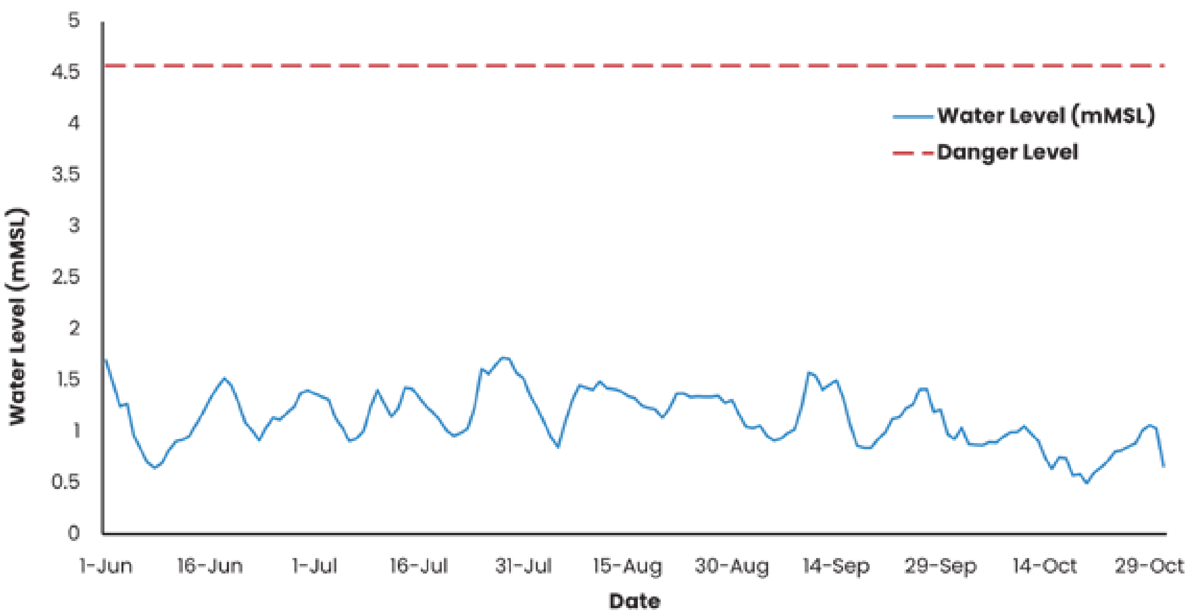


Figure 3 Monsoon Hydrograph of Karnafuly River at Kalurghat point (Source: FFWC)

Similar to the previous hydrograph, the Karnafuly River at Kalurghat remained in a non-critical state throughout the June–October observation period, with water levels consistently below the danger level of 4.57 mMSL. The water level did not exceed the danger level at any point, and as such, the river condition did not result in any flooding episodes around the station. Recorded levels were low and stable overall, and even the seasonal maximum did not come close to the danger threshold, indicating minimal flood risk at this monitoring point during the period under review.

Water levels began at 1.70 mMSL on 1 June and declined sharply to around 0.65 mMSL by 8 June, then rose gradually to approximately 1.53 mMSL on 18 June. A modest oscillation continued into July, with the highest level recorded on 28 July (1.72 mMSL), which is still about 2.85 m below the danger level. After this peak, levels fell to around 0.85 mMSL on 5 August, then rose briefly to 1.49 mMSL on 11 August before stabilizing in the lower range. In early September, the levels rose slightly to 1.58 mMSL, then receded again by mid-month, while October reflected a post-monsoon recession, reaching the seasonal low of 0.50 mMSL on 20 October and ending at 0.67 mMSL on 31 October. Overall, the hydrograph indicates routine monsoon-related fluctuations without any indication of flood-level conditions in adjacent areas.

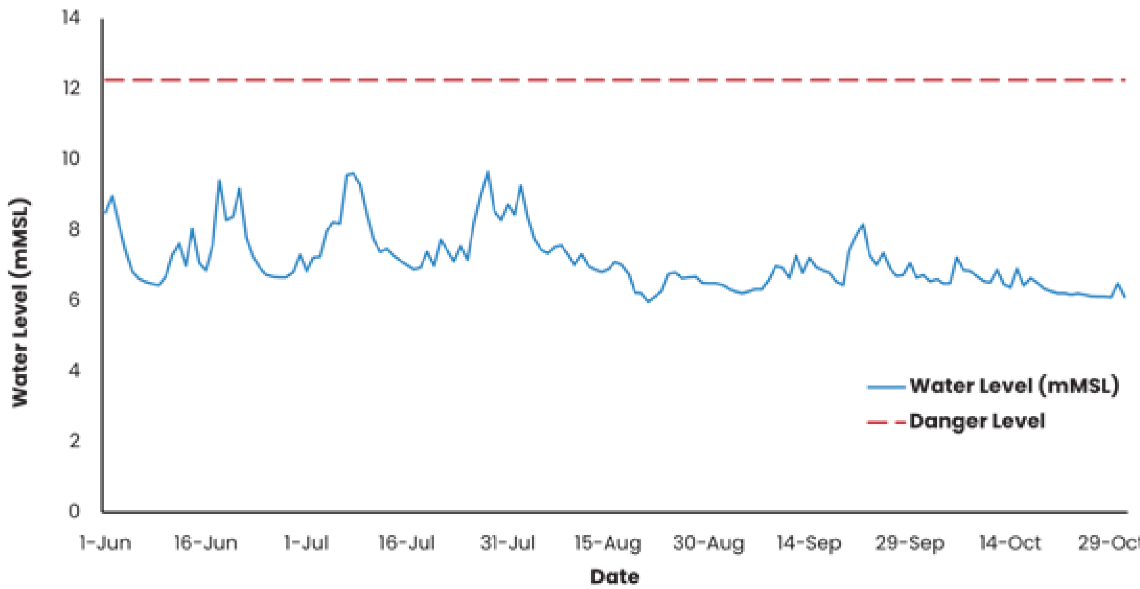


Figure 4 Monsoon Hydrograph of Matamuhuri River at Lama point (Source: FFWC)

Water levels at Lama station remained consistently below the danger level of 12.25 mMSL throughout June–October, indicating that the Matamuhuri River did not experience any flooding scenario during the monitored period. The hydrograph shows a monsoon-responsive pattern characterized by several distinct early-season rises followed by a gradual recession and stabilization toward the end of the season. Overall, the river exhibited short-duration flood pulses rather than prolonged high-water conditions, suggesting that stage increases were largely driven by episodic rainfall and upstream inflows that receded relatively quickly.

The season began with relatively elevated levels, rising from 8.51 mMSL on 1 June to 8.97 mMSL on 2 June, declining to around 6.44 mMSL by 9 June. Subsequent fluctuations produced a notable June crest of 9.42 mMSL on 18 June, with levels remaining high through 21 June (9.19 mMSL); even at this stage, the river stayed more than 2.8 m below the danger level. The highest levels of the monitoring period occurred in early July, when the river peaked at 9.56–9.61 mMSL on 7–8 July, before receding through mid-July. A further late-July rise was observed, reaching 9.65 mMSL on 28 July, after which levels declined into a clearer recession phase.

From mid-August onward, the hydrograph indicates a sustained reduction in river stage, reaching the seasonal low of 5.97 mMSL on 21 August. After this point, levels remained comparatively stable, generally fluctuating within the mid-6 mMSL range, with only brief increases, including a short September rise that peaked at 8.16 mMSL on 22 September. By October, water levels were largely steady and low, ending at 6.11 mMSL on 31 October. In summary, while the Matamuhuri River at Lama did not approach the danger level in 2025, the sharp peaks observed in June and July highlight the importance of close monitoring during early monsoon windows when rapid stage increases were most pronounced.

1.4.2 Overview of Meteorological Conditions 2025

In 2025, Bandarban station exhibited pronounced departures from normal rainfall patterns, marked by a prolonged dry spell early in the year and a highly uneven distribution of monsoon rainfall. Observed rainfall was nil from January to March, despite normal rainfall totals of around 7 mm, 19 mm, and 55 mm, respectively, indicating an unusually dry start to the year. April rainfall also remained below normal (47 mm observed against 98 mm normal), reinforcing the persistence of early-season moisture deficit. A sharp reversal occurred in May, when rainfall increased abruptly to 578 mm, substantially exceeding the normal value (333 mm) and indicating a short period of intensified rainfall concentration. Following this peak, rainfall remained consistently below normal through the core monsoon months: June (520 mm vs 632 mm), July (591 mm vs 693 mm), and August (413 mm vs 489 mm). The declining trend extended into September and October, with October showing a particularly large deficit (121 mm observed compared to 209 mm normal). A modest late-season anomaly was observed in November, where rainfall slightly exceeded normal (57 mm vs 43 mm), before returning to zero rainfall in December. Overall, the pattern suggests that rainfall in 2025 was not only below normal for much of the year but also concentrated on a narrower window, with May standing out as the dominant rainfall month. Observed rainfall analysis for May to October 2025 of this station also shows that extreme events were limited and mainly concentrated in the early monsoon period. Only three events were found where daily rainfall exceeded 100 mm, occurring in May and June. In addition, five 2-day consecutive rainfall events exceeded 150 mm, mostly in May, while three 3-day consecutive rainfall events exceeded 250 mm, all occurring in May. No such extreme multi-day events were observed during the later monsoon months.

Temperature conditions showed a generally warmer-than-normal daytime profile, particularly during the pre-monsoon and post-monsoon periods. Observed maximum temperature (Tmax) exceeded normal values in most months, with the largest positive departures recorded in March (+2.6°C) and December (+2.1°C), and notable increases also observed in February (+1.9°C) and October (+1.3°C). June matched the normal Tmax, while July was marginally lower than normal (−0.4°C), indicating limited cooling during the peak monsoon window. Minimum temperature (Tmin) showed a more mixed pattern. Nights were warmer than normal in the winter months, especially in January (+1.5°C) and February (+1.2°C), but from April onward Tmin generally remained at or below normal, with sustained negative deviations during May to September (approximately 1.0–1.3°C below normal)

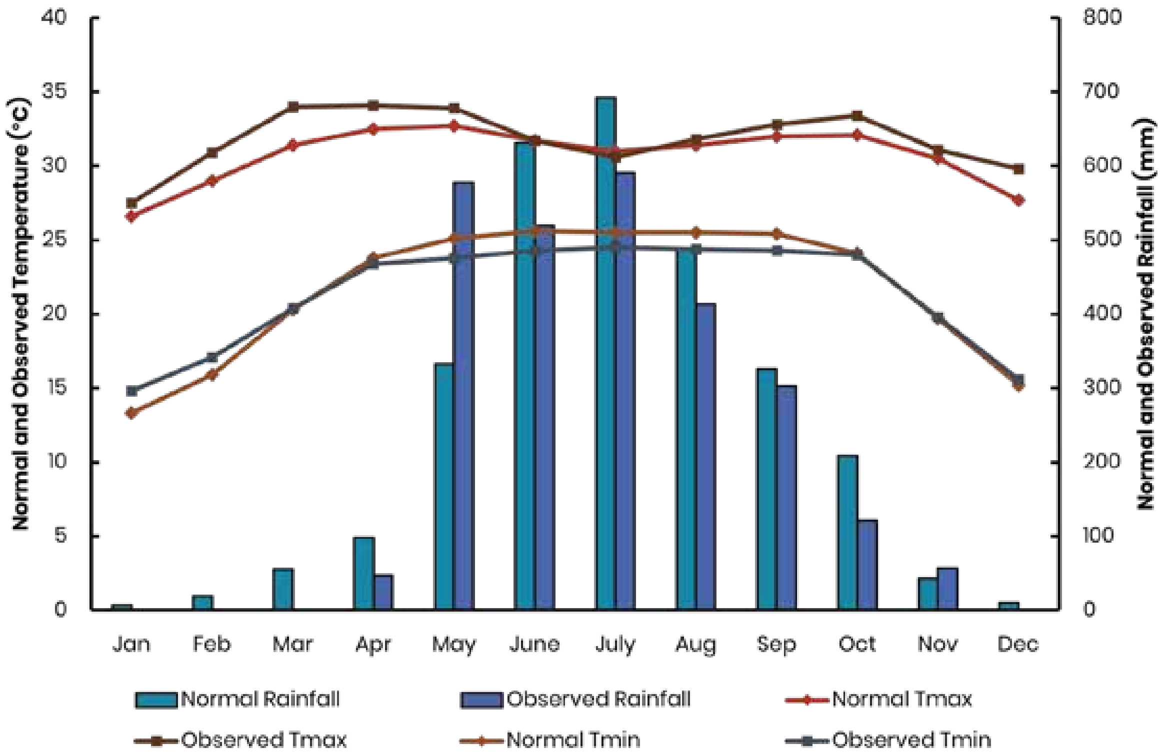


Figure 5 Observed and normal climatology of Bandarban station in 2025 (Source: BMD)

This combination points to warmer days alongside comparatively cooler nights during much of the monsoon season, reflecting increased variability in daily temperature conditions.

Taken together, the 2025 climatology for Bandarban indicates early-season dryness, followed by a concentrated rainfall surge in May, and then persistently below-normal rainfall through the main monsoon period. Such conditions may have increased moisture stress and evapotranspiration demands earlier in the year, while also elevating the potential for short-duration high-impact events (including localized flooding or landslide triggers) during the May rainfall peak. The subsequent rainfall deficits through June–October may have implications for soil moisture recharge, water availability, and agricultural performance, particularly where cropping calendars depend on sustained monsoon rainfall rather than isolated high-intensity episodes.

Meteorological conditions at Chattogram station in 2025 showed clear departures from normal climatology, particularly in rainfall distribution, and displayed several similarities to the pattern observed in the previous station analysis. As with the earlier findings, the year began with a pronounced rainfall deficit: no rainfall was recorded from January to March, despite normal monthly totals of 8 mm, 20 mm, and 56 mm. April also remained drier than normal (66 mm observed vs 101 mm normal), indicating continued suppression of early-season precipitation. A sharp transition occurred in May, when rainfall rose abruptly to 606 mm, far exceeding the normal value of 350 mm, reflecting a concentrated period of heavy rainfall rather than a gradual seasonal build-up. This feature is consistent with the earlier station pattern, where rainfall was also observed to intensify strongly over a short window following early dryness.

During the monsoon months, rainfall remained variable. June was slightly below normal (562 mm vs 625 mm), while July recorded a major surplus (905 mm observed vs 716 mm normal), indicating another intense accumulation phase. Rainfall then declined sharply in August (349 mm vs 501 mm), recovered moderately in September (361 mm vs 306 mm), and fell well below normal again in October (106 mm vs 234 mm). November was marginally above normal (50 mm vs 43 mm), followed by zero rainfall in December, reinforcing the pattern of uneven rainfall distribution across the year. Observed rainfall analysis for May to October 2025 indicates that extreme and persistent rainfall events were more frequent in Chattogram. A total of six days recorded daily rainfall exceeding 100 mm during the analysis period. In addition, eight 2-day consecutive rainfall events exceeded 150 mm, while four 3-day consecutive rainfall events exceeded 250 mm, highlighting the occurrence of prolonged high-accumulation rainfall episodes during the monsoon season.

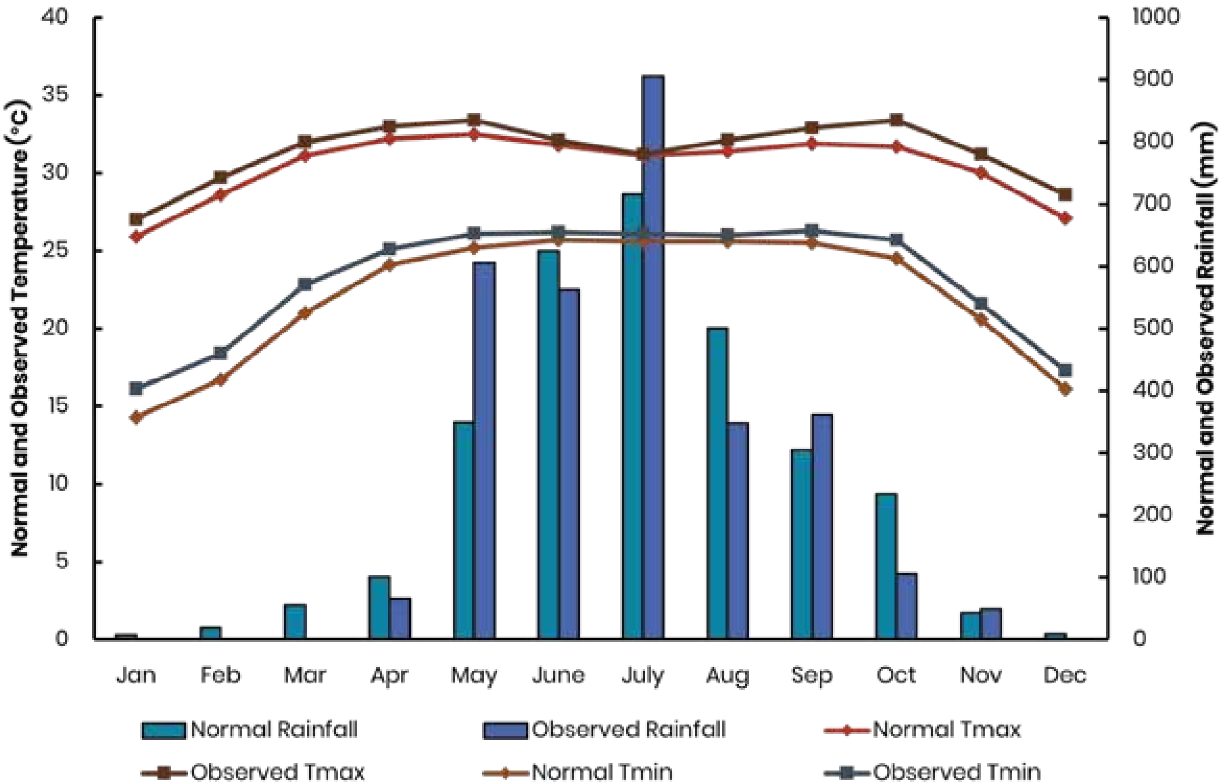


Figure 6 Observed and normal climatology of Chattogram station in 2025 (Source: BMD)

Temperature trends indicate that 2025 was consistently warmer than normal in Chattogram. Maximum temperatures remained above normal throughout the year, with the largest deviations in October (+1.7°C) and December (+1.5°C). Minimum temperatures also exceeded normal values in all months, with notable anomalies in January (+1.8°C) and March (+1.8°C), pointing to warmer nights alongside elevated daytime temperatures. Overall, the Chattogram climatology mirrors the previous station in some key respects. For instance, it showed early-year dryness and rainfall concentrated into fewer high-intensity months, as well as persistent warming across both daytime and nighttime conditions, which may influence runoff response and the potential for short-duration heavy rainfall impacts during peak monsoon episodes.

