

## Beyond Monetary Value: Understanding the Upside-Down Pattern of Disaster Loss in Marginal Communities

Shinto VP<sup>1</sup>, Anees Rehman A<sup>2\*</sup>, Linda Mary Simon<sup>3</sup>, Jerry Johny<sup>4</sup>, Jyothis Rachel Mathews<sup>5</sup>, Siji Paul V<sup>6</sup>

<sup>1</sup>Assistant Professor, Dept of English, Christ College, Thrissur [shintovp@christcollegeijk.edu.in](mailto:shintovp@christcollegeijk.edu.in)

<sup>2</sup>Assistant Professor, Dept of Economics, Christ College, Thrissur [aneesrahman10200@gmail.com](mailto:aneesrahman10200@gmail.com)

<sup>3</sup>Assistant Professor, Dept of Commerce, Christ College, Thrissur [drlindamarysimon@gmail.com](mailto:drlindamarysimon@gmail.com)

<sup>4</sup>Assistant Professor, Dept of Business Administration, Christ College of Engineering [jerryjohnyat@gmail.com](mailto:jerryjohnyat@gmail.com)

<sup>5</sup>Assistant Professor, Dept of Business Administration, Ahalia School of Management [jyothisrachel@gmail.com](mailto:jyothisrachel@gmail.com)

<sup>6</sup>Assistant Professor, Dept of Commerce, Christ College, Thrissur [sijipaul@christcollegeijk.edu.in](mailto:sijipaul@christcollegeijk.edu.in)

### Abstract

Disaster impact evaluation remains predominantly monetary, often overlooking the disproportionate burdens faced by low-asset and marginalized households. This study examines 312 vulnerable landslide-affected households in Idukki District, Kerala, to construct a comprehensive Disaster Loss Index (DLI) that assesses losses across multiple dimensions: physical, economic, social, and livelihood. The results reveal an “upside-down” pattern: households with smaller assets report lower absolute monetary losses, yet endure complete destruction and prolonged livelihood disruption. By integrating quantitative index construction with field-level evidence, the study demonstrates that conventional monetary valuation fails to reflect the full scale of disaster-induced deprivation among marginal communities. The findings argue for a shift beyond monetary value toward relational metrics that capture proportional, structural, and livelihood-based dimensions of loss. Such an approach enhances the equity and accuracy of post-disaster assessments and strengthens policy efforts toward inclusive recovery and resilience building.

**Key Words:** Landslide Disaster, Economic Loss, Disaster Loss Index, Marginalized Community, Resilience

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### Introduction

Disasters have always challenged the stability and sustainability of human settlements, but their impacts are rarely distributed evenly across social or economic groups. Vulnerable and marginal communities frequently bear the heaviest burdens, not only because of their geographical exposure but also due to long-standing inequalities that reduce their capacity to prepare, withstand, and recover (UNDRR, 2022). In such settings, the devastation caused by disasters cannot be fully captured by conventional economic valuation or asset-based accounting systems that prioritize the magnitude of monetary loss over the proportion of livelihood erosion. As a result, disaster impact assessments often misrepresent the actual degree of human and material suffering (Wisner et al., 2004; Cutter et al., 2013).

Kerala, located along India’s southwestern coast, has witnessed increasing incidences of climate-induced hazards such as floods and landslides over the past decade. Among its districts, Idukki is particularly prone to recurrent landslides due to its steep terrain, unplanned land use, and fragile ecological conditions (Kumar & Thomas, 2020). While large infrastructural collapses receive attention in economic loss statistics, the destruction of small houses, farmlands, and livelihood assets belonging to poor households often goes unrecognized or undervalued. For these households, the

loss of modest assets such as livestock, tools, or a single dwelling structure may constitute a near-total collapse of their socio-economic foundation. Yet, when measured in strict monetary terms, their recorded losses appear minimal compared to wealthier groups, creating what this study identifies as the “upside-down” pattern of disaster loss representation.

This mismatch between quantitative value and qualitative impact underscores a major methodological gap in disaster research and recovery planning. Traditional frameworks tend to equate the scale of economic damage with the severity of disaster impact, leading to an implicit bias that underestimates the vulnerabilities of marginal communities (Hallegatte & Rozenberg, 2017). Consequently, monetary loss indicators, while efficient for national accounting and insurance estimation, fail to address the contextual dimensions of deprivation—structural fragility, livelihood dependence, and social exclusion—that shape the real experience of disaster. A growing body of scholarship now advocates for inclusive, multidimensional assessment tools that link quantitative loss measures with household-level resilience, proportional deprivation, and capacity to recover (Birkmann, 2013; Cardona et al., 2012).

