

Unpacking Household Disaster Losses in Post-Conflict Communities: Pathways to Community Resilience – Evidence from Idukki District, Kerala, India

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Abstract

This study examines how landslide affected households in Idukki district, Kerala, experience and recover from disaster losses, and how these micro level processes shape community resilience. This study synthesizes household level evidence on the average economic, productive, and asset losses incurred due to landslide events, providing an integrated assessment of impact severity across the study area. The observed averages indicate that, while losses are moderate on aggregate, they encompass significant damage to agricultural assets, production, and recovery-related expenditures, reflecting both immediate shocks and longer-term livelihood disruptions. By quantifying these losses and integrating them into composite indices and regression models, the analysis establishes a systematic framework for examining displacement, income recovery, and resilience among landslide-affected households, forming a robust empirical basis for targeted policy and resilience planning.

Keywords: household disaster losses, post-conflict communities, community resilience, landslide, Idukki district, Kerala

Introduction

This study examines how landslide-affected households in Idukki district, Kerala, experience and recover from disaster losses, and how these micro-level processes shape community resilience. This study synthesizes household-level evidence on the average economic, productive, and asset losses incurred due to landslide events, providing an integrated assessment of impact severity across the study area. The observed averages indicate that, while losses are moderate on aggregate, they encompass significant damage to agricultural assets, production, and recovery-related expenditures, reflecting both immediate shocks and longer-term livelihood disruptions. By quantifying these losses and integrating them into composite indices and regression models, the analysis establishes a systematic framework for examining displacement, income recovery, and resilience among landslide-affected households,

forming a robust empirical basis for targeted policy and resilience planning.

Literature Review

To a broader concept of this study by linking granular loss assessment with Sustainable Development Goals (SDGs) pathways, particularly SDG2 (Zero Hunger), SDG1 (No Poverty), and SDG 13 (Climate Action), this research provides a robust evidence base for policy formulation focused on building adaptive and resilient agricultural systems in landslide-prone regions. The methodological framework and results offer valuable insights for researchers and policy makers aiming to achieve sustainable agricultural development through risk-sensitive planning and resource allocation.



Methodology

Primary data from 312 affected households were collected through a structured survey capturing pre- and post-disaster income, housing and land damage, loss of productive assets and employment, displacement, and access to government assistance. A Household Loss Index and Agricultural Loss Index were constructed by normalizing and aggregating major tangible loss components under households and agricultural activity of the households. This study also captured the Income recovery ratio and its determining variables in the study area.

Findings

Firstly, the Household Loss Index constructed for this study showed that the 312 landslide-affected households reveal a highly uneven distribution of impacts with important resilience implications. Nearly two-thirds of the households (67.6%) fall under the low loss category (loss index ≤ 0.5), with a low mean loss index of 0.21 and a relatively small total loss value, indicating strong absorptive capacity and the ability to withstand landslide shocks with minimal long-term disruption. In contrast, 17.6% of households experienced medium-level losses (loss index 0.5–1.0), recording a mean loss index of 1.00 and a substantially higher total loss value, suggesting moderate stress where recovery is largely dependent on short-term support and adaptive coping mechanisms. Although only 14.7% of households fall into the high loss category (loss index > 1.0), they account for the largest share of total economic loss, with a mean loss index of 2.00, reflecting severe damage to housing, assets, and livelihoods and indicating low absorptive resilience and heightened long-term vulnerability. The overall mean loss index of 0.56 suggests moderate average losses across the study area; however, the concentration of losses among a small segment of households highlights significant disparities in resilience, underscoring the need for targeted and differentiated resilience-building and recovery interventions for highly affected households rather than uniform policy measures.

The logistic regression analysis was employed

to examine the determinants of household displacement following the landslide event, with displacement status coded as 1 for displaced households and 0 otherwise. The results indicate that government-related factors, household damage costs, and family size are statistically significant predictors of displacement, while proximity to the hazard and property damage alone do not exert a significant influence when other variables are controlled. Specifically, higher levels of household damage significantly increase the likelihood of displacement, underscoring the role of direct physical and economic loss in forcing relocation decisions. Family size shows a negative association with displacement, suggesting that larger households may rely more on internal coping mechanisms or face greater constraints to relocation. The significance of government-related variables reflects the influence of institutional engagement in displacement outcomes, although the marginal coefficient values indicate that these effects operate within a complex recovery context rather than in isolation. Overall, the findings suggest that displacement is primarily driven by the severity of household-level impacts and demographic characteristics rather than spatial proximity alone, reinforcing the importance of targeted household-focused interventions in landslide-prone regions.