In case of Cox's Bazar, the station recorded a highly uneven rainfall pattern in 2025, with an extended dry spell early in the year followed by short periods of intensified rainfall during the monsoon. Observed rainfall was zero from January to March, despite normal totals of 6.0 mm, 15 mm, and 39 mm, indicating a clear early-season deficit. A sharp increase began in April, when rainfall exceeded normal (157 mm observed vs 86 mm normal) and intensified further in May (526 mm vs 352 mm). The most pronounced anomaly occurred in July, with 1,384 mm of rainfall recorded against a normal of 978 mm, indicating a strong concentration of rainfall into a peak monsoon window. In contrast, rainfall fell below normal in June (708 mm vs 856 mm) and dropped sharply in August (351 mm vs 694 mm), remaining below normal through September (304 mm vs 411 mm) and October (158 mm vs 250 mm). November showed a small surplus (61 mm vs 49 mm), while December again recorded no rainfall. Overall, the pattern reflects early dryness followed by heavy rainfall concentrated in a limited number of months, similar to trends observed in the other coastal and hill-adjacent stations assessed. Observed rainfall during May to October 2025 reveals that Cox's Bazar experienced frequent high-intensity and persistent rainfall events. During the period, six days recorded daily rainfall exceeding 100 mm. Furthermore, twelve 2-day consecutive rainfall events exceeded 150 mm, and eight 3-day consecutive rainfall events exceeded 250 mm, highlighting the prevalence of sustained heavy rainfall accumulation throughout the monsoon season.

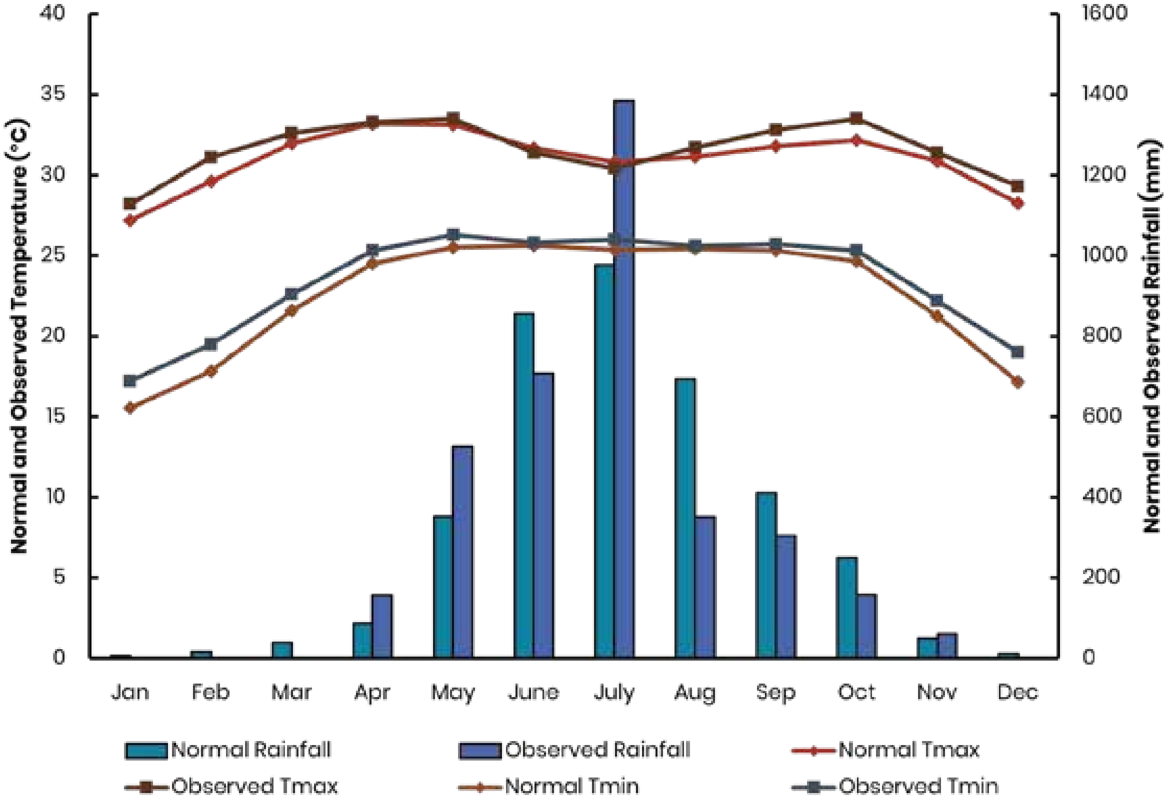


Figure 7 Observed and normal climatology of Cox's Bazar station in 2025 (Source: BMD)

Temperature conditions were generally warmer than normal, particularly for night-time temperatures. Maximum temperatures were above normal in most months, with the largest increases in February (+1.5°C) and October (+1.3°C), although slight negative departures were observed during peak monsoon months such as June and July (around −0.3°C to −0.4°C). Minimum temperatures remained consistently above normal throughout the year, with notable anomalies in January (+1.7°C) and December (+1.8°C), indicating warmer nights and reduced cooling in the winter period. Taken together, Cox's Bazar climatology suggests a warmer year with rainfall concentrated into fewer high-intensity monsoon periods. These conditions can influence runoff behavior and heighten sensitivity to short-duration heavy rainfall events despite overall deficits across several months.

1.5 Landslide Early Warning System

To strengthen early warning and enable timely early action in landslide prone areas, actions related to Landslide Early Warning dissemination were implemented through two primary channels, early warning voice messages and special warning bulletins. Dissemination content was prepared and delivered in both English and Bangla to ensure accessibility across technical stakeholders and community audiences. The voice messages and special bulletins focused on landslide risk linked with heavy rainfall, while also providing rainfall intensity updates to support practical decision making on the ground.

1.5.1 Landslide Early Warning Dissemination through Voice Messages and Special Warning Bulletin

Voice messages were a primary mechanism for large-scale dissemination of early warning information, ensuring coverage of communities even in remote and hard-to-reach areas. Voice message dissemination was conducted at scale across Bandarban and Chattogram. A total of 20,960 voice messages were disseminated in Bandarban and 7,526 in Chattogram. In both districts, the voice messages included landslide alerts alongside warnings of heavy rainfall, and also carried information on expected heavy, moderate, and light rainfall episodes. Dissemination was carried out at a granular geographic level, targeting locations identified as vulnerable. In Bandarban, messages were sent to areas such as Lama and Naikhongchhari, while in Chattogram, dissemination covered Chattogram City Corporation and Bashkhali. This targeted approach supported localized preparedness by ensuring that risk information reached communities, including the local leaders, where landslide exposure is higher.

In addition to voice outreach, special bulletins were issued to support institutional coordination and structured dissemination with visual information of warning levels in both Bangla and English. A total of 11 special bulletins were issued by BMD with technical support from RIMES. These bulletins were disseminated through Integrated Forecast Dissemination Portal (INSTANT) and email, supporting rapid information flow among relevant agencies, partners and stakeholders.

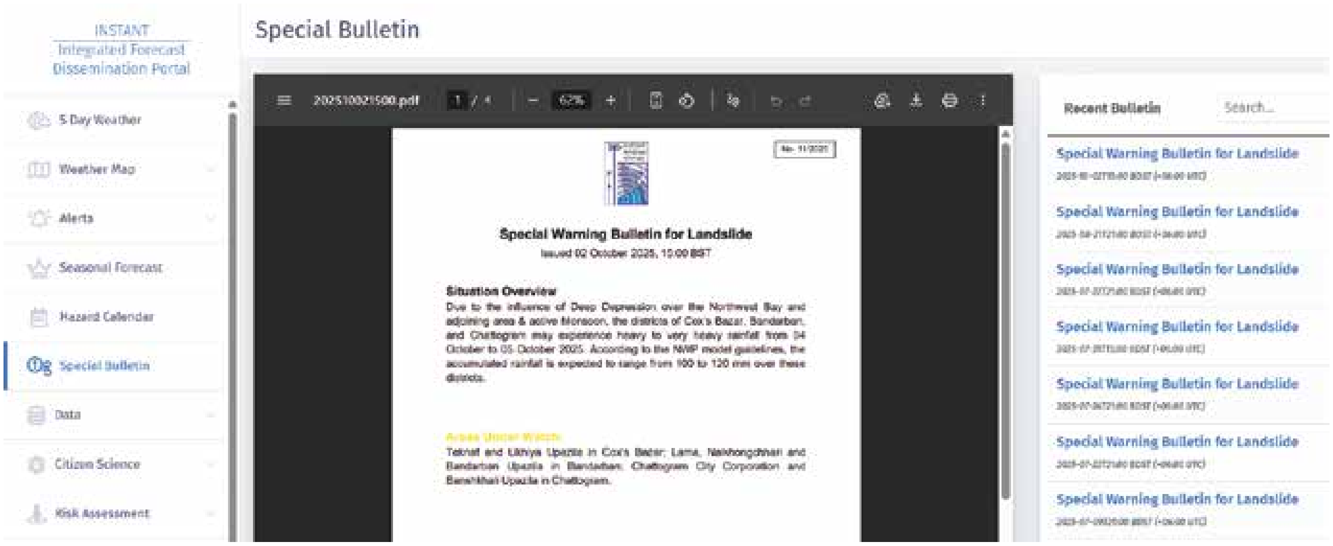
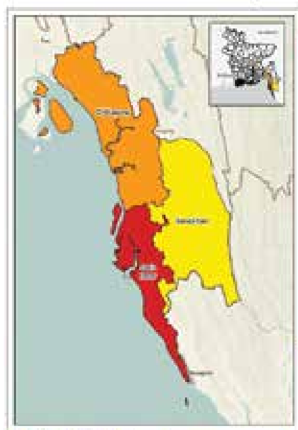


Figure 8 Screenshot of Special Bulletin disseminated through Integrated Forecast Dissemination Portal (INSTANT)



No. 10/2025

Special Warning Bulletin for Landslide

Issued 21 August 2025, 21:00 BST

Situation Overview

Due to active southwest monsoon, the districts of Cox's Bazar, Bandarban, and Chattogram may experience heavy to very heavy rainfall from 23 August to 24 August 2025. According to the NWP model guidelines, the accumulated rainfall is expected to range from 250 to 300 mm over these districts.

High Landslide Risk Areas:
Risky areas are Teknaf and Ukhiya Upazila in Cox's Bazar; Naikhongchhari Upazila in Bandarban

Medium Landslide Risk Areas:
Risky areas are Wards No. 7, 8, 9, and 14 of Chattogram City Corporation and Banshkhali Upazila in Chattogram.

Comparatively Less Risk Areas (Under Watch):
Risky areas are Lama Upazila in Bandarban.

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This bulletin has been prepared as a guidance by the Regional Integrated Multi-Hazard Early Warning System (RIMES) in collaboration with Bangladesh Meteorological Department, under the ECHO-funded project 'Anticipatory Action for Landslides Causing Displacement for Communities in Chattogram and Bandarban Districts in Bangladesh,' and the GFFO-funded project 'Child Centered Anticipatory Action for Better Preparedness of Communities and Local Institutions in Northern and Coastal Areas of Bangladesh,' implemented by Save the Children Bangladesh.

Potential Risk of Landslides (as of 21 August 2025 and valid for 23-24 August 2025)

Advisory Associated with Risk Levels

- Promptly broadcast early warnings in communities.
- Immediately evacuate from hilly slopes or high-risk areas to designated shelters. Prioritize the evacuation of the elderly, children, disabled individuals, and pregnant women to safety.
- Take dry food, clean water, essential medicines, a flashlight, candles, matches, clothing for 3 days and secure important documents while going to shelter.
- Maintain communication with family members, neighbors, volunteers, and the local disaster management committees.
- Keep your phone charged and a power bank ready for emergency use.
- Be aware that flash floods may occur alongside landslides, so avoid staying near rivers or streams to protect yourself from floodwaters.
- Keep drains and water passages near your house clear.
- Move livestock and pets to a safe place.
- Distribute anticipatory action packages to support immediate early actions.
- Follow the instructions of the local administration and disaster management committee and monitor forecasts regularly.

- Initiate the shelter preparation.
- Promptly broadcast alerts in vulnerable communities.
- Evacuate elderly, children, disabled individuals, and pregnant women from hilly slopes or high-risk areas to neighboring safer places.
- Ensure you are in a safe location during the night.
- Prepare dry food, clean water, essential medicines, a flashlight, candles, matches, clothing, and secure important documents.
- Be ready for anticipatory action packages distribution to support early action.
- Maintain communication with family members, neighbors, volunteers, and the local disaster management committee.
- Keep your phone charged and a power bank ready for emergency use.
- Remove any objects (branches, garbage) that could obstruct drainage and keep the drains and water passages near your house clear.
- Follow the instructions of the local administration and disaster management committees. Monitor forecasts regularly.

- Monitor forecasts regularly.
- Follow the instructions of the local administration and disaster management committees.
- Be aware of the location of potential shelters in advance.
- Keep essential emergency items ready (dry food, clean water, essential medicine, flashlight, candles, matches, clothing, important documents).
- Make a plan to move quickly to a safe location.
- Maintain communication with family members, neighbors, volunteers, and the local disaster management committee and discuss preparedness.
- Keep your phone charged and a power bank ready for emergency use.
- Ensure you are in a safe location during the night.
- Pay special attention to the elderly, children, and persons with disabilities.

This bulletin has been prepared as a guidance by the Regional Integrated Multi-Hazard Early Warning System (RIMES) in collaboration with Bangladesh Meteorological Department, under the ECHO-funded project 'Anticipatory Action for Landslides Causing Displacement for Communities in Chattogram and Bandarban Districts in Bangladesh,' and the GFFO-funded project 'Child Centered Anticipatory Action for Better Preparedness of Communities and Local Institutions in Northern and Coastal Areas of Bangladesh,' implemented by Save the Children Bangladesh.

Figure 9 Special Warning Bulletin for Landslide in Bangla

Following circulation at the institutional level, the bulletin messages were further communicated at the community level through local dissemination practices such as miking. This community level communication complemented the digital channels and helped translate forecast information into anticipatory actions by ensuring that warnings were repeated and reinforced through locally trusted methods.

2. METHODOLOGY

This study primarily focuses on assessing community responses to the different initiatives implemented during the 2025 landslide season under the project titled "Anticipatory Action for landslides causing displacement for communities in Chattogram and Bandarban Districts in Bangladesh" supported by ECHO. Accordingly, the study was designed to capture both individual and collective perspectives from target communities in landslide-prone areas, to generate a comprehensive understanding aligned with the study objectives. To ensure robust and well-grounded analysis, the study adopted a mixed-methods approach, triangulating qualitative and quantitative data. Individual household surveys, Focus Group Discussions (FGDs), and Key Informant Interviews (KIIs) were conducted to gain deeper insight into community experiences, perceptions, and the overall beneficiary context of the interventions under the project.

2.1 Sampling Method

The assessment applied both qualitative and quantitative data collection strategies, including household surveys, Key Informant Interviews (KII), and Focus Group Discussions (FGD). The quantitative survey focused on individual questionnaires, while the qualitative study primarily relied on KII and FGD questionnaires. The study area focused on selected unions and wards located across Chattogram and Bandarban districts, where contextual vulnerabilities and geographic diversity made these locations particularly significant for the assessment.