In this study, 312 vulnerable landslide-affected households were selected from Idukki District to

\*Author for Correspondence: [aneesrahman10200@gmail.com](mailto:aneesrahman10200@gmail.com)

construct a Disaster Loss Index (DLI) integrating economic, structural, and livelihood dimensions. The index captures not only direct financial damages but also secondary impacts such as displacement, livelihood disruption, and asset erosion. Preliminary findings suggest that the pattern of loss is indeed inverted: households with the lowest monetary values of damage often report the highest levels of destruction relative to their total assets. This pattern reflects the structural paradox of disaster vulnerability where those with the least to lose, lose everything.

The study therefore calls for a conceptual and methodological shift beyond monetary value to incorporate relational and proportional approaches in disaster assessment. By recognizing how vulnerability amplifies the experience of loss, such frameworks can improve the fairness and effectiveness of post-disaster recovery programs, policy interventions, and resilience building strategies at the grassroots level. Ultimately, this approach redefines what it means to measure loss—not as a matter of wealth destroyed, but as a measure of well-being, security, and livelihood stability disrupted.

### Literature Review

The assessment of disaster-induced losses has traditionally relied on monetary indicators such as infrastructure damage, property value, and income disruption (Rose, 2004; Hallegatte & Przulski, 2010). Although these measures facilitate cost-benefit analyses and fiscal recovery planning, they tend to obscure the differentiated impacts on marginalized populations whose asset bases are inherently limited (Cutter et al., 2013). For low-income households, a small absolute loss may represent the destruction of their livelihood and physical security, yet such losses appear statistically minor when compared to wealthier groups (Wisner et al., 2004). This discrepancy creates a measurement paradox in disaster research—the smaller the asset, the smaller the monetary loss reported, but the greater the real impact endured.

Scholars have increasingly argued that disaster assessment should extend beyond direct economic valuation to encompass social vulnerability, resilience, and livelihood components (Birkmann, 2013; Cardona et al., 2012). The concept of multidimensional loss integrates non-monetary aspects such as housing quality, access to recovery networks, occupational dependence, and psychological well-being. This approach highlights the relational nature of disaster impacts, where proportional loss and recovery capacity are more critical indicators of vulnerability than sheer financial magnitude (Turner et al., 2003; Pham et al., 2021).

In the Indian context, recent empirical studies have illustrated how disaster risk and resilience vary across socio-economic gradients in rural and highland areas (Kumar & Thomas, 2020; Nair et al., 2022). Landslide-prone regions like Idukki exemplify how steep terrain, fragmented landholdings, and low diversification of income sources exacerbate vulnerability. Despite substantial exposure, the damages recorded in

conventional datasets often appear modest because smallholder households possess fewer monetizable assets. Consequently, policy responses guided solely by value-based estimates risk excluding those most severely affected in proportional terms.

To address these gaps, emerging frameworks propose composite indices that integrate structural, social, and livelihood dimensions into disaster evaluation (Birkmann & Cardona, 2015). Building on this perspective, the present study develops a Disaster Loss Index (DLI) designed to reveal the “upside-down” reality of disaster consequences among marginal communities in Idukki. By combining quantitative indicators with contextual interpretation, the index captures the relational depth of loss and informs more equitable recovery strategies.

### Methodology

#### Study Area

The study was conducted in Idukki District, one of the most landslide-prone regions in Kerala, India. Characterized by steep slopes, fragile soil composition, and concentrated rural settlements, Idukki experiences recurring monsoon-triggered landslides that severely affect agricultural households and marginal communities. The area’s dependence on small-scale farming and limited livelihood diversification amplifies the socio-economic consequences of disasters (Kumar & Thomas, 2020).

#### Sampling and Data Collection

A total of 312 vulnerable households severely affected by recent landslides were purposively selected for the survey. The households were identified through village-level disaster records and local administrative lists of affected families. Structured interviews were conducted using a pre-tested questionnaire designed to capture socio-economic, structural, and livelihood losses.

#### Construction of the Disaster Loss Index (DLI)

The Disaster Loss Index (DLI) was developed as a composite measure to capture multidimensional losses experienced by households. Three major dimensions were identified based on literature review and field observations:

$$X_{ij} = \frac{X_{ij} - X_{min}}{X_{max} - X_{min}}$$

where  $X_{ij}$  is the normalized score for household  $i$  across indicator  $j$  and  $X_{min}$   $X_{max}$  represent the minimum and maximum values of that indicator across all households. After normalization, dimension-wise indices were calculated as the arithmetic mean of constituent indicators. The overall DLI for each household was then computed as the weighted average of the three dimensions

$$DLI_i = \sum_{k=1}^3 w_k D_{ik}$$

where  $w_k$  denotes the weight assigned to each dimension. Equal weights were initially adopted given the interconnected nature of the loss dimensions.