The OLS regression results examining the determinants of the income recovery ratio (bounded between 0 and 1) indicate that post-landslide recovery is generally strong across households, while still shaped by clear socio-economic and damage-related factors. The significant and high constant reflects an overall near-complete recovery trend, consistent with field evidence that most households were able to restore income levels over time. The loss index shows a positive and significant association with income recovery, suggesting that households experiencing higher losses often received greater assistance or adopted stronger coping strategies, enabling effective recovery in real-world conditions. Pre-disaster income also positively influences recovery, highlighting the role of existing economic capacity in enhancing adaptive resilience. In contrast, larger family size and higher housing damage costs significantly reduce income recovery, reflecting increased dependency burdens and diversion of resources toward reconstruction rather

than livelihood activities. Variables such as government support, proximity, migration, and property loss do not show significant effects, indicating that income recovery depends more on household-level economic strength and damage exposure than on location or relocation decisions. When viewed alongside the logistic displacement model, these findings suggest that while severe household damage increases the likelihood of displacement, households that avoid displacement or receive adequate support are still able to achieve high income recovery, reinforcing the distinction between physical displacement and economic resilience in landslide-affected communities.

In this study The ALI (Agriculture Loss Index) was developed as a composite metric to comprehensively capture multidirectional landslide-induced damages across eight normalized variables such as area affected (ha), production loss (kg), crop loss value (INR), asset damages (Lakhs- rupees), livestock loss (INR) recovery expenditure (Lakhs- rupees), cultivated area (ha), and pre disaster agriculture income (INR). The Agriculture Loss Index (ALI) applied to 312 landslide-affected farm households indicates a moderate mean impact ($ALI = 0.213$) alongside pronounced heterogeneity in loss exposure, a pattern consistent with the household loss index and regression results presented earlier. While the majority of households experienced manageable agricultural disruption, approximately 10% fall within a high-severity category ($ALI > 0.369$), signaling concentrated vulnerability. Asset damage constitutes the dominant loss component, averaging ₹57.81 lakhs per household and in many cases exceeding annual pre-disaster agricultural income, reinforcing regression evidence that damage intensity is a critical determinant of displacement and recovery outcomes. Production and crop losses are widespread but moderate, whereas livestock losses are limited to a smaller subset of households, reflecting selective yet severe impacts. K-means clustering further distinguishes four loss archetypes severe (9.3%), high (27.2%), moderate (62.8%), and low (0.6%) providing a structured basis for differentiated policy responses aligned with SDG 1 (No Poverty), SDG 2 (Zero Hunger), and SDG 13 (Climate Action). Taken together, the ALI complements the displacement and income-recovery models by demonstrating

that, despite relatively strong average recovery, concentrated agricultural and asset losses continue to shape long-term livelihood resilience in landslide-prone farming systems.

The Integrated SDG impact matrix developed with the help of Cluster Analysis showed a robust empirical basis for advancing multiple Sustainable Development Goals through targeted agricultural resilience interventions in landslide-prone regions. By classifying affected households into four distinct vulnerability archetypes, the analysis translates quantified loss patterns into actionable policy pathways, enabling differentiated strategies aligned with SDG 2 (Zero Hunger), SDG 1 (No Poverty), SDG 13 (Climate Action), and SDG 17 (Partnerships). This structured approach supports evidence-based prioritization of resilience planning and resource allocation across heterogeneous farming systems.

Conclusion

To conclude, the study demonstrates that landslide impacts are not uniformly distributed but are characterized by pronounced heterogeneity in losses, displacement, and recovery outcomes. While average indicators suggest moderate losses and relatively strong income recovery, composite indices and regression results reveal that severe asset damage and household-level vulnerabilities remain decisive factors shaping displacement and long-term resilience. By integrating loss indices, clustering techniques, and econometric models, the analysis provides a comprehensive evidence base for targeted resilience-building and policy interventions, emphasizing the need for differentiated strategies to support highly affected households in landslide-prone regions.