From the given population, the sample size was determined using Cochran's Sample Size Formula:

$n = z^2 * (p*q)/d^2$

Where,
n = Sample size
z = Confidence level; for a 95% confidence level, the z score is approximately 1.96
p = Estimated proportion of the population with the attribute of interest, 50% was selected based on literature review
q = Proportion of the population without the attribute of interest, where q = 1 − p
d = Margin of error (in decimal form); for this assessment, the margin of error was taken as 5%

$$n = \frac{z^2 * (p*q)}{d^2}$$

$$n = \frac{1.96^2 * (0.5*0.5)}{0.05^2}$$

$$n \approx 384$$

For this study, a multistage simple random sampling approach was used. To maintain precision of the survey estimates across multiple unions and wards in the same region, the confidence level was set at 95%, corresponding to a z-value of 1.96. This level is scientifically appropriate and consistent with standard practice, offering a reliable balance between precision and feasibility (Cochran, 1977; Fowler, 2014; Lohr, 2010). As the selected unions and wards fall within a similar geographic region and share broadly comparable hazard characteristics, overall population variability is expected to be moderate. Given this relatively clustered and less dispersed study area, a 95% confidence level is sufficient to maintain statistical validity without inflating sample size unnecessarily (Kish, 1965). Additionally, a 5% margin of error was retained to ensure precision and reduce uncertainty, aligning with best practice for community-level field assessments. The methodology also kept the p value and q value at 0.5, as it accounts for maximum variability and ensures a conservative estimation of sample size that remains robust even when population characteristics are not fully known (Singh & Masuku, 2014). All variables were carefully considered to preserve the integrity of the sample size calculation and account for potential uncertainty within the study population.

For a large population, the sample size usually represents at least 50 percent of the population. Therefore, in this study, the total significant sample size for all selected upazilas combined was found to be approximately 384. However, to ensure a representative assessment from each upazila and union/ward, and to reduce the chances of sampling error, the final sample size was kept above the calculated minimum. As the study includes a total of sixteen unions and wards across Chattogram City Corporation, Banshkhali Upazila, Lama Upazila, and Naikhongchhari Upazila, the quantitative sample was adjusted to 25 individual questionnaires per union or ward according to the Cochran's Sample Size Formula. This results in a combined total of 400 household surveys, which enhances representativeness and allows for better disaggregated analysis across the various unions and wards.

Different types of questionnaires were developed depending on their intended use. The individual survey questionnaire was designed from the perspective of quantitative assessment, whereas the Focus Group Discussion (FGD) and Key Informant Interview (KII) questionnaires are designed to facilitate qualitative analysis. Both FGDs and KIIs were conducted in each selected union or ward, with a planned distribution of two FGDs and two KIIs per location. The participants in this study were selected at random, with each eligible member of a household having an equal probability of being selected. The study site and assessment details are summarized in the following table.

Table 1 Study Area and Assessment Summary

District	Upazila Name	Union/Ward Name	Onsite Individual Survey	FGD[a]	KII[b]
Chattogram	Chattogram City Corporation	Ward 7	25	2	1
		Ward 8	25	2	1
		Ward 9	25	2	1
Chattogram	Banshkhali	Shandhanpur	25	2	1
		Kalipur	25	2	1
Bandarban	Lama	Lama Sadar	25	2	1
		Ghazalia	25	2	1
		Phaitong	25	2	1
		Aziznagar	25	2	1
		Ruposhi Para	25	2	1
		Faisakhali	25	2	1
		Shorai	25	2	1
Bandarban	Naikhongchhari	Sadar	25	2	1
		Sonaichhari	25	2	1
		Ghumdhum	25	2	1
		Baisha	25	2	1

Notes

- FGD: At least 50% of participants must be women and youth to ensure gender equality and promote inclusivity. Each FGD should ideally include 15 participants.
- KII: KII respondents must be members of the Union Disaster Management Committee (UDMC) and/or the Upazila Disaster Management Committee (UzDMC) or other relevant stakeholders whose roles contribute to disaster management, community leadership, or local governance.

3. ASSESSMENT FINDINGS

The assessment focused on community perceptions of ECHO-supported anticipatory actions interventions for landslide risk management during the 2025 landslide season, including the effectiveness of early warning, preparedness measures, and anticipatory cash support. It examined how cash assistance, provided ahead of heightened landslide risk, supported safer decisions, reduced losses, and minimized displacement. Additionally, the assessment reviewed community capacity to anticipate and respond to landslide hazards and the extent to which combined cash and non-cash interventions strengthened resilience in landslide-prone areas of Chattogram and Bandarban.

3.1 Participant Demographics Distribution

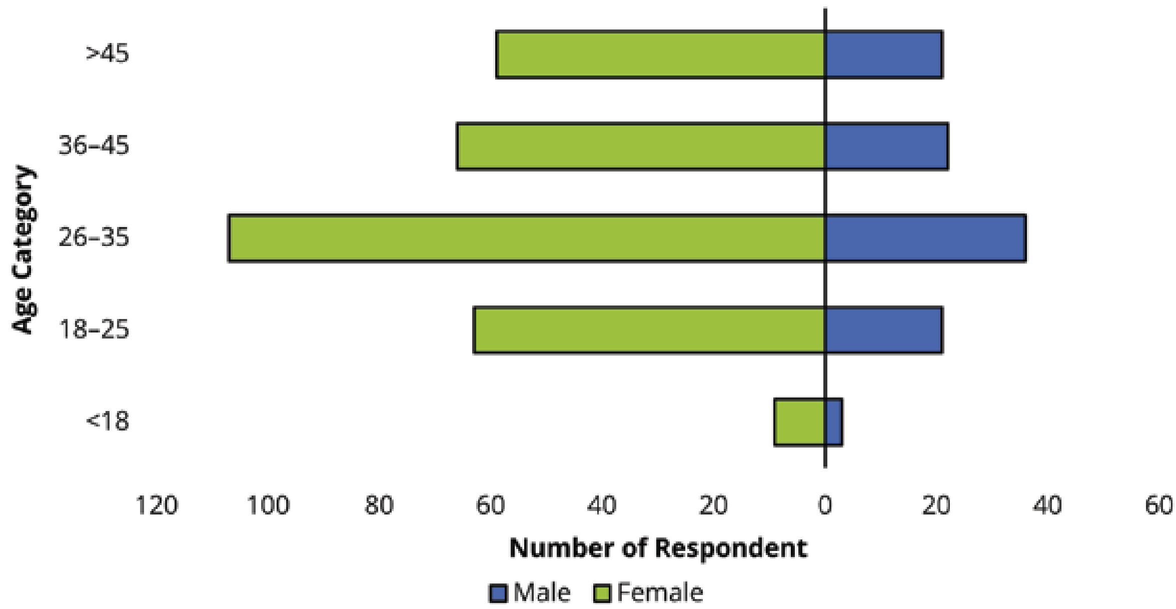


Figure 10 Gender and age distribution of respondents of the study

The figure 10 presents the age- and sex-disaggregated distribution of community members who participated in the post-impact assessment in Lama, Naikhongchhari, Chittagong City Corporation, and Banshkhali. The largest share of respondents falls within the 26–35 age group, with female participants outnumbering male participants in this category. The 18–25 and 36–45 age groups also show substantial participation for both sexes, while participation among individuals above 45 years is comparatively lower. Representation of participants below 18 years is minimal. Overall, the graph demonstrates that the assessment primarily engaged an adult population, with higher female participation across most age groups.

The following figure 11 illustrates the occupation-wise distribution of assessment participants. Housewives constitute the highest proportion of respondents, followed by farmers and day laborers. A smaller number of participants are students, while business owners, NGO/CSO staff, teachers, drivers, unemployed individuals, and other occupations represent relatively minor shares. The graph indicates that most participants are engaged in household management, agriculture, and daily wage labor.

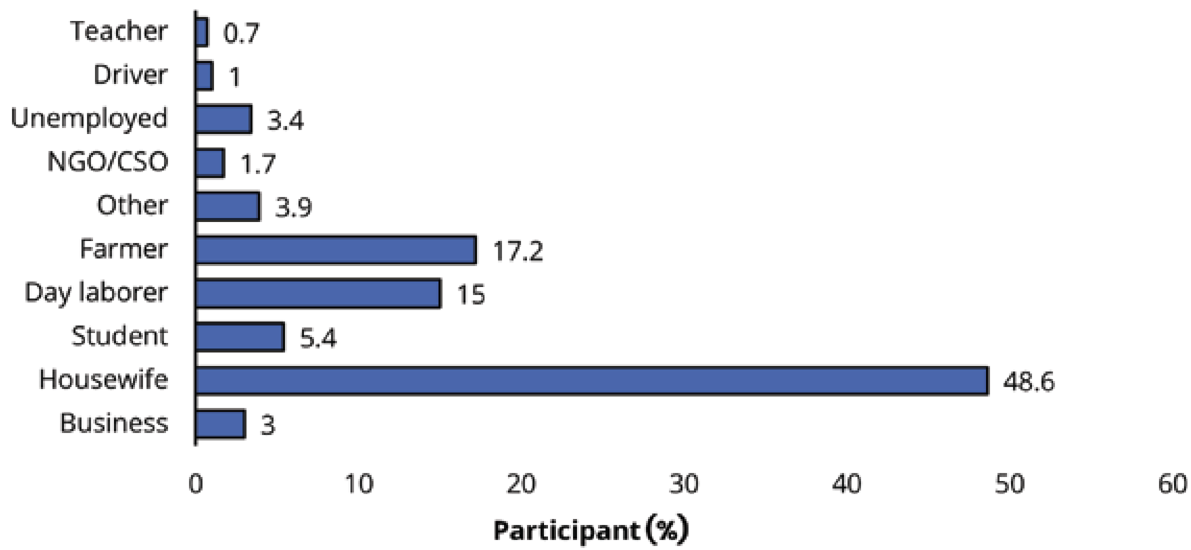
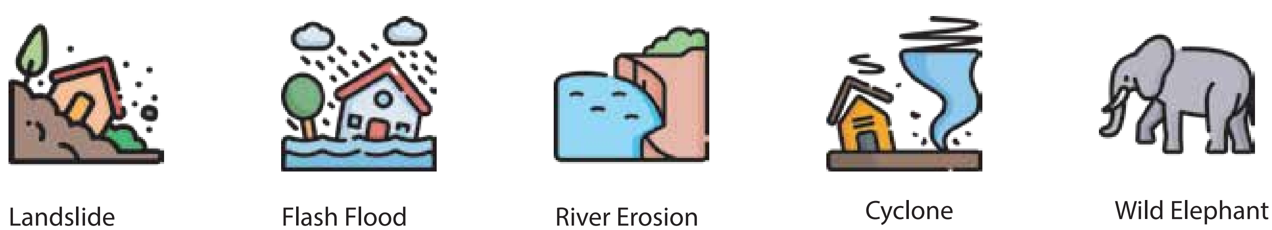


Figure 11 Distribution of occupation amongst participants

3.2 Observed Situation Reported by Participants



Infographic 1 Major Hazards in the project area

All participants identified landslides as the primary hazard affecting the area. Local Flash flooding was consistently reported as a major secondary hazard, often occurring simultaneously with landslides. While hydrological data based on river conditions indicate that water levels remained below the danger level, suggesting a low likelihood of widespread flooding, participants reported experiencing localized flash flooding. They explained that during such events, hill slopes frequently collapse, leading to significant loss of life and damage to settlements.

In addition to landslides and flash floods, communities reported being severely affected by riverbank erosion. As a result of erosion, many households have lost their homes and agricultural land and were forced to relocate to nearby hill areas, which in turn increased their exposure to landslide risk. This cyclical pattern of displacement and re-exposure was repeatedly highlighted during FGDs.

Some participants also reported impacts from cyclones, particularly through heavy rainfall that exacerbates slope instability and flooding. Furthermore, communities identified wild elephant movement as an additional hazard. Participants noted that elephant incursions have led to crop losses, and in some cases, human fatalities, further compounding household vulnerability.

3.3 Participation in Project Trainings and Learning Lab Activities

3.3.1 Familiarity with and Participation in Learning Lab Activities

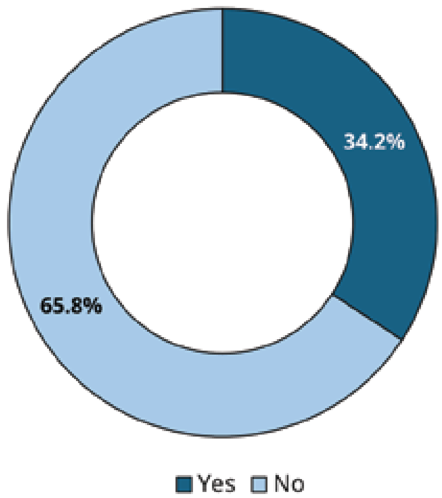


Figure 12 Familiarity with and participation in Learning Lab activities

Learning Lab was one of the unique interventions under this project designed for the DMC members. Figure 12 shows that only about 34.2% of respondents reported knowing about the Learning Lab. Moreover, FGD findings depict that Learning Labs are established in only a few unions. Hence, most of the unions included in the assessment do not yet have Learning Lab activities.

3.3.2 Most Useful Support and Information Received from the Learning Lab

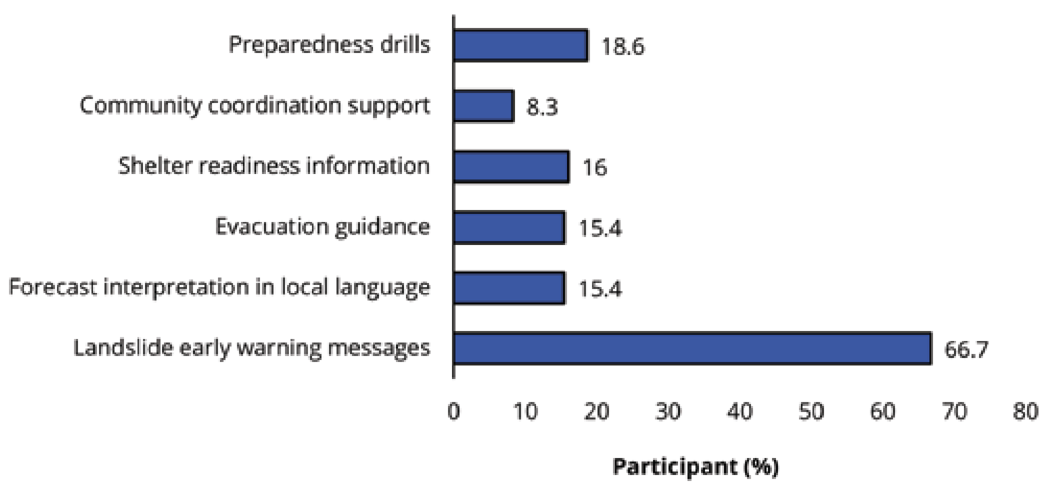


Figure 13 Support and information received from the Learning Lab

The figure illustrates the types of support and information that community members found most useful from the Learning Lab. The results show that Landslide Early Warning information was received through multiple sources, including miking, voice messages, and learning lab sessions. Overall, 66.7% of respondents reported receiving

Landslide Early Warning information, and it was identified as the most useful form of support. These messages were considered critical for enabling timely and appropriate preparedness and response actions. In addition, forecast interpretation in the local language was highlighted as an important form of support. This is particularly relevant in Lama and Naikhongchhari, where communities include linguistically diverse populations who may have limited proficiency in Bangla. Local-language interpretation of forecasts was therefore perceived as essential for understanding warnings and taking informed action.

Other forms of support were reported as useful by a smaller proportion of respondents, including preparedness drills (18%), shelter readiness information (16%), and evacuation guidance (15%). These findings indicate that, while multiple Learning Lab services are valued, early warning dissemination and locally understandable forecast information are the most critical supports for the assessed communities.

3.3.3 Contribution of Interpreter Pool and Resource Pool Trainings to Anticipatory Action

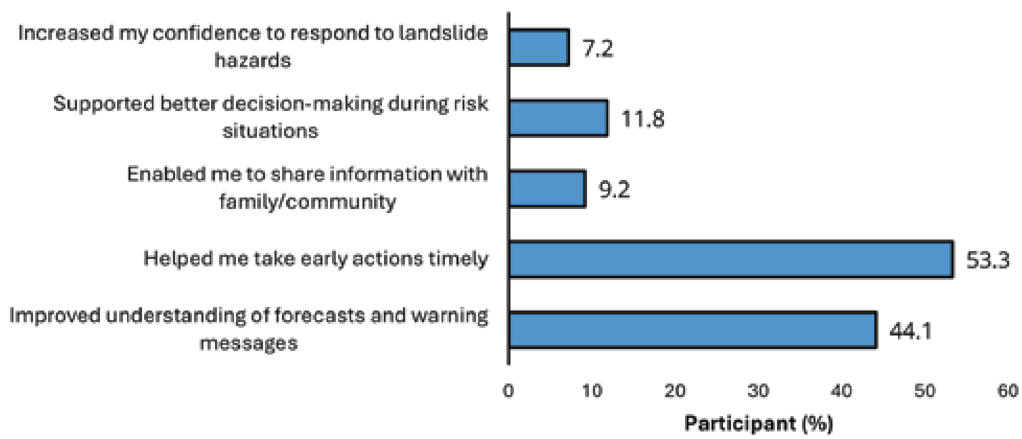


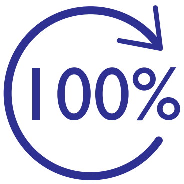
Figure 14 Contribution of interpreter and resource Pool trainings to anticipatory action

The Interpreter Pool and Resource Pool trainings directly or indirectly helped participants understand Landslide Early Warnings and take early actions (Figure 14). The results indicate that the training had a direct impact on taking early action. More than half of the respondents (53.3%) said that the training helped the community take timely actions after receiving early warning information. This reflects the usefulness of the training in supporting early action at the community level. In addition, 44.1% of respondents reported that throughout the training their understanding of forecasts and warning messages improved, helping them interpret landslide-related information more clearly. This improved understanding aligns with the findings presented in Section 3.5.2, where 81.1% of households reported taking early action after receiving early warning information, suggesting that strengthened interpretation capacity contributed to action-oriented responses.