Sensitivity analysis confirmed that varying weights did not substantially alter the relative ranking of households.

**Interpretation and Validation**

Households were categorized into low, moderate, and high loss groups based on percentile cut-offs of the overall DLI distribution. To interpret the “upside-down” nature of the results, the DLI scores were compared with the recorded monetary loss values (in INR). Correlation and cross-tab analyses were used to explore how low-asset households displayed high proportional losses despite reporting smaller monetary damage. Community focus group discussions further validated this pattern, confirming the disconnect between economic valuation and perceived disaster experience.

**Economic Loss Dimension** – captured direct financial losses including damage to house, assets, agricultural land, livestock, and productive equipment.

**Structural Loss Dimension** – measured the physical extent of housing and infrastructure damage, including rating scales for destruction, partial damage, or safe condition.

**Livelihood Loss Dimension** – assessed the disruption of livelihood activities, employment days lost, reduction in agricultural production, and displacement duration. Each dimension comprised several indicators normalized to a unit-free scale using the min–max normalization method to ensure comparability.

**Results and Discussion**

The analysis of 312 landslide-affected households in Idukki reveals a highly uneven pattern of disaster loss, where conventional monetary indicators fail to reflect the depth of deprivation among marginal communities. The composite Disaster Loss Index (DLI), constructed from economic, structural, and livelihood dimensions, shows that many low-asset households fall into the high-loss category despite reporting comparatively small absolute rupee values of damage. This apparent contradiction underscores the central argument of the study: that disaster severity cannot be understood solely through aggregated financial figures, but must be interpreted in relation to household asset bases, housing conditions, and livelihood dependence.

**The Total Loss to the informal households in the study area: An Economic Analysis.**

List of losses faced by the households	Amount in rupees (% of total loss)
house damage	26881000.00 (14.67)
Land loss	117159006.00 (63.97)
Loss on furniture	2567200.00 (1.40)
Loss on home appliances	1488700.00 (0.81)
Loss on food grains	372900 (0.20)
Loss of income from employment	7728630.00 (4.21)
Health cost	169300.00 (0.09)
Loss of offensive measures	5666200.00 (3.09)
Cost on agricultural loss	11538015.00 (6.29)
Cost on animal husbandry loss	1453450.00 (0.79)
Loss on water facilities	986630.00 (0.53)
Loss on sanitation facilities	5249500.00 (2.86)
Other losses	1883200.00 (1.02)
<b>Total Loss</b>	<b>183143731.00</b>

Table: 01

The table presents the aggregate disaster-related losses incurred by all informal households in the study area. According to the estimates, land loss accounts for the single largest component of damage, amounting to 117,159,006 rupees. This is followed by house damage, which constitutes a further 26,881,000 rupees of loss. Substantial losses are also recorded under loss of income, agricultural loss, and the destruction of sanitation facilities such as household latrines and toilets. Given the magnitude of these losses, the primary concern expressed by respondents is the reconstruction of these destroyed assets. Households reported spending substantial amounts from their own resources to rebuild, in addition to the limited support received through government assistance schemes. The specific patterns and sources of reconstruction expenditure are discussed in the subsequent section.

Table 2

Repairing cost spent by the households	Amount in rupees
Roof	20276470.00
Electricity	1836100.00
Walls	16149100.00
Furniture	1613500.00
Kitchen and appliances	1160100.00

Sanitation and water	4823300.00
Defensive measures	3464000.00
Others	2147200.00
<b>Total Cost</b>	<b>51469770.00</b>

The table presents the repair and reconstruction expenditures incurred by informal sector households in the study area. A disaggregated view of their spending indicates that resources were concentrated almost entirely on the construction of new dwellings, with the largest outlays directed towards roofing, wall structures, sanitation facilities, and defensive measures intended to protect against future hazards. Despite these efforts, the reconstruction process for many houses remains incomplete, primarily due to limited government support and the precarious financial position of the affected households. In numerous cases, construction activities were halted midway as families were unable to mobilize additional funds. This situation reflects a broader financing gap, whereby the assistance provided is insufficient to meet the full cost of constructing a safe and adequate house under current economic conditions.

**Disaster Loss Index: Interpretation and Implication**

The Disaster Loss Index (DLI) reinforces the evidence from the loss and reconstruction tables by showing that the highest index scores are concentrated among

households reporting relatively modest absolute rupee losses but extensive damage to land, housing, and basic services (Birkmann, 2013; Cardona et al., 2012). Households that lost small plots of land, single dwellings, and sanitation facilities record disproportionately high DLI values because these assets constituted the core of their livelihood and everyday functioning, a pattern consistent with earlier work on disaster impacts in low-asset settings (Wisner et al., 2004; Hallegatte & Rozenberg, 2017). At the same time, several better-off households with larger absolute monetary losses display lower DLI scores, as the remaining asset base and diversified income sources cushion the overall impact (Cutter et al., 2013; Hallegatte & Przulski, 2010). This divergence between monetary loss totals and DLI rankings illustrates the upside-down pattern of disaster impact in the study area and underscores the need for assessment frameworks that account for proportional and structural loss rather than relying solely on aggregate financial damage (UNDRR, 2022; IPCC, 2014).