Among the respondents, 11.8% mentioned that the training supported better decision-making during risk situations, while 9.2% reported that the training enabled them to share warning information with family members and the wider community. FGD discussions also confirmed that trained participants were more confident in interpreting warning messages, explaining risks to others, and supporting community awareness activities, especially in areas where formal communication channels are limited. However, participation in Interpreter Pool and Resource Pool trainings was not uniform across all unions and wards (see Section 3.3.1), and limited coverage in some remote areas may have reduced the overall impact of the intervention.

3.4 Forecast and Early Warning

3.4.1 Modes of Receiving Forecast and Early Warning Information



The assessment found that 100% of respondents received early warning information directly or indirectly, albeit through different modes of dissemination. Overall, 38.08% of participants reported receiving early warning information directly through voice messages, while 61.92% reported receiving early warning information indirectly through different communication channels. Among participants who could not receive voice messages, miking was the most frequently reported mode of communication (52.09%), highlighting the continued importance of community-based dissemination, particularly in areas where mobile network coverage, handset access, or registration for alert services may be inconsistent. Other commonly reported sources included volunteers (14%), local government bodies or the Union Disaster Management Committee (UDMC) (10.57%), and neighbors (9.83%).

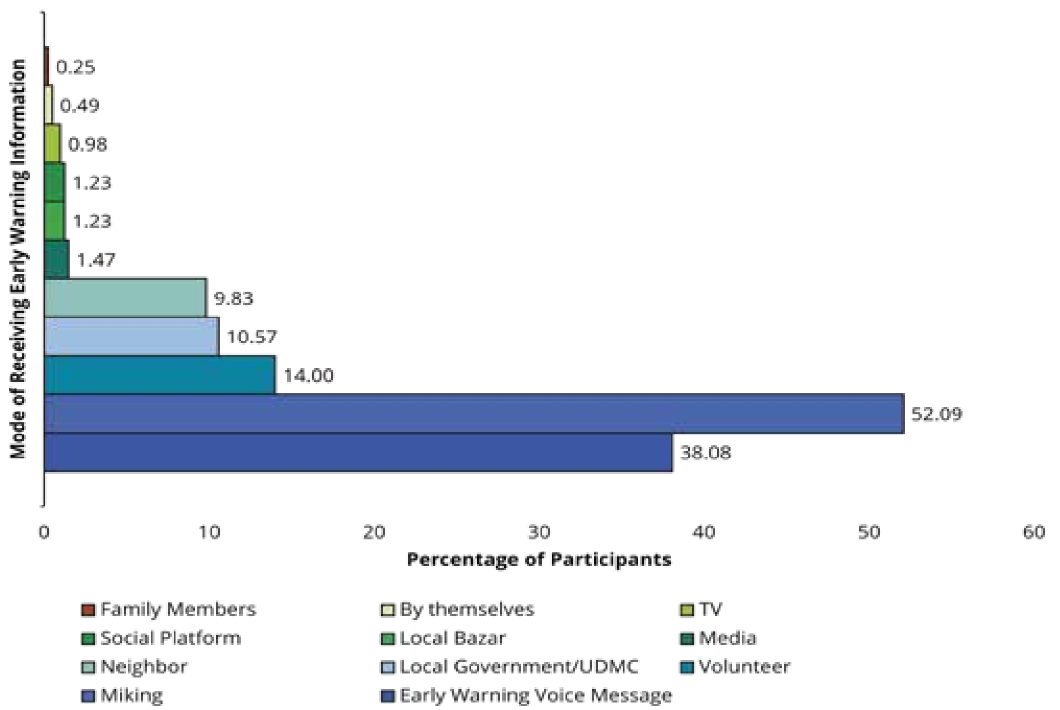


Figure 15 Communication Pathways through which participants received early warning information

Smaller proportions reported receiving early warning information through media (1.47%), local bazaars (1.23%), social platforms (1.23%), and television (0.98%). Only a very small share reported receiving information independently (0.49%) or from family members or relatives (0.25%).

Patterns in voice message receipt varied by geography. At the district level, participants in Chittagong reported comparatively higher receipt of voice messages than those in Bandarban. Among the participants in Chittagong, 89.69% reported receiving voice messages, whereas 21.94% participants of Bandarban district reported receiving voice messages, indicating a substantial gap in coverage.

The FGD findings reveal that voice message coverage was lower in Bandarban. This is due to poor network conditions in Bandarban, which may worsen during adverse weather. This has implications for early warning and early action, as households not reached through direct alerts are more likely to depend on secondary channels and may receive warning information later, less consistently, or with reduced specificity. The findings therefore reinforce the need to strengthen community-based dissemination mechanisms, particularly miking and volunteer networks, as both a complement to voice messaging and a critical contingency to ensure that warnings reach all households.

3.4.2 Mobile Network Conditions During Disaster Periods

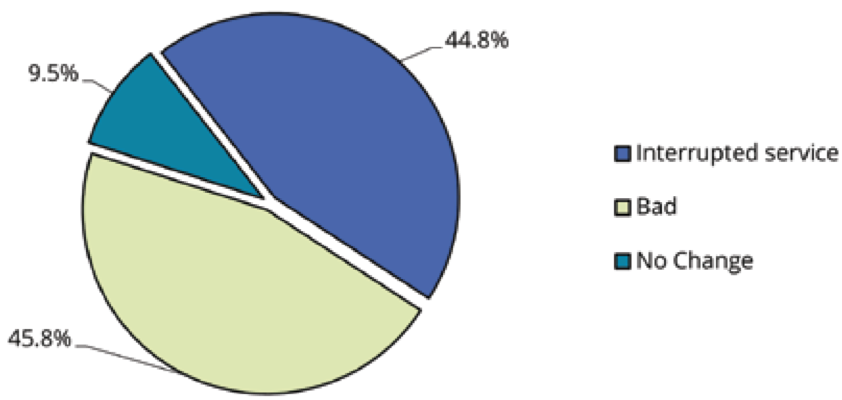


Figure 16 Mobile network conditions during disaster periods

The figure 16 illustrates the status of mobile network services during disaster events. The findings indicate that mobile connectivity is severely constrained during hazard periods, particularly in remote and hard-to-reach areas. Almost 44.8% of respondents reported that mobile services were interrupted during disasters, while a similar proportion (45.8%) indicated that network quality was poor. Together, these results show that the vast majority of respondents experienced either complete disruption or unreliable mobile connectivity during emergency situations. This constraint resulted in some households not receiving early warning voice messages during emergency periods even in bad weather as well, which further limited their ability to take timely early actions.

Only a small proportion of respondents reported no change in network conditions during disaster periods. FGDs further revealed that many participants live in remote hill areas with weak or no mobile coverage, and that network conditions often deteriorate further during heavy rainfall and landslide events. Consistent with FGD findings, participants highlighted that network disruptions significantly hinder early warning dissemination, coordination, and emergency communication, forcing communities to rely on alternative methods such as hand miking, person-to-person dissemination, walkie-talkies, or physical travel, which are time-consuming and less effective during emergencies.

3.4.3 Participant Feedback on Message Quality and Dissemination

Participants provided detailed and practical feedback on how the forecast and early warning messages could be improved to better support preparedness and timely decision-making. A major theme was the timing of message delivery. Many participants indicated that messages should be issued earlier, explaining that additional lead time would allow households to secure assets, organize family members, arrange transport, and prepare for evacuation where required. Suggested lead times most commonly ranged from two to three days to as much as six to seven days prior to an expected hazard. This feedback reflects an expectation that the warning system should not only inform households of impending risk but should do so early enough to enable meaningful preparedness actions rather than last-minute reactions.

Participants also emphasized improvements to message content and language. Multiple respondents stressed the importance of using local language to ensure that messages are accessible to all, including those who may not be comfortable with formal or non-local wording. In addition, participants recommended that voice messages focus only on essential information and clear instructions, noting that excessive details can reduce clarity and make it more difficult to identify the most important actions to take. The manner of delivery was also raised frequently. Participants suggested increasing repetition of messages, particularly during high-risk periods, and slowing the pace of delivery to ensure the message can be understood properly, remembered, and communicated to others. These recommendations collectively highlight that comprehension and usability depend not only on what is communicated, but also on how it is communicated.

In describing dissemination challenges, participants drew attention to connectivity constraints, particularly in areas where mobile networks are unstable or unavailable. Under such conditions, participants suggested expanding and formalizing alternative dissemination methods, including miking and walkie-talkie communication. Some participants noted that Wi-Fi may remain available in certain contexts even when mobile networks are disrupted, indicating potential scope for internet-based delivery where feasible. Participants further linked effective early warning to broader preparedness capacity and support. Suggestions included training for community members to strengthen understanding of forecasts and recommended actions, alongside complementary preparedness inputs such as improving shelters and facilities, ensuring safe-house space for livestock, distributing leaflets and torchlights, strengthening rescue team capacity, and improving drinking water availability after a catastrophe. While these issues extend beyond message design, they reflect community expectations that early warning is most effective when integrated with preparedness knowledge and practical response capacity.

3.4.4 Experience, Accuracy Perceptions, and Sharing Practices amongst voice message recipients

Among participants who received voice messages, additional questions explored familiarity with message sources, satisfaction with message length, perceived accuracy, understanding, and communication to others. Familiarity with the phone numbers used for voice message delivery was high, with 88.24% of recipients stating that they recognized the relevant numbers and 11.76% reporting that they did not (Figure 17). This pattern indicates that most recipients can identify the source of messages, which is important for trust and for reducing the risk that warnings are disregarded as unknown or suspicious calls.

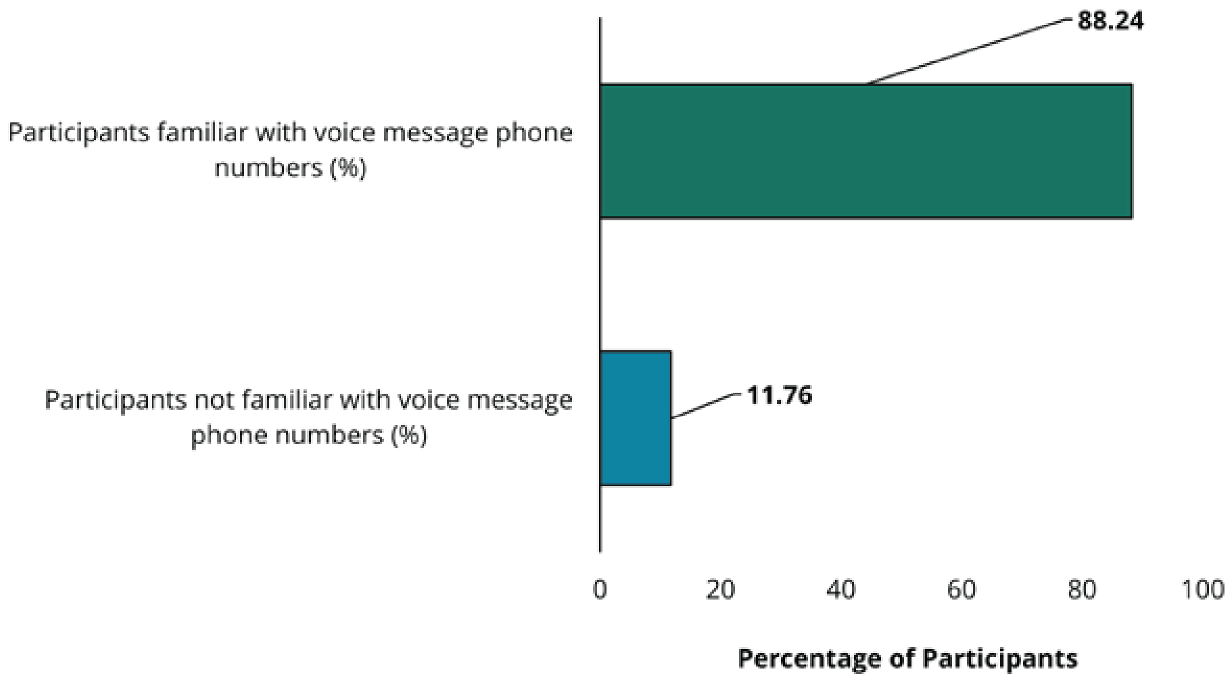


Figure 17 Rate of familiarity with voice message phone number

The timing and frequency of receipt were also explored in Figure 18. Most recipients (73.90%) stated that messages were generally received prior to hazards, including landslides, heavy rainfall, cyclones, floods, and lightning. This suggests that warnings are being positioned as anticipatory information rather than only being disseminated during hazard impacts. At the same time, variation remained in how consistently people received messages: 16.30% reported receiving them occasionally and 11.80% reported receiving them regularly, with a small number noting that messages were received only a few times. This variation may reflect differences in coverage, network access, hazard exposure, or operational targeting and underscores the importance of ensuring that frequency and consistency are appropriate for the risk context.

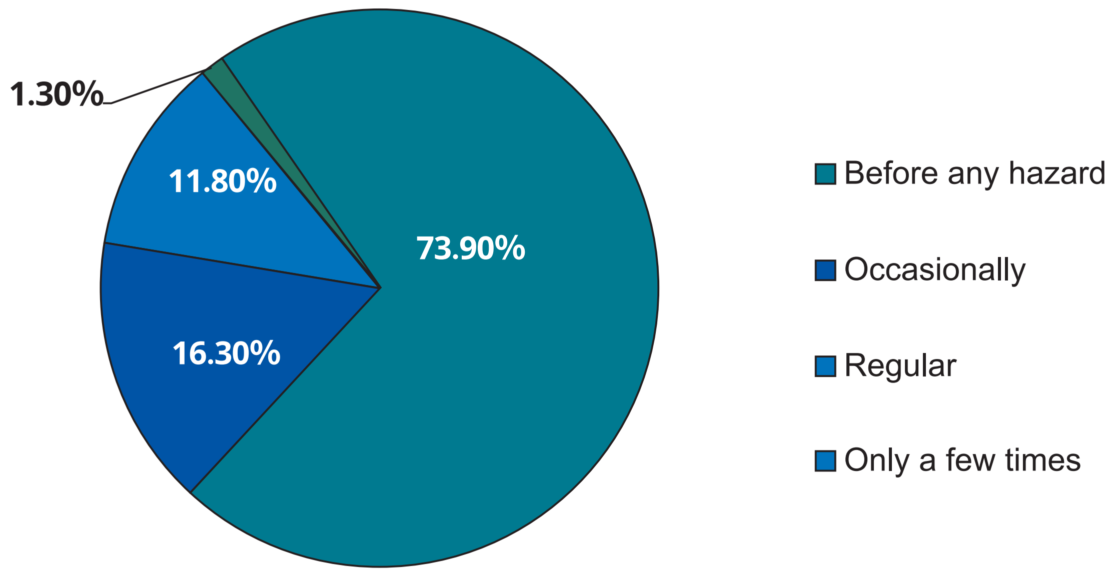


Figure 18 Timing of receiving early warning voice messages by participants

Recipients expressed strong satisfaction with the length of voice messages. Nearly all respondents stated that the message length was appropriate, while only 0.7% suggested that the messages could be shortened; none stated that the length was unacceptable. This feedback suggests that message duration is not a major barrier to usability and that the principal concerns relate more to language, clarity, timing, and repetition.

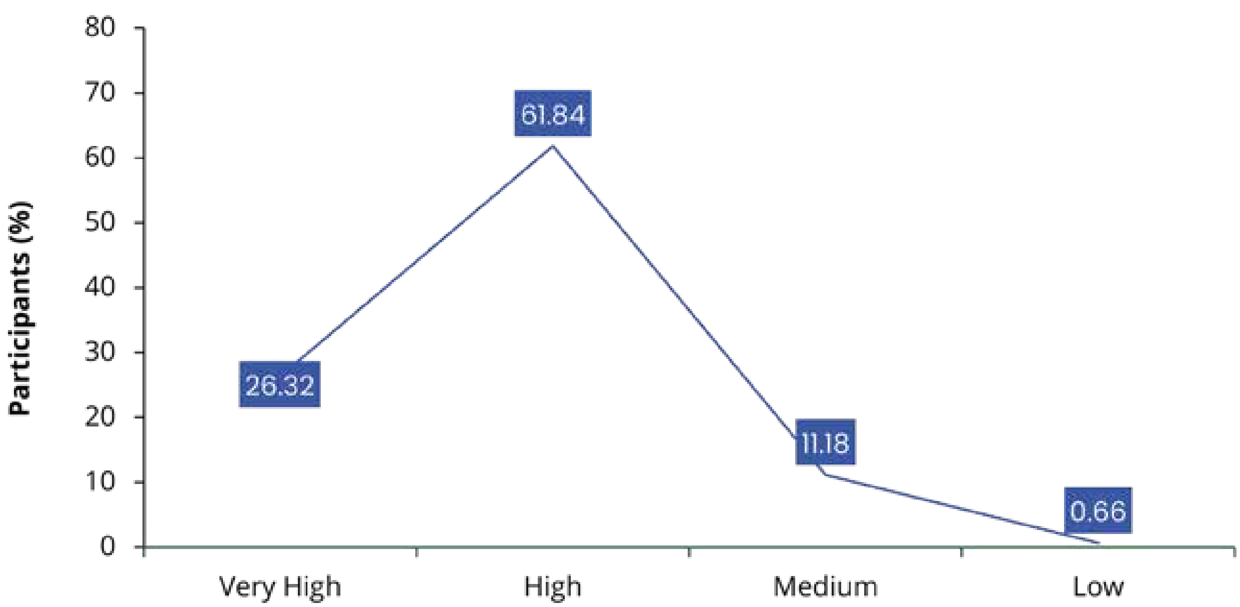
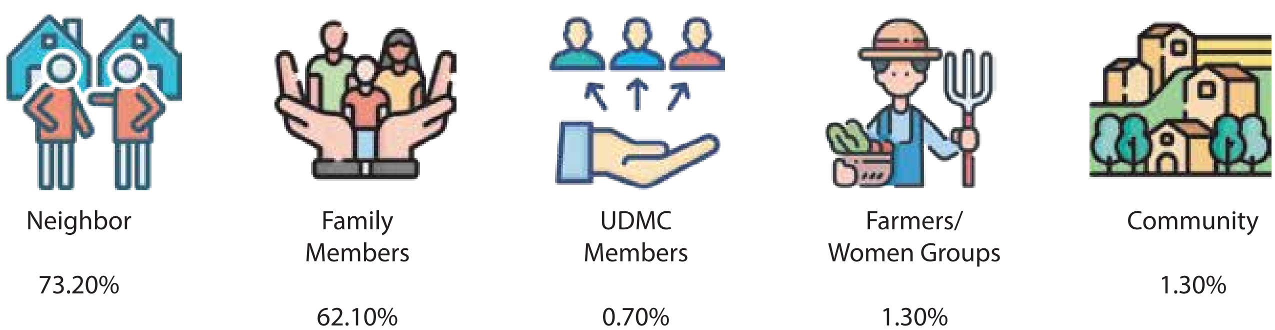


Figure 19 Participants' perceived level of accuracy of early warning voice messages

Perceptions of accuracy were also highly positive (Figure 19). A combined 88.16% rated the accuracy of early warning information through voice message as very high (26.32%) or high (61.84%), while smaller proportions rated it as medium (11.18%) or low (0.66%). High perceived accuracy is a key enabling factor for early action, as households are more likely to respond appropriately when they trust that warning information is reliable.

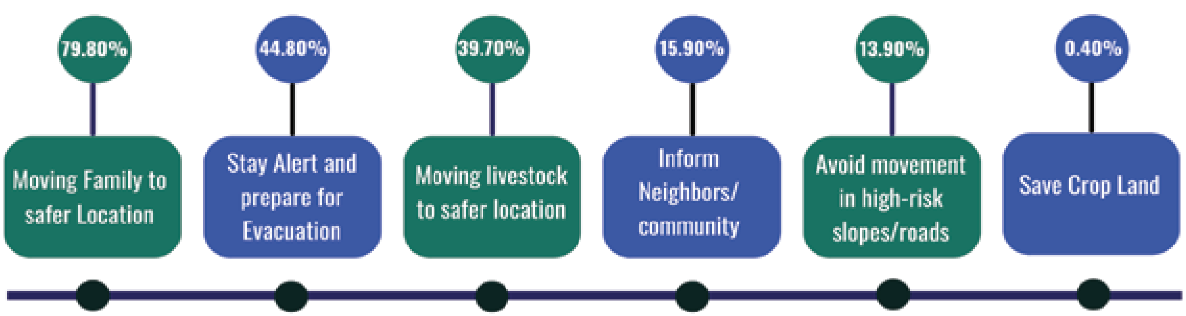
Understanding of message content was similarly strong, with 94.77% reporting full understanding and 5.33% reporting partial understanding; no participants indicated that the messages were not understandable at all. These findings suggest that, among recipients, voice messages are generally comprehensible and credible.

Recipients also reported actively sharing warning information with others, indicating that voice messages have a multiplier effect beyond direct recipients. The majority of recipients reported sharing messages with neighbors (73.20%) and family members (62.10%), reflecting the central role of interpersonal networks in hazard communication. Although smaller proportions reported sharing messages with UDMC members (0.70%), farmers' or women's groups (1.30%), and the wider community (1.30%), these forms of sharing are nevertheless important, as they can contribute to organized community preparedness and group-based response actions. Overall, these patterns indicate that the voice message system supports both direct warning dissemination and informal community-level diffusion of risk information.



Infographic 2 Method of sharing early warning information

3.4.5. Potential Actionable Benefits of Receiving Early Warning on Time



Infographic 3 Potential Actions and Benefits if Early Warning were Received on time

The assessment indicates that timely access to early warning information could have enabled additional life-saving and loss-reducing actions, particularly in contexts where indirect dissemination methods are often delayed or disrupted during disasters. In remote and hilly areas, voice messages may not always reach households due to poor network connectivity during extreme weather, while public miking is frequently constrained by risky or inaccessible roads. As a result, delays in receiving information through secondary channels can reduce the window for early action.

When asked how they could have benefited if early warning had been received on time, participants consistently highlighted the potential for earlier and more protective decision-making at the household level. Many indicated that timely voice messages would have supported the relocation of family members to safer locations, improved preparedness and alertness ahead of possible evacuation, and reduced uncertainty during hazard periods. Others noted that advance warnings would have enabled the safe movement of livestock, protection of livelihoods and assets, and avoidance of travel along high-risk slopes or roads. Participants also emphasized that timely warnings would have facilitated earlier information sharing within communities.

Collectively, these findings underscore that direct and timely early warning delivery has the potential to significantly enhance early action, especially where indirect or manual dissemination methods are slowed or rendered ineffective during emergencies.

3.5. Landslide Early Warning and Early Actions

3. 5.1 Community Response to Landslide Early Warning

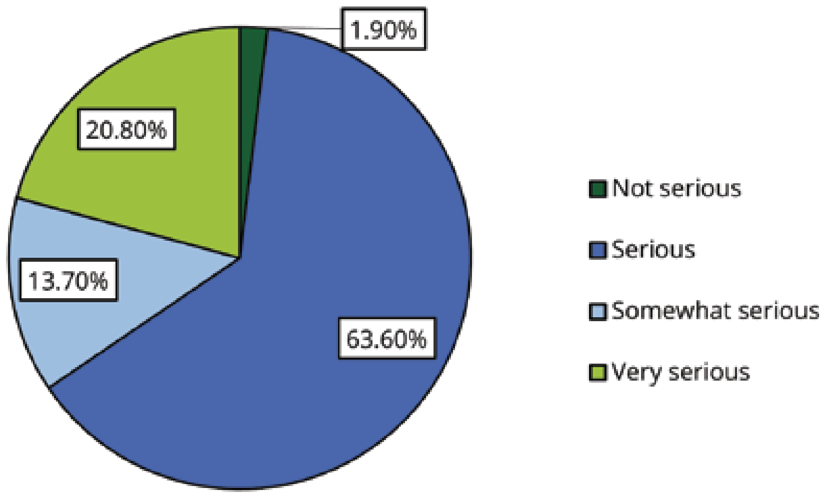


Figure 20 Community response to Landslide Early Warning

The figure illustrates how respondents perceived the seriousness of the recent landslide after receiving early warning information. The findings indicate a high level of risk perception among community members, as reflected by the large proportion of respondents who perceived the landslide risk as serious or very serious.

A clear majority of respondents (63.6%) considered the landslide situation serious, while an additional 20.8% considered it very serious. Together, these results show that over 84% of respondents recognized the landslide threat as serious or very serious upon receiving the information. In contrast, 13.7% of respondents perceived the situation as somewhat serious, and only a very small proportion (1.9%) reported not taking the information seriously. Importantly, respondents who perceived the warning as serious or very serious reported sharing the information with their neighbors, indicating strong community-level dissemination and peer-to-peer communication following receipt of early warnings. This reflects a positive behavioral response and suggests that the early warning messages were both credible and actionable, contributing to wider awareness beyond direct recipients.

Overall, the results demonstrate that early warning information effectively influenced community risk perception and encouraged informal dissemination, which is critical for enhancing preparedness in landslide-prone areas.

3.5.2 Early Action Taken After Receiving Early Warning Information

The findings in figure 21 show that early warning messages supported timely action among most respondents. Overall, 81.1% of respondents reported that they took early action after receiving voice messages, while 18.9% stated that they did not receive early warning information and therefore could not take action. Among those who did not receive early warning information, reported reasons included poor or disrupted mobile network connectivity during heavy rainfall, residence in remote or hard-to-reach hill areas with weak coverage, lack of access to registered mobile numbers, and delays in secondary dissemination methods such as miking or door-to-door communication. This indicates that voice messaging is an effective early warning channel, while also highlighting remaining gaps in coverage, particularly in remote areas, as noted in the FGDs.

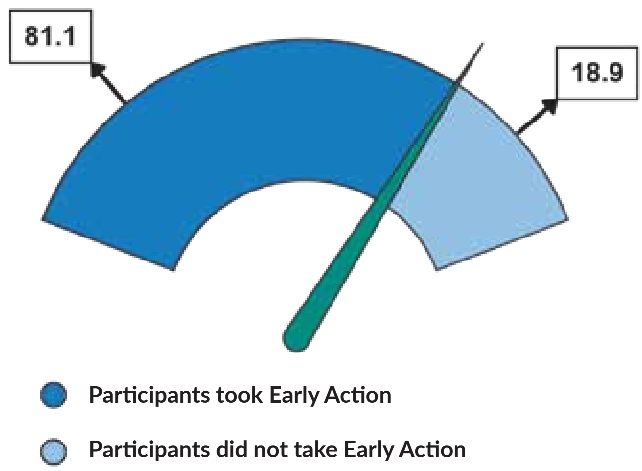


Figure 22 presents the types of actions taken after receiving early warning information. The most common action was relocation to safer locations or evacuation, reported by 77.6% of respondents, showing strong compliance with life-saving guidance.

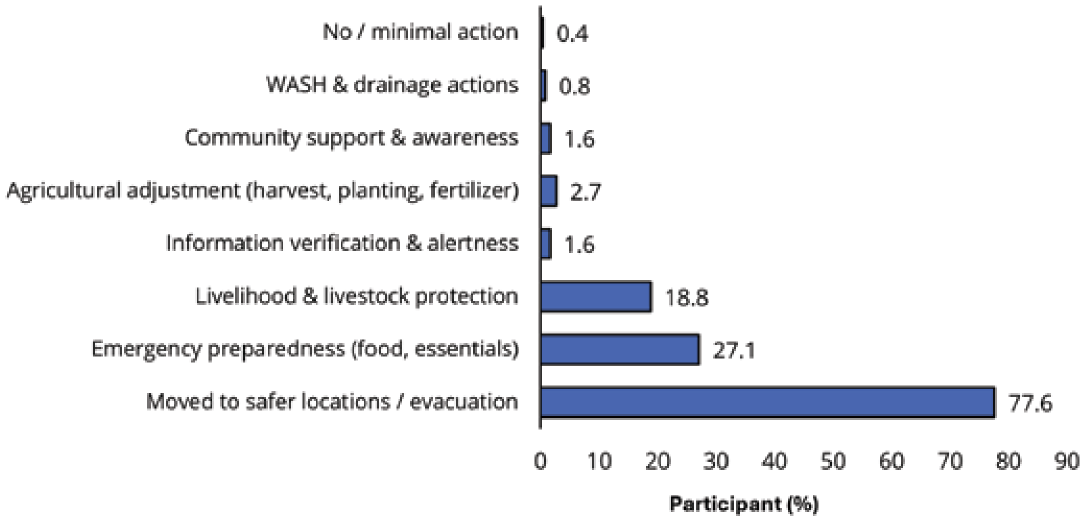


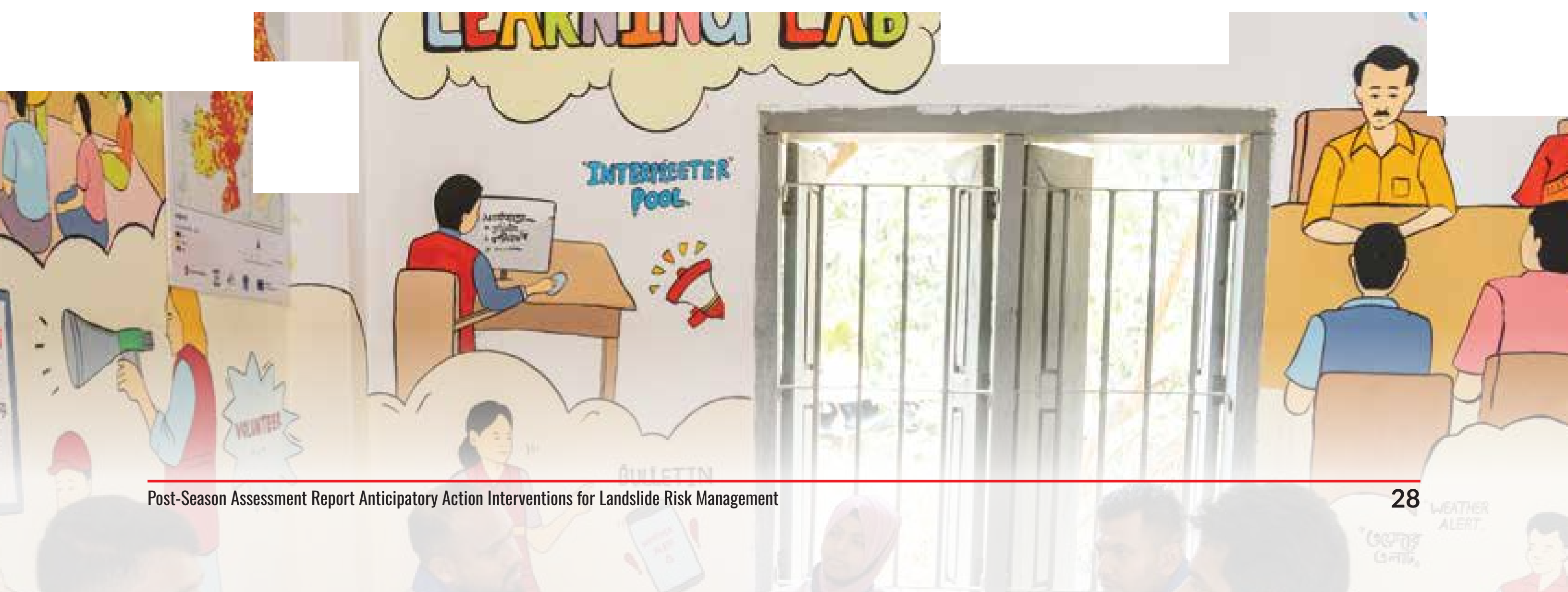
Figure 22 Type of action taken in response to the early warning information

In addition, 27.1% of respondents undertook emergency preparedness measures, such as preparing food, water, and essential items. A further 18.6% reported taking actions related to livelihood and livestock protection, reflecting efforts to reduce economic losses alongside ensuring personal safety.

Other actions, including verifying information, adjusting agricultural activities, raising community awareness, and improving drainage or WASH conditions, were reported by smaller proportions of respondents. Only a very limited number of participants (0.4%) indicated no or minimal action after receiving warnings. FGD discussions confirmed that households that received timely warnings were more likely to evacuate early, protect assets, and support neighbors, particularly where volunteers and local leaders were active. Overall, the findings show that early warning information was widely used and translated into practical, risk-reducing actions, especially evacuation and preparedness measures.

3.5.3 Community Action Response Following Landslide Early Warning

The figure shows when community members decided to take action in response to landslide risk. More than half of the respondents (57%) reported that they took action immediately after receiving the early warning, indicating a high level of trust in the warning messages and quick response. In addition, 23% of respondents reported taking action after the information was widely shared within the community, underscoring the importance of peer-to-peer communication and community-level dissemination.