Table 3

DLI Range	Severity Level	Interpretation
0.00 – 0.33	Mild	Minor impact of disaster on livelihood, property, and access to services
0.34 – 0.66	Moderate	Noticeable economic or physical disruption; some risk to lives and assets
0.67 – 1.00	Severe	Major losses, high vulnerability, possibly displacement or long-term disruption

**"Mild" in Name Only: The Hidden Severity of Loss Among the Poor**

Analysis of the loss distribution table reveals that the majority of respondents fall within the "Mild" severity category across individual heads of disaster damage. However, this classification requires reinterpretation within the context of economic marginalization: for low-asset households, even "mild" monetary losses

often represent a substantial proportion of their total wealth and livelihood capacity, effectively translating to severe existential threats rather than minimal impact. This underscores the limitations of absolute severity thresholds and reinforces the need for relative, context-sensitive metrics like the Disaster Loss Index to capture true vulnerability among informal sector communities. Table 4

Loss Type	Severity Level	Number of Samples	Percentage
House Damage	<i>Mild</i>	294	94.2
	Moderate	13	4.2
	Severe	5	1.6
Land Loss	<i>Mild</i>	167	92.8
	Moderate	11	6.1
	Severe	2	1.1
Income Disturbances	<i>Mild</i>	168	53.8
	Moderate	70	22.4
	Severe	9	2.9
Damage on Sanitation Facilities	<i>Mild</i>	114	36.5
	Moderate	33	10.6
	Severe	2	0.6

<b>Reconstruction Cost</b>	<i>Mild</i>	224	71.8
	Moderate	55	17.6
	Severe	33	10.6
<b>Respondents on Satisfaction Government incentives</b>	Low	223	71.5
	Moderate	48	15.4
	High	41	13.1
<b>Whole Loss</b>	<i>Mild</i>	254	81.4
	Moderate	43	13.8
	Severe	15	4.8

The composite index constructed in this study categorizes most respondents within the "mild" loss severity level, suggesting limited overall impact from the landslide. However, this numerical classification belies the profound reality of severe disruption experienced by these households, particularly among economically marginalized groups. Low index values primarily reflect the modest monetary worth of destroyed assets rather than the actual scale of devastation, which often entails the complete loss of shelter, land, and livelihood essentials for low-asset families. As the UNDP (2004) observes, "A poor household losing a modest home may be more severely affected than a wealthy household losing a larger, more valuable home, because the former loses a higher proportion of their total assets and may lack insurance or recovery support" (United Nations Development Programme, *Reducing Disaster Risk: A Challenge for Development*). This highlights a fundamental limitation of monetary-based indices and loss calculations, which systematically undervalue the needs of the poor and distort resource allocation for recovery incentives.

Moreover, vulnerability among these communities extends far beyond financial metrics, encompassing their capacity to resist, cope with, and recover from hazards (Wisner et al., 2004). While the "mild" categorization remains statistically valid, it demands careful socio-economic reinterpretation—one that foregrounds the precarious asset bases of informal households and integrates non-monetary indicators of deprivation in disaster-prone regions. Such nuance is essential for equitable policy design and resilience-building efforts.

### Conclusion

This study reveals the critical limitations of monetary-based disaster loss assessments through the Disaster Loss Index (DLI) applied to 312 landslide-affected households in Idukki, Kerala. While conventional metrics classify most losses as "mild" due to low absolute rupee values, the analysis exposes an upside-down reality: for economically marginalized informal households, even modest asset destruction such as small homes, land plots, and sanitation facilities translates to total livelihood collapse and stalled reconstruction.

Key findings demonstrate that land loss, housing damage, and indirect costs like income disruption dominate aggregate damages, yet these fail to capture proportional severity among the asset-poor, who bear the deepest relative impacts. The DLI bridges this gap by integrating economic, structural, and livelihood

dimensions, highlighting how low monetary figures mask existential threats and financing shortfalls that leave households in prolonged vulnerability.

Ultimately, disaster assessment must shift beyond monetary value toward relational, context-sensitive frameworks that prioritize equity, recovery capacity, and non-financial deprivation. Adopting such multidimensional indices in policy design will ensure more just resource allocation, targeted reconstruction support, and inclusive resilience strategies for marginal communities facing recurrent hazards. This approach not only redefines loss measurement but also advances sustainable development goals in disaster-prone regions.

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