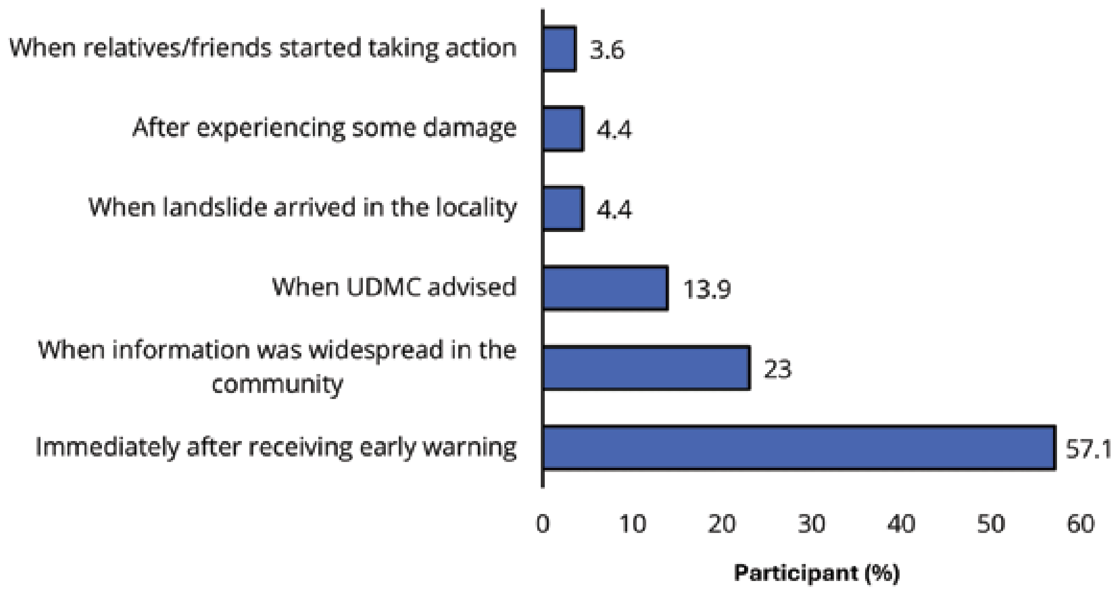


Figure 23 Community action response following Landslide Early Warning

A further 14% of respondents reported that they acted after receiving advice from Union Disaster Management Committee (UDMC) members, highlighting the continued role of local authorities in guiding preparedness and response actions. FGD discussions also confirmed that UDMC members and trained volunteers often support households in deciding when and how to act. Only a small proportion of respondents reported taking action after experiencing damage, when the landslide had already affected the area, or after observing relatives or friends taking action. This indicates that most community members acted early and proactively, rather than waiting for visible impacts or losses before responding.

3.5.4 Lead Time Available for Early Action and Preparedness

The figure 24 shows the amount of lead time available to community members for taking early action or preparedness measures after receiving early warning information. Most respondents (80.5%) reported receiving 1–3 days of lead time, which enabled them to prepare, relocate to safer places, and take other early actions. In contrast, 15.6% of respondents stated that they received less than one day of lead time, which required immediate and rapid response.

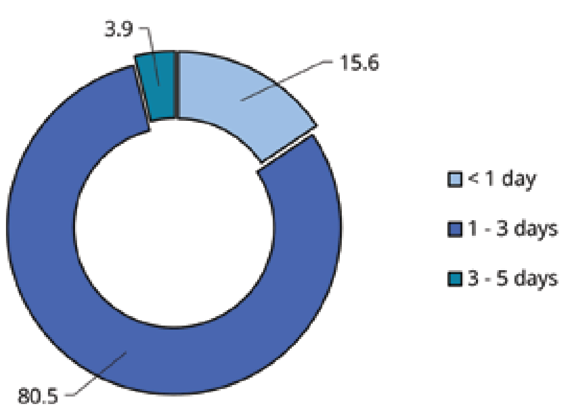


Figure 24 Lead time availability for taking early actions following the Landslide Early Warning

Only a small proportion (3.9%) reported receiving 3–5 days of lead time. FGD discussions further indicated that shorter lead times were more common in remote and hard-to-reach areas, where warnings often arrive late due to poor network coverage and reliance on manual dissemination methods. This limited lead time reduced some households' ability to take more planned, comprehensive preparedness actions.

3.5.5 Limiting Factors for Not Taking Early Action

The key constraints that prevent community members from taking early action despite receiving warning information are summarized in Figure 25. The findings show that resource-related and communication-related barriers were the most significant limiting factors.

Nearly half of the respondents (approximately 48–50%) reported that limited capacity or resources, such as a lack of cash, emergency equipment, transport, or local support, prevented them from taking early action. This finding reflects issues raised during FGDs, where participants frequently mentioned shortages of emergency items (e.g., stretchers, raincoats, ropes), high transportation costs, and limited availability of trained volunteers.

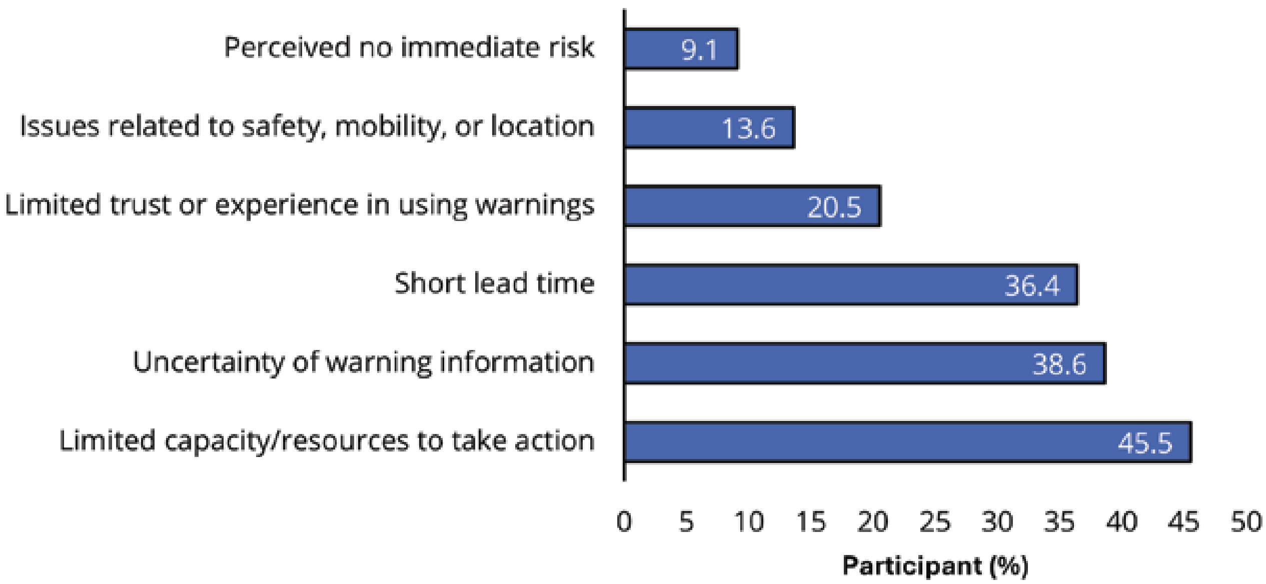


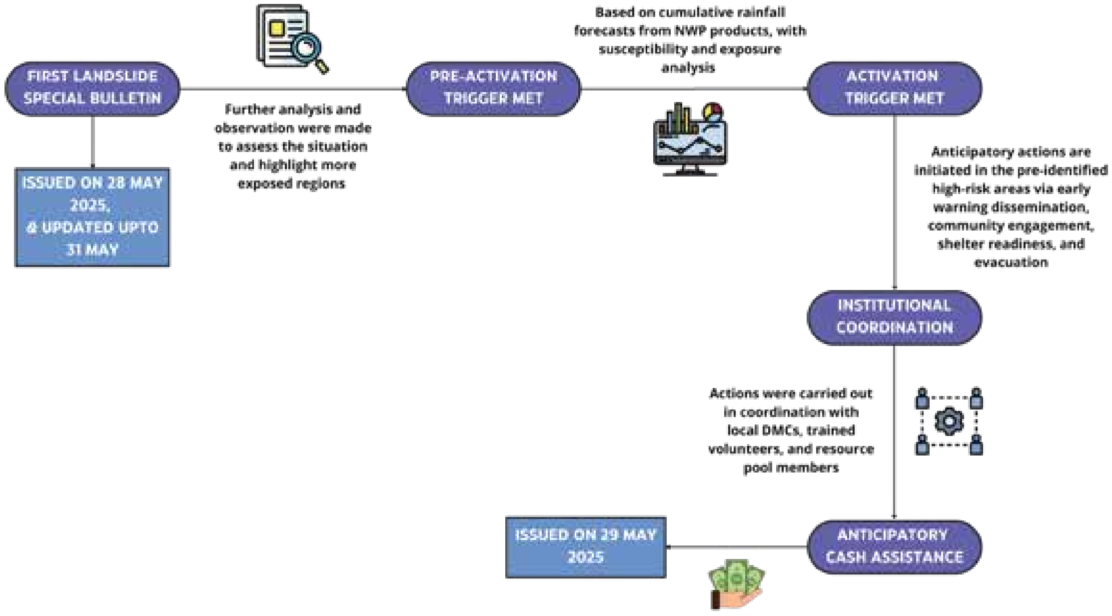
Figure 25 Limiting factors for not taking early action by the community

Approximately 40% of respondents identified uncertainty in warning information as a limiting factor. While participants consider or perceive the Landslide Early Warning information as serious, there is a matter of lacking confidence or uncertainty in the warning information at the micro scale due to the highly localized rainfall pattern and complex terrain. In addition, around 36% of participants reported that short lead time constrained their ability to take action. FGDs indicated that in remote locations, early warnings often reached communities late through manual, door-to-door dissemination, reducing the available time for evacuation or preparedness.

Concerns related to safety, mobility, or location were also reported by a notable proportion of respondents. These concerns align with FGD findings on poor road conditions, difficult terrain, and lack of transport during heavy rainfall or landslide events, which particularly affect vulnerable groups. Only a small proportion of respondents (approximately 9%) reported no immediate risk or no limiting factors, indicating that most households face at least one constraint when responding to early warnings.

3.6. Timeline of Anticipatory Action (AA) Intervention

During the late May 2025 rainfall episode, anticipatory actions for landslides were activated once rainfall-based trigger conditions were met for 29-31 May 2025, according to the Special Bulletin issued by BMD on 28 May 2025, drawing on cumulative rainfall forecasts combined with landslide susceptibility and exposure considerations. Following activation on 28 May 2025, coordination was undertaken with local response structures and trained community resources to implement pre-agreed early actions. Community-level dissemination was carried out through voice messages, megaphones, indigenous-language communication support, and door-to-door dissemination, particularly where network connectivity was disrupted and terrain limited access. Shelter readiness activities were implemented in identified locations, including site preparation and basic readiness arrangements, alongside evacuation support where feasible.



Infographic 4 Timeline of AA initiative in May 2025

As part of the anticipatory package, cash assistance of BDT 5,000 per household was distributed on 29 May 2025 to selected high-risk households in Naikhongchhari, supporting urgent early actions and essential needs such as food, medicine, lighting, and transport, while dissemination and readiness actions continued as heavy rainfall persisted.

3.7. Cash Support and Mobile Banking Service

3.7.1 Mobile Banking Familiarity and Access to Cash Support

The assessment also reviewed household familiarity with mobile banking services and the extent to which cash support under ECHO was received during the year's landslide event. In general, participants demonstrated high exposure to mobile banking systems. A total of 76.12% described themselves as very familiar and active users of mobile banking services, indicating strong potential for cash-based interventions delivered through digital platforms. At the same time, 18.91% reported being familiar with mobile banking but not using it, suggesting that awareness does not necessarily translate into utilization and that barriers such as access, trust, documentation, or agent availability may still affect uptake. A smaller proportion (4.98%) reported having never heard of mobile banking, indicating that a minority of households remain digitally excluded and may require additional orientation or alternative delivery methods.

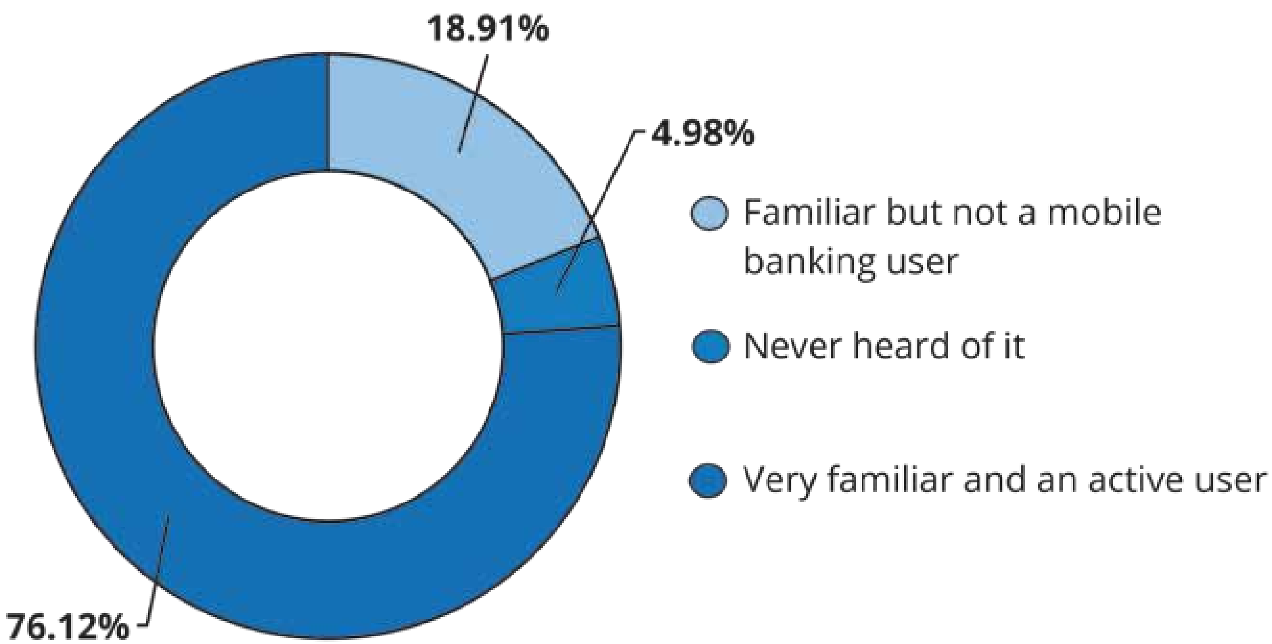


Figure 26 Participants familiarity with cash support

Despite relatively strong mobile banking familiarity, receipt of cash support under ECHO during the landslide was limited. Only 12.30% of participants reported receiving cash support, while 87.70% reported receiving none. This pattern indicates that the majority of surveyed households did not benefit from direct financial assistance during the event, which has implications for their ability to take early action, meet immediate needs, and recover after impacts. Among those recipients who received financial help, cash was the primary modality, as 90.91% reported receiving cash, while 9.09% reported receiving necessary utensils. The dominance of cash as a modality suggests a preference or operational emphasis on flexible assistance that households can allocate according to their most urgent priorities.

3.7.2 Timeliness, Utilization of Support, and Delivery Constraints

The timing of cash support is critical for effective anticipatory action. Findings indicate that cash was received with a lead time of approximately one day before some landslide events, which in certain cases enabled early preparedness actions. However, in remote hilly areas, heavy rainfall often disrupts transportation and market access, limiting households' ability to effectively use the support before impact. When assistance was received after the landslide, its role shifted primarily toward coping and recovery rather than immediate protection.

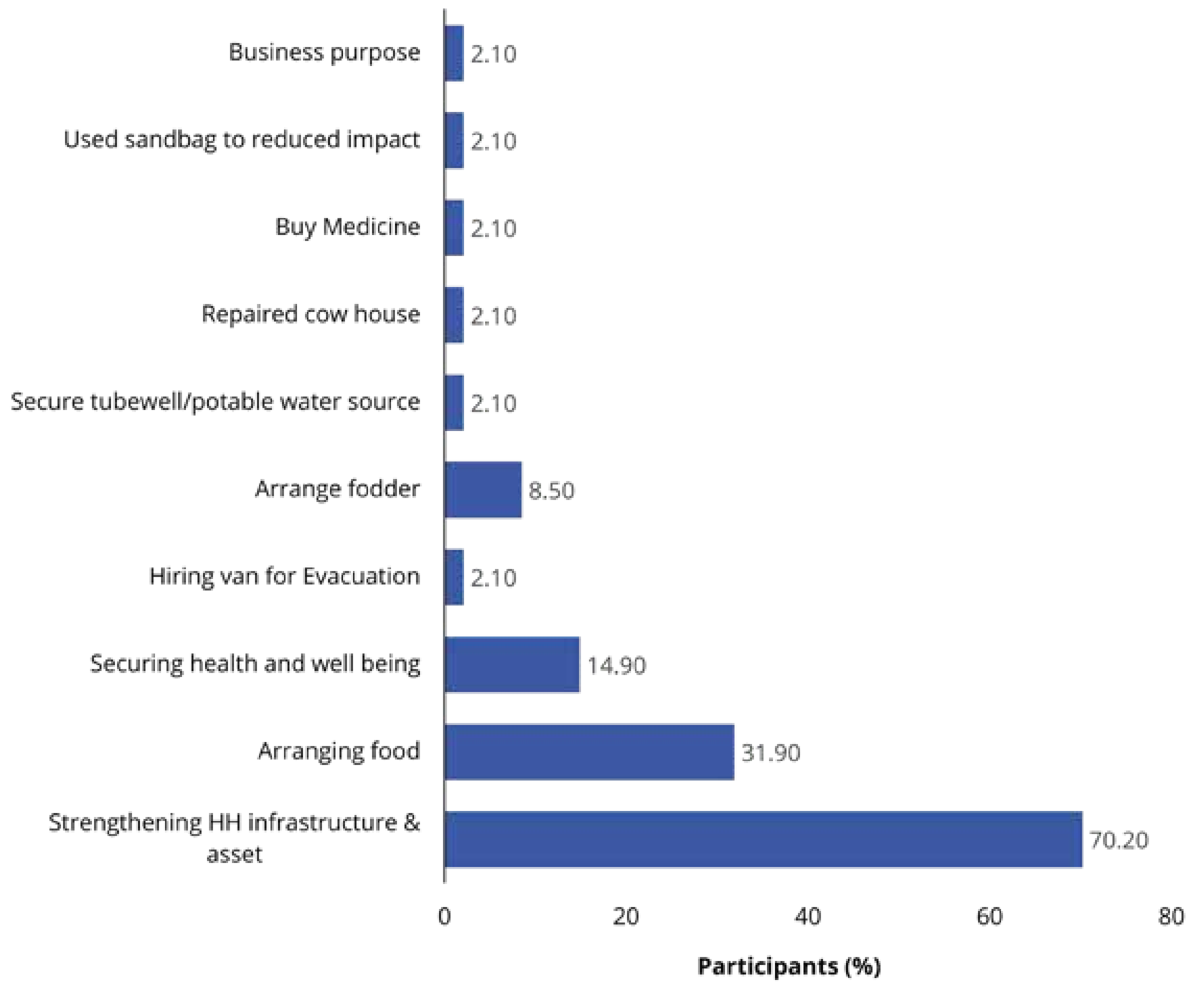


Figure 27 Usage of Cash Support

Recipients reported using the support in ways that directly addressed urgent priorities and reduced immediate vulnerability. The most commonly reported use was strengthening household infrastructure and assets (70.20%), indicating that recipients prioritized measures to protect homes and reduce further damage or exposure. Many also reported using the support to arrange food (31.90%), reflecting immediate consumption needs during or after the hazard. Health and well-being needs were also reported (14.90%), suggesting that some households used assistance for medical costs or related protection. Livelihood-related needs were reflected in the use for arranging fodder (8.50%), while smaller proportions reported hiring a vehicle for evacuation, securing potable water sources, repairing livestock shelters, buying medicine, using sandbags to reduce impacts, or business-related needs (each 2.10%). No recipients reported saving any portion of the cash, indicating that assistance was fully absorbed into immediate and pressing needs rather than being retained for future use.

Operational barriers were also noted, particularly for those receiving money through mobile money transfer systems. All recipients reported that mobile money transfer agent locations were distant, creating practical constraints in cashing out or receiving funds. In emergency conditions, for instance, when travel can be unsafe, expensive, or restricted, such distance can delay access to assistance and may undermine the effectiveness of cash support for timely early action. This finding suggests that the accessibility and geographic distribution of agents should be considered an important determinant of how quickly households can benefit from digital cash transfers.

3.7.3 Implications for Households Without Cash Support

Participants who did not receive cash support took early actions with their own resources. However, a range of early actions was limited by financial constraints. This illustrated how a lack of assistance can heighten vulnerability and reduce coping capacity. Furthermore, among participants who did not receive cash, nearly half (47.7%) reported being unable to provide sufficient food for their families during the landslide. This indicates that meeting basic consumption needs was a major challenge (Figure 28). A further 20.1% reported having to take loans to cope with the situation, implying longer-term financial burdens that may persist beyond the immediate crisis period.

Financial limitations also affected mobility and evacuation-related decisions; 9.3% stated that they could not hire vehicles for evacuation, and approximately 9.0% reported being unable to purchase fodder for livestock, which has direct consequences for livelihood protection. In addition, 6.5% indicated that they were unable to strengthen their households in preparation for the hazard, suggesting reduced ability to implement preventive measures that could lessen damage. Smaller proportions reported constraints related to household maintenance (1.1%), recovery of damages (1.4%), ensuring fencing of gardens (1.4%), and reduced house maintenance overall (3.6%). These findings collectively demonstrate that the absence of cash support constrained households' options for preparedness, protection, and recovery, and that even relatively modest financial assistance may play an important role in enabling timely early action and reducing losses.

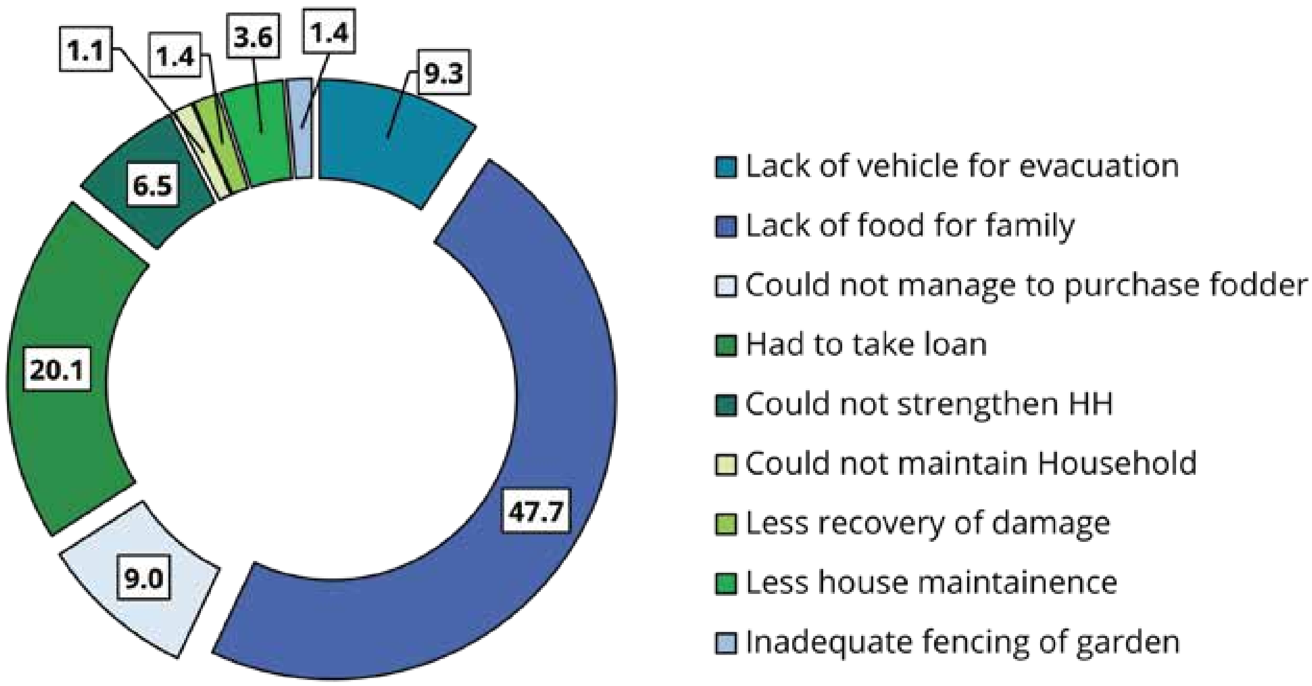


Figure 28 Constraints faced by households taking Early Actions without cash support

3.8 Return on Investment (ROI)

3.8.1 Analytical Framework

The economic performance of the anticipatory action intervention was assessed using the avoided-loss valuation method. This approach is widely used in international evaluations of early warning systems and anticipatory cash assistance, where benefits are quantified as the monetary value of losses that would not have occurred had timely early action been taken. In this analysis, anticipatory cash support provided to at-risk households was treated as the primary investment. At the same time, the value of losses avoided through early warning–enabled actions was considered the economic return.

3.8.2 Data Sources

The analysis was based on primary data collected through a post-event household assessment. For each beneficiary household, the following information was recorded:

• **Total Avoided Loss per Person (BDT):**
Self-reported monetary value of assets, livelihoods, and expenditures that were protected or not lost as a result of acting on early warning information (e.g., household assets, relocating valuables, protecting livestock, avoiding repair or replacement costs).

• **Cash Support per Person (BDT):**
Fixed anticipatory cash amount provided to each eligible household prior to the hazard event to facilitate early action.

3.8.3 Benefit Estimation

The economic benefit for each household was defined as the total avoided loss per person, calculated as:

$$\text{Benefit}_i = \text{Total Avoided Loss per Person}_i$$

This avoided-loss estimate represents the counterfactual difference between the expected losses in the absence of early action and the actual losses experienced after early-warning–triggered preparedness measures were implemented.

To maintain analytical conservatism and reduce the risk of overestimation, only direct, tangible losses reported by households were included in the benefit calculation.

3.8.4 Cost (Investment) Estimation

The investment cost was defined as the anticipatory cash transfer provided per person, calculated as:

$$\text{Cost}_i = \text{Cash Support per Person}_i$$

Operational, administrative, and system-level costs were excluded from the ROI calculation in order to isolate the economic efficiency of the cash support component.

3.8.5 ROI Calculation

Return on Investment (ROI) was calculated for each analytical group using the standard economic formula:

$$ROI = \frac{Beneft - Cost}{Cost}$$

Where:

Benefit = Total avoided loss per person (BDT)

Cost = Cash support per person (BDT)

ROI values are presented as ratios, indicating the net economic return generated per unit of cash invested.

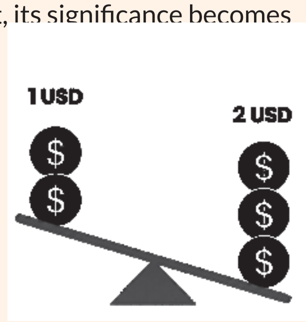
3.8.6 Economic Effectiveness of Anticipatory Action

3.8.6.1 Estimated Economic Returns for Households Receiving Cash Support

The assessment indicates that beneficiaries who received early warning information together with anticipatory cash support were able to avoid an average loss of BDT 14,355 per household by taking timely early actions. Each beneficiary received a fixed anticipatory cash transfer of BDT 5,000, which served as the primary financial input to support preparedness and anticipatory measures.

Key Findings of Estimated Economic Returns for Households Receiving Cash Support

Using an avoided-loss–based return on investment (ROI) framework, the estimated ROI for cash-supported households was 1.87. This indicates that every $1 invested through anticipatory cash assistance generated avoided losses of approximately $2 (Ref to Annex). While the ratio itself is important, its significance becomes clearer when considered against household income levels and coping capacity. For many affected households, the avoided loss represents a substantial share of monthly income, approximately 2 times. This effectively protects resources that would otherwise take months or even a year to recover through regular earnings.



This finding is particularly significant in landslide-prone contexts because the early actions taken by households are not minor adjustments; they are often fundamental "do-or-die" measures. In most cases, the anticipatory cash was used for actions such as house strengthening or relocation to safer areas, both of which require relatively large, immediate expenditures that are difficult for low-income households to mobilize on short notice. Unlike other anticipatory action scenarios where investments may primarily protect cash crops or movable high-value materials, this context involves households with limited financial resilience needing to invest substantial amounts, which are more than two times of the average monthly income, to safeguard their homes and move family members out of harm's way. As a result, the economic value of anticipatory cash support is reflected not only in the ROI calculation but also in the fact that it enabled households to take essential protective actions that would otherwise be financially out of reach.

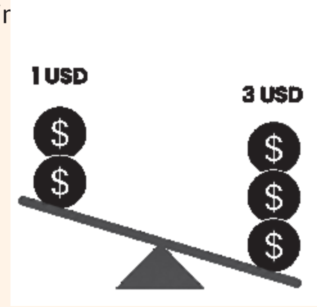
3.8.6.2 Estimated Economic Returns for Households Receiving Proxy Support

On average, participants who did not receive anticipatory cash support were able to avoid losses of BDT 21,738 per person by receiving and acting on early warning information. Although no direct cash assistance was provided, these households implemented early actions using their own resources to reduce potential landslide impacts.

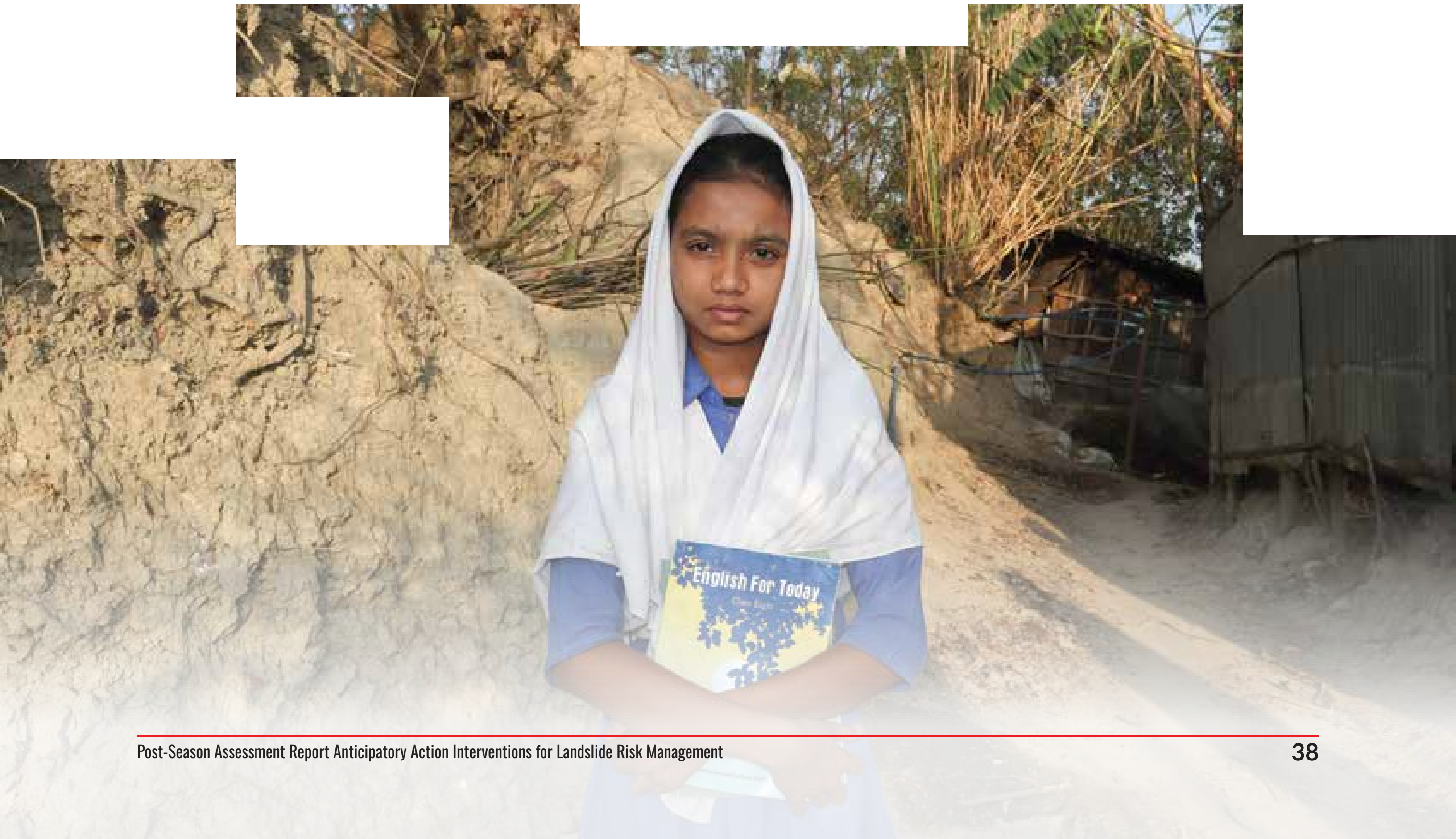
Findings from the FGDs indicate that households generally require BDT 5,000–6,000 to carry out basic early action measures. For the purpose of this analysis, an average cost of BDT 5,000 per household was applied to keep synchronization with the amount of cash support. Common actions reported by communities included reinforcing houses with bamboo and rope, stabilizing vulnerable slopes using geobags, constructing temporary drainage channels to divert rainwater, and covering weak hill slopes with plastic or polythene to reduce water infiltration.

Key Findings of Estimated Economic Returns for Households Receiving Proxy Support

Using an avoided-loss–based return on investment (ROI) approach, the estir participants was 3.34. This indicates that the **economic value of avoided losses was more than three times higher** than the assumed cost of early action (Ref to Annex). FGDs further confirmed that landslide events often result in the complete loss of houses and essential household assets, with damage frequently exceeding three times the average monthly household income, making recovery through regular earnings extremely difficult.



It should also be noted that, since this "three times" benchmark applies to non-cash households, the significance of avoided losses for cash-supported households is likely even higher given their comparatively lower income levels. At the same time, in landslide contexts, the investment cost at the household level is relatively high because substantial expenditure is often required to protect each family through house strengthening or relocation. As a result, compared to other hazards where lower-cost measures may protect high-value crops or materials, the return on investment in landslide anticipatory actions may appear comparatively lower because the upfront protection costs are inherently higher. It is important to note that this ROI reflects only the monetary value of avoided losses and does not capture the lifesaving benefits of timely early action, which are unquantifiable but represent the greatest and most critical outcome of anticipatory measures in landslide-prone settings. Overall, these findings reinforce that early warnings and anticipatory actions, whether supported by cash or implemented through household resources, play a critical role in enabling timely and targeted measures that protect lives, reduce asset loss, and strengthen household resilience in landslide-prone areas.



4. SUMMARY OF FINDINGS FROM FOCUS GROUP DISCUSSIONS (FGDS) and Case Stories

The Focus Group Discussions (FGDs) conducted across selected unions in the Lama and Naikhongchhari upazilas of Bandarban District, as well as in landslide-prone wards of the Chattogram City Corporation and Banshkhali upazila, provided in-depth qualitative insights that complement and contextualize the individual household survey findings. Overall, FGDs confirmed that landslides remain the most severe and recurrent hazard, frequently occurring in combination with flash floods, and in some locations further compounded by cyclones, riverbank erosion, wild elephant movement, and fire hazards.

4.1 Landslide Risk Severity and Major Historical Impacts

Participants consistently described landslides as a long-standing and structural risk, rather than isolated or rare events. Communities recalled multiple major and fatal landslide incidents over the past decade. In Lama Upazila, participants cited incidents where six to ten people died in single landslide events, particularly in 2017, with additional fatalities reported in subsequent years, including 2019, 2022, 2023, and 2024. In Naikhongchhari, FGDs highlighted repeated landslides affecting the same wards almost every year, resulting in loss of life, destruction of houses, and damage to agricultural land.

In Chattogram City Corporation, participants reported child fatalities linked to landslides and flash floods, particularly in densely populated hill settlements with poor drainage and houses located directly below unstable slopes. These experiences have deeply influenced community risk perception and underscore that landslides remain a life-threatening and recurring hazard in both rural and urban hill contexts.

4.2 Landslide and Flash Flood Events Experienced

FGDs confirmed that landslides and flash floods occurred again during the current reporting year, particularly during peak monsoon months. In Lama Upazila, participants reported landslides affecting several wards, resulting in damage to houses, local roads, and community infrastructure, and in one case, a religious structure was directly impacted by a landslide. Communities in Naikhongchhari reported landslide incidents during August that caused house damage and livelihood losses, and one fatal case was cited where an individual engaged in livelihood activities in a remote hill area did not receive early warning information prior to the event.

In Chattogram City Corporation, FGDs reported minor to moderate landslides and mudflows during heavy rainfall in July-August this year, leading to partial house damage, blocked access roads, and livestock losses. Flash floods occurring simultaneously with intense rainfall were reported to have heightened risks for children, particularly in low-lying and poorly drained areas. Although not all events caused fatalities, participants emphasized that the current year once again demonstrated the predictable and recurring nature of landslide risk during the monsoon season. FGDs revealed that a proportion of landslide incidents are not openly disclosed or formally reported at the community level, leading to potential underestimation of landslide frequency and impacts.

4.3 Early Warning Dissemination and Application

FGDs validated that early warning information is now disseminated through multiple channels, including voice messages, volunteer-led public miking, mosque announcements, and coordination meetings of Union Disaster Management Committees (UDMCs). Where warnings were received with sufficient lead time, communities reported taking timely preparedness and early actions, including evacuation, house strengthening, and drainage clearance. However, FGDs highlighted persistent last-mile communication gaps, particularly in remote wards and paras with limited or no mobile network coverage. In such locations, early warning dissemination often depends on door-to-door communication or volunteers traveling on foot, which can delay message delivery by several hours or even a full day. Participants also noted that hand miking is often ineffective in hilly terrain due to limited sound coverage, difficult access, and electricity outages.

4.4 Community-Level Early Actions

Following receipt of early warnings, households reported undertaking several anticipatory actions, including:

- Temporary evacuation to safer locations or shelters.
- Strengthening houses using ropes, bamboo, and temporary supports.
- Clearing and constructing temporary drainage channels.
- Covering exposed hill slopes with polythene sheets.
- Relocating livestock and safeguarding important documents.

FGDs indicated that these actions typically required BDT 5,000–6,000 per household, yet were widely perceived as effective in reducing damage, preventing injuries, and protecting assets, in some cases valued at BDT 20,000–30,000.

4.5 Evacuation Barriers and Shelter Constraints

Despite increased awareness of landslide risk, FGDs highlighted ongoing barriers to evacuation, including poor road conditions, lack of transportation during heavy rainfall, long distances to shelters, and concerns about livestock safety and asset security. Participants also emphasized limitations in shelter facilities, particularly shortages of food, essential medicines, safe drinking water, sanitation facilities, and adequate space, which discourage timely evacuation.

4.6 Capacity Gaps and Priority Needs

FGDs consistently highlighted the need for:

- Ward-level training, drills, and simulation exercises
- Expansion of volunteer coverage in remote areas
- Improved last-mile communication tools, particularly walkie-talkies
- Basic emergency equipment, including hand mikes, stretchers, emergency lights, raincoats, ropes, umbrellas, life jackets, plastic boats, and geobags

Geobags were repeatedly identified as essential for temporary slope protection, drainage management, riverbank erosion control, and safer movement in landslide-prone areas.

4.7 Case Stories

4.7.1 Case 1: Ms. Tumpa Barua, 1 No Ward, Naikhongchhari Sadar, Bandarban

Ms. Tumpa Barua, a resident of Ward 1 in Naikhongchhari Sadar, reported experiencing significant losses during previous landslide events, when a portion of her house was severely damaged, and muddy runoff entered the dwelling, resulting in extensive damage to household assets. During the current year, she received Landslide Early Warning information through voice messages and miking by volunteers. Acting on the warning, she evacuated to a designated shelter with her children and elderly family members to ensure their safety. Using the anticipatory cash support provided through the project, she purchased dry food items to meet her family's immediate needs while in the shelter. In addition, prior to evacuation, she bought some polythene and undertook preventive measures with it. For instance, she covered the most vulnerable section of her house with this polythene to reduce the impact of muddy runoff. Following the extreme rainfall event, Mrs. Barua reported that her house remained largely intact, with only a small amount of mud entering the structure. No household assets were damaged, and only a minor portion of the kitchen was affected. She emphasized that timely early-warning information, combined with anticipatory cash support, enabled her to take effective early actions that significantly reduced damage and protected her family and assets.

4.7.2 Case 2: Ms. Samsun Nahar, Aziznagar, Lama, Bandarban

For several years, Ms. Samsun Nahar, a resident of Ward 2 in Aziznagar Union, Lama Upazila, has faced repeated losses to her small vegetable garden located at the foot of a hill slope behind her house. During periods of extreme rainfall, runoff from the slope regularly carries mud and debris into the field, damaging crops that serve as an important source of household income. During the current year, Ms. Nahar received early warning information on heavy rainfall through a voice message. This voice message was disseminated under the project-supported Landslide Early Warning system, which provides advance rainfall and risk alerts to vulnerable households to support anticipatory action. Acting on the warning, she constructed a temporary drainage channel to divert muddy runoff away from the vegetable plot before the rainfall intensified. The advance notice provided through the voice message gave her sufficient lead time to implement this low-cost preventive measure before peak rainfall occurred. As a result, the crops were protected from flash flooding and mudflow, and no damage was reported. She noted that timely access to early warning information enabled her to take a simple but effective early action that safeguarded her livelihood. This case demonstrates how project-supported early warning translated directly into livelihood protection by enabling practical and timely preparedness measures at the household level.

4.7.3 Case 3: Kauser Jannat, Hospital Para, Lama Sadar, Bandarban

During a period of extreme rainfall in August, Landslide Early Warning information was disseminated through public miking in Hospital Para, Lama Sadar. The warning was issued as part of the project-supported early warning dissemination system, which combines voice messages, miking, and local coordination to alert at-risk households in advance of heavy rainfall. Upon receiving the warning, she attempted to strengthen her house, which is located in a highly vulnerable area beside a stream pathway and at the foothill of a steep slope. She was unable to evacuate to shelter due to the slippery and unsafe access route, and because available shelter facilities were considered inadequate for her family's needs. To reduce risk, she reinforced the structure using tree poles and polythene and placed a limited number of geobags and polythene sheets on the adjacent slope. These actions were taken immediately after receiving the early warning, reflecting increased awareness of

landslide risk and the importance of preparedness before peak rainfall. However, a landslide occurred at night and washed away the geobags, polythene, and even the supporting poles, resulting in damage to her house. She reported that her kitchen collapsed, leaving the household without cooking facilities and causing severe hardship for several days. She noted that if sufficient funds had been available in advance, she could have purchased additional geobags to stabilize the slope more effectively and stocked dry food to better support her family during the emergency period. Her experience highlights two key lessons: first, timely early warning enabled her to take protective measures before the landslide occurred; second, limited access to anticipatory resources and safe evacuation options reduced the effectiveness of preparedness efforts. The case underscores the importance of combining early warning with adequate cash or material support and improved shelter access to strengthen household-level resilience in high-risk locations.

4.7.4 Case 4: Parvin Akter, Ward 14, Chattogram City Corporation

Ms. Parvin Akter, a mother of three, lives in a highly vulnerable location adjacent to a hill slope in Ward 14 of Chattogram City Corporation. Due to persistent security concerns and the physical risks associated with evacuation, relocating to a shelter during emergencies is often not possible for her household. Each year, episodes of extreme rainfall trigger landslides in the surrounding area, frequently damaging her home and, in some instances, completely destroying her kitchen. She also recalled past flash flood events during which household assets were washed away. In previous years, limited access to timely early warning and evacuation support increased the household's exposure to risk during heavy rainfall events. During the current year, although she did not receive anticipatory cash support, Ms. Akter received Landslide Early Warning information through voice messages. These voice messages were disseminated under the project-supported early warning system, designed to provide advance notice of heavy rainfall and landslide risk to vulnerable households. She reported closely following the warnings and taking early actions to reduce risk. As evacuation was not feasible, she strengthened the structure of her house and kitchen and cleared drainage pathways to divert runoff from the hill slope away from the dwelling. The advance notice enabled her to act before peak rainfall, allowing her to implement protective measures in time. As a result, during the recent rainfall event, her household avoided major structural damage and experienced significantly lower losses than in previous years. This case demonstrates how project-supported early warning information improved household preparedness and risk management, even in situations where evacuation was not possible, thereby reducing exposure and potential losses.

5. KEY CHALLENGES AND RECOMMENDATIONS

5.1 Key Challenges

- Persistent last-mile early warning gaps due to poor or disrupted communication channels (for example, mobile networks), limited volunteer coverage, and ineffective hand-miking in hilly terrain.
- Uneven access to anticipatory action capacity, including limited cash, materials, geobags, and preparedness tools, especially in remote wards.
- Evacuation and shelter constraints caused by poor road conditions, lack of transport, livestock safety concerns, and inadequate shelter facilities.
- Limited ward-level coordination and preparedness, with unclear roles, and reduced volunteer engagement due to high-risk terrain.
- Underlying and compounding risk drivers such as deforestation, hill cutting, jhum cultivation, poor drainage, flash floods, and repeated displacement.
- Gaps in multi-hazard risk assessment and planning approaches in hilly areas, limiting the ability to anticipate and manage compound and cascading hazard impacts.
- Limited representation and engagement of communities in wider coordination and learning platforms related to anticipatory action and preparedness.
- Lack of information and constraints in accessing and operationalizing formal financing and support mechanisms for early action at local government and committee levels.
- Inconsistent continuity of community preparedness support over time, including limited routine practice, refresher learning, and sustained awareness activities.
- Practical limitations in evacuation and shelter readiness, including resource and service constraints that reduce the effectiveness of safe movement and temporary protection for households.

5.2 Key Recommendations

- Strengthen last-mile early warning dissemination through expanded ward-level volunteers, satellite internet, walkie-talkies/HAM radio stations, hand-mikes, megaphones, and multi-channel communication.
- Prioritize the integration of multi-hazard risk analysis in hilly regions, recognizing the compound and cascading impacts associated with landslides.
- Improve ward-level preparedness and response capacity through localized training, and clear assignment of early warning focal persons.
- Promote increased community engagement in national and global anticipatory action platforms and coordination mechanisms.
- Orient the Disaster Management Committees (upazila, union, and ward levels) on accessing and utilizing government-led Anticipatory Action financing mechanisms.
- Enhance evacuation feasibility and shelter effectiveness by providing evacuation equipment, temporary shelters, livestock-inclusive arrangements, and minimum shelter services.
- Scale up anticipatory and community-led early actions by pre-positioning geo-bags, supporting low-cost household preparedness, and continuing anticipatory cash or in-kind support.
- Address underlying landslide risk drivers through nature-based solutions, including slope vegetation, improved drainage, waste management, and awareness of unsafe land-use practices.
- Support communities in strengthening continuous climate risk resilience through capacity-building initiatives, including risk management strategies, awareness campaigns, simulations, and drills.

6. CONCLUSION

This Post-Impact Assessment concludes that the anticipatory action interventions for landslide risk management in Chattogram and Bandarban, implemented by Save the Children with RIMES, ASHIKA, and YPSA, and supported by ECHO, have demonstrated clear value in reducing disaster impacts, strengthening preparedness behavior, and improving community decision-making during the 2025 monsoon season. The evidence indicates that landslide risk in the Chattogram and Bandarban is not episodic or exceptional but structural, recurrent, and increasingly predictable, shaped by a combination of intense short-duration rainfall, fragile hill geology, deforestation, unplanned settlements, and repeated displacement. Even in a year without prolonged riverine flooding, landslides continued to cause damage, displacement, and fatalities, reaffirming that landslides require dedicated anticipatory mechanisms rather than reliance on flood-centric preparedness systems.

From a post-impact perspective, the assessment demonstrates that early warning information meaningfully altered risk outcomes. Communities that received Landslide Early Warnings showed higher levels of risk recognition, earlier decision-making, and greater uptake of protective actions, particularly evacuation to safer locations. The high level of trust in warning accuracy and the rapid translation of information into action indicate that early warning has moved beyond awareness-raising and has become an operational tool influencing household behavior. Importantly, the assessment confirms that early warnings were not only individually consumed but also socially transmitted, amplifying their reach through community networks and reinforcing collective preparedness.

The findings further establish that anticipatory action is most effective when information is combined with enabling capacity. Training interventions strengthened communities' ability to interpret warnings, assess risk, and act decisively, while anticipatory cash support reduced financial constraints that often delay or prevent early action. The economic analysis provides compelling post-impact evidence that anticipatory investments generate substantial returns through avoided losses. Households that were able to act early protected assets valued far beyond the cost of preparedness measures, validating anticipatory action as both a humanitarian and economically sound approach to disaster risk management in landslide-prone contexts.

At the same time, the assessment identifies critical structural and operational limitations that constrain impact and equity. Last-mile communication failures remain a defining challenge, particularly in remote hill areas where mobile networks are unreliable or collapse entirely during heavy rainfall. In such settings, dependence on manual dissemination reduces lead time and undermines the consistency of early action. Evacuation decisions are further constrained by inadequate shelters, lack of transport, difficult terrain, and concerns over livestock and asset security. These constraints highlight that early warning alone cannot deliver protection unless supported by functional evacuation systems, accessible shelters, and practical resources at the ward level.

The post-impact findings also reveal important gaps in landslide visibility and documentation. Community discussions indicate that a proportion of landslide events are not formally reported or openly disclosed, especially when impacts are localized or do not result in fatalities. This under-reporting masks the true frequency and cumulative impact of landslides and weakens evidence-based planning and advocacy. Addressing this gap is essential for accurately capturing risk trends and ensuring that anticipatory systems are calibrated to real, rather than perceived, levels of hazard.

In conclusion, the assessment confirms that anticipatory action for landslides is feasible, effective, and necessary in the Chattogram Hill Tracts. Landslide Early Warning systems and anticipatory action interventions have contributed to measurable reductions in loss, improved preparedness behavior, and strengthened community confidence in early warning systems. However, sustaining and scaling these outcomes will require a shift from project-based implementation toward institutionalized, locally embedded systems that address last-mile communication, evacuation feasibility, shelter adequacy, and underlying risk drivers such as unsafe land use and environmental degradation.

Drawing on the key challenges and recommendations identified in this assessment, future strengthening of anticipatory landslide risk management should focus on enhancing last-mile early warning reliability through diversified communication channels, expanding ward-level training and volunteer coverage, improving evacuation and shelter readiness, and ensuring more equitable access to anticipatory cash or material support in high-risk areas. Addressing underlying drivers of vulnerability, including hill cutting, unsafe settlement patterns, drainage limitations, and environmental degradation, alongside strengthening multi-hazard risk analysis and systematic documentation, will be critical for institutionalizing lessons learned.

Overall, the evidence presented in this Post-Impact Assessment underscores that anticipatory landslide risk management should be embedded as a sustained and integral component of Bangladesh's disaster risk management architecture. Early warning systems, preparedness capacity, and anticipatory resources must be systematically aligned to reduce recurrent losses, prevent displacement, and protect lives in highly exposed hill regions.

ANNEX

A. Estimated Economic Returns for Households Receiving Cash Support

The return on investment (ROI) for households receiving cash support was estimated by comparing the average avoided damage with the average amount of cash assistance received.

$$ROI = \frac{14{,}355 - 5{,}200}{5{,}200} \approx 1.77$$

Where:

Average support received: BDT 5,200 per household

Total households supported: 31

Total value of cash support: approximately BDT 445,000

Average avoided damage per household: approximately BDT 14,355

Total avoided damage: approximately BDT 161,200

The calculated ROI indicates that for every USD 1 invested in cash support, households generated an estimated net economic return of about USD 2 through avoided damages.

B. Estimated Economic Returns for Households Receiving Non-Cash Support

The ROI for households receiving non-cash support was estimated by comparing the average avoided damage with the average value of the support received.

$$ROI = \frac{21{,}738 - 5{,}200}{5{,}200} \approx 3.17$$

Where:

Average value of support received: BDT 5,200 per household

Total households supported: 370

Total value of support: approximately BDT 445,000

Average avoided damage per household: approximately BDT 21,738

Total avoided damage: approximately BDT 356,500

The estimated ROI suggests that each USD 1 invested in non-cash support generated approximately USD 3 in net economic returns through avoided losses.

For more information